

THE TRI ERA TIME TRAVELERS

TRIVIA SHOW:

EARTH EDITION

HOSTED BY:

DR NEXUS

GUESTS:

PLATO

LAKOTA DAKOTA NAKOTA

ARYABHATA





CATEGORY

ANCIENT INSTITUTION



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"This philosophical institution, founded around 387 BCE in Athens, became a cornerstone of ancient Greek learning and was dedicated to studying philosophy, mathematics, and astronomy."



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**WHAT IS THE
ACADEMY?**



✓ WHAT IS THE ACADEMY?

- Plato founded the Academy sometime between 390-380 BCE in Athens.
- Commonly regarded as the most prestigious and most influential of all educational institutions in ancient times.
- The Academy's idea was to have an institution where dedicated scholars would meet, discuss, and lecture about the nature of the universe.
- Notable scholars associated with The Academy: Aristotle, Eudoxus of Cnidus, Xenocrates, Polemon, Herclides Ponticus (Kalligas et al., 2020).



CATEGORY

**ANCIENT ASTRONOMICAL
BELIEFS**



CATEGORY

ANCIENT ASTRONOMICAL BELIEFS

"This philosophical concept suggests that the physical world is only a shadow of perfect, unchanging ideals, much like the stars and planets that follow idealized patterns in the cosmos."



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**WHAT IS THE
THEORY OF
FORMS?**





WHAT IS THE THEORY OF FORMS?

- Plato believed that the material world we see around us is constantly changing, imperfect, and unreliable.
- Beyond this physical world, there exists a non-physical realm of Forms, which are the true essence or perfect prototypes of everything we encounter in the physical world.
- Forms are abstract, perfect, unchanging concepts or ideals (Politis, 2021).

CATEGORY

COSMIC GEOMETRY



CATEGORY

COSMIC GEOMETRY

"These geometric solids, including the cube, tetrahedron, and octahedron, were believed to represent the fundamental elements of the universe and the harmonious structure of the cosmos."



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"These geometric solids, including the cube, tetrahedron, and octahedron, were believed to represent the fundamental elements of the universe and the harmonious structure of the cosmos."



WHAT ARE PLATONIC SOLIDS?





WHAT ARE PLATONIC SOLIDS?

- The Platonic solids have been known since antiquity. It has been suggested that certain carved stone balls created by the late Neolithic people of Scotland represent these shapes.
- The tetrahedron represented fire
- The cube represented earth
- The octahedron represented air
- The icosahedron represented water
- The dodecahedron represented the cosmos or aether (the substance that fills the universe beyond the earthly realm) (Kouremenos, 2018).



CATEGORY

ANCIENT PHILOSOPHY
AND ASTRONOMY



CATEGORY

ANCIENT PHILOSOPHY AND ASTRONOMY

"In this famous allegory, the journey from ignorance to knowledge was compared to prisoners emerging from a cave, symbolizing the transition from seeing mere shadows to understanding the true reality."



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"In this famous allegory, the journey from ignorance to knowledge was compared to prisoners emerging from a cave, symbolizing the transition from seeing mere shadows to understanding the true reality."



**WHAT IS THE
ALLEGORY OF
THE CAVE?**



WHAT IS THE ALLEGORY OF THE CAVE?

- It appears in *The Republic*
- It describes the journey to knowledge
- The cave represents human imitations
- It reflects Plato's Theory of Forms
- It illustrates how people can be trapped in their limited perceptions and misunderstand the true nature of reality (Kouremenos, 2018).

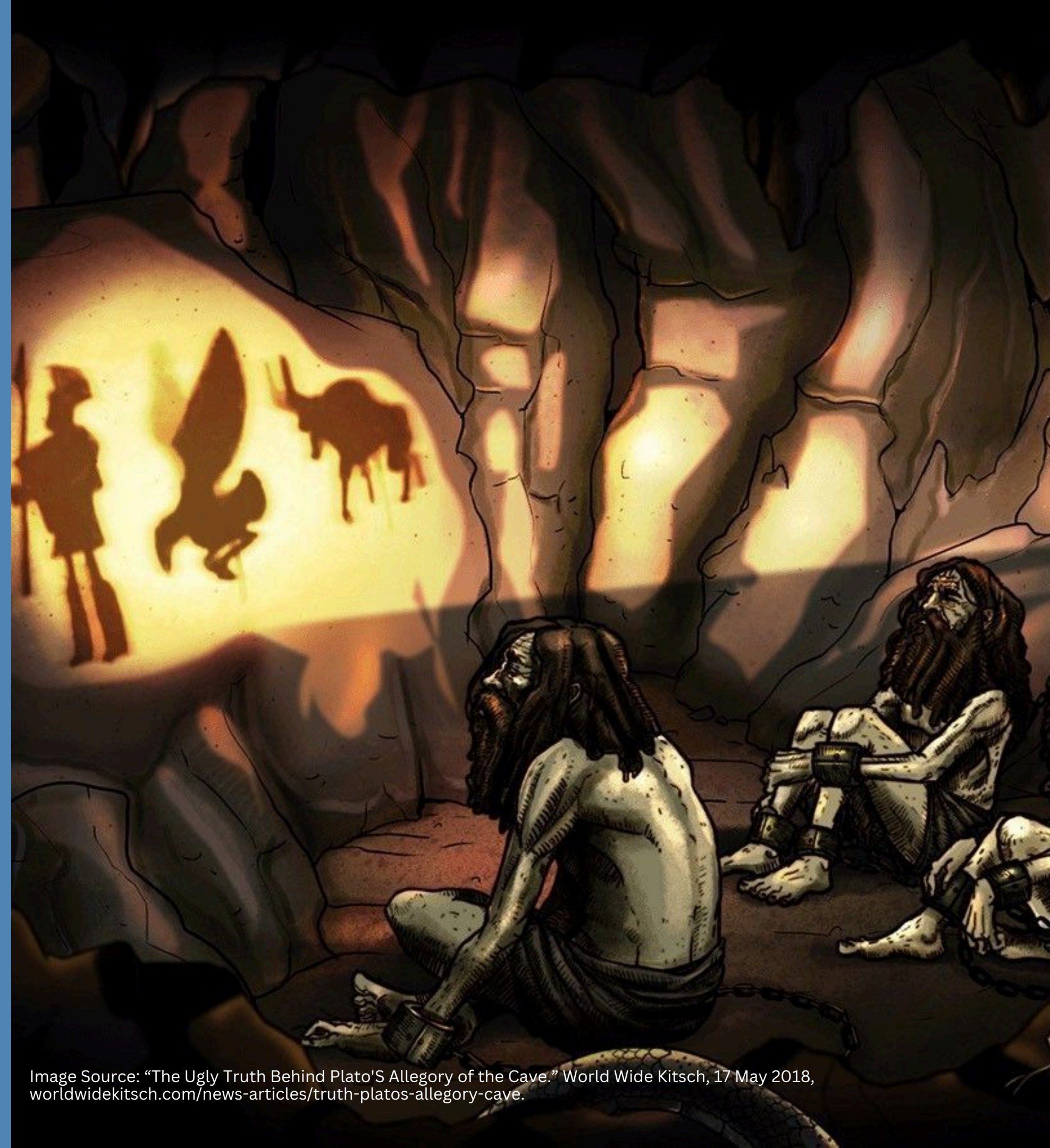


Image Source: "The Ugly Truth Behind Plato'S Allegory of the Cave." World Wide Kitsch, 17 May 2018, worldwidekitch.com/news-articles/truth-platos-allegory-cave.



CATEGORY

**ANCIENT PHILOSOPHY
AND ASTRONOMY**



CATEGORY

ANCIENT PHILOSOPHY AND ASTRONOMY

"A series of written works where ancient philosophers engage in discussions to examine and discuss ideas like justice, virtue, and the nature of the universe."



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ANCIENT PHILOSOPHY AND ASTRONOMY

"A series of written works where ancient philosophers engage in discussions to examine and discuss ideas like justice, virtue, and the nature of the universe."

