ARVIN GOTTLIEB

PLANETARIUM

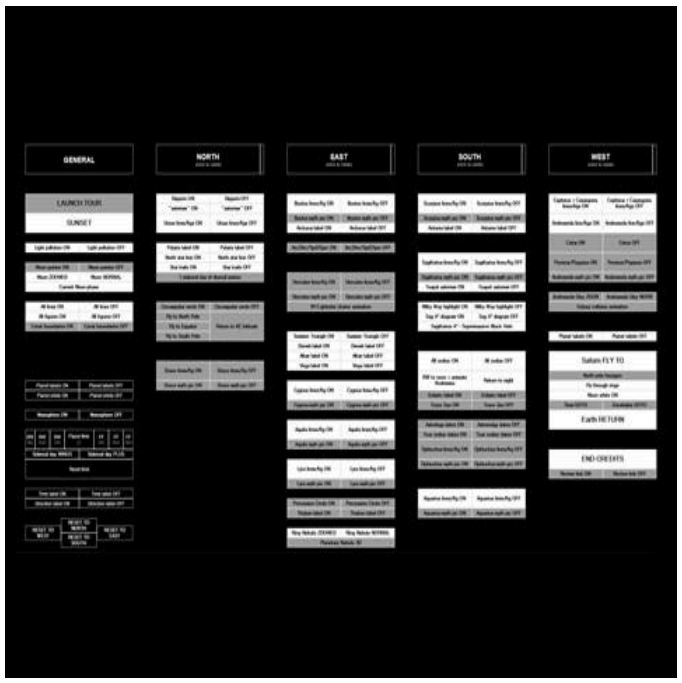
Mid Fall 2025

Last updated: 10/22/25 by P. Hess

INTRO

Launch tour

INTRO

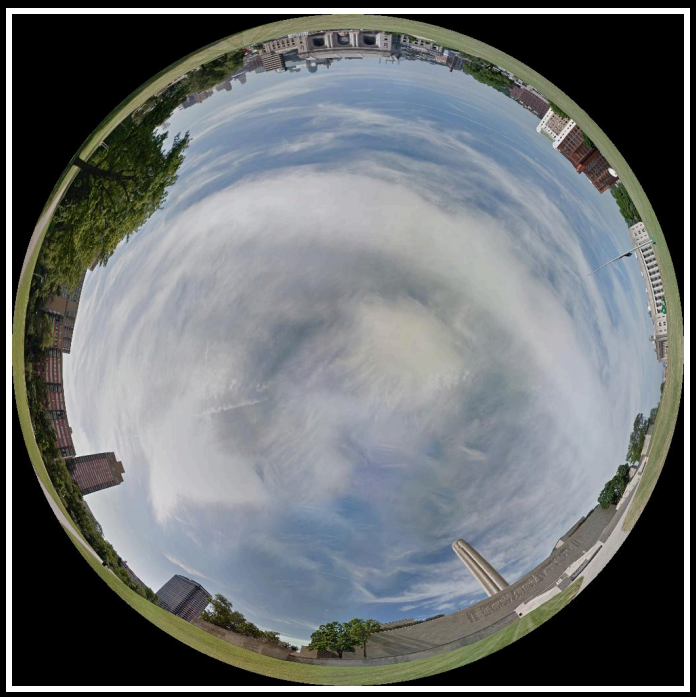


Summary: Set up SkyExplorer software to the current daytime sky view for audience seating.

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

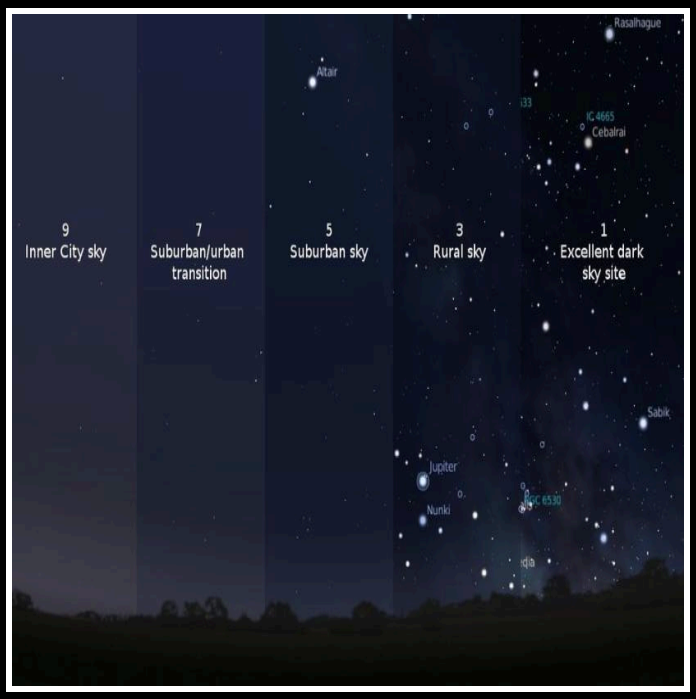


Summary: Introduce setting and timing for tour

Script: “Welcome to “Stargaze Kansas City,” our seasonal star tour! During this 40-minute presentation we will be taking a look at stars, planets, constellations, and deep- space objects that will be visible in our evening sky this season here in Kansas City. 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: Point out the limitations of observing the night sky near a city.

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, hiding the light from fainter stars. Being around so many bright sources of light also leaves our eyes little time to adjust to darkness. Even the Moon can be a large source of light pollution when it is out and visible. 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.”

Moon phase

INTRO

Summary: CHECK PHASE AND LOCATION BEFORE TOUR. Only visible in early evening sky when it is waxing.

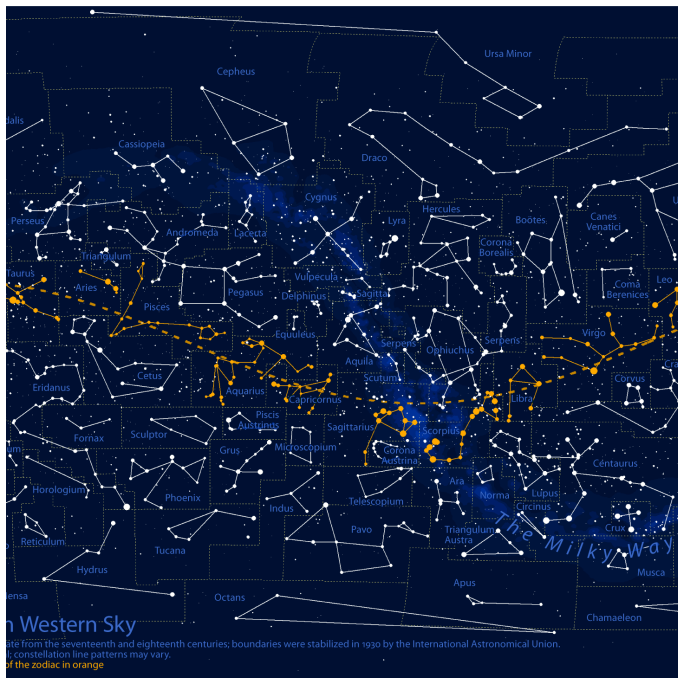
Notes:

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

Script: “Can we see the moon 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.’”

All constellation lines

INTRO



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

Notes:

- International Astronomical Union, 1930

Script: “Constellations have been used by humans for thousands of years as tools to guide travelers on land and sea, to help farmers know when the end of a harvest season approaches, and as representations of the goddesses and gods worshiped by people throughout history. 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.

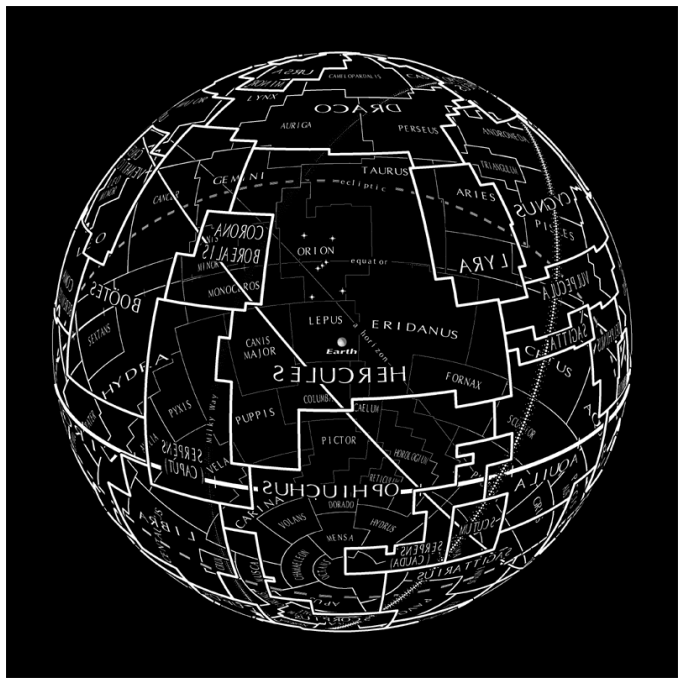
Notes:

- 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 many different mythological traditions. We will be looking at several of these during our tour. Most constellations found in the northern hemisphere were borrowed from Greek mythology, while many in the southern hemisphere were adapted from imagery described by later Western explorers in the 16th through 19th centuries.”

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

Motion sickness/Dippers

NORTH

Summary: See if guests recognize Big and Little Dippers.

Notes:

- during N rotate, discuss motion sickness
- be sure not to call them constellations

Script: "As our view rotates, 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.

"Our northern sky plays host to a very familiar set of star patterns. Many of you are probably already familiar with these two spoon-like shapes in the sky. They are the Big and Little Dipper! Though they are two of the most recognizable groups of stars in the sky, you may be surprised to learn that neither is actually an official constellation."

