

“Two-Eyed Seeing: NASA & Indigenous Astronomy – For the Benefit of All”

Annette S. Lee, Gerardo Aldana, David Begay, Kalepa Baybayan, Jarita Holbrook, Tavia La Folette, Nancy Maryboy

May 24-27, 2021

International Astronomical Union – Communicating Astronomy with the Public (IAU-CAP)



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.

<https://nativeskywatchers.com/index.html>



Welcome to *Native Skywatchers!*

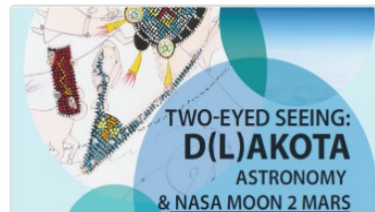
Designed by Annette S. Lee (2007), the *Native Skywatchers* initiative seeks to remember and revitalize indigenous star and earth knowledge. The overarching goal of *Native Skywatchers* is to communicate the knowledge that indigenous people traditionally practiced a sustainable way of living and sustainable engineering through a living and participatory relationship with the above and below, sky and earth.



Two Eyed Seeing:
OJIBWE Astronomy & NASA Moon 2 Mars

Friday, October 23, 2020
from 10-11 am cdt

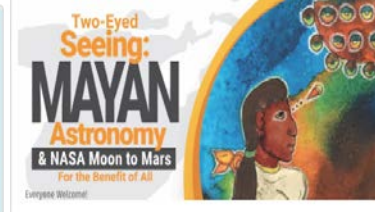
[More Info](#) [Register](#)



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

December 17, 2020
from 6:30-7:30 pm pst
=8:30-9:30 pm cst

[View](#)

We aim to improve current inequities in education for native young people, to inspire increased cultural pride, and promote community wellness. We hope to inspire all people to have a rekindling or deepening sense of awe and personal relationship to the cosmos.



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

January 29, 2021
9 am PST, 10 am MST, 11 am cst, 12 noon est

[View](#)



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

Friday, February 26, 2021
10:30 am cst

[View](#)



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

[View](#)



Two Eyed Seeing:
Art, Indigenous Astronomy & NASA Moon 2 Mars

Friday, April 30, 2021
9 am cdt, 10 am edt, 8 am mdt, 7 am pdt

[View](#)

For thirteen years we have been leading indigenous astronomy revitalization efforts starting with our own communities, Ojibwe and D/Lakota. We invite you to join our effort in 'building community around the native star knowledge'.

New Event - LIVE (VIRTUAL) SHOW!



event flyer, A. Lee, Oct. 2020

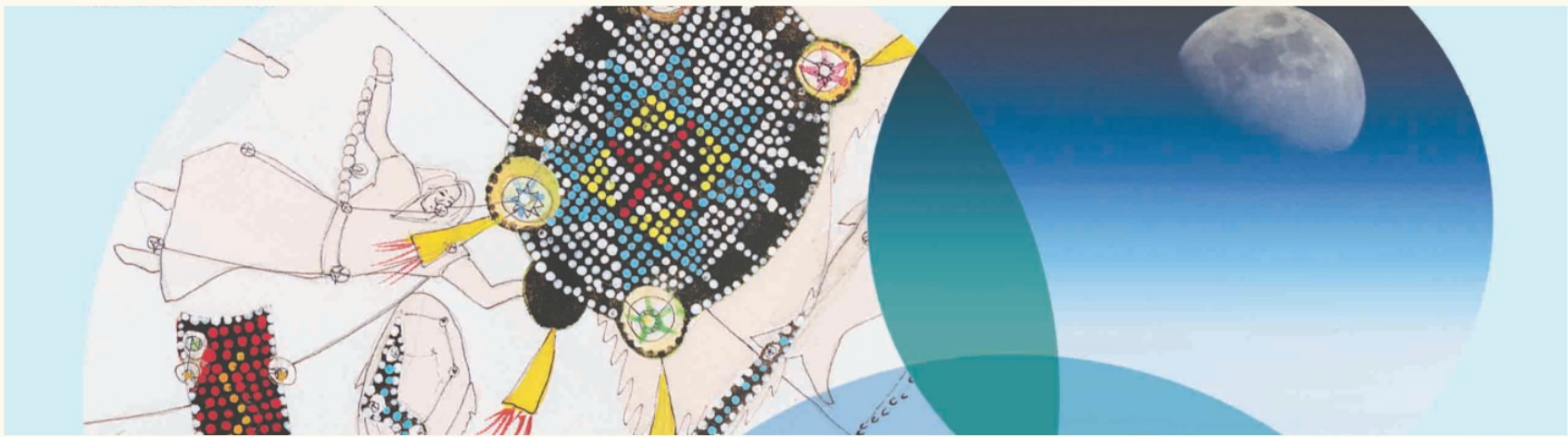
"Two Eyed Seeing: OJIBWE Astronomy & NASA Moon to Mars"

