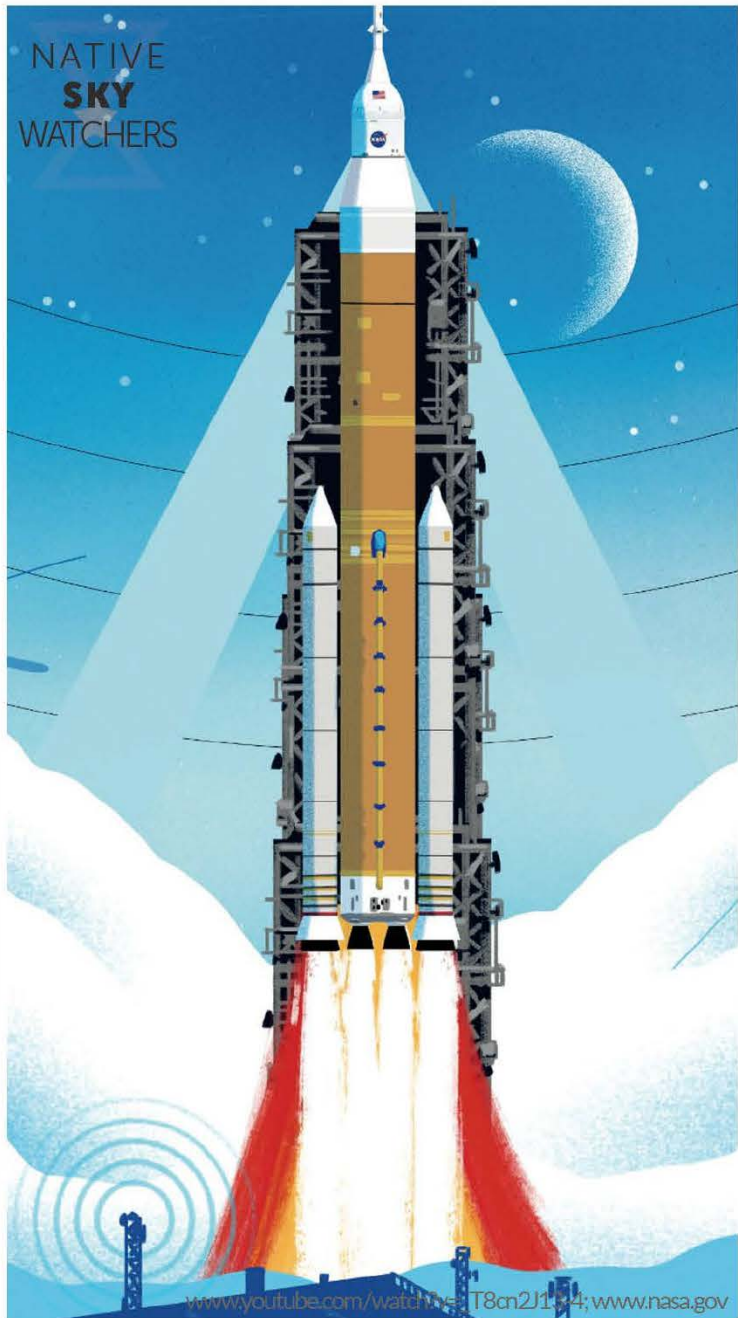


NATIVE
SKY
WATCHERS



www.youtube.com/watch?v=T8cn2J1s4; www.nasa.gov

TWO-EYED SEEING: AFRICAN INDIGENOUS ASTRONOMY & NASA MOON TO MARS



art by Jasmina Daves



www.nasa.gov/exploration/systems/orion/gallery/index.html

FEB. 26
FRIDAY
2021
10:30 AM CST



www.nasa.gov





Two Eyed Seeing – NASA & Indigenous Astronomy – For the Benefit of All

As described by Mi'kmaw elders: *Etuaptmumk*

Two-Eyed Seeing is learning to see from one eye with the strengths of Indigenous knowledges and ways of knowing, and from the other eye with the strengths of Western knowledges and ways of knowing, and to use both these eyes for the benefit of all. (Bartlett, Marshall and Marshall 2012, 336)

Join us!...For this eight month project that weaves together Indigenous Astronomy and NASA content in a way that will engage K-12 learners to participate in science and culture. Seven seasonal live (virtual) events will be produced and delivered each month Oct. 2020 to April 2021. Funded by NASA - Next Gen STEM, focus: Moon to Mars & STEM on Station.