"Asterisms"

NORTH

ASTERISM	CONSTELLATION
Big Dipper	Ursa Major
Circlet	Pisces
Great Square	Pegasus
Hyades	Taurus
Keystone	Hercules
Kids	Auriga
Little Dipper	Ursa Minor
Little Milk Dipper	Sagittarius
Northen Cross	Cygnus
Pleiades	Taurus
Sickle	Leo
Summer Triangle	
Teapot	Sagittarius
Urn, (Water Jar)	Aquarius
Winter Triangle	

Summary: Define "asterism" and explain their differences & similarities to constellations.

Notes:

- constellation: an internationally recognized pattern and region of stars
- asterism: a pattern of stars not forming an official constellation (or consisting of stars from multiple constellations)

Script: "The 'Big and Little Dipper' are asterisms, which are groups or patterns of stars that are not officially recognized as constellations. Some asterisms are part of larger constellations, like the Big and Little Dipper. Others are made up of stars from multiple constellations. In this case, the stars of the dippers belong to official constellations: Ursa Major and Minor, or the Big and Little bears."

Ursa major & minor

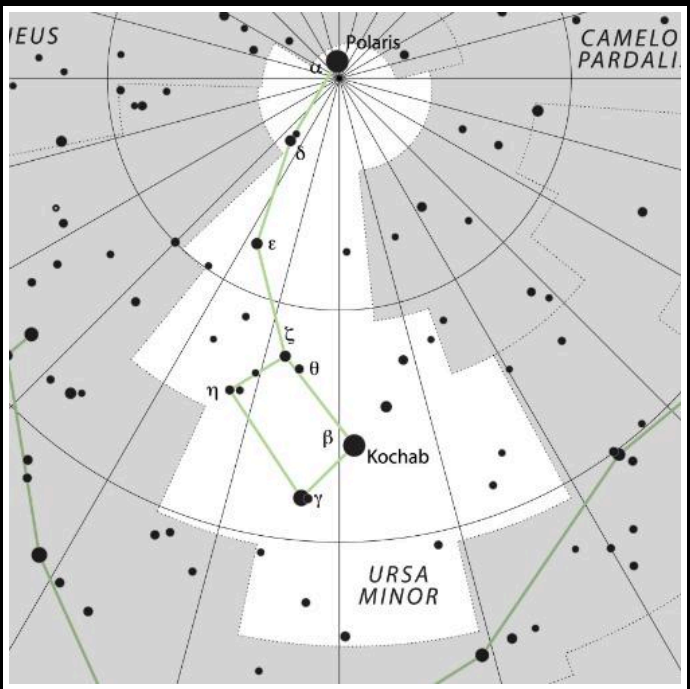
NORTH

Summary: Briefly discuss the mythology of Ursa Major.

Script: “There are many stories about these constellations from various cultures and mythologies. 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.”

Polaris - The North Star

NORTH



Summary: Explain importance of North Star.

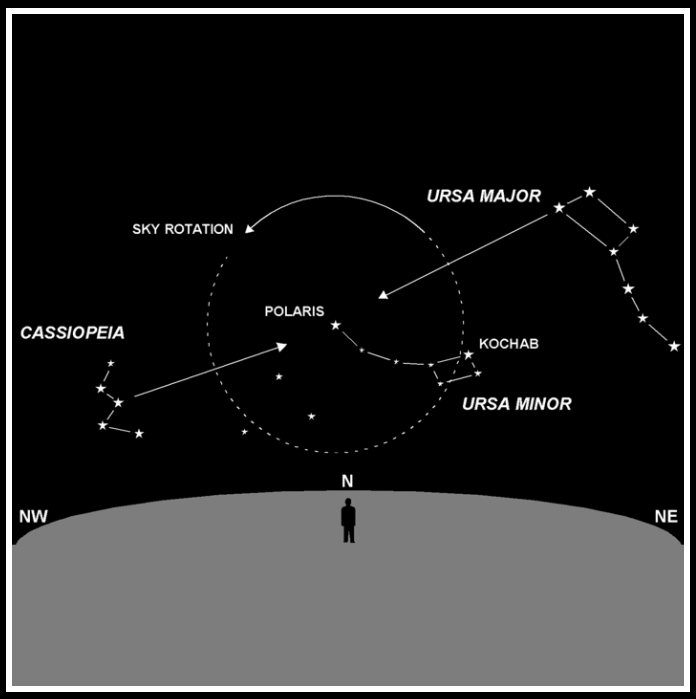
Notes:

- points almost exactly geographic north
- misconception: NOT the brightest star in the sky (it’s the 45th brightest)

Script: “The star at the end of the little bear’s tail is officially known as Polaris. This star has been used by humans for thousands of years for nighttime navigation both on land and sea. It is special because, no matter where you are on planet Earth and no matter what time of night it is, the North Star will always point north!”

North Star line

NORTH



Summary: Technique for finding Polaris.

Notes:

- if the Big Dipper is not visible, use Cassiopeia, which opens toward Polaris

Script: "A technique for finding the North Star, which some of you might be familiar with, is to locate the two stars on the end of the spoon of the Big Dipper and draw an imaginary line through them across the sky. This line points right at Polaris! If you can't find the Big Dipper, you can also use the constellation of Cassiopeia to locate the North Star, as the 'W' of Cassiopeia always opens towards Polaris."

Star trails/diurnal motion

NORTH

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

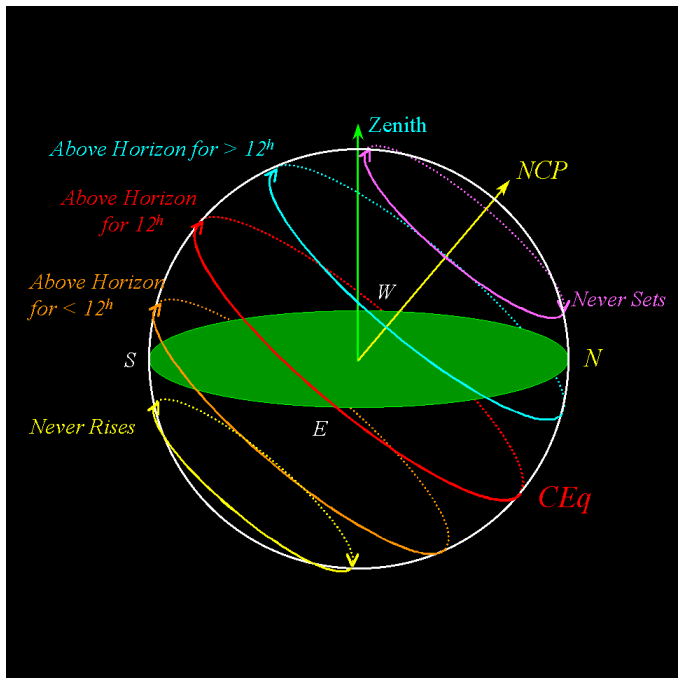
Notes:

- notice how Polaris isn't exactly north

Script: "The planetarium can help to illustrate how the stars and sky move throughout the night. By setting every star in the sky to draw a trail behind itself, then speeding up time, we can very easily see the motions of the cosmos revealed. As the Earth rotates around its axis, the stars appear to circle around our night sky. The point which they all rotate around happens to be Polaris, which explains why it is so special and how it got its nickname."

Circumpolar

NORTH



Summary: Region of sky that stays visible all night.

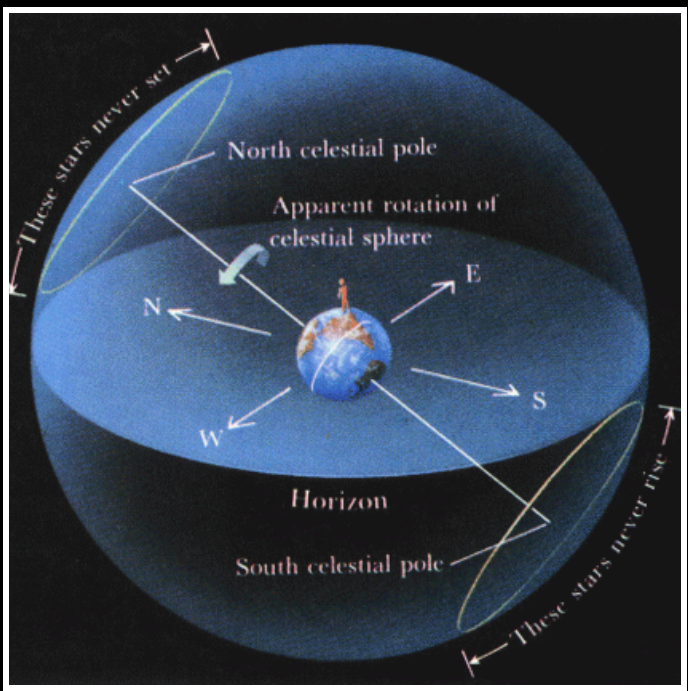
Notes:

- differs in size based on latitude.

Script: "One interesting result of the interaction of Earth's rotation and the night sky, is that depending on where you are observing, a portion of the night sky will likely be visible all night long, no matter the season. We call this region, as well as stars and constellations inside it: circumpolar. This circle describes the region of circumpolar objects here in Kansas City."

Fly north/south/equator

NORTH



Summary: As you go north, the circumpolar circle gets bigger.