Friday, Oct. 23, 10 am – 11 am cdt

Boozhoo, Aaniin! Join us for a 60 m live show featuring the *Native Skywatchers - Ojibwe Team*: Carl Gawboy (elder), William Wilson (elder), Jeffrey Tibbetts, Jim Knutson-Kolodzne, and Annette S. Lee. Weaving together Indigenous Ojibwe Astronomy & NASA science this event will offer insights from both world-views with focus on the Moon. Topics include: Ojibwe Fall constellations like the *Mooz*, teachings related to *Mikinaak* (Snapping Turtle)...*Maingan Mikan* (the Wolves Path), *Bugonagiizhig* (Hole in the Sky), the soundscapes of fall, and more!

Educator Leads and Partnering Schools: Lindsey Markwardt, Indian Education Home School Liason, grades 5-12, the Alternative School, Cloquet, MN Cloquet Area Alternative Education Program (CAAEP), Melissa Peterson M. Ed, 5th Grade Teacher K-5 Science Coordinator, North Star Academy Duluth Edison Charter School, Duluth, MN, and Genie Turner, 5th & 6th grade, Nett Lake Elementary School, Nett Lake, MN.





event flyer, A. Lee, Oct. 2020

"Two Eyed Seeing: D(L)akota Astronomy & NASA Moon 2 Mars"

Friday, Nov. 13, 10 am – 11 am cst

Hau Mitákuyepi! Join us for a 60 m live show featuring the Native Skywatchers - D(L)akota Team: Janice Bad Moccasin, Ida Downwind, Ramona Kitto Stately, Jim Knutson-Kolodzne, Annette S. Lee, and James Spotted Thunder. Weaving together Indigenous D(L)akota Astronomy & NASA science this event will offer insights from both world-views.

Supporting organizations : *Dakhóta lápi Okhódakičhiye*, Minnesota Indian Education Association, and We Are Still Here Minnesota!

Educator Leads and Partnering Schools: Michael Connelly-Science Specialist-American Indian Magnet-St. Paul Public Schools, MN and Jillian Stately, Equity Specialist-Indian Education-Osseo Area Schools, Osseo, MN.

D(L)akota Moon Months - *Haŋ Wi:*

October - *Čhaŋwápakasna Wí* - Trees shaking off the leaves Moon

November - *Thahéčapšur Wí* - Deer Antler Shedding Moon

December - *Čhaŋkápopha Wí* - Moon of Popping Trees

Refer



James Spotted Thunder....



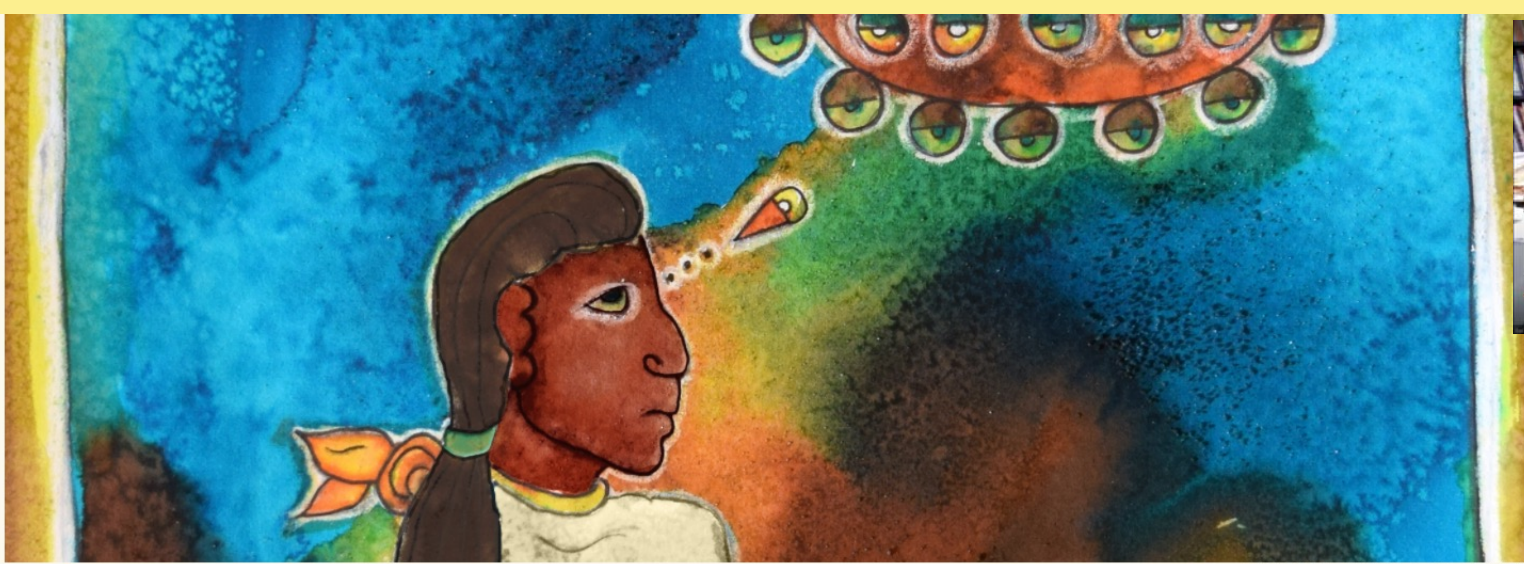
Mila, Braxton, Jamison... Lakota, Osseo Area Schools