**WHAT IS THE
DIALOGUE?**

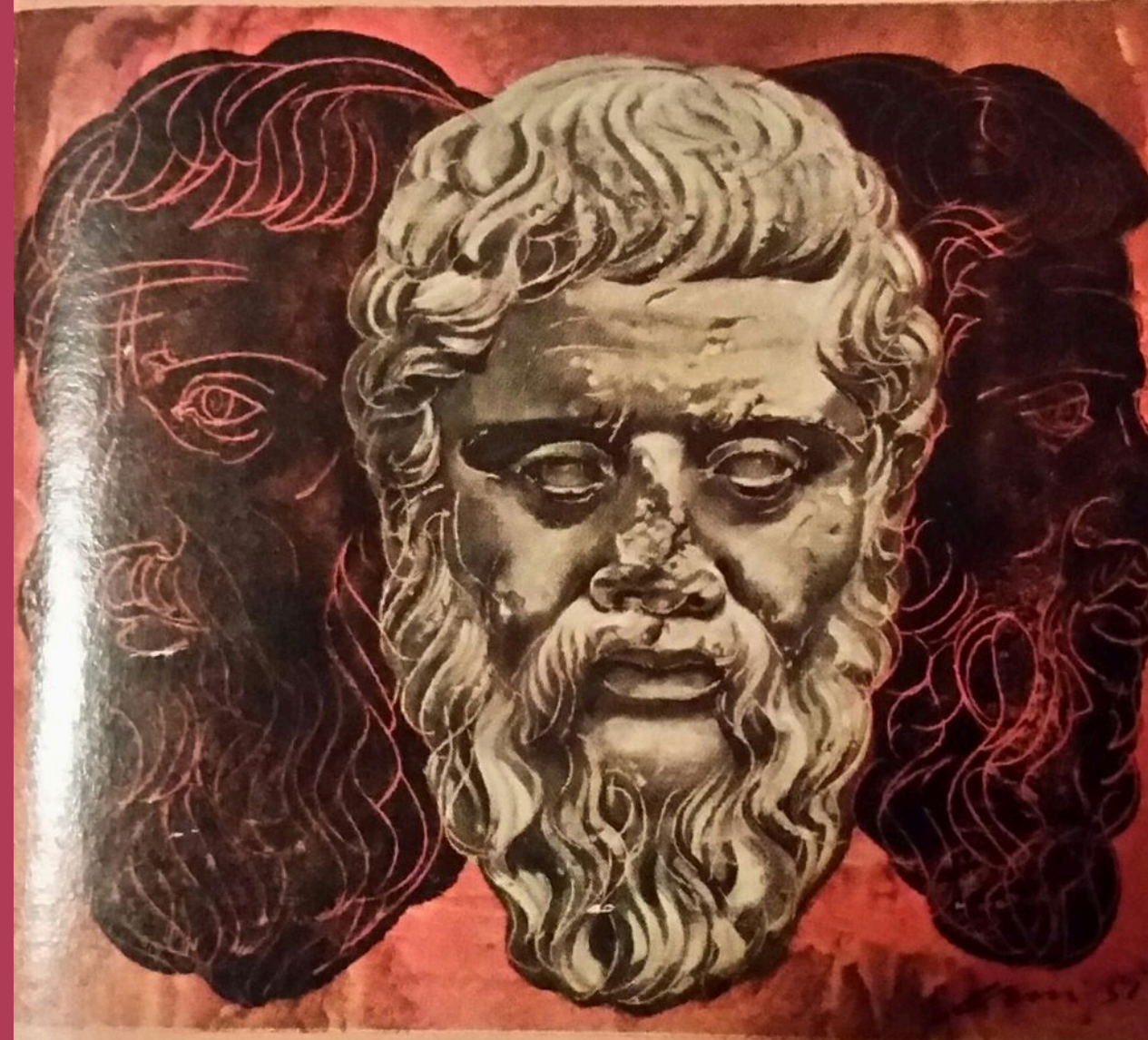


A MENTOR BOOK



451
ME1270
\$1.75

GREAT DIALOGUES OF PLATO



Complete Texts of THE REPUBLIC •
APOLOGY • CRITO • PHAEDO • ION •
MENO • SYMPOSIUM A
Modern Translation by W. H. D. Rouse -
Translator of *The Odyssey* and *The Iliad*.

Image Source: Image of Great Dialogues of Plato.
www.listal.com/viewimage/9332272h.

✓ WHAT IS THE DIALOGUE?

- Socrates, plays the central role. Socrates never wrote down any of his own teachings, so we rely on Plato's writings to understand his philosophy.
- In the *Timaeus*, Plato presents an elaborately wrought account of the formation of the universe and an explanation of its impressive order and beauty.
- Plato wasn't just making up his characters. Many of the people in his Dialogues, like the famous philosopher Parmenides or Plato's brother Glaucon, were real historical figures (Petraiki, 2023).



CATEGORY

**LAKOTA CEREMONY AND
CULTURE LINKED TO
ASTRONOMY**



CATEGORY

LAKOTA CEREMONY AND CULTURE LINKED TO ASTRONOMY

This annual sacred ritual by Lakota/Dakota/Nakota (“Sioux”) tribes took place traditionally around the summer solstice and links the Earth to the sky above. It gives great importance to the celestial bodies at that particular time of year (Hollabaugh, 2017, pg. 137).



WHAT IS THE SUN DANCE CEREMONY?

HOLLABAUGH, MARK. THE SPIRIT AND THE
SKY : LAKOTA VISIONS OF THE COSMOS,
UNIVERSITY OF NEBRASKA PRESS, 2017.
PROQUEST EBOOK CENTRAL,
[HTTPS://EBOOKCENTRAL.PROQUEST.COM/L
IB/VIU/DETAIL.ACTION?DOCID=4849376.](https://ebookcentral.proquest.com/LIB/VIU/DETAIL.ACTION?DOCID=4849376)



✓ WHAT IS THE SUN DANCE CEREMONY?

- The Sun Dance Ceremony is a four day and four night long sacred ritual that involves erecting a tree in the middle of the dance grounds
- The whole event is fully spiritual in nature.
- It is focused on praying and asking ancestors for things such as improvement on skills such as hunting, better warrior/fighting abilities, healing, or general health and prosperity of a tribe/family