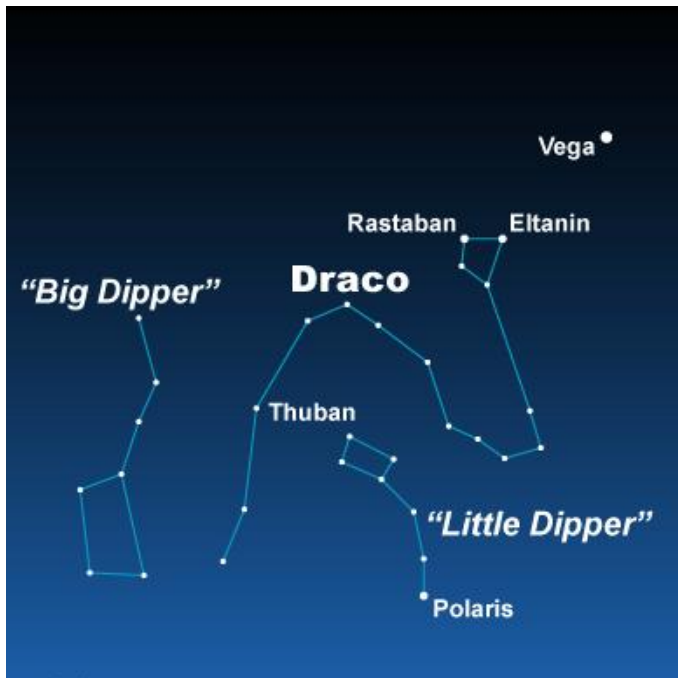
Notes:

- at north pole, Polaris= directly overhead
- farther south than Equator= no Polaris

Script: "The concept of circumpolar is helpful to understanding how the stars and their positions are connected to Earth's geography. Here in KC, we are relatively close to the equator (only 39 degrees away), so Polaris is lower in the sky and the region of circumpolar stars is relatively small. Travel north, and the North Star gets higher in the sky as the circle grows. At the north pole, Polaris is directly overhead and the whole sky is circumpolar. Travel south, and the circle shrinks, until nothing is circumpolar at the equator and Polaris is barely visible.

Draco

NORTH



Summary: Draco the dragon.

Notes:

- 8th largest constellation
- Contains former North Star

Script: "Slithering between the bear constellations is Draco, the Dragon! Historians have debated which mythological dragon that Draco is meant to represent. Some believe that it was Ladon, who guarded the golden apples of the garden of Hesperides and was killed by Hercules during one of his 12 labors. Others say Draco was killed by the goddess Minerva and tossed into the sky upon defeat and became twisted as it froze in the celestial north pole. Draco notably contains the star Thuban, which was once the North Star long ago!"

WEST

The Summer Triangle

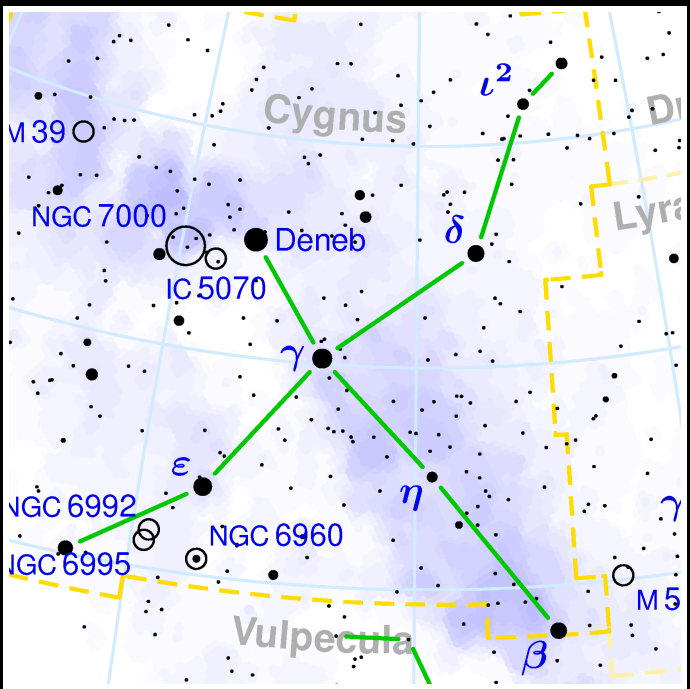
WEST

Summary: Asterism made from 3 stars near Milky Way.

Script: "Overhead after sunset but starting to set towards the west in the fall sky, we find three bright stars, which form a famous triangle asterism known as the Summer Triangle! Before reliable calendars were available, many farmers and navigators used asterisms like the Summer Triangle to help them to identify the changing seasons. When the three stars of the Summer Triangle are all visible after sunset, you know that summer has arrived! The stars of the Summer Triangle are named Deneb, Altair, and Vega, and unlike many other asterisms, these three stars belong to three separate constellations."

Cygnus & Deneb

WEST



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

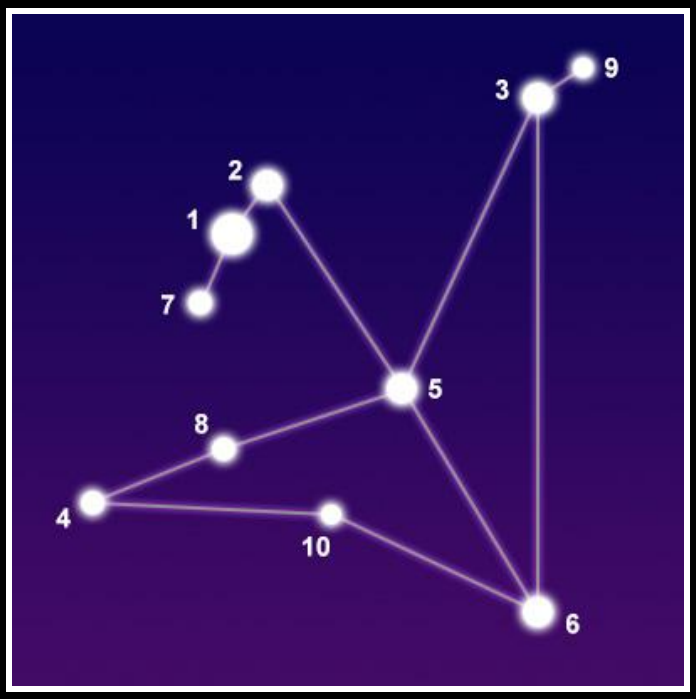
Notes:

- 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: "The constellation containing Deneb 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."

Aquila & Altair

WEST



Summary: Aquila the eagle and its eye Altair.

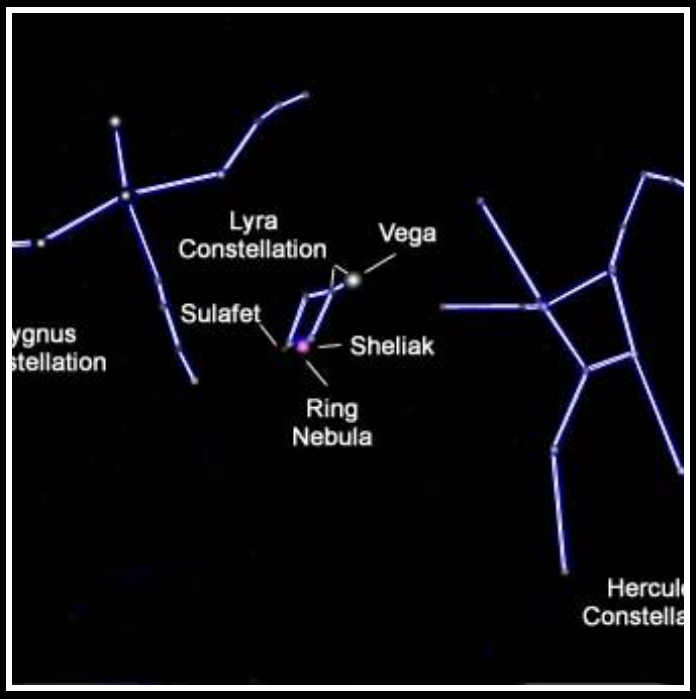
Notes:

- kidnapped the boy Ganymede & brought him to Olympus to be Zeus' cupbearer
- two famous supernovae occurred in this constellation, one in 389 BCE & another in 1918

Script: "The star Altair belongs to Aquila, the eagle. Aquila was the eagle responsible for carrying Zeus' lightning bolts into battle."

Lyra & Vega

WEST



Summary: Lyra the harp, containing Vega

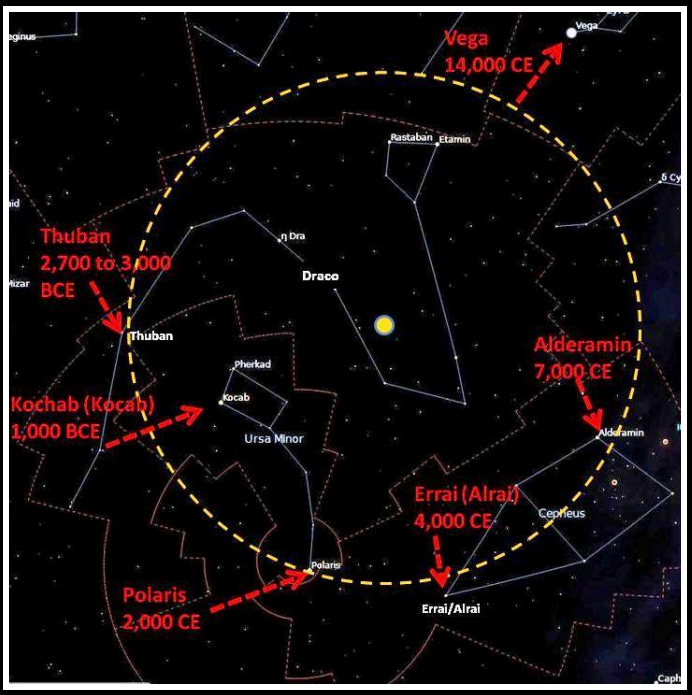
Notes:

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

Script: "Containing Vega, the 5th brightest star, is the constellation Lyra, the harp. 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."