Janice Bad Moccasin

Hau Mitakuyepi! Anpetu kin de Owasin.





Artwork by G. Aldana & A. Lee, Nov. 2020

"Two Eyed Seeing: Mayan Astronomy & NASA Moon to Mars"

Thursday, Dec. 17, 6:30 – 7:30 pm pst

Everyone Welcome! Please join us Thursday, December 17, 2020, 6:30 pm pst for a live (virtual) show featuring Mayan Indigenous Astronomy, presented by: Gerardo Aldana, Andrea Carrillo, Annette S. Lee, Andrea Medina, Graciela Rodriguez, and NASA Astronaut Jose Hernandez! Supporting organizations are *Native Skywatchers*, NASA, and the Chicano Studies Institute at UC Santa Barbara.

Our lead educators are Andrea Carrillo and Graciela Rodriguez from Adelante Charter School in Santa Barbara, California.

Learn about MAYAN ECLIPSE Cycles!

Chol Qij – the 260 Day Count: With the help of our 1st grade partners, learn the basic count used in Mayan texts to track astronomical cycles.

Communities of Time: Classic Mayan Art and the K'iche' Creation narrative known as the Popol Vuh represent time and elements of time as a balance, and not as a mechanical, objective process. Our 1st grade partners recount the story of Vukub Kaquix (7 Macaw), the false Sun.

The Classic Period Lunar Series: See how Mayan scribes recorded the phases of the Moon within their historical inscriptions.

Xultun Moons and Modern Satellites: Find out how archaeologists encountered a mural showing Classic Mayan astronomers by using remote sensing and satellite technology.

The Dresden Codex Eclipse Table: See how a Postclassic scribe tracked eclipse cycles as recorded in a 14th century Mayan screenfold manuscript known as the Dresden Codex.





Artwork by M. Bainbridge 2000, Copyright © N. Maryboy

"Two Eyed Seeing: Navajo (Dine) Astronomy & NASA Moon to Mars"

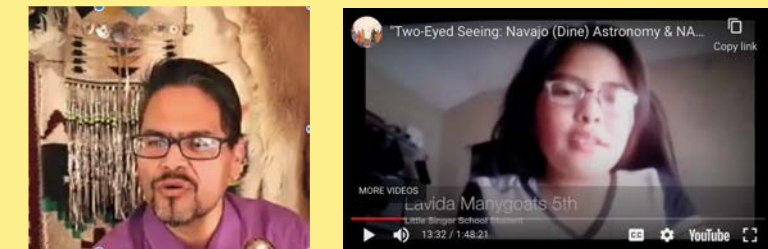
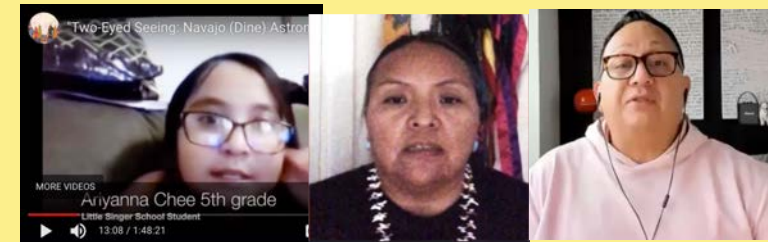
Friday, January 29, 2021

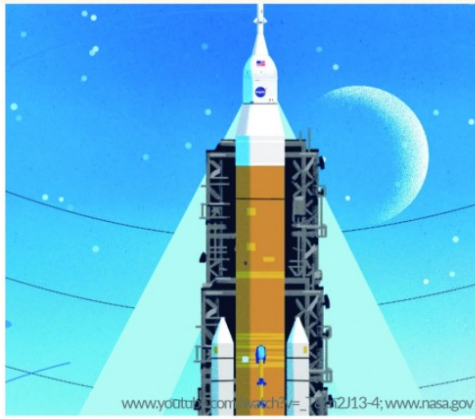
9 am Pacific Time, 10 am Mountain Time, 11 am Central Time

Join us for an exciting session on Navajo (Dine) little known ancient astronomy! Learn how the Coyote created chaos as the Holy Beings were naming the stars. See how Navajo star knowledge is still used today, and what is the Navajo protocol for telling stories of the sky. We will focus on the skies of the Navajo winter months. Learn from Navajo traditional knowledge holders, and visit actual classrooms in the American Southwest.