CATEGORY

**LAKOTA CEREMONY AND
CULTURE LINKED TO
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CATEGORY

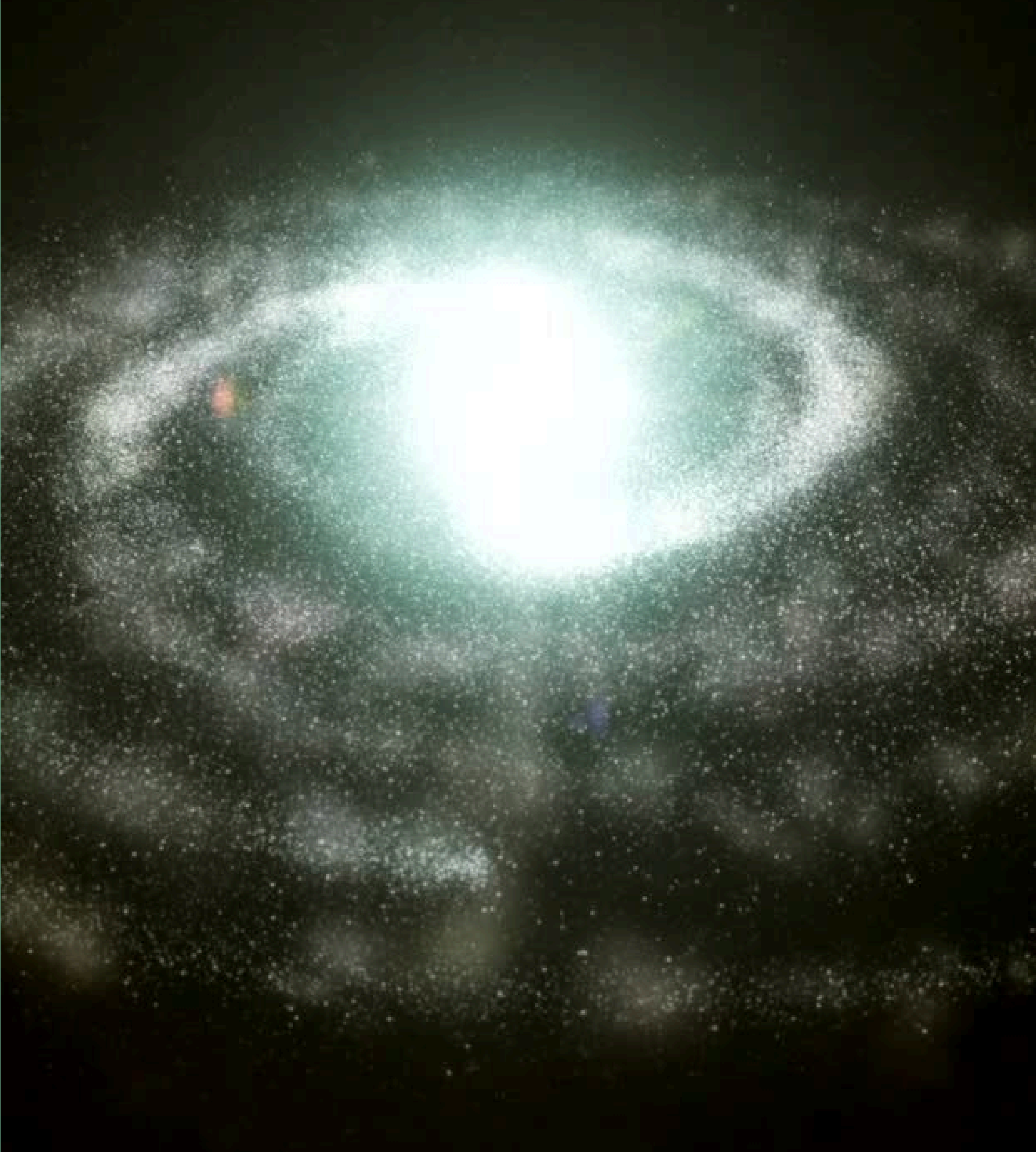
LAKOTA CEREMONY AND CULTURE LINKED TO ASTRONOMY

The Sioux people believed this part of the sky was responsible for carrying their loved ones to the Spirit World after their passing, and that other celestial bodies protected this portion of the sky so that “bad spirits” could not find their loved ones while crossing over (Hollabaugh, 2017, pg. 181)



WHAT IS THE MILKY WAY?

HOLLABAGH, MARK. THE SPIRIT AND THE SKY : LAKOTA VISIONS OF THE COSMOS, UNIVERSITY OF NEBRASKA PRESS, 2017. PROQUEST EBOOK CENTRAL, [HTTPS://EBOOKCENTRAL.PROQUEST.COM/LIB/VIU/DETAIL.ACTION?DOCID=4849376](https://ebookcentral.proquest.com/lib/VIU/detail.action?docid=4849376).



WHAT IS THE MILKY WAY?

- Also known as **THE SPIRIT WAY**, “wanáǵi thacháŋku” (Hollabaugh, 2017, pg. 181).



CATEGORY

**LAKOTA CEREMONY AND
CULTURE LINKED TO
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CATEGORY

**LAKOTA CEREMONY AND
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ASTRONOMY**

**The Lakota people
believed this star was
especially important due
to its stationary
placement (Hollabaugh,
2017, pg. 181).**



WHAT IS THE NORTH STAR?

HOLLABAUGH, MARK. THE SPIRIT AND
THE SKY : LAKOTA VISIONS OF THE
COSMOS, UNIVERSITY OF NEBRASKA
PRESS, 2017. PROQUEST EBOOK
CENTRAL,
[HTTPS://EBOOKCENTRAL.PROQUEST.CO
M/LIB/VIU/DETAIL.ACTION?
DOCID=4849376.](https://ebookcentral.proquest.com/lib/VIU/detail.action?docid=4849376)



WHAT IS THE NORTH STAR?

- They called it “The Star that always stands in one place,” “Wicháŋpi Owáŋžila.”
- Like many ancient civilizations, the North Star was especially important to the Sioux for directional and navigational reasons!



CATEGORY

FAMOUS LAKOTA CHIEF BLACK ELK AND HIS ASTRONOMICAL VIEWS

**NEIHARDT, J. G., BLACK ELK, PETRI, H. N., & DEMALLIE,
R. J. (1984). THE SIXTH GRANDFATHER: BLACK ELK'S
TEACHINGS GIVEN TO JOHN G. NEIHARDT. UNIVERSITY
OF NEBRASKA PRESS.**



CATEGORY

**FAMOUS LAKOTA CHIEF
BLACK ELK AND HIS
ASTRONOMICAL VIEWS**

**The name of the seven
different tribes of the
Great Sioux Nation, and
which is represented by
the seven stars of the
Big Dipper (Neihardt,
1984, pg. 312).**



WHAT IS THE SEVEN COUNCIL FIRES?

**THE BIG DIPPER
CONSTELLATION IS
CALLED “THE DRIED
WILLOW” BY THE SIOUX,
OR “CHANŠÁŠA IPÚSYE”
(HOLLABAUGH, 2017, PG.
66).**



The Seven Council Fires

✓ WHAT IS THE SEVEN COUNCIL FIRES?

- It encompassed all three different “Sioux” tribes—the Dakota, Lakota, and Nakota.
- The different names of the tribes were decided by the areas of which they lived (Neidhart, 1984, pg. 312-313).



CATEGORY

FAMOUS LAKOTA CHIEF BLACK ELK AND HIS ASTRONOMICAL VIEWS

**MICHAEL STELTENKAMP, S.J., BLACK ELK: HOLY MAN OF THE OGLALA
(NORMAN: UNIVERSITY OF OKLAHOMA PRESS, 1993)**



CATEGORY

FAMOUS LAKOTA CHIEF BLACK ELK AND HIS ASTRONOMICAL VIEWS

**Chief Black Elk asserted
“some sign would be seen”
upon his death. This
astronomical event happened
on the night of his death that
shocked the communities of
the time (Steltenkamp, 1993,
pg. 131).**



**WHAT IS THE
AURORA
BOREALIS?**



WHAT IS THE AURORA BOREALIS?

- **Sioux people placed great significance on seeing the Aurora Borealis, referring to them as “the sky shows itself,” or “maḥpiya thaŋiŋ” - they believed they were spirits dancing (Hollabaugh, 2017, pg. 115)**



CATEGORY

**MODERN DAY
INVOLVEMENT WITH
TRADITIONAL LAKOTA STAR
TEACHINGS**

**NASA. (1999, MARCH 12). NASA AND
LAKOTA SIOUX JOIN TOGETHER TO
REACH FOR THE STARS . NASA.
[HTTPS://WWW.JPL.NASA.GOV/NEWS/N
ASA-AND-LAKOTA-SIOUX-JOIN-
TOGETHER-TO-REACH-FOR-THE-
STARS/](https://www.jpl.nasa.gov/news/nasa-and-lakota-sioux-join-together-to-reach-for-the-stars/)**