Planetary nebula 3D

WEST

Summary: Discuss stellar death and planetary nebulae.

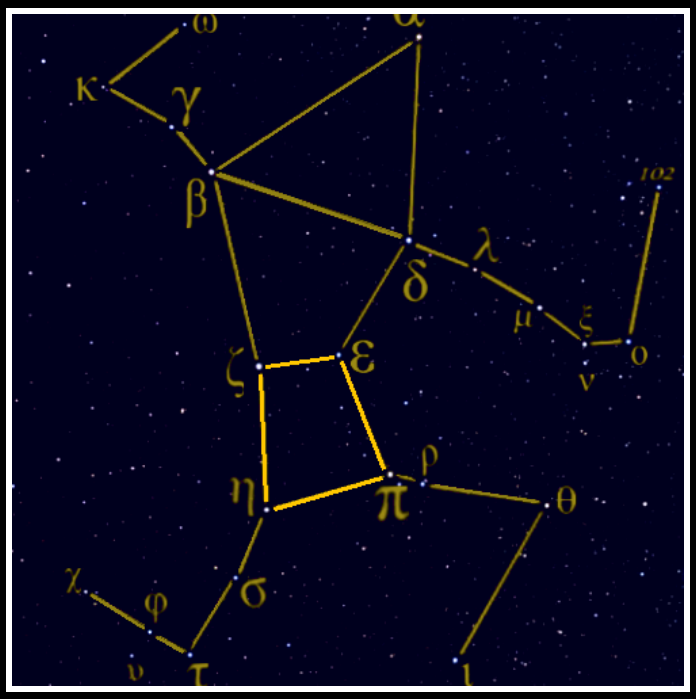
Notes:

- planetary nebula: the remnants of a low-mass star (like our Sun) after it exhausts its fuel supplies late in life
- red = hydrogen, green = ionized oxygen, and blue = helium

Script: “Instead of exploding into supernovae or collapsing into black holes, stars with smaller mass, like our own Sun, will simply dissipate their layers out into space once they exhaust their fuel supplies, leaving behind a hot, inert White Dwarf core and rings of gas known as a planetary nebula.”

Hercules

WEST



Summary: Demi-god hero of antiquity

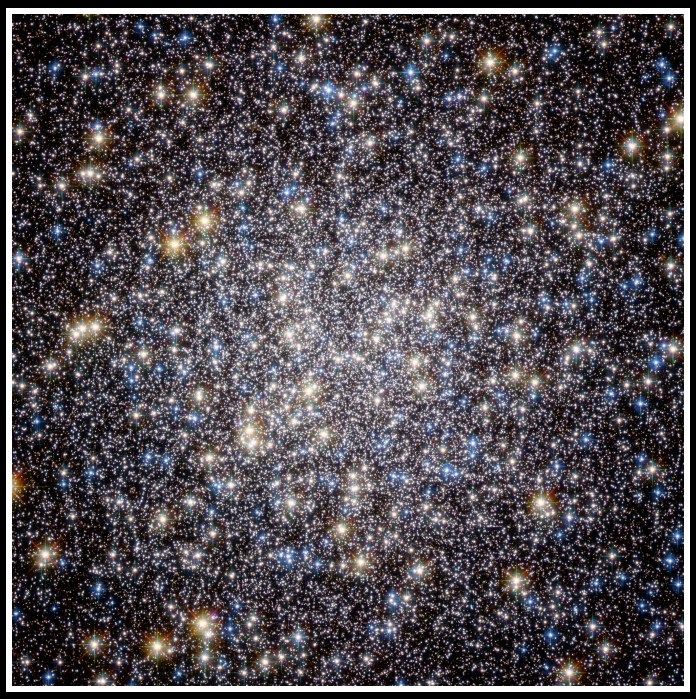
Notes:

- based on Greek hero Heracles
- son of Zeus and a mortal woman
- 12 labors

Script: “One of the bigger spring and summer-time constellations is Hercules. Born of a mortal woman, Hercules was a great hero with god-like strength, thanks to his father being the king of the gods Zeus. Zeus’s wife Hera was not fond of her husband’s meddling with mortal women, so she cursed Hercules with madness, causing him to kill his own wife and children. As penance for his actions, he served the citizens of Ancient Greece by defeating many monsters and accomplishing impossible feats during his famous twelve labors.”

M13 Globular Cluster

WEST



Summary: One of the biggest star clusters in our galaxy.

Notes:

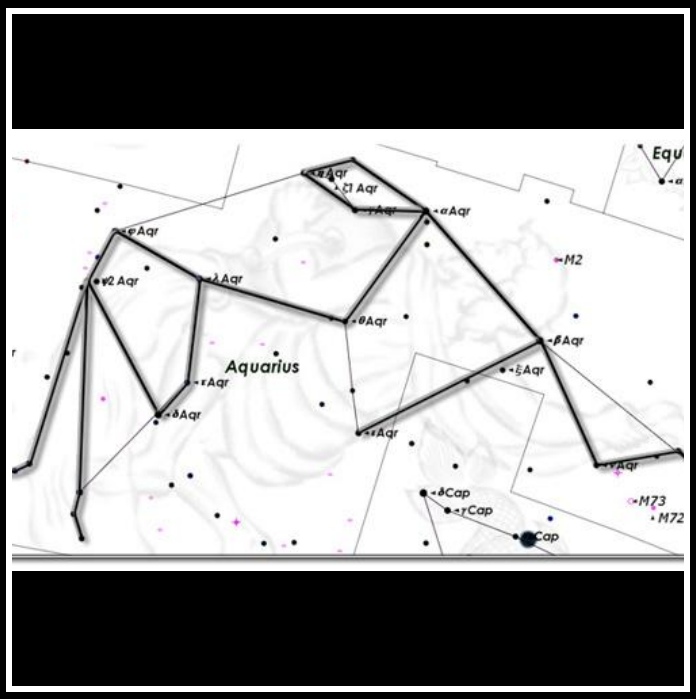
- Over 300,000 stars bound by gravity
- 145 ly in diameter

Script: “One of the first deep-space objects ever discovered can been found in Hercules. Messier object #13 is a gigantic globular cluster containing over 300,000 stars packed more than a hundred-times more closely than the neighboring stars around our Sun. This cluster is so dense with stars that they often collide, creating multiple new stars at a time. Many of the stars of M13 are very close in age, so astronomers think they are siblings born from the same interstellar nebula.”

SOUTH

Aquarius

SOUTH



Summary: Ganymede's constellation form.

Script: "Facing our southern fall skies, we will first look at the constellation 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."

Sagittarius

SOUTH

Summary: The centaur archer.

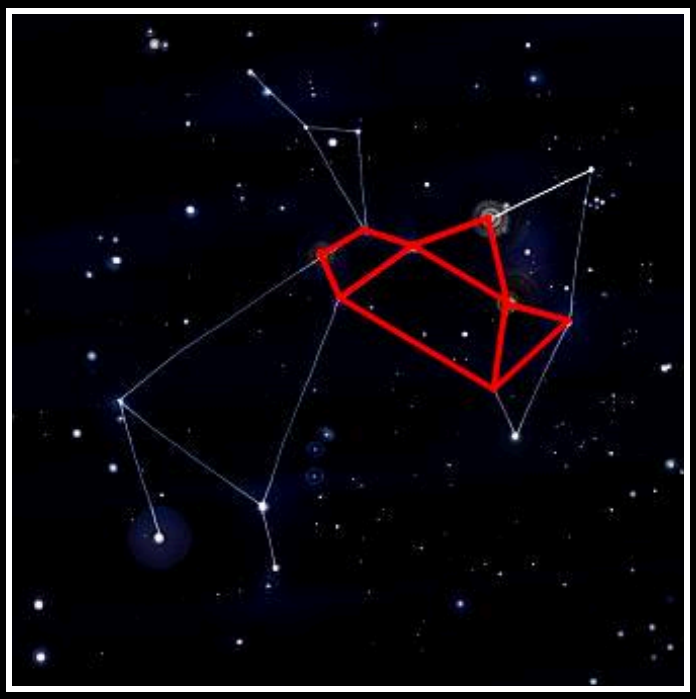
Notes:

- Babylonians: Nergal (war god)
- Greeks: Argonauts & the golden fleece

Script: "Also in our southern sky this season is Sagittarius, the centaur. This constellation depicts an archer, so look for his bow and arm drawing the bowstring back *[TRACE FIGURE]*. The identity of this centaur differs from culture to culture. For example, the Babylonians saw this group of stars as representing their god of war and death called Nergal, whereas the Greeks thought this figure symbolized a centaur who was sent down by the gods to lead the Argonauts in their quest for the Golden Fleece."

Teapot asterism

SOUTH

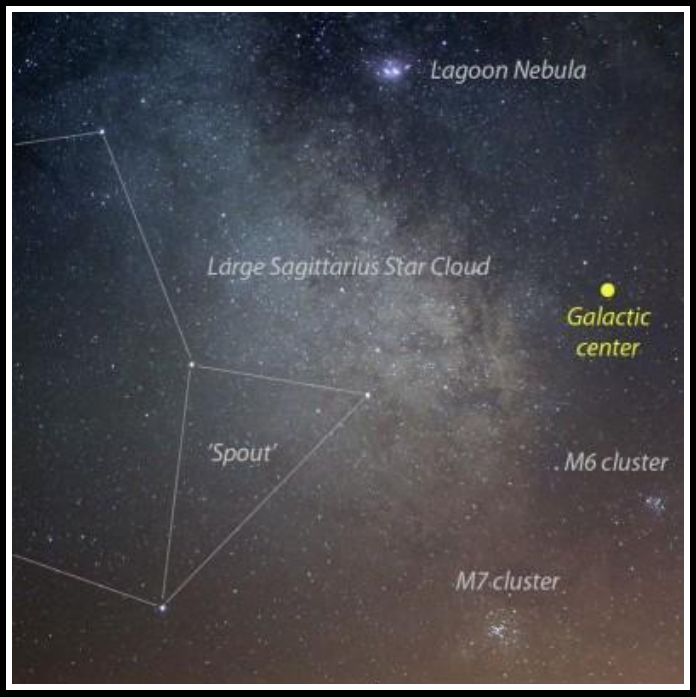


Summary: Helps find Sagittarius and galactic center.