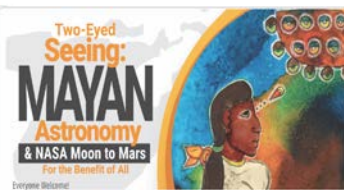
Schedule of Upcoming Live Shows for this Project:



Two Eyed Seeing:
OJIBWE Astronomy & NASA Moon 2 Mars
 Friday, October 23, 2020
 from 10-11 am cdt
[More Info](#) [Register](#)



Two Eyed Seeing:
D(L)AKOTA Astronomy & NASA Moon 2 Mars
 Friday, November 13, 2020
 from 10 am – 11 am cst
[More Info](#) [Register](#)



Two Eyed Seeing:
MAYAN Astronomy & NASA Moon to Mars
 For the Benefit of All
 Everyone Welcome!
Two Eyed Seeing:
Mayan Astronomy & NASA Moon to Mars
 December 17, 2020
 from 6:30-7:30 pm pst
 =8:30-9:30 pm cst



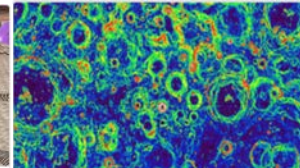
Two Eyed Seeing:
NAVAJO-DINE Astronomy & NASA Moon 2 Mars
 January 29, 2021
 9 am PST, 10 am MST
[Register](#)



Two Eyed Seeing:
AFRICAN Indigenous Astronomy & NASA Moon to Mars
 Friday, February 26, 2021
 10:30 am cst
[Register](#)



Two Eyed Seeing:
HAWAIIAN Indigenous Astronomy & NASA Moon to Mars
 March 12, 2021
 9 am hst, 11 am pst, 12 noon mst, 1 pm cst, 2 pm est
[Register](#)



Two Eyed Seeing:
STEAM, Indigenous Astronomy & NASA Moon 2 Mars
 April 2021
 TBA
[Coming soon...](#)



INSPIRE - ENGAGE - EDUCATE - EMPLOY
The Next Generation of Explorers

- Follow
- [f](#) [t](#) [y](#) [p](#)
- What is Next Gen STEM?
- Commercial Crew Program
 - Small Steps to Giant Leaps
 - Explore Moon to Mars
 - STEM on Station
 - NASA STEM Engagement
- Related Topics
- All Topics A-Z

What is Next Gen STEM?

NASA's Office of STEM Engagement executed a series of efforts to develop STEM products and opportunities that provide a platform for students to contribute to NASA's endeavors in exploration and discovery. These mission-driven activities include over 20 evidence-based products and opportunities to engage students in authentic STEM experiences. NASA is working to provide mission driven opportunities that enhance STEM literacy and help build a vibrant and diverse next generation STEM workforce.

Commercial Crew Program | Small Steps to Giant Leaps

Moon to Mars

Moon to Mars **MARS 2020 STEM TOOLKIT**

Connect Students to #CountdownToMars

Earn Educator Badges

NASA **STEM** FORWARD TO THE MOON #NASASTEM

EXPLORE HUMANS in SPACE with STEM on Station

Funded by:

NASA Next GEN STEM

with focus on
Moon to Mars &
STEM on
Station

LAND ACKNOWLEDGEMENT



Land Acknowledgement



Chukwu abiam, Eke kere uwa, ekele muo

Greetings, Creator of the World

Ehu na Ala ndewo ni

Greetings, heaven and earth

Ala nna dirikwa

Greetings, our ancestors

Ndiche, ekelem unu

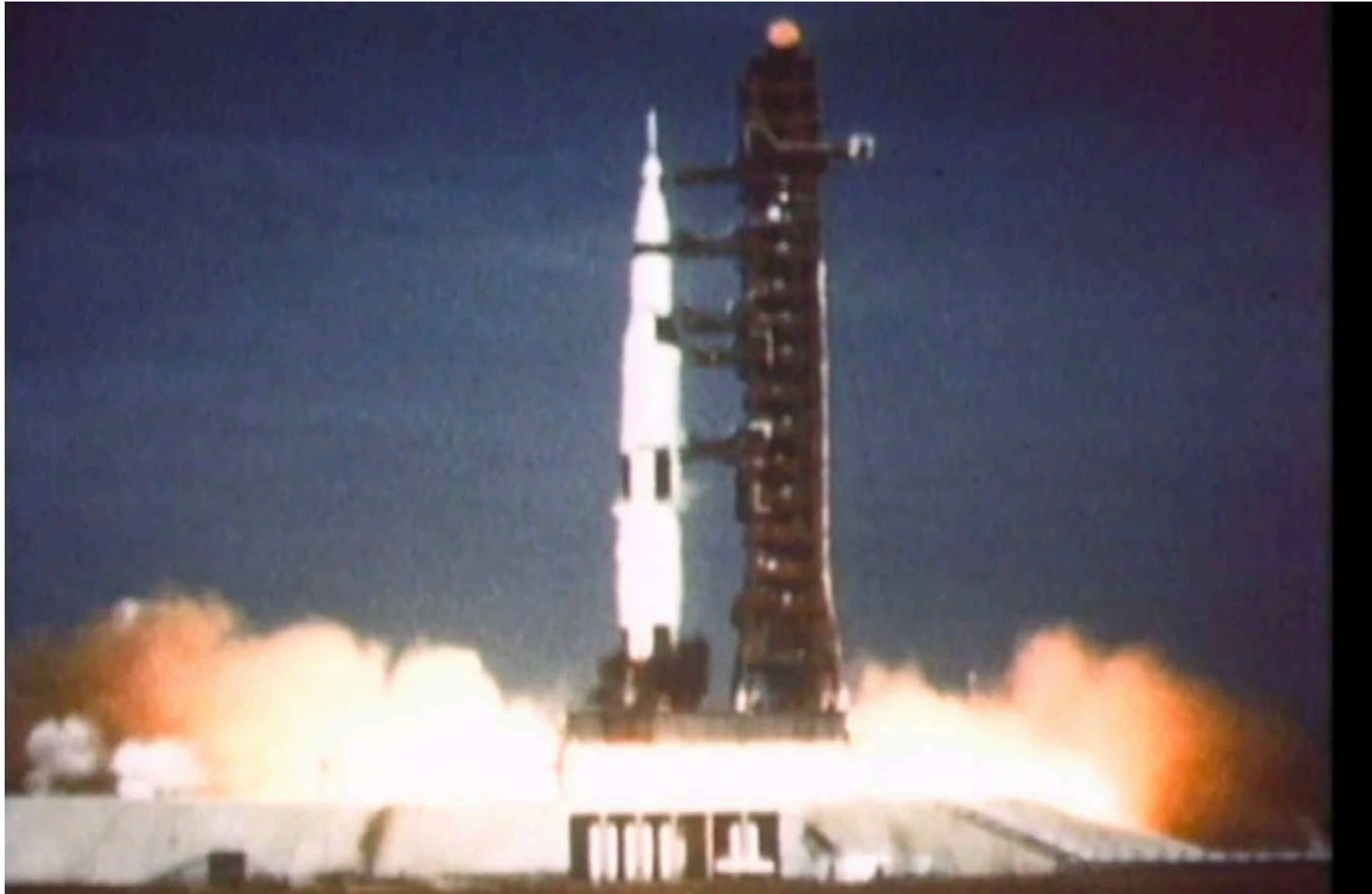
Long live our native land

Cha, Cha, Cha, Igbo kwenu! kwezuo!

Our umbilical cords are buried in the land to continue our linkage to *Ala* (earth) and *Ndiche* (ancestors). We have a duty to sustain the land and leave it clean, healthy and just for posterity.



1. NASA How We Are Going to the Moon Video



https://www.youtube.com/watch?v=_T8cn2J13-4

2. Introduction - Panelists



Jarita Holbrook



Dr. Osuji



Ms. Said



Ms. Vanegas



Annette S. Lee

2. NASA Alphonse Stirling-Apollo Program



2. Apollo and Artemis are Greek Gods - Ms. Venegas' class

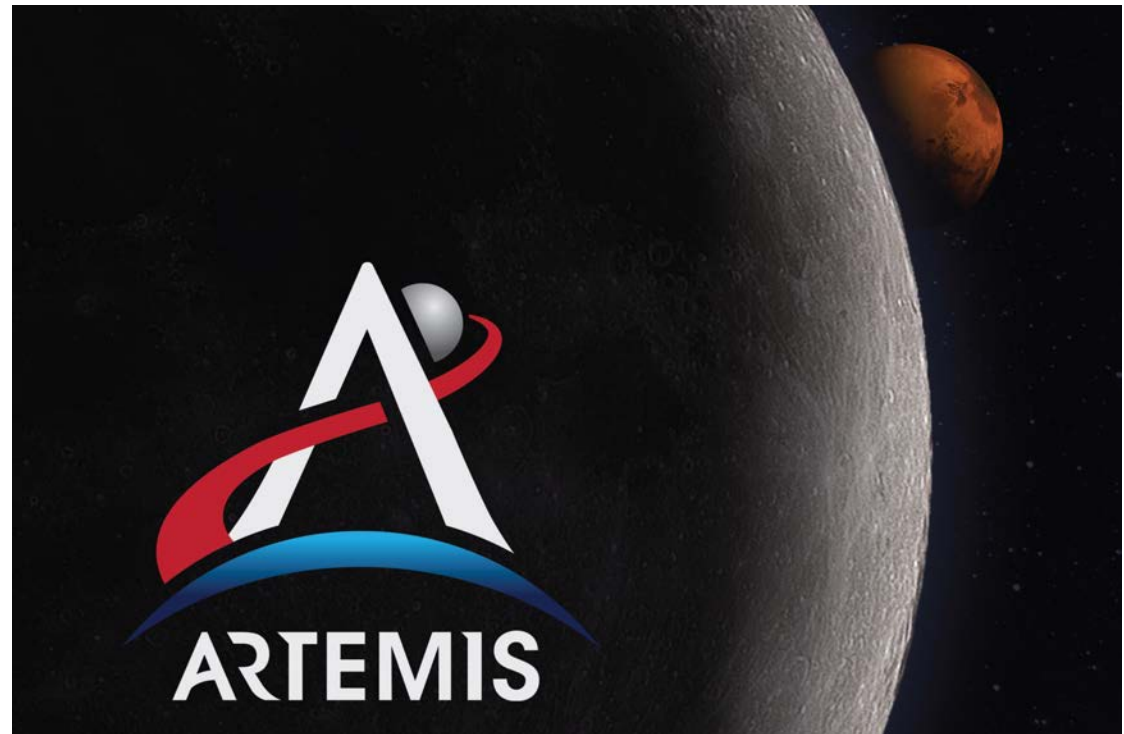


About Apollo

Apollo is a Greek god who drove the sun chariot. He is the twin brother of Artemis. He is the god of poetry, sun, music, and healing.