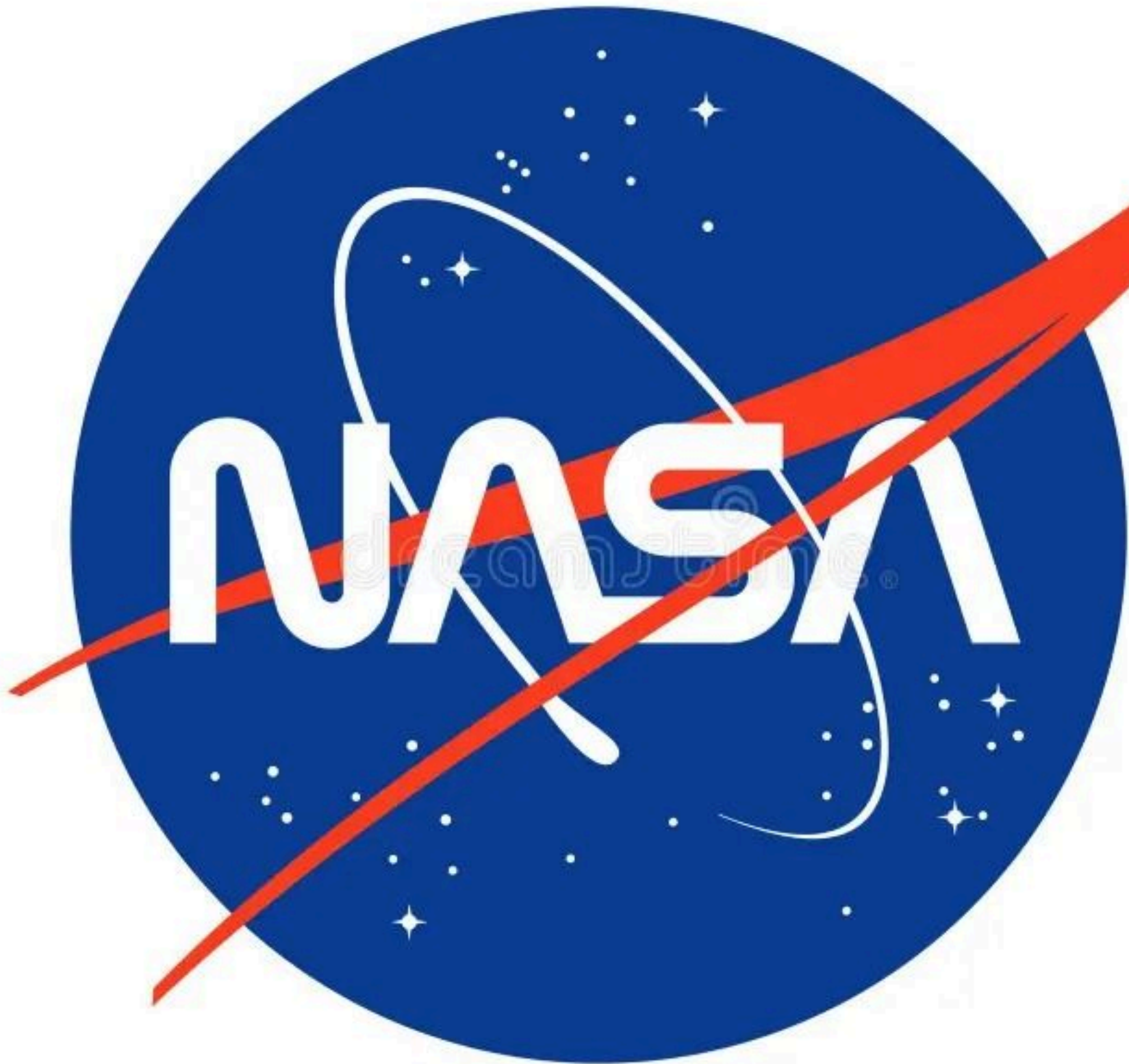
CATEGORY

MODERN DAY INVOLVEMENT WITH TRADITIONAL LAKOTA STAR TEACHINGS

In the Spring of 1999, this organization partnered with a Lakota Sioux Nation in the USA to explore connections between then-recent space findings and traditional Lakota star knowledge



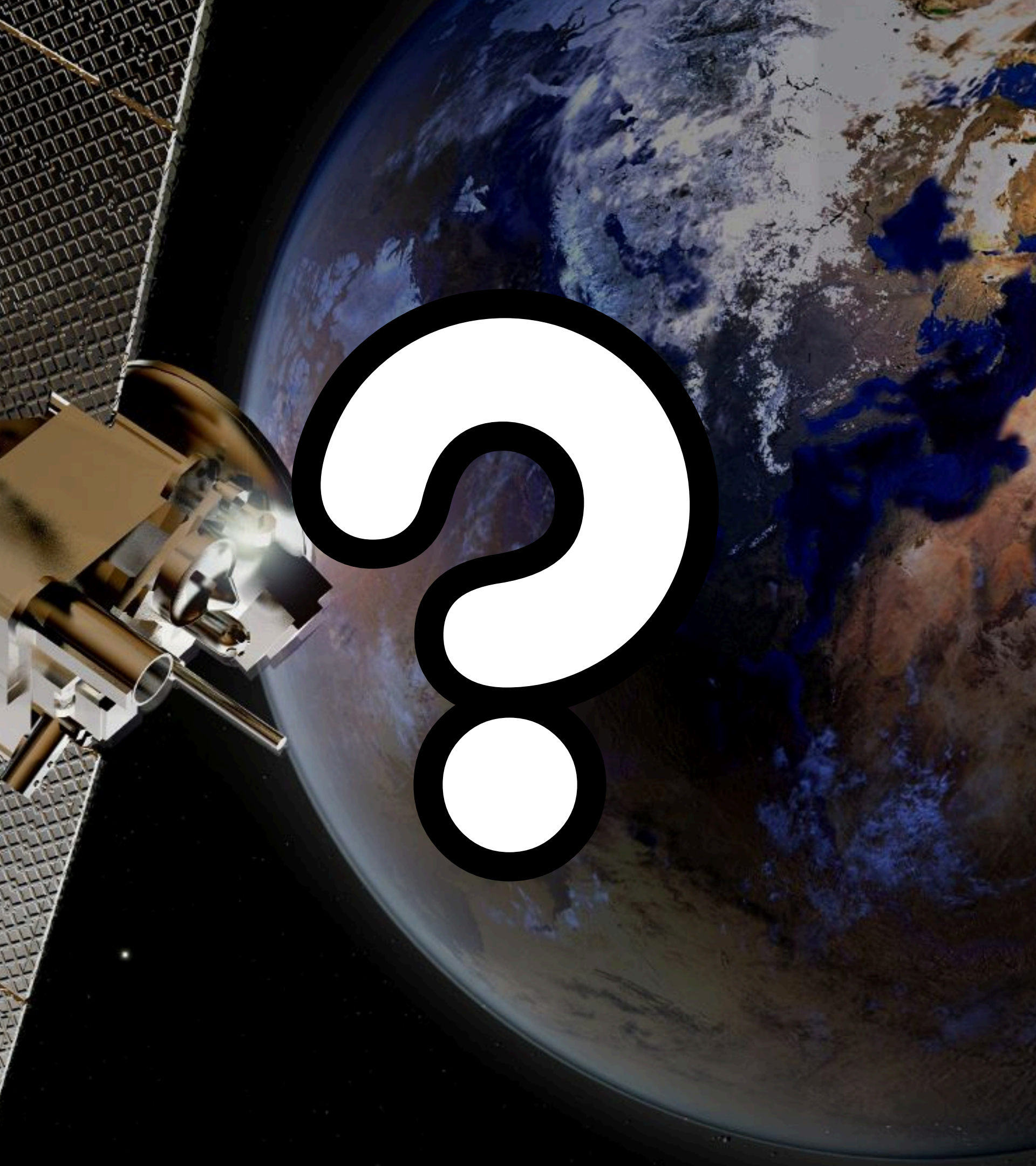
**WHAT IS
NASA?**



WHAT IS NASA?

“In a program sponsored by NASA's Native American Initiative, [Chief Joseph Chasing Horse] is working with Jet Propulsion Laboratory (JPL) representatives to help develop education materials that join traditional Lakota teachings with modern science. Chasing Horse, a direct descendant of the spiritual leader Crazy Horse, serves as ambassador to the United Nations for the Lakota Sioux Nations.”

(<https://www.jpl.nasa.gov/news/nasa-and-lakota-sioux-join-together-to-reach-for-the-stars/>)



CATEGORY

**MODERN DAY
INVOLVEMENT WITH
TRADITIONAL LAKOTA STAR
TEACHINGS**



CATEGORY

**MODERN DAY
INVOLVEMENT WITH
TRADITIONAL LAKOTA
STAR TEACHINGS**

**NASA has this program that
focuses on building
relationships across NASA
and Indigenous communities.**



WHAT IS THE INDIGENOUS PEOPLE'S INITIATIVE?

NASA. (N.D.). INDIGENOUS PEOPLES
INITIATIVE. NASA.
[HTTPS://APPLIEDSCIENCES.NASA.GOV/
INDIGENOUS-PEOPLES-INITIATIVE](https://appliedsciences.nasa.gov/indigenous-peoples-initiative)



WHAT IS THE INDIGENOUS PEOPLE'S INITIATIVE?