Presented by: David Begay-Ph.D., Nancy Maryboy-Ph.D., Wilphina Becenti-M.Ed., Albert Brent Chase, Sarah Margoles-M.S.,M.Ed., Ashley Teren-M.Ed., Tom Tomas-M.Ed., and Annette S. Lee-Ph.D. Our lead schools are: Little Singer Community School in Winslow, Arizona and Miller Middle School in Durango, Colorado. Supporting organizations are Native Skywatchers, Indigenous Education Institute, and NASA. Funded by NASA – Next Gen STEM.

<https://nativeskywatchers.com/two-eyed-nasa-navajo.html>





"Two Eyed Seeing: African Indigenous Astronomy & NASA Moon to Mars"

Friday, February 26, 2021

10:30 am cst, 11:30 am est, 9:30 am mst, 8:30 am pst

Join us for an exciting live show on African Indigenous Astronomy and NASA Moon to Mars. Presentations will include: parallels between the Greek Twin Gods-Apollo (Sun) and Artemis (Moon) and the West African country of Benin's Twin Gods - Mawu (Moon) and Liza (Sun) from the Fon people and properties of the Moon from the over-arching feminine representation to the astrochemistry on the lunar south pole. A closer look at African Thunder gods may provide insight for naming the next NASA mission...!

Presented by: Jarita Holbrook, Amun Said, Carmen Gavin Vanegas, Angela Osuji, and Annette S. Lee. Our leads schools are: All Nations-South High School and Washburn High School in Minneapolis, Minnesota. Supporting organizations are Native Skywatchers and NASA. Funded by NASA – Next Gen STEM.





"Two Eyed Seeing: Hawaiian Indigenous Astronomy & NASA Moon to Mars"

Friday, March 12, 2021

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

Join us for an exciting live show on Hawaiian Indigenous Astronomy including the revitalization of Wayfinding and traditional Hawaiian methods of navigation. Students from the Volcano School of Arts and Sciences will present their research which will include a place-based activity, "Make Your Own Hawaiian Star Compasses" and essential understanding of the Hawaiian Star Families. Also an important discussion on the parallels between the Indigenous Hawaiian process of choosing a crew and the NASA process used for the Artemis Moon mission (2024) and later the Mars mission (2030's), both grounded in similar missions of exploration but employing different technologies.

Presented by: Kālepa Baybayan, Lisa Barnard, Barbara Sarbin, Jacqueline Ramirez, and Annette S. Lee. Our lead school is the Volcano School of Arts & Sciences in Volcano, Hawai'i. Supporting organizations are Native Skywatchers, 'Imiloa Astronomy Center, and NASA. Funded by NASA – Next Gen STEM.

<https://nativeskywatchers.com/two-eyed-nasa-hawaiian.html>



Kālepa Baybayan



Lisa Barnard



Jacqueline Ramirez





©South African Astronomical Observatory (SAAO), 1998; ©William Wilson, "Bebaamaadizid Anung, 2021"; Art by Ms. Richardson & Mrs. Venzen-Hall's students; ©Annette S. Lee, "Pipe Ceremony in the Stars", 2021; ©SAAO

"Two Eyed Seeing: Art, Indigenous Astronomy & NASA Science - Making Spirit, Making Art"

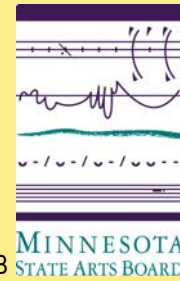
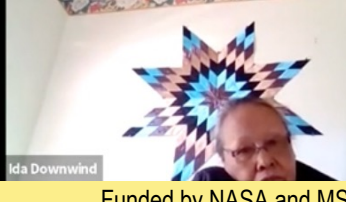
Friday, April 30, 2021

9 am cdt, 10 am edt, 8 am mdt, 7 am pdt

Join us for an exciting live show at the intersection of: art, culture, and science. Three incredible teams will present their creative work from the Ojibwe cultural lens, the D(L)akota cultural lens and the African American/South African cultural lens. The Ojibwe team will share knowledge about the Spring constellations like: Mishi Bizhiw (the Great Panther) and Madoodiswan (the Sweat Lodge). D