Script: “Many recognize Sagittarius not for its mythological connection, but for a distinctive teapot shape formed by its brightest stars. This is another useful asterism that can help you find Sagittarius. It can also be used to find the center of our Milky Way galaxy! Simply follow the pointy spout of the teapot over towards the brightest portion of our galaxy, and you can find the center.”

Milky Way & galactic center

SOUTH



Summary: Brighten up the Milky Way and discuss features

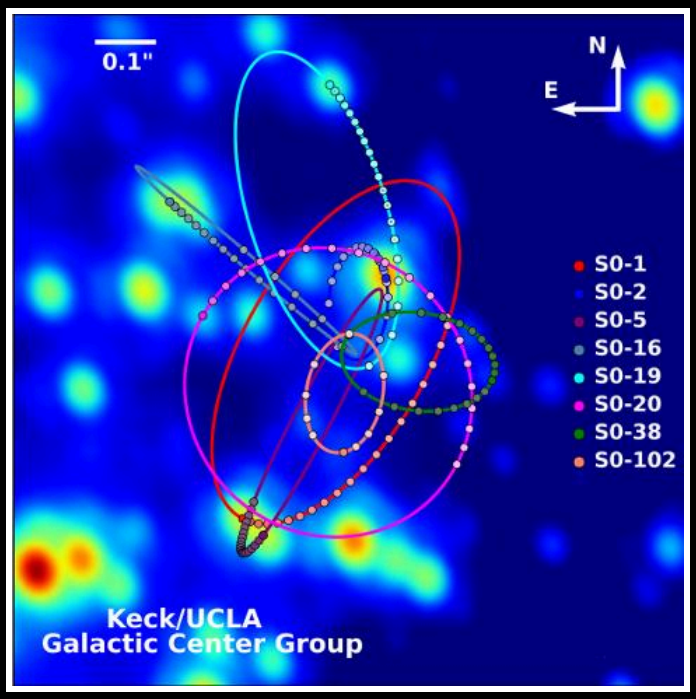
Notes:

- Center is 26,000ly away from us, 1,000,000 stars in span of only 1 ly
- Closest star to our sun is 4 ly away

Script: “The planetarium can brighten the Milky Way so that we can see it more easily. Summer is the best time of the year to observe our galaxy, since we are facing towards the galactic center this time of year, where it appears much brighter. On a clear enough night, you can see the faint glow of the estimated 400 billion stars that make up our galactic neighborhood, as well as the darker clouds of gas and dust where new stars are being born.”

Sagittarius A* diagram

SOUTH



Summary: Proof that a supermassive black hole exists at the center of our galaxy.

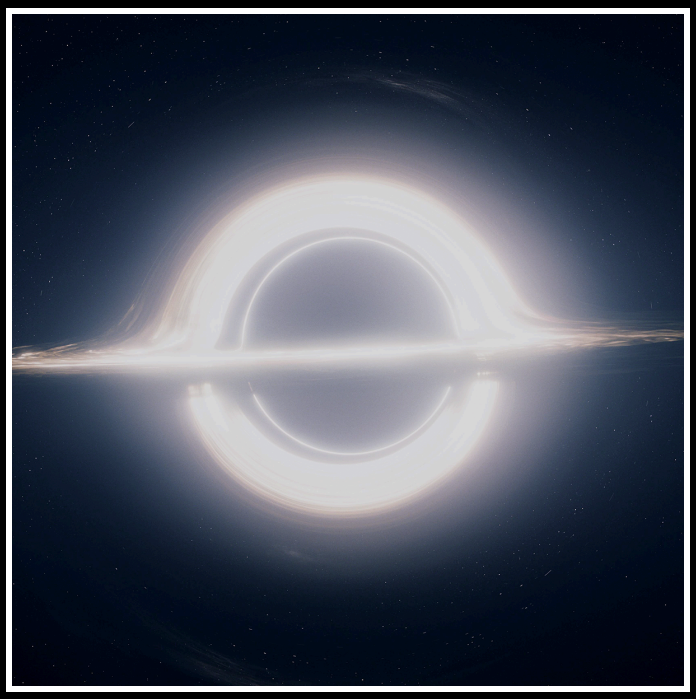
Notes:

- by comparing the object's mass with its diameter (calculated by the speed and position of orbiting stars), we know it must be a black hole

Script: "The center of our galaxy is a region of space densely packed with hundreds of thousands of stars, clusters, and nebulae, circling and swirling around at millions of miles per hour; speeds only made possible by an incredibly massive object at our galaxy's center. Thanks to advances in telescope technology, we have recently been able to peer deep into this gravitational maelstrom, revealing what truly lurks at the center of our galaxy: A supermassive black hole!"

Black Hole simulation

SOUTH



Summary: Simulation of the supermassive black hole at center of the Milky Way.

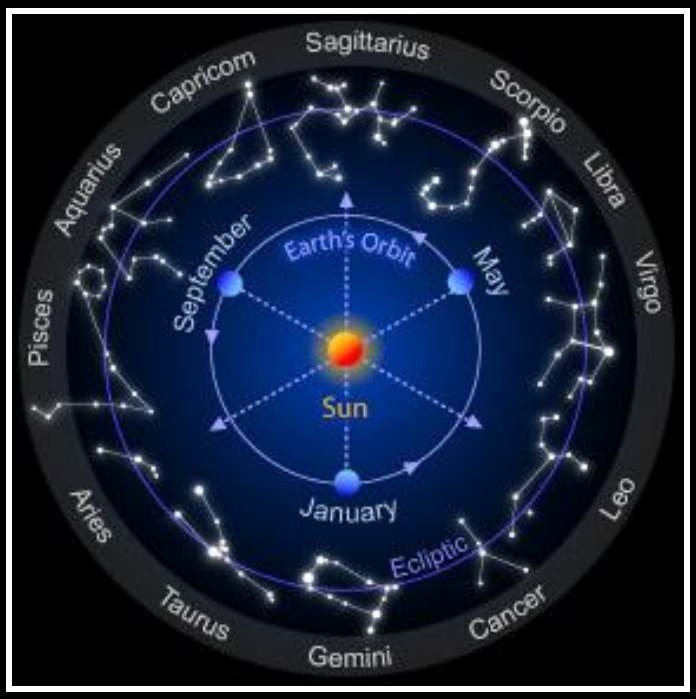
Notes:

- As seen in the movie Interstellar (2014)

Script: "Using advanced physics simulations, we can predict what a black hole might look like up close. As a singularity, the actual black hole itself cannot be seen. The dark disk visible here is called the event horizon, which represents the region where nothing, not even light, can escape the tidal forces of gravity. Materials like gas and dust that approach the black hole form a flattened band of spinning matter called an accretion disk, which glows brightly as particles are accelerated to speeds approaching the speed of light."

12 zodiac constellations

SOUTH

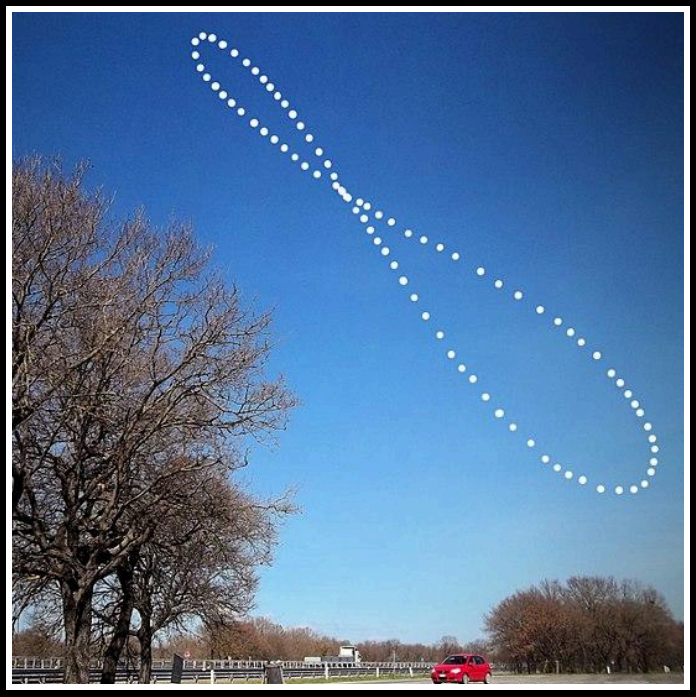


Summary: Introduce the constellations of the Zodiac and relate to astrology.

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.