- **NASA works with “Indigenous communities through place-based remote sensing training, community engagement, and co-production of knowledge,”** (<https://appliedsciences.nasa.gov/indigenous-peoples-initiative>).

ADDITIONAL INFORMATION FOR THIS SECTION:

WHY WAS SEEING THE AURORA SO SHOCKING FOR THE COMMUNITIES THE NIGHT CHIEF BLACK ELK DIED? BECAUSE THE AURORA BOREALIS ARE NOT OFTEN SEEN IN THAT GEOGRAPHICAL LOCATION. AS MARK HOLLOBAUGH WROTE,

“AURORA ARE RARE IN THE TRADITIONAL LAKOTA LANDS OF NORTHERN NEBRASKA AND SOUTHERN SOUTH DAKOTA DUE TO THE LOWER MAGNETIC LATITUDE. THEY ARE ONLY A LITTLE MORE COMMON IN WESTERN NORTH DAKOTA, NORTHEASTERN WYOMING, AND EASTERN MONTANA,” (PG. 115).

WHY DID NASA PARTNER WITH LAKOTA TO STUDY STAR KNOWLEDGE?

THE GOAL WAS ULTIMATELY TO ENGAGE LAKOTA YOUTH TO TEACH THEM MORE ABOUT THEIR HISTORY WHILE SEEING HOW THEIR ANCESTORS MAY HAVE BEEN ACCURATE IN THEIR FINDINGS. IN THE ARTICLE IT STATES,

“WE HOPE TO EXCITE LAKOTA YOUTH ABOUT NASA SPACE SCIENCE AND SEE WHAT WE CAN LEARN FROM THIS CULTURAL INTERCHANGE,’ SAID JPL SCIENCE EDUCATOR RICHARD SHOPE. ‘WE ARE EXPLORING THE CONNECTIONS BETWEEN RECENT SPACE FINDINGS AND TRADITIONAL LAKOTA STAR KNOWLEDGE.’

‘MY PEOPLE ONCE HUNTED FOR BUFFALO - NOW WE HUNT FOR KNOWLEDGE,’ SAID CHIEF JOSEPH CHASING HORSE, SPIRITUAL LEADER FOR THE EVENT. FOR THE LAKOTA PEOPLE, THE SPRING GATHERING MARKS THE TIME WHEN THE SUN TRAVELS WITH THE TRADITIONAL DRIED RED WILLOW CONSTELLATION.

THROUGHOUT LAKOTA HISTORY, IT WAS A TIME OF MIGRATION FOR HUNTERS WHO FOLLOWED THE MOVEMENTS OF BUFFALO HERDS,”
([HTTPS://WWW.JPL.NASA.GOV/NEWS/NASA-AND-LAKOTA-SIOUX-JOIN-TOGETHER-TO-REACH-FOR-THE-STARS/](https://www.jpl.nasa.gov/news/nasa-and-lakota-sioux-join-together-to-reach-for-the-stars/)).



**ARYABHATA'S
ASTRONOMY
AND WORK ON
AXIAL
ROTATION**



ARYABHATA'S ASTRONOMY AND AXIAL ROTATION

**“Describe the axial rotation
of Earth... in poetry.”**



ARYABHATA'S ASTRONOMY AND AXIAL ROTATION

**“Describe the axial rotation
of Earth... in poetry.”**

**“JUST AS A PASSENGER IN A BOAT
MOVING DOWNSTREAM
SEES THE STATIONARY TREES ON THE
RIVERBANKS
AS MOVING UPSTREAM,
SO DOES AN OBSERVER AT LANKA SEE
THE FIXED STARS MOVING WESTWARD
AT EXACTLY THE SAME SPEED.”**



ARYABHATA'S ASTRONOMY AND AXIAL ROTATION

“Describe the axial rotation of Earth... in poetry.”

“JUST AS A PASSENGER IN A BOAT MOVING DOWNSTREAM SEES THE STATIONARY TREES ON THE RIVERBANKS AS MOVING UPSTREAM, SO DOES AN OBSERVER AT LANKA SEE THE FIXED STARS MOVING WESTWARD AT EXACTLY THE SAME SPEED.”

 **LANKA**

(“ARYABHATIYA” 64)