2. NASA -Artemis -Dawn Stanley



3. Google Earth fly over Africa

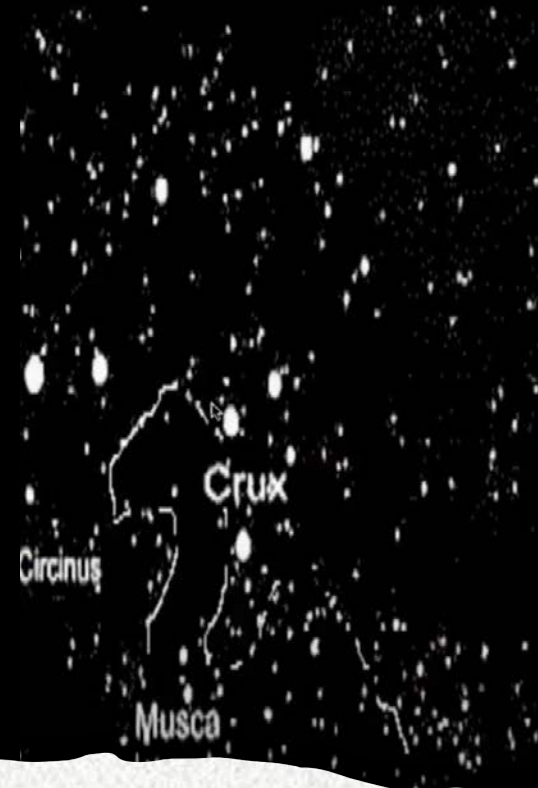


3. Benin – Mawu & Lisa – Jasmina Davé

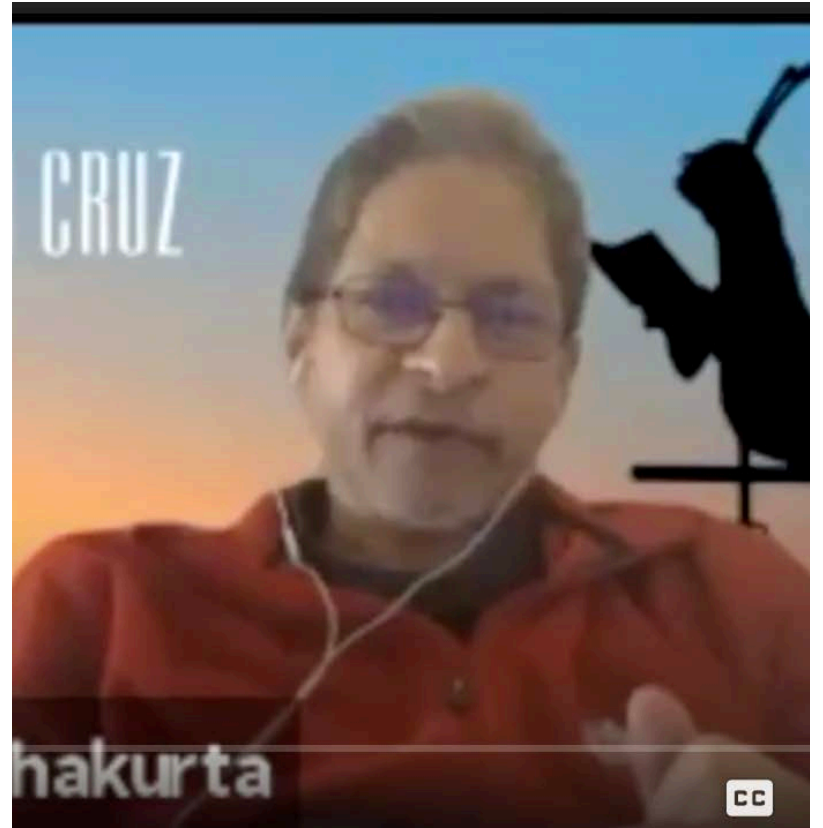
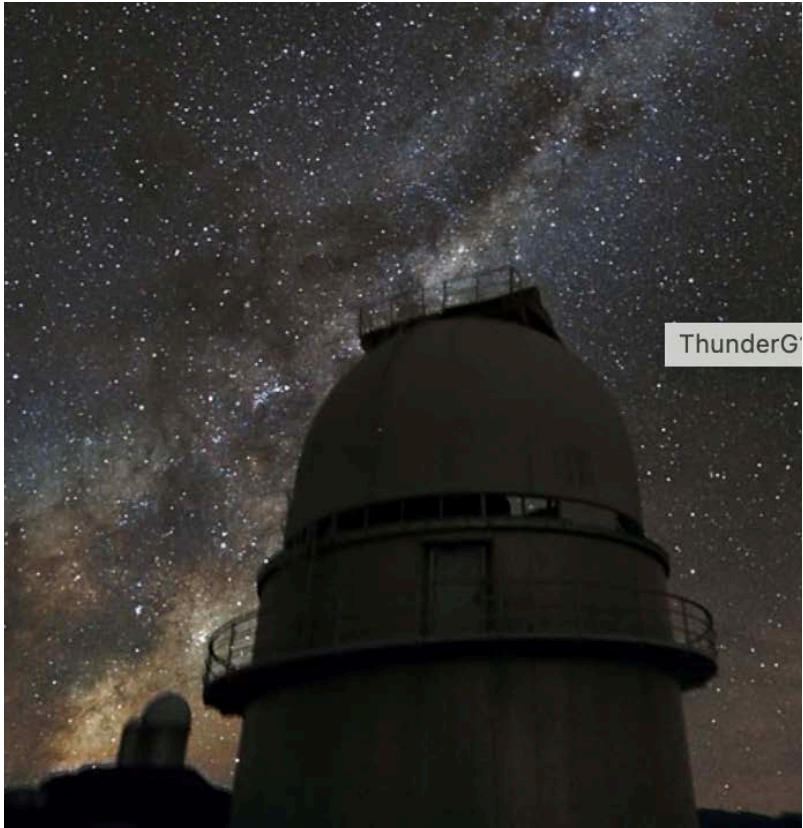