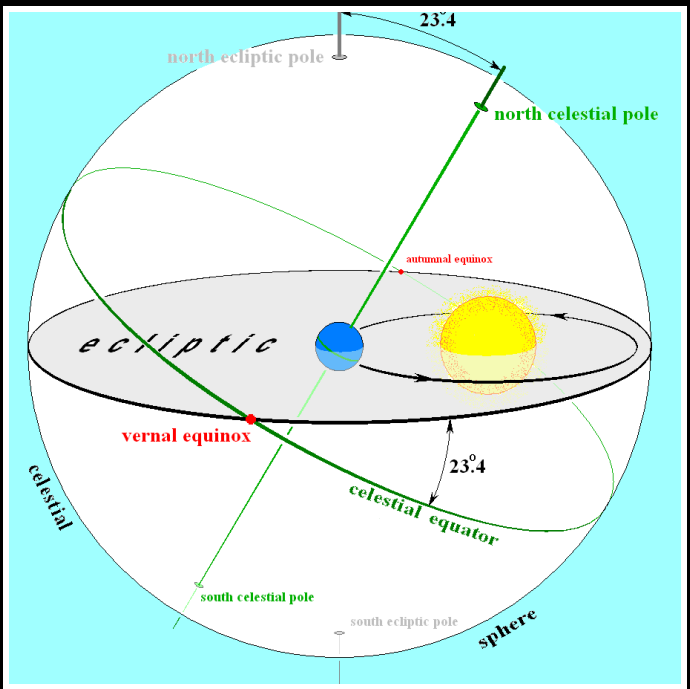
Notes:

- 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

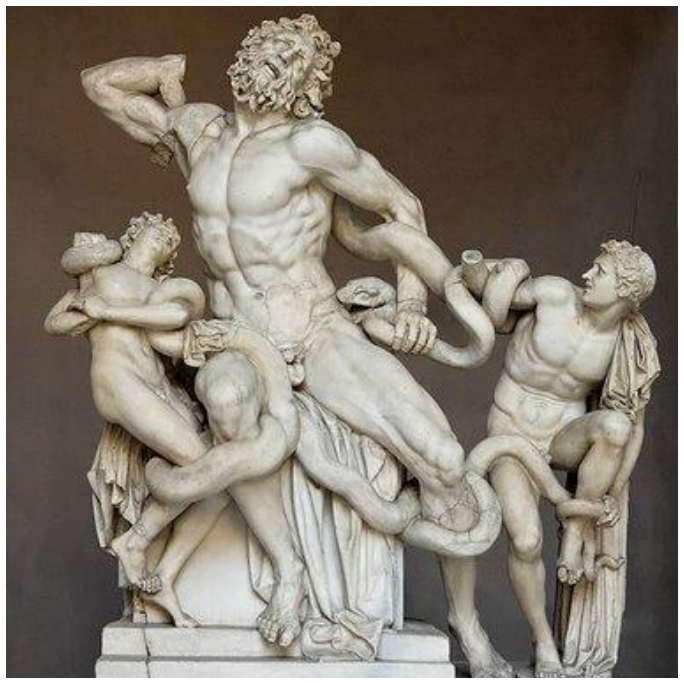
Notes:

- 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. Its 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:

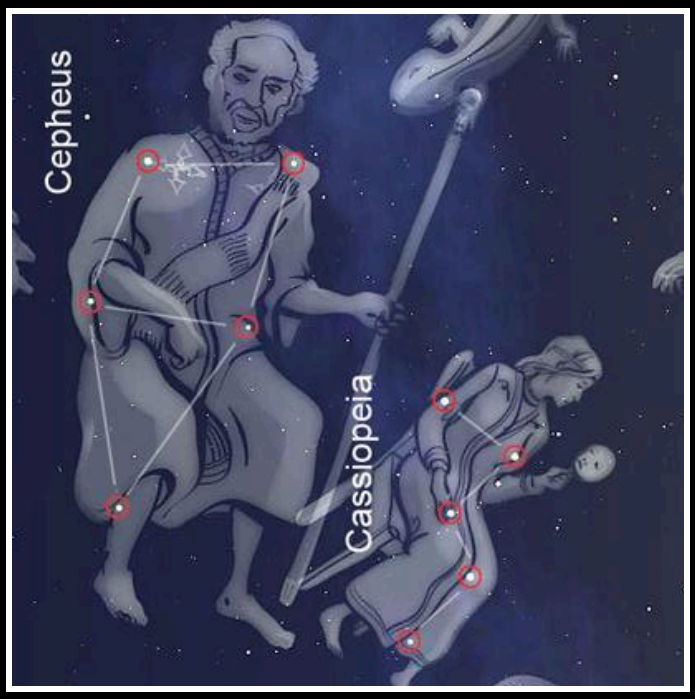
- Greek: the serpent-bearer

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.”

EAST

Cepheus & Cassiopeia

EAST



Summary: King and queen of ancient Africa.

Notes: N/A

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. Their story continues in the Fall when their daughter Andromeda rises!”

Andromeda

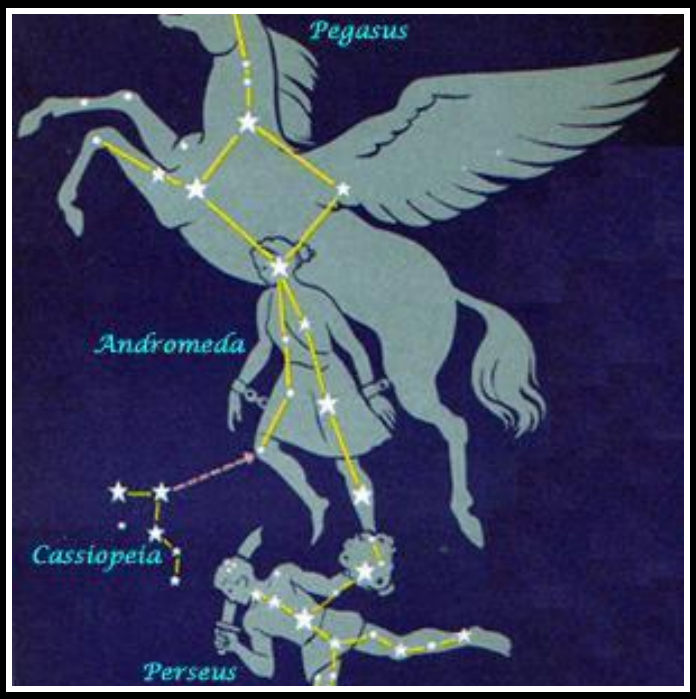
EAST

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

EAST



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

EAST

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

EAST

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!"

Pleiades star cluster

EAST

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

EAST

Summary: The story of the Devil's Tower.

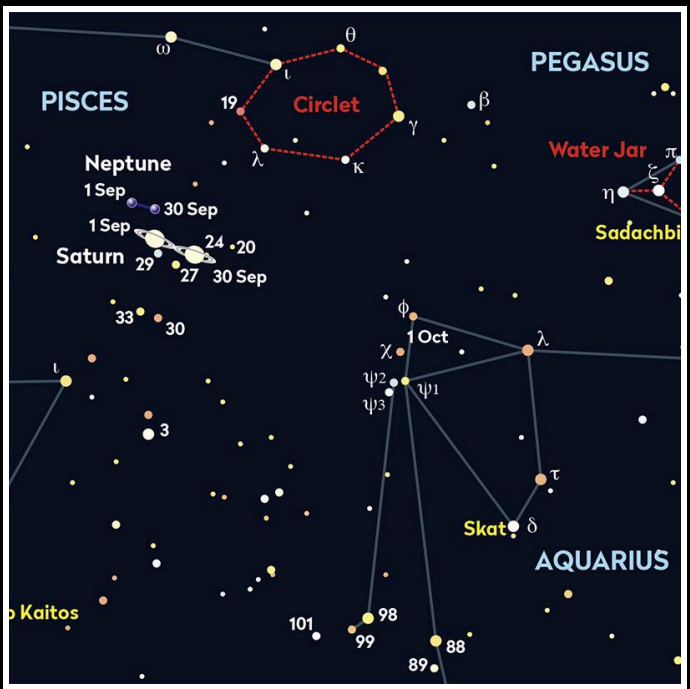
Notes:

- 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."

Planet identification

EAST



Summary: How to tell planets and stars apart.

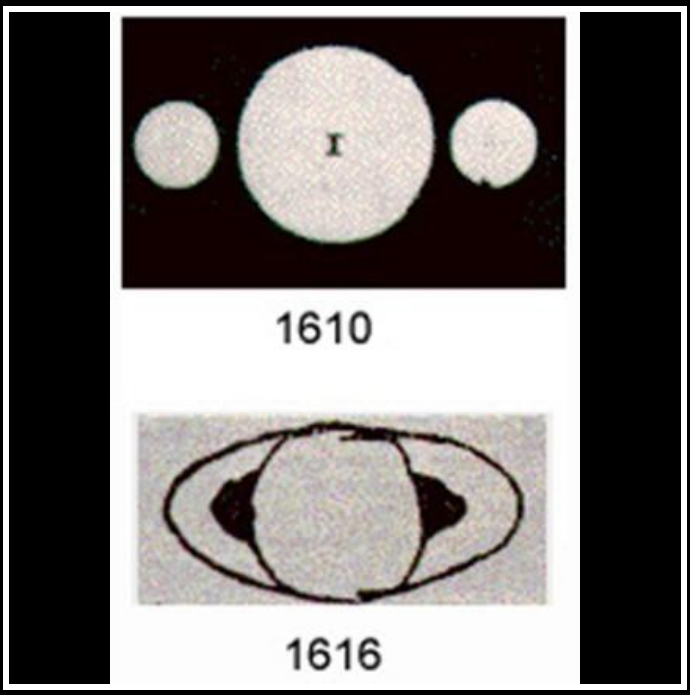
Notes:

- Mars may still be slightly visible in West

Script: "Rising in the east around sunset this season, you may notice a bright point of light that stands out . Looking closely, you may also notice that unlike the stars around it, this point of light does not twinkle! This object is much closer than the more distant stars, so its light is able to pass through the Earth's atmosphere without the distortion that causes stars to twinkle. This is the planet Saturn! Planets also orbit the Sun at different speeds, so they will appear to 'wander' around the sky throughout the year. In-fact, the word 'planet' means wanderer in ancient Greek!"

Saturn - fly to

EAST



Summary: Jewel of the Solar System.