ARYABHATA'S ASTRONOMY AND AXIAL ROTATION VS TODAY

**“IT TAKES THIS LONG FOR THE
EARTH TO COMPLETE ONE FULL
ROTATION ON ITS AXIS”**

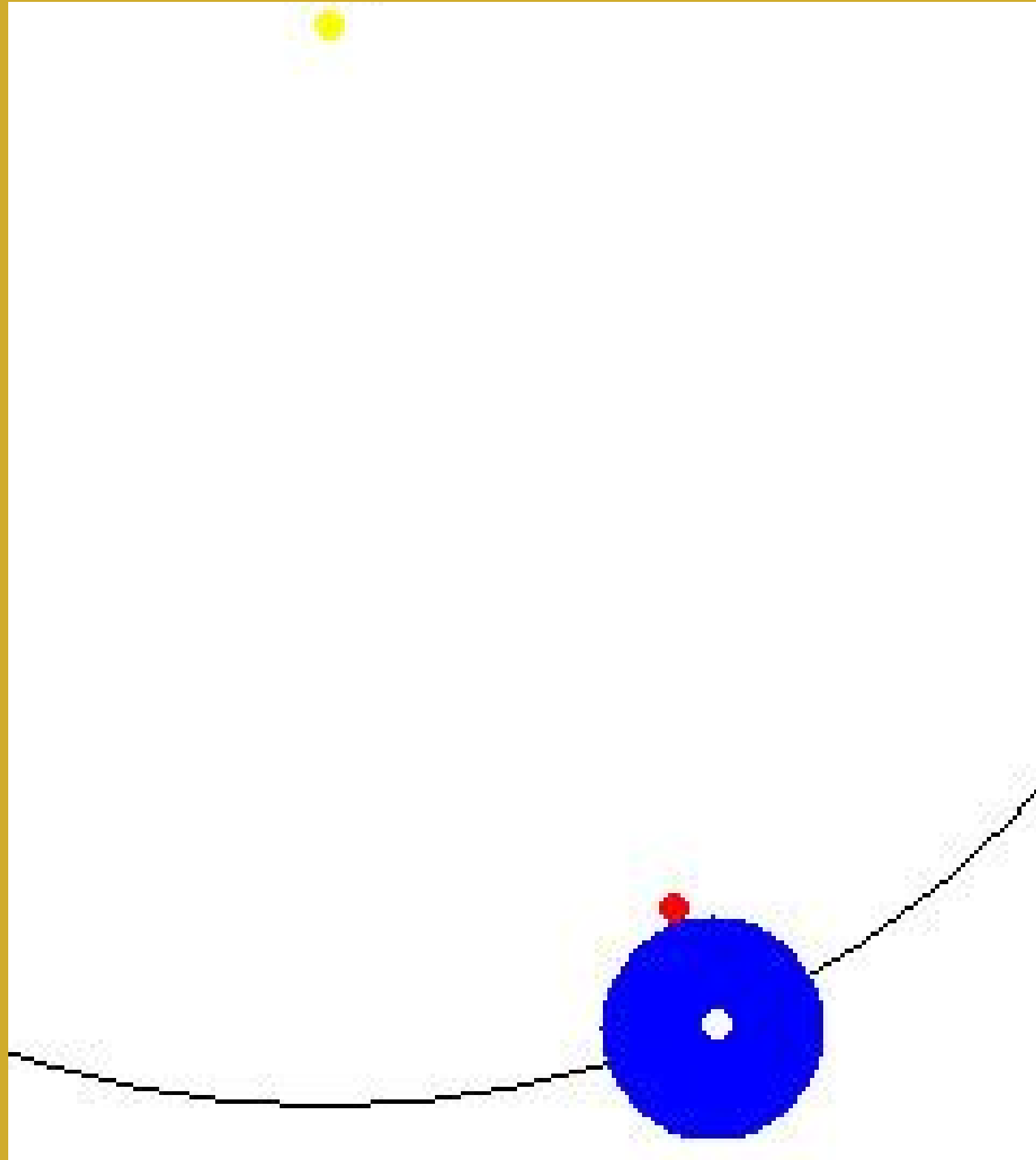


ARYABHATA'S ASTRONOMY AND AXIAL ROTATION VS TODAY

**“IT TAKES THIS LONG FOR THE
EARTH TO COMPLETE ONE FULL
ROTATION ON ITS AXIS”**

**23 HOURS, 56 MINUTES, AND 4.1
SECONDS, ALSO KNOWN AS A
SIDEREAL DAY**

**CURRENT VALUE: 23HOURS,
56MINUTES, AND 4.091 SECONDS**



ARYABHATA'S ASTRONOMY AND AXIAL ROTATION VS TODAY

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ARYABHATA'S ASTRONOMY AND AXIAL ROTATION VS TODAY

**“A YEAR CONSISTS OF THIS
MANY DAYS (GIVE YOUR
ANSWER TO FIVE DECIMAL
PLACES)”**



ARYABHATA'S ASTRONOMY AND AXIAL ROTATION VS TODAY

**“A YEAR CONSISTS OF THIS
MANY DAYS (GIVE YOUR
ANSWER TO FIVE DECIMAL
PLACES)”**

365.25868 SOLAR DAYS

CURRENT VALUE: 365.2422

**THANK YOU FOR
JOINING US TODAY!**

Group Members:

Chuck as Dr. Nexus

Janette as Plato

Olivia as Lakota/Dakota/Nakota

Aidan as Aryabhata

OUR SCRIPT

OUR SCRIPT: [HTTPS://DOCS.GOOGLE.COM/DOCUMENT/D/18X_KNSIJS4PCHSKAIT2UDQ_XTPX1KEY6/EDIT?
USP=SHARING&OUID=112321955286006626643&RTPOF=TRUE&SD=TRUE](https://docs.google.com/document/d/18X_KNSIJS4PCHSKAIT2UDQ_XTPX1KEY6/edit?usp=sharing&oid=112321955286006626643&rtPOF=true&sd=true)

NOTE: MUCH OF OUR CONTENT AND COURSE COMMENTARY IS TO BE FOUND ON THE SCRIPT

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AIDAN'S SECTION:

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CONTINUED

JANETTE'S SECTION:

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ADDITIONAL WORK

AYABHATA RESEARCH NOTES (“ARYABHATIYA”)

KALAKRIYA - THE RECKONING OF TIME:

(VERSES 1-2) 12 MONTHS OF THIRTY DAYS OF SIXTY NADIS OF SIXTY VINDIKAS OF 6 PRANAS (OR 60 LONG LETTERS). 1 PRANA = 4 SECONDS

- EARTH SPINS 1 ARCMINUTE PER PRANA (60TH OF A DEGREE EVERY 4 SECONDS)
- PLANETS MOVE TOWARD OUR EAST (MOSTLY).
- INDIAN ASTONOMERS LARGELY DIDNT ACCEPT THIS, SO IT WASNT TAKEN FURTHER THERE (TO ORBITS...). THAT WAS COPERNICUS LATER...
- JUST LIKE ARISTARCHUS' HELIOCENTRIC MODEL. WASNT BELIEVED AND SO SHUT DOWN UNTIL REVITALIZED BY COPERNICUS LATER

(3) DIFFERENCE BETWEEN 2 PLANETS' # OF REVOLUTIONS = NUMBER OF CONJUNCTIONS

- KEEP IN MIND THEY THOUGHT IT WAS ORBITING EARTH, NOT THE SUN
- REVOLUTION: 1 “ORBIT”
- CONJUNCTION: WHEN TWO PLANETS, ETC. APPEAR TO COME TOGETHER (IN OTHER WORDS, WHEN ONE PASSES THE OTHER)

(4...) GETS INTO EPICYCLE STUFF RELATING TO MOON, BUT LINKS BACK TO BELOW

KEEP READING FOR MORE EPICYLES INFO

(7-8) 1 SOLAR YEAR IS A YEAR OF MEN. THIRTY SOLAR YEARS = 1 YEAR OF THE FATHERS. TWELVE YEARS OF THE FATHERS = 1 YEAR OF THE GODS. 12000 YEARS OF GODS = A YUGA (FOR ALL PLANETS). 1008 YUGAS OF PLANETS MAKES A DAY OF BRAHAM

360 YEARS IN A YEAR OF THE GODS

- CAN SEE HERE THAT THEY HAD IDEA THAT UNIVERSE HAS EXISTED FOR A LONG TIME. IDEA OF INFINITE UNIVERSE THAT WASNT ADOPTED TIL MUCH LATER WITH _ (IN NOTES). SEE BELOW (11)
- TIES RELIGIOUS DATING SYSTEM TO ASTRONOMY AND CELESTIAL SPHERE.
- “TIME [...] IS MEASURED BY (THE MOVEMENTS OF) THE PLANETS AND THE ASTERISMS ON THE SPHERE”

AYABHATA RESEARCH NOTES ("ARYABHATIYA")

(11) "TIME, WHICH HAS NO BEGINNING AND NO END, IS MEASURED BY (THE MOVEMENTS OF) PLANETS AND THE ASTERISMS ON THE SPHERE"

(12) ALL PLANETS MOVING SAME DISTANCE EACH DAY, EQUALLY.

(13) MOON COMPLETES SMALL ORBIT IN A SHORT TIME. SATURN IN MUCH LONGER BECAUSE OF ITS LARGER CIRCLE AND IDENTICAL SPEEDS.

(15) "BENEATH THE ASTERISMS ARE SATURN, JUPITER, MARS, THE SUN, VENUS, MERCURY, AND THE MOON, AND BENEATH THESE IS THE EARTH SITUATED IN THE CENTER OF SPACE LIKE A HITCHING-POST"

- EVIDENTLY VERY INFLUENCED BY ARISTOTLE, ETC.

(16) ORBITS ARE COMPLETED FASTER THE CLOSER THEY ARE TO THE EARTH (SAME SPEEDS, SHORTER DISTANCE)

- SAYS SAME THING AS KEPLER'S 3RD LAW, REALLY, JUST WITH A DIFFERENT BASIS
- EACH BECOME "LORDS FOR THE DAYS FROM SUNRISE"
- SATURDAY = SATURN, SUNDAY = SUN...

(17 - 21) COMPLICATED EPICYCLE STUFF

(22-...) DETERMINING EXACT PLANET PLACEMENT FROM THE MEAN (THE CENTER OF THE EPICYCLE (I THINK))

(25) ORBIT SPEED = EPICYCLE SPEED FOR PLANETS

- 2 EPICYCLES ARE USED (OF APSIS AND CONJUNCTION) WITH VARIABLE RADII ! (PTOLEMY'S STAY THE SAME : EPICYCLE RADIUS = EARTH-SUN RADIUS)

AXIAL ROTATION:

FUN:

- IT WAS A REVOLUTIONARY PRINCIPLE (PUN INTENDED!)
- FORTUNATELY, ARYABHATA LIVED IN A SOCIETY WHERE SUCH REVOLUTIONARY VIEWS DID NOT RISK THE KIND OF PERSECUTION WHICH BEFELL SOCRATES, BRUNO OR GALILEO.
 - BUT HE DID CATCH SOME FLACK
- THE ORIGINAL STATEMENTS OF ARYABHATA ON AXIAL ROTATION AND SIDEREAL DAY ARE SPREAD OVER 4 VERSES OUT OF HIS 85 VERSES ON ASTRONOMY.

1. "JUST AS A PASSENGER IN A BOAT MOVING DOWNSTREAM SEES THE STATIONARY (TREES ON THE RIVER BANKS) AS TRAVERSING UPSTREAM, JUST SO DOES AN OBSERVER AT LANKA SEE THE FIXED STARS AS MOVING TOWARDS THE WEST AT EXACTLY THE SAME SPEED (AT WHICH THE EARTH MOVES FROM WEST TO EAST). " [GOLA 9]

A. LANKA:

I. "THE EQUATOR IS THE ONLY PART OF THE EARTH WHERE EACH AND EVERY PORTION OF THE ENTIRE SKY IS BROUGHT INTO VIEW BY THE DAILY ROTATION FOR SOME TIME DURING 24 HOURS. AT ANY OTHER PLACE, SOME PORTION OF THE SKY REMAINS PERMANENTLY HIDDEN FROM THE OBSERVER."