Awrka-cirka (Sky-Camel)

Awrka-cirka, the “sky-camel”. This is a black image in the sky at night in the region of Waadaamo-xooro or waadaamo-lugud (the Southern Cross) caused by the fact that there are no important stars in that area; and in the blackness is said to appear the shape of a huge male camel on dark nights in the months of April and May. Somali folklore has a legend about this Sky-camel. It says that the camel was once, long ago, positioned in the north, above the mountains of cir-shiida, in the Warsangeli district of Erigavo. One year there was a severe drought, and the people of the district attacked the great sky-camel and tried to kill it for meat. First they built a huge platform on top of the highest mountain of the cir-shiida, tall enough for the people standing on it to reach up to the tail of the sky-camel and cut it off. The camel felt the pain and raced off to the south - where it is still to be seen. The Milky Way is said to be the path taken by the sky-camel on its hurried journey southwards.



4. Somali Awrka-Circka, Sky Camel – Ms. Said



4. Observing at Keck

5. Somali Moon Guides

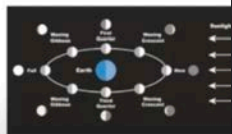
MOON GUIDES

There are 28 stations/days in which the moon aligns along with the stars and these positions are associated with weathers. Somali people use the moon and stars as guides for weather. These moon's alignments fall in certain times and predict weather. This is also used as a sign of good or bad will to the ones born under it. In a book by Galaal, he calls them stations and each station falls on a certain prediction of the weather and the fate of the child born then. These alignments, their meaning and names are taken from oral traditions.



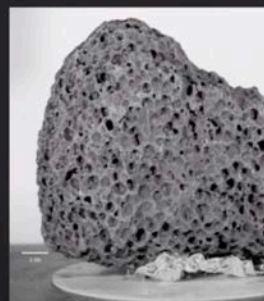
The Moon

The Moon orbits around Earth and it's Earth's only natural satellite. It has different phases depending on what side it is illuminated by the Sun. It takes about 29.5 days for the Moon to travel all the way around the Earth and complete its orbit. When it is night the moon reflects light from the Sun making it bright at night.



What is the composition of the moon?

- During the Apollo 17 exhibition, Harrison Schmitt used a special tool to collect soil and rock samples from the moon's lunar surface. He found ancient rocks formed when the moon had Maria's of lava. That rock is now called lunar highlands.
- The moon and earth's compositions do have similar traits, but earth having such a protective atmosphere- is home to more elements than the moon with little protection from its thin exosphere.