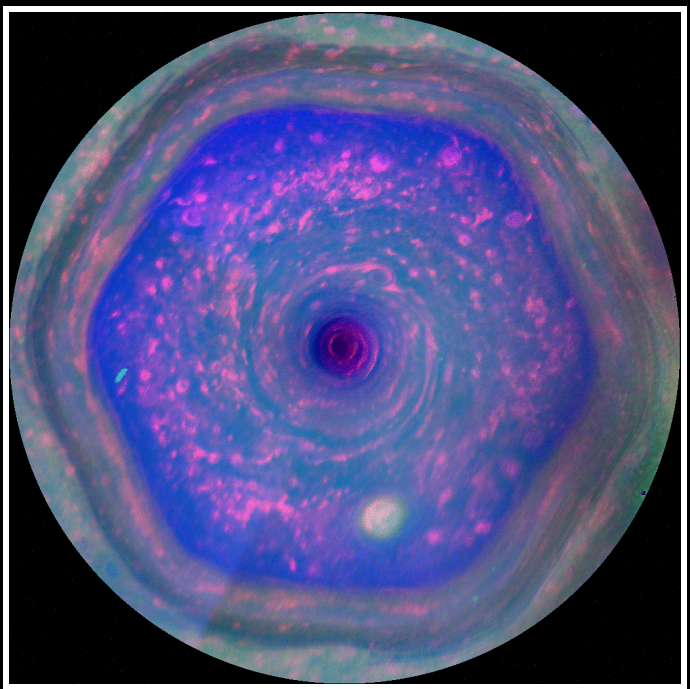
Notes:

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

Script: “Let’s now journey to the ‘jewel of our Solar System,’ 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

EAST



Summary: Mysterious storm on Saturn’s north pole.

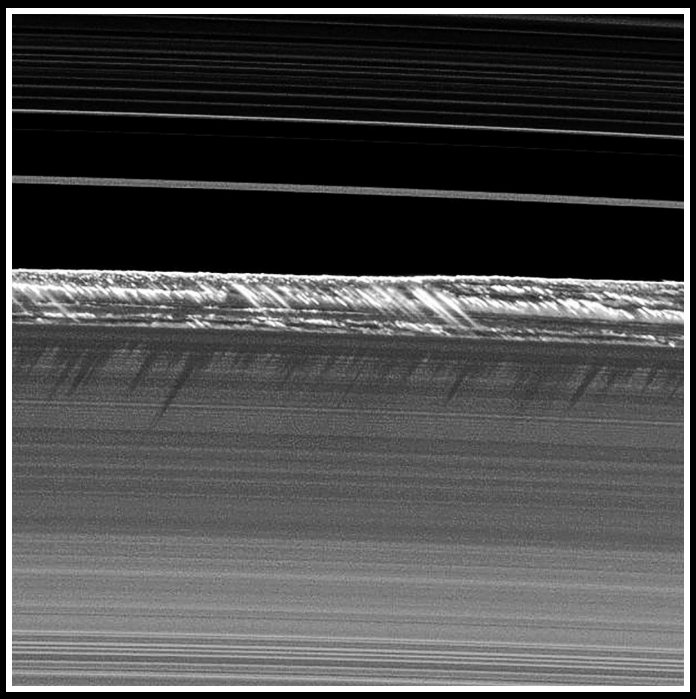
Notes:

- 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

EAST



Summary: Icy particles from destroyed moon.

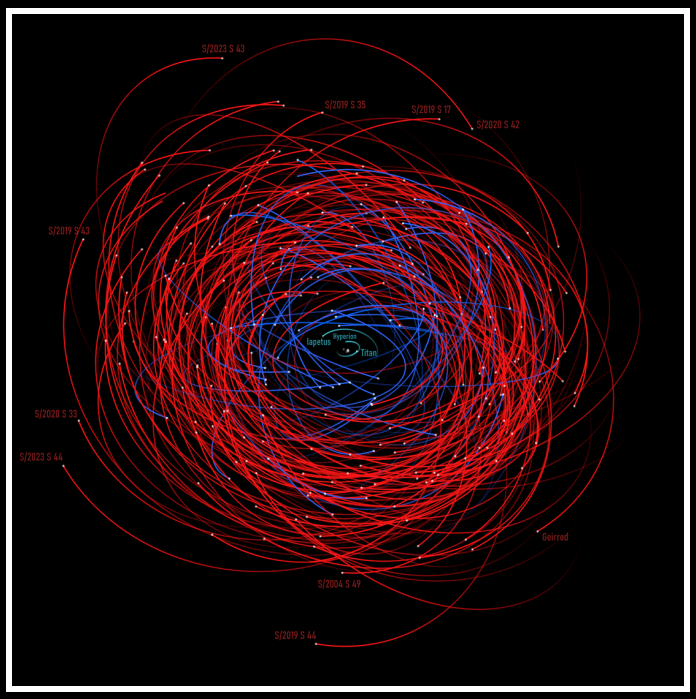
Notes:

- 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

EAST



Summary: Most moons in the Solar System!.

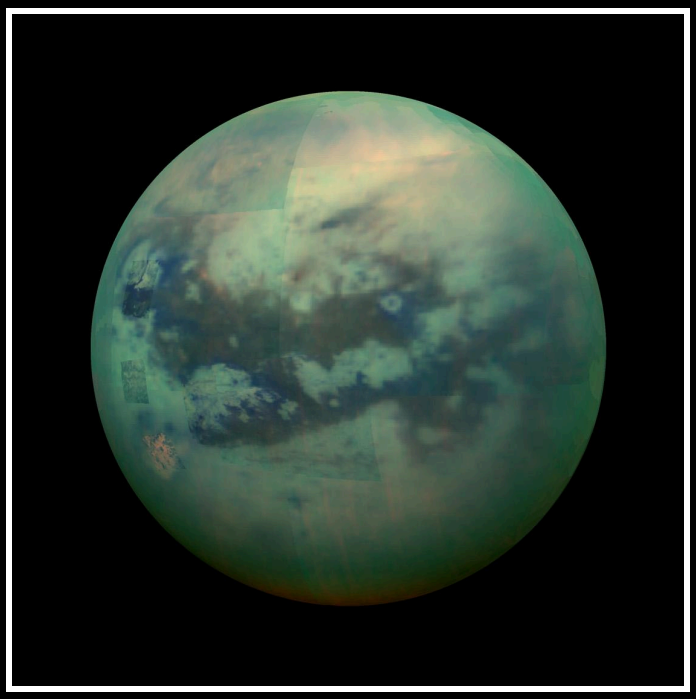
Notes:

- 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

EAST



Summary: An almost Earth-like moon.

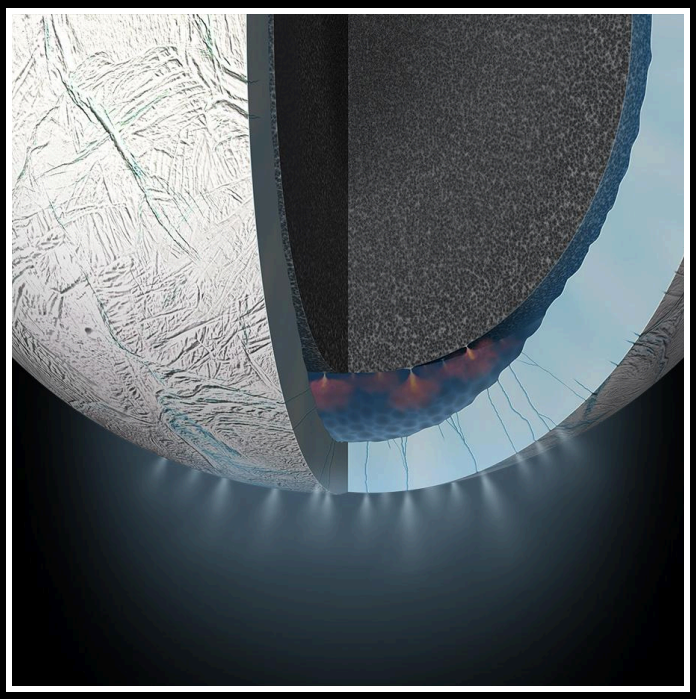
Notes:

- 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

EAST



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.”

End credits

EAST

Summary: End credits, thank yous, and questions.

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

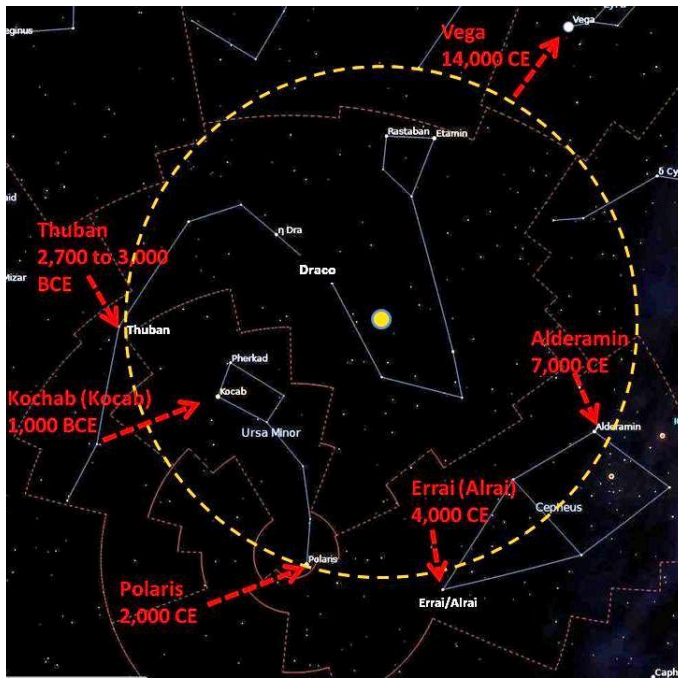
Summary: If you feel confident about your presentation, feel free to invite guests to leave a positive review online!