II. SEE WHOLE SKY AT THE EQUATOR

III. AND "THEIR ORBITS CROSS THE HORIZON AT RIGHT ANGLES AND ARE BISECTED BY IT, SO THAT EVERY FIXED STAR REMAINS ABOVE THE HORIZON FOR 12 HOURS DAILY"

IV. THE IMPORTANT PART WAS THAT YOU HAD TO BE ON EQUATOR. SIMPLY CHOSE LANKA AS IT WAS ON THE EQUATOR. AND IT WAS ON A MERIDIAN WITH INDIAN CENTER OF LEARNING, UJJAYINI

B. THE VISIBILITY OF THE WHOLE SKY AND THE VERTICAL NATURE OF THE STELLAR ORBITS MUST HAVE BEEN AMONG THE REASONS FOR ARYABHATA SPECIFYING A POINT ON THE GEOGRAPHICAL EQUATOR (LANKA) IN THE QUOTED VERSE (GOLA 9).

C. AS DESCRIBED BY ARYABHATA IN GOLA 16, AN OBSERVER AT THE NORTH POLE SEES ONE HALF OF THE CELESTIAL SPHERE AS REVOLVING FROM LEFT TO RIGHT (I.E., CLOCKWISE) WHILE AN OBSERVER AT THE SOUTH POLE SEES THE OTHER HALF AS REVOLVING FROM RIGHT TO LEFT (I.E., ANTICLOCKWISE).

D. SAME BACKLASH AS EVERYONE ELSE

I. NO ONE BELIEVED HIM. OTHERS HID HIS THEORY TO SAVE HIM EMBARRASSMENT. DIDN'T MENTION IT IN THEIR WORKS

II. "IF THE EARTH IS ROTATING EASTWARD AT A VERY RAPID SPEED, HOW DO BIRDS FLYING IN THE SKY RETURN TO THEIR NESTS (WHICH WOULD BE CONTINUOUSLY SHIFTING FROM THEIR ORIGINAL POSITIONS) ? MOREOVER, WHY DO NOT ARROWS, SHOT TOWARDS THE SKY, FALL WESTWARD? WHY DO NOT THE CLOUDS APPEAR TO MOVE ONLY TOWARDS THE WEST? IF THE EARTH ROTATES SLOWLY, THEN HOW CAN IT COMPLETE ONE ROTATION IN A DAY?" - LALLA (AROUND 8TH CENTURY), ANOTHER ADMIRER OF ARYABHATA

AXIAL ROTATION:

2. THE PERIOD OF ROTATION OF EARTH IS 23 HOURS 56 MINUTES 4.1 SECONDS".

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- "IN A YUGA OF 4320000 SIDEREAL YEARS, THE EARTH ROTATES EASTWARD 1582237500 TIMES" - ...(P66)
- FURTHER IT GIVES AN EXTREMELY ACCURATE VALUE FOR THE NUMBER OF ROTATIONS OF EARTH PER LUNAR ORBIT ($1582297500/57759936 = 27.3964693572$)
 - REAL NUMBER?
- (DOESNT LIKE DECIMALS/FRACTIONS SO HE WRITES IT LIKE THIS)
 - "THE ADOPTION OF A CYCLE OF 4320000 (OR ITS MULTIPLES) ENABLED INDIAN ASTRONOMERS TO AVOID INCONVENIENT FRACTIONS; THEY COULD EXPRESS THEIR FINDINGS IN PLAIN INTEGERS (EVEN IF LARGE). FOR INSTANCE, INSTEAD OF SAYING THAT A (SIDEREAL SOLAR) YEAR CONSISTS OF $366\ 11175/43200$ SIDEREAL DAYS, THEY WOULD RATHER SAY THAT A YUGA CONSISTS OF 1582237500 SIDEREAL DAYS."
 - THEY KNOW HOW MANY YEARS ARE IN A YUGA, SO IT IS EASIER THIS WAY

3. THE EARTH ROTATES BY AN ANGLE OF ONE MINUTE OF AN ARC IN A PRANA [GLTIKA 6]

- BACKGROUND: 12 MONTHS OF THIRTY DAYS OF SIXTY NADIS OF SIXTY VINDIKAS OF 6 PRANAS (OR 60 LONG LETTERS).
- "TO ROTATE BY AN ANGLE OF 1 MINUTE (= 6~ DEGREE), TIME TAKEN BY EARTH IS $1/(60 \times 360)$ OF A SIDEREAL DAY - A TIME INTERVAL CALLED "PRII).A"
- QUOTES FROM SECTION OF POEM/BOOK
- 1 PRANA = 4 SECONDS
 - 21600 PRANAS IN A DAY. 86400 SECONDS IN A DAY
 - 4 SECONDS (WHAT A COINCIDENCE!?)
- EARTH SPINS 1 ARCMINUTE PER PRANA (60TH OF A DEGREE EVERY 4 SECONDS)
 - 86400S IN 360 DEGREES (ONE SIDEREAL DAY)

4. THE ROTATION OF EARTH CAUSES THE NAKSATRA DINA (SIDEREAL DAYS). [KALAKRIYA 5]

- THE CONJUNCTION OF THE SUN AND THE EARTH FORMS THE [CIVIL] DAYS; WHILE THE ROTATION OF EARTH CAUSES THE NAKṢATRA DINA (SIDEREAL DAYS). (KALAKRIYA 5)
- "SIDEREAL DAY IS THE TIME TAKEN BY ANY NAKṢATRA (FIXED STAR) TO PERFORM ONE COMPLETE REVOLUTION AROUND THE EARTH (RELATIVE TO AN OBSERVER ON EARTH). THE LATIN WORD "SIDEREAL" MEANS "PERTAINING TO THE (FIXED) STARS"
 - SIDEREAL DAY: " DURATION BETWEEN TWO SUCCESSIVE STAR-RISES"
- SUNREAL DAY: TIME TAKEN BY THE SUN TO GO AROUND THE EARTH ONCE (RELATIVE TO A TERRESTRIAL OBSERVER); FOR INSTANCE, THE DURATION BETWEEN TWO SUCCESSIVE SUNRISES.
 - (OF COURSE ITS DIFFERENT EVERYWHERE, WHICH ARYABHATA MENTIONS IN GOLA 17)
- DUE TO THE ORBITING OF EARTH AROUND SUN / SUN AROUND EARTH, THE SUN TAKES SLIGHTLY MORE TIME THAN A FIXED STAR TO COMPLETE ITS DAILY REVOLUTION AROUND EARTH
 - (THE SLIGHT DIFFERENCE BETWEEN SIDEREAL AND SOLAR DAY OCCURS BECAUSE THE EARTH, APART FROM ROTATING AROUND ITS AXIS, ALSO REVOLVES AROUND THE SUN).
 - THE DIFFERENCE BETWEEN A SIDEREAL DAY AND SOLAR DAY IS APPROXIMATELY 4 MINUTES.
 - OVER THE COURSE OF A YEAR, THATS ~1440MIN, OR 1 DAY.
- THEREFORE, THE NUMBER OF TIMES THE STAR REVOLVES AROUND THE EARTH IS ONE MORE THAN THE NUMBER OF DAYS (THE NUMBER OF TIMES THE SUN DOES) IN THE YEAR.
- TAKE INTO ACCOUNT ELLIPTICAL ORBITS, VARYING VELOCITY, 23°26'21 TILT OF THE EARTH
 - WHICH MAKE THE DURATION OF A SOLAR DAY IS NOT UNIFORM...
 - OUR HOURS ARE DEFINED SO THAT 1 MEAN SOLAR DAY = 24 HOURS.
- ALL EFFECT THE LENGTH OF VARYING SUNREAL DAY

PLATO'S RESEARCH NOTES

A) PLATO'S THE ACADEMY

PRESTIGE AND INFLUENCE OF PLATO'S ACADEMY

- REGARDED AS THE MOST PRESTIGIOUS AND INFLUENTIAL EDUCATIONAL INSTITUTION IN ANTIQUITY.
- FOUNDED BY PLATO, ONE OF HISTORY'S GREATEST THINKERS.
- ACTIVE FOR ABOUT THREE CENTURIES (C. 387 BC TO C. 86 BC), WITH A LASTING IMPACT ON PHILOSOPHY AND SCIENCE.