LRO

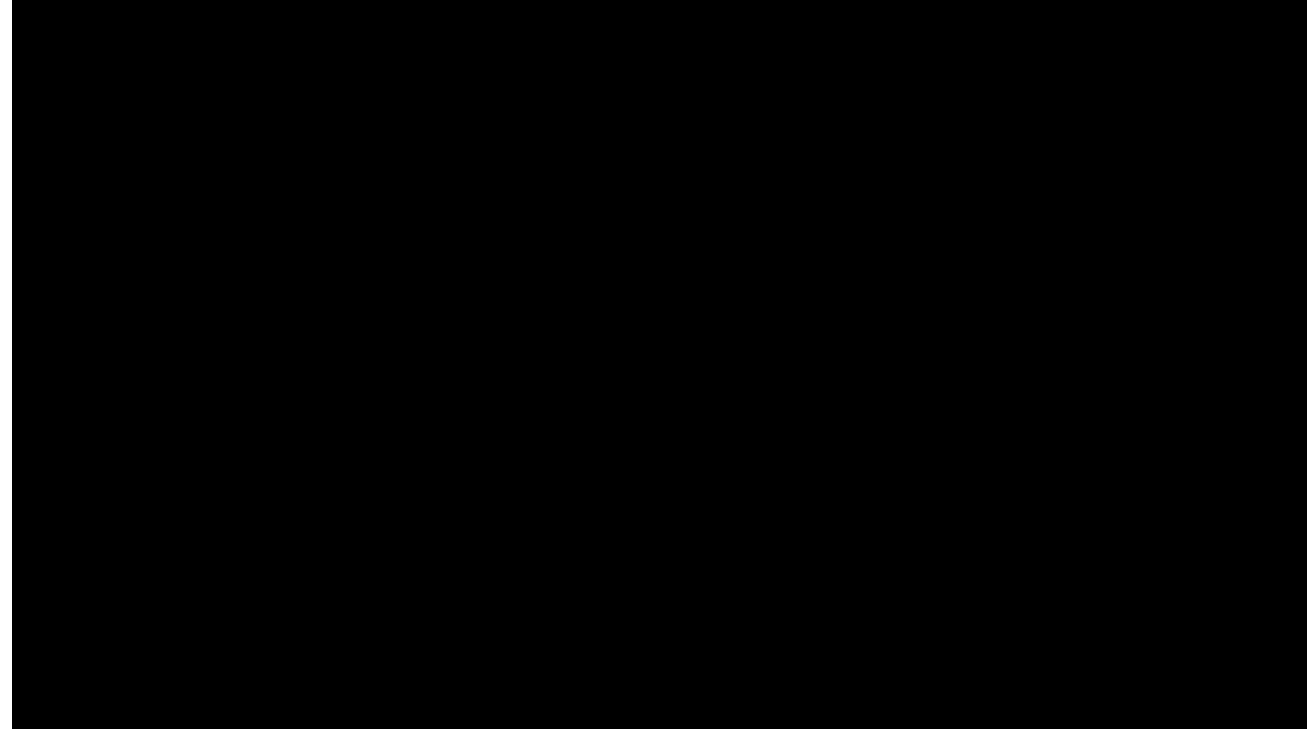
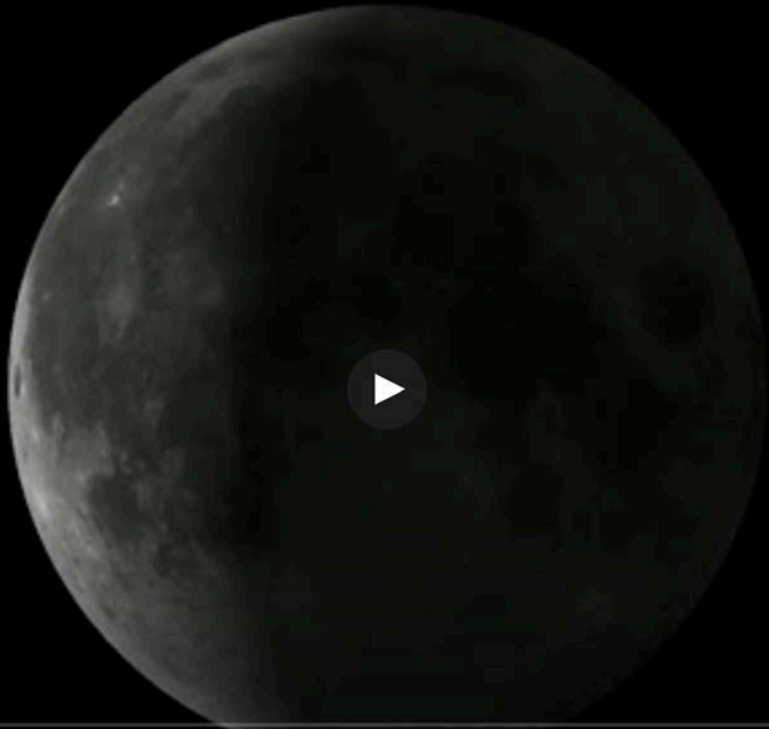
The LRO or Lunar Reconnaissance Orbiter is trying to make a 3D map of the moon. The spacecrafts mass if 4,000 pounds, and was launched June 18th, 2009. Making a 3D map of the Moon it would make it a lot easier to plan future missions to the Moon.

5. Moon Chemistry- Dr. Osuji's Class

5. Map of Africa



5. Lunar Libration



6. NASA -Space Launch System (SLS)

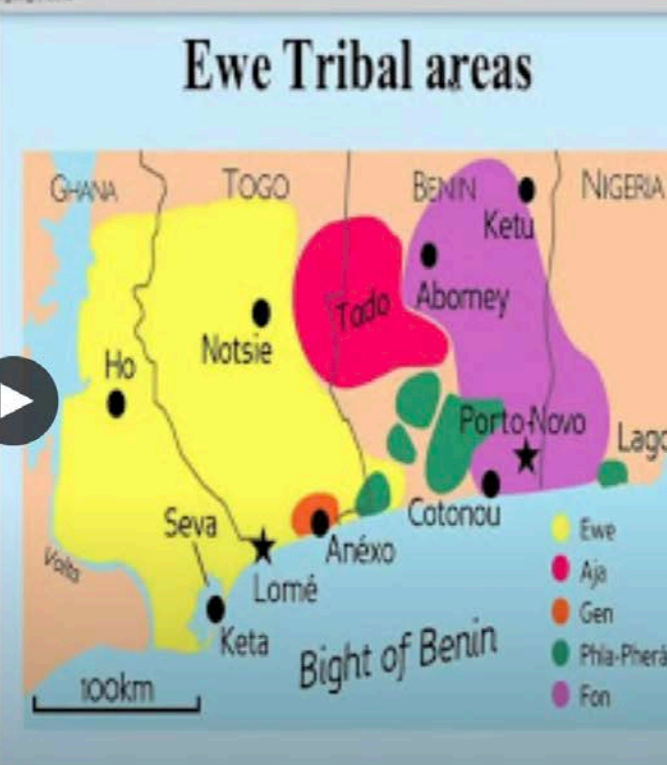


6. Thunder Gods of Africa

Khebioso (Kebioso)