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!”

BONUS

Precession/Polaris age

BONUS



Summary: The changing of the North Star

Notes:

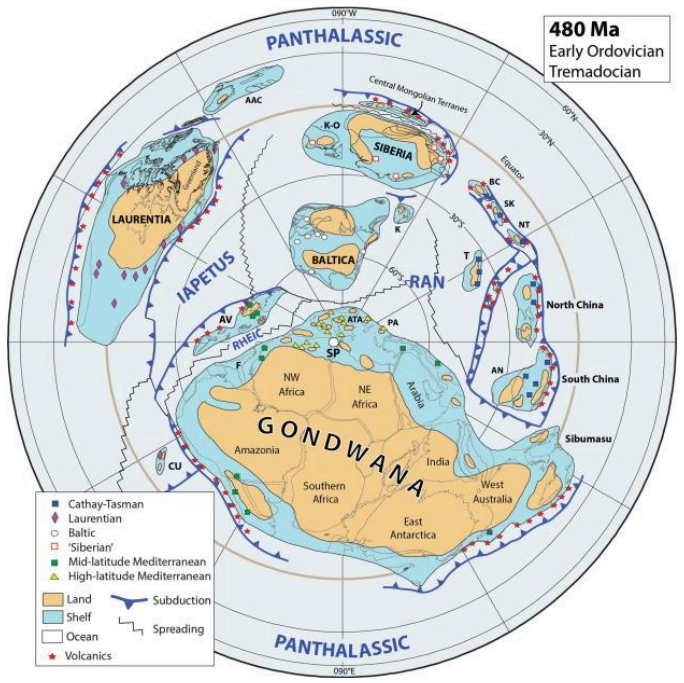
- Exactly 25,772 years for a full cycle

Script: “Polaris has not always been the North Star, nor will it always be! The Earth not only rotates around its axis, but it also slowly wobbles, much like a toy top. And over the course of thousands of years, the North Pole wobbles away from Polaris, making about four circles over roughly 100,000 years.

Polaris itself has not been around that long, on the scale of the age of the Earth. It was formed roughly 70 million years ago, close in time to the K-T impact event, which caused the extinction of the majority of the dinosaurs.”

Ordovician history

BONUS



Summary: Things older than Polaris

Notes: n/a

Script: “If the dinosaurs had telescopes, the North Star would not have been the only thing missing. Saturn’s rings are estimated to have formed as recently as after the K-T impact! Also, flowers didn’t even evolve until the later cretaceous period.”

Shark Week intro

BONUS

Summary: Bu-duh…….bu-duh……..

Notes:

- Start the animation before reading

Script: “But some other things have been around far, far longer. In fact, there is a creature that has existed for so long, their fossils pre-date the arrival of trees on land. This special animal first appeared all the way back in the Ordovician Period, and is so famous, it has a whole week dedicated to it every July. It’s the shark! Happy Shark Week everyone! Please enjoy a special treat this week only, as we take a brief and briny detour, exploring some interesting connections between sharks and space!”

Earth’s rings

BONUS

Summary: Earth may have had rings???

Notes:

- Recent Nov 2024 study

Script: “Without flowers or trees, the world looked a lot different back in 488 million years BCE. In fact, there would be one huge change you could see from anywhere on the planet. A very recent study in fall of 2024 has identified potential evidence that the Earth once had rings! During the Ordovician, a giant asteroid may have collided with the Earth, causing high levels of a specific kind of meteorite traceable by scientists today. This body is believed to have passed within Earth’s Roche limit, causing it to be torn apart by gravity, leading to the formation of a ring of debris, which could have lasted for up to 40 million years!”

Shark evolution

BONUS

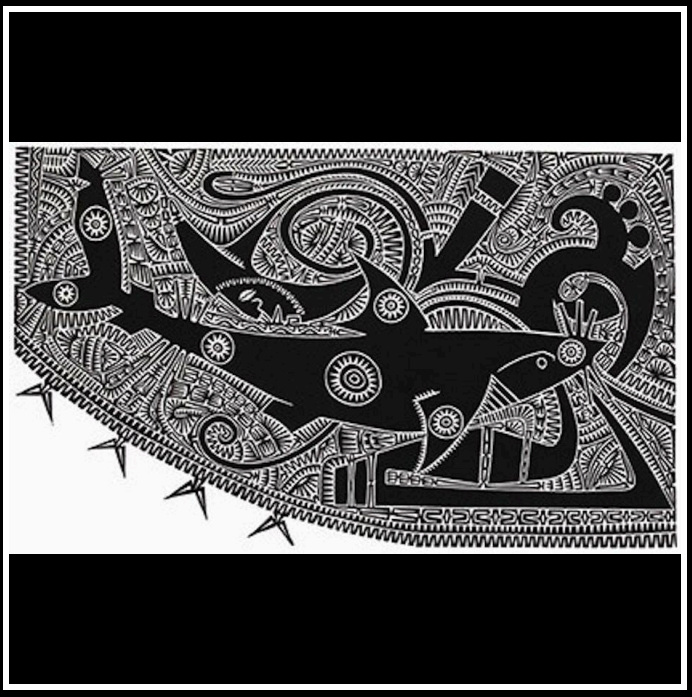
Summary: Bu-duh-bu-duh-bu-duh-BUDULAA

Notes: n/a

Script: “Sharks reached perfection nearly half-a-billion years ago and they have barely changed since then. They comprise 580 species, have outlived 5 mass extinction events, can survive in climates from the equator to the poles, and have been found living as deep as 12,000 feet. They range in size from the Dwarf Lanternfish’s diminutive 7.9-inches, to the (thankfully) recently extinct Otodus Megalodon, whose fossils have been found to indicate a maximum length of up to 80 feet!”

Baidam

BONUS



Summary: Aboriginal Australian constellation

Notes:

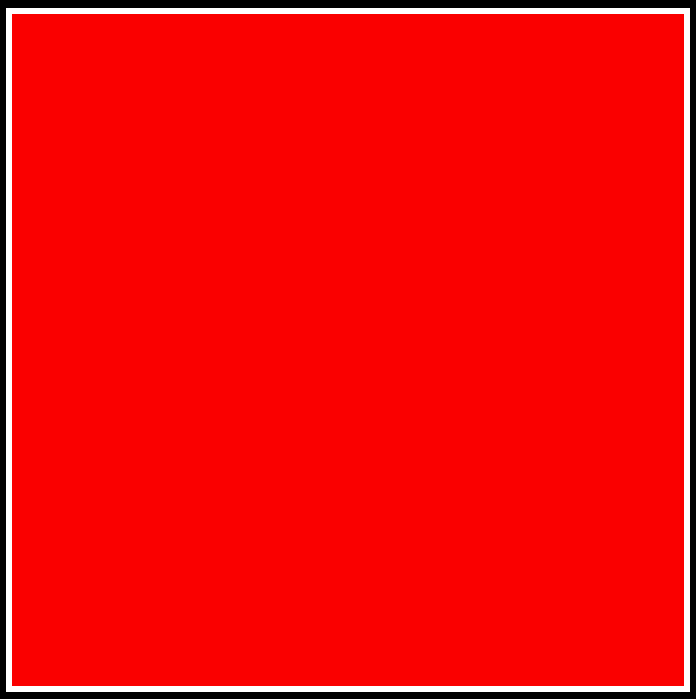
- Sometimes mistakenly associated with The Pleiades.

Script: “There are no shark constellations in the current official 88, but fortunately, the aboriginal people of the Torres Strait Islands in northern Australia have a different interpretation of the 7 stars of the Big Dipper. To them, these 7 stars are Baidam, the shark. Baidam can be used for navigation and it is said to provide knowledge about the seasons and gardening. Its orientation in the northern sky at different times of the night or the year could indicate good times for planting crops, or dangerous times for sea travel, for when the shark lies across the horizon, it indicates shark mating season!”

ASDF

Asdf

ASDF



Summary: Asdf.

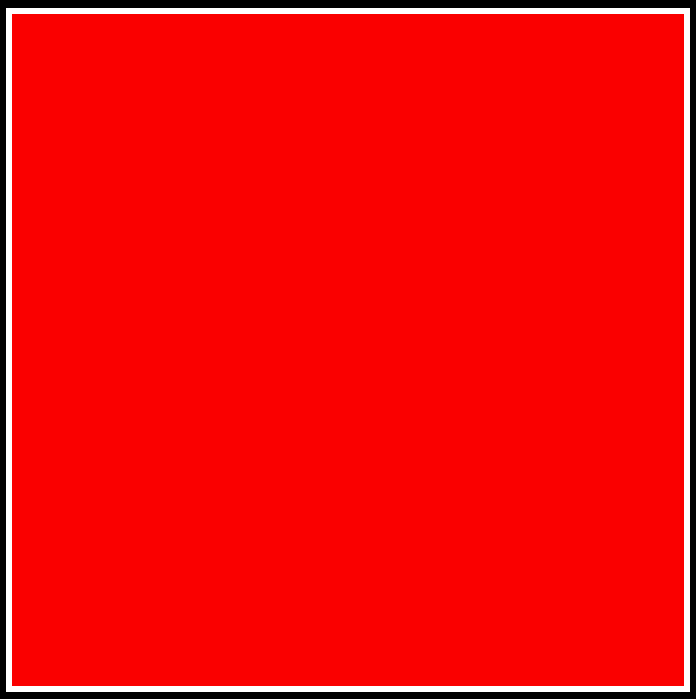
Notes:

- asdf

Script: “Asdf.”

Asdf

ASDF



Summary: Asdf.

Notes:

- asdf

Script: “Asdf.”