MULTIFACETED ROLE OF THE ACADEMY:

- THE ACADEMY WAS NOT JUST A PHILOSOPHICAL SCHOOL BUT ALSO A CENTER FOR SCIENTIFIC RESEARCH.
- SERVED AS A VENUE FOR POLITICAL ADVICE AND GUIDANCE ON PRIVATE AND CIVIC LIFE.
- IT AIMED TO ALIGN PHILOSOPHY WITH PRACTICAL SOCIETAL NEEDS AND PERSONAL CONDUCT.

CONTRIBUTION TO PHILOSOPHY AND SCIENCE:

- THE ACADEMY PRODUCED SOME OF THE MOST BRILLIANT MINDS IN PHILOSOPHY, SCIENCE, AND POLITICAL THOUGHT.
- ITS IDEAS HAVE HAD A PROFOUND AND LASTING INFLUENCE ON THE DEVELOPMENT OF HUMAN THOUGHT.

WIDESPREAD ACKNOWLEDGMENT:

- THE ACADEMY'S IMPORTANCE HAS BEEN UNIVERSALLY RECOGNIZED, BOTH IN ANCIENT TIMES AND MODERN ERAS.
- EVEN THINKERS CRITICAL OF ITS INTELLECTUAL ACHIEVEMENTS HAVE ACKNOWLEDGED ITS SIGNIFICANCE.

SOURCE: KALLIGAS, P., BALLA, C., BAZIOTOPOULOU-VALAVANI, E., & KARASMANIS, V. (2020). PLATO'S ACADEMY ([EDITION UNAVAILABLE]). CAMBRIDGE UNIVERSITY PRESS. [HTTPS://WWW.PERLEGO.COM/BOOK/4221481](https://www.perlego.com/book/4221481)

PLATO'S RESEARCH NOTES

B) THE THEORY OR FORMS

FORM CHARACTERISTICS (PHAEDO)

- A FORM IS DESCRIBED AS UNIFORM (MONOEIDES, "UNI-FORM") AND NON-COMPOSITE (ASUNTHETON).
- THIS CONCEPT IS ADDRESSED IN PHAEDO, WHERE SOCRATES COUNTERS KEBES' OBJECTION ABOUT THE SOUL'S DISSOLUTION AFTER THE BODY'S DEATH.

SOCRATES' ARGUMENT

- SOCRATES ARGUES THAT THE SOUL CANNOT DISSOLVE BECAUSE IT IS AKIN TO THE FORMS (WHICH IT IS IDEALLY ENGAGED WITH).
- THE FORMS ARE UNIFORM AND NON-COMPOSITE, AND ONLY COMPOSITE THINGS CAN DISSOLVE.

INTERCHANGEABILITY OF TERMS

- MONOEIDES (UNIFORM) AND ASUNTHETON (NON-COMPOSITE) ARE USED INTERCHANGEABLY TO DESCRIBE BOTH THE FORMS AND THE SOUL.
- CONNECTION TO OTHER DIALOGUES:
- IN REPUBLIC AND PARMENIDES, FORMS ARE DESCRIBED AS ONE (HEN), MEANING UNITARY, WHICH IS CLOSELY RELATED TO THE UNIFORM AND NON-COMPOSITE NATURE.
- PLATO USES THE TERM EIDOS (FORM OR ESSENCE) TO SIGNIFY AN IDEA OR QUALITY THAT IS ONE, NOT MULTIPLE COMBINED QUALITIES.

SOURCE: POLITIS, V. (2021). PLATO'S ESSENTIALISM ([EDITION UNAVAILABLE]). CAMBRIDGE UNIVERSITY PRESS.

[HTTPS://WWW.PERLEGO.COM/BOOK/4230532](https://www.perlego.com/book/4230532)

C) THE ALLEGORY OF THE CAVE

"ASTRONOMY IN THE CAVE"

- **THE FREED PRISONER BEGINS BY OBSERVING SHADOWS AND REFLECTIONS, PROGRESSING TO DIRECT OBSERVATION OF THE OUTSIDE WORLD.**
- **THIS JOURNEY SYMBOLIZES THE PHILOSOPHER'S PATH FROM INDIRECT KNOWLEDGE (MATHEMATICS) TO DIRECT KNOWLEDGE (PHILOSOPHY).**
- **THE TWO STAGES CORRESPOND TO PLATO'S "DIVIDED LINE": SHADOWS REPRESENT THE STUDY OF SENSIBLES (MATHEMATICS), AND DIRECT OBSERVATION REPRESENTS FORMS (PHILOSOPHY).**

"THE SUN AS THE METAPHOR OF THE GOOD"

- **THE GOOD IS COMPARED TO THE SUN, AS IT MAKES VISION (KNOWLEDGE) POSSIBLE.**
- **THE GOOD UNIFIES THE FORMS AND IS THE ULTIMATE TRUTH THAT PHILOSOPHERS MUST GRASP.**
- **JUST AS THE SUN CREATES HARMONY IN THE PHYSICAL WORLD, THE GOOD CREATES HARMONY AMONG THE FORMS.**

SOURCE: KOUREMENOS, T. (2018). PLATO'S FORMS, MATHEMATICS AND ASTRONOMY (1ST ED.). DE GRUYTER. [HTTPS://WWW.PERLEGO.COM/BOOK/727739](https://www.perlego.com/book/727739)

PLATO'S RESEARCH NOTES

D) THE DIALOGUE BY PLATO

- IN PLATO'S DIALOGUES HUMAN BEINGS ARE VISUALISED AS ART BODIES AND AS ART MATERIALS: AS STATUES AND CHOREUTS, AS COLOURS, METALS, AND INTERWEAVING THREADS. ONE OF THE CENTRAL IDEAS IN PLATO'S PHILOSOPHY IS THE THEORY OF FORMS, WHERE ABSTRACT, IDEAL FORMS (E.G., GOODNESS, BEAUTY, JUSTICE) EXIST IN A HIGHER, NON-MATERIAL REALM. THESE FORMS ARE PERFECT, IMMUTABLE, AND ETERNAL, WHILE THE PHYSICAL WORLD IS JUST A MERE SHADOW OF THEM.
- IN DIALOGUES LIKE THE **REPUBLIC**, **THEAETETUS**, AND **PHAEDO**, PLATO EXPLORES THE RELATIONSHIP BETWEEN KNOWLEDGE, PERCEPTION, AND REALITY, ADDRESSING ISSUES OF EPISTEMOLOGY AND METAPHYSICS.
- **TIMAEUS**: THIS DIALOGUE IS PARTICULARLY IMPORTANT IN RELATION TO ANCIENT ASTRONOMY, WHERE PLATO DISCUSSES THE CREATION OF THE UNIVERSE. PLATO ADOPTS A MATHEMATICAL AND HARMONIOUS VIEW OF THE COSMOS, INFLUENCED BY PYTHAGOREAN THOUGHT.
- PLATO'S VISION OF THE COSMOS REFLECTS A GEOCENTRIC MODEL, WHERE THE EARTH IS AT THE CENTER, AND THE HEAVENS ARE ORDERED IN A CIRCULAR AND HARMONIOUS MANNER. THE CELESTIAL BODIES, INCLUDING THE STARS AND PLANETS, ARE SEEN AS PERFECT, REGULAR, AND ETERNAL.
- IN BOOK VII OF **THE REPUBLIC**, THE ALLEGORY OF THE CAVE SUGGESTS THAT UNDERSTANDING THE COSMOS, ESPECIALLY THE MOVEMENTS OF THE STARS AND PLANETS, HELPS ONE ASCEND FROM THE SHADOWS OF MATERIAL EXISTENCE TO THE LIGHT OF TRUTH.

SOURCE: PETRAKI, Z. (2023). SCULPTURE, WEAVING, AND THE BODY IN PLATO (1ST ED.). DE GRUYTER. [HTTPS://WWW.PERLEGO.COM/BOOK/4188911](https://www.perlego.com/book/4188911)