Lightning God - Ewe people

an ethnic group who occupy the south-eastern part of Ghana, and also parts of neighbouring Togo and Benin



The map, titled "Ewe Tribal areas", shows the geographical distribution of several Ewe subgroups across the borders of Ghana, Togo, and Benin. The subgroups are color-coded: Ewe (yellow), Aja (pink), Gen (orange), Phia-Pherá (green), and Fon (purple). Key locations marked include Ho, Notsie, Seva, Keta, Lomé, Anéxo, Tado, Abomey, Ketu, Porto Novo, and Cotonou. The Bight of Benin is also labeled. A 100km scale bar is provided at the bottom left of the map. A play button icon is overlaid on the map area.

Q & A

Somali Awrka-Cirka (Sky-Camel)



"Awrka-Cirka, the "Sky-Camel". This is a black image in the sky at night in the region of Wadaamo-Xooro or Waadaamo-Lugud (the Southern Cross), caused by the fact that there are no important stars in that area; and in the blackness is said to appear the shape of a huge male camel on dark nights in the months of April and May. Somali folklore has a legend about this Sky-Camel. It says that the camel was once, long ago, positioned in the north, above the mountains of Cir-Shiida, in the Warsangeli district of Erigavo.

One year there was a severe drought, and the people of the district attacked the great sky-camel and tried to kill it for meat. First they built a huge platform on top of the highest mountain of the Cir-Shiida, tall enough for the people standing on it to reach up to the tail of the sky-camel and cut it off. The camel felt the pain and raced off to the south - where it is still to be seen. The Milky Way is said to be the path taken by the Sky-Camel on its hurried journey southwards.

Photo by Diana Robinson

First they built a huge platform on top of the highest mountain of the Cir-Shiida, tall enough for the people standing on it to reach up to the tail of the sky-camel and cut it off. The camel felt the pain and raced off to the south - where it is still to be seen. The Milky Way is said to be the path taken by the Sky-Camel on its hurried journey southwards.

In the month before the start of the gu rains, the Sky-Camel is seen with its head down towards the east. Then it is said to be drinking water — Wuu Afku-Rubadlaynayaa. In April and May, its image is upright again, and can be seen clearly between eight and twelve o'clock at night, apparently satisfied, and chewing the cud heartily. In June and July, its head appears to be turned upwards towards the zenith, its back falling towards the west, apparently cropping the tops of the trees. In fact, the three different periods of the grazing year in this region of Africa are closely pictured by the onset of the gu rains, all the livestock are busy drinking the spring waters. Towards the middle of the rains, when there is plenty of green grass and water, the animals have fed so well that they spend long periods contentedly sitting and chewing. And when the rains are finished, and the green grass parches, the camels begin cropping from the trees. -Written by Educator Amun Said

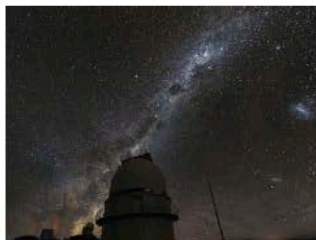


Photo Credit: ESO Bardon LaSilla

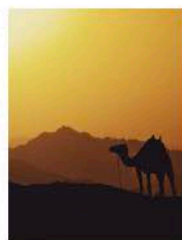
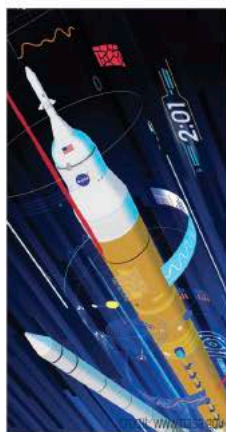


Photo by Mariam Sollman

Observing the Milky Way

Astrophysicists use observatories situated on mountaintops around the world in order to study the physical properties of celestial bodies including our own galaxy the Milky Way. We had the opportunity to do a virtual visit with Prof Raja Guha Thakurta and his team as they observed distant stars in the halo of our galaxy. They are determining the Milky Way's collision with the Large Magellanic Cloud has shifted our galaxy's dark matter halo.



credit: www.nasa.gov

Thank you!

Credit for this work:

Holbrook, Jarita, Amun Said, Carmen Gavin Vanegas, Angela Osuji, and Annette S. Lee. "Two-Eyed Seeing: African Indigenous Astronomy & NASA Moon to Mars", Feb. 2021, <https://nativeskywatchers.com/two-eyed-nasa-african.html>

Additional Thanks to: All Nations - South High School and Washburn High School both in Minneapolis, Minnesota.



Artwork © M. M. Davies, 2021



credit: www.nasa.gov

References:

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Kröger, F. (1986). The notion of the moon in the calendar and religion of the Balsa (Ghana). *Systèmes de Pensée En Afrique Noire*, 7, 149-151. <https://doi.org/10.4000/span.610>

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San & Sotho People of South Africa



Photo by April Cox

The San people of Southern Africa - Young girl with magical properties throws the fire up into the sky which makes the Milky Way to show the hunters the way to come home. Among the Sotho people also of Southern Africa, they saw the many stars as a herd of elephants that was so big that there are too many elephants to count. Thus, the Milky Way is called the Path of Elephants - Gwara Renzou (McCosh, 1979).

NASA Space Launch System (SLS)

NASA's Space Launch System, or SLS, is a super-heavy-lift launch vehicle that provides the foundation for human exploration beyond Earth's orbit. With its unprecedented power and capabilities, SLS is the only rocket that can send Orion (the space craft), astronauts, and cargo to the Moon on a single mission. Offering more payload mass, volume capability, and energy, SLS is designed to be flexible and evolvable and will open new possibilities for payloads, including robotic scientific missions to places like the Moon, Mars, Saturn, and Jupiter. <https://www.nasa.gov/exploration/systems/sls/overview.html>



Photo by www.nasa.gov

African Thunder Gods

Thunder and lightning are dramatic physical events that merit their own gods!

Ngai is the supreme god of the Gikuyu people of Kenya and when he stretches his joints in preparation for battle it makes thunder. Amadioha is the thunder god of the Igbo people of Nigeria. Bwaza is the thunder god of the Gurage people of Ethiopia. Deng is the rain god that is also connected to thunder of both the Nuer and the Dinka people of South Sudan. Khebioso is the lightning god of the Ewe people of Ghana and Togo. Xevioso is the god of thunder & lightning of the Fon people of Ghana and Togo, and is related to So the Thunder God of the Anlo people of Ghana. Kiwanuka/Sserubwatuka is the god of thunder of the Ganda people of Uganda. Sserubwatuka previously was a human and his twin brother is Musoke the rainbow God. Shango is the thunder god and god of the forge (blacksmith) of the Yoruba people of Nigeria.

What if we had the ability to rename the Space Launch System (SLS) rocket after one of the African Thunder gods?



Photo by Steve Kiezi

Thank you!

nativeskywatchers@gmail.com

www.nativeskywatchers.org

Educator Materials & Resources:

- **Booklet** featuring Hawai'ian Indigenous Astronomy & NASA Moon to Mars content | [Coming soon...](#)
- **Slides** supplement to the Live Show & NASA Moon to Mars content | [Coming soon...](#)
- **Event Flyer** | [View](#)
- **Worksheet** | [Coming soon...](#)
- **Recording** of Live Event (will be posted ~week after the event) | [Coming soon...](#)

Schedule of Upcoming Live Shows for this Project:



Two-Eyed Seeing:
Ojibwe Astronomy
& NASA Moon 2 Mars

Two Eyed Seeing:

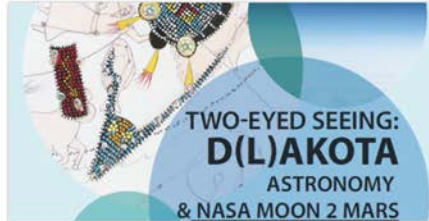
**Ojibwe Astronomy & NASA
Moon to Mars**

Friday, October 23, 2020

from 10-11 am cdt

[More Info](#)

[View](#)



TWO-EYED SEEING:
D(L)AKOTA
ASTRONOMY
& NASA MOON 2 MARS

Two Eyed Seeing:

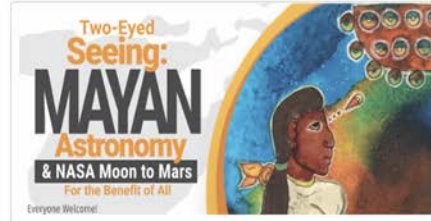
**D(L)akota Astronomy & NASA
Moon to Mars**

Friday, November 13, 2020

from 10 am – 11 am cst

[More Info](#)

[View](#)



Two-Eyed
Seeing:
MAYAN
Astronomy
& NASA Moon to Mars
For the Benefit of All
Everyone Welcome!

Two Eyed Seeing:

**Mayan Astronomy & NASA
Moon to Mars**

December 17, 2020

from 6:30-7:30 pm pst
=8:30-9:30 pm cst

[View](#)



Two Eyed Seeing:
**NAVAJO (Dine) Astronomy &
NASA Moon to Mars**

January 2021

9 am PST, 10 am MST

[Register](#)

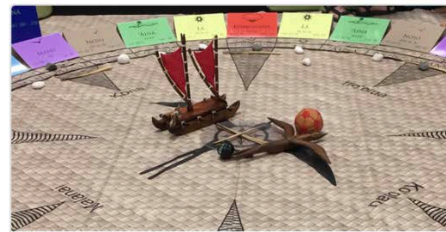


Two Eyed Seeing:
**AFRICAN Indigenous
Astronomy & NASA Moon to
Mars**

Friday, February 26, 2021

10:30 am cst

[Register](#)



Two Eyed Seeing:
**HAWAI'IAN Indigenous
Astronomy & NASA Moon to
Mars**

March 12, 2021

9 am hst, 11 am pst, 12 noon mst, 1 pm
cst, 2 pm est

[Register](#)



Two Eyed Seeing:

**HAWAI'IAN Indigenous
Astronomy & NASA Moon to
Mars**

March 12, 2021

9 am hst, 11 am pst, 12 noon mst, 1 pm
cst, 2 pm est

[Register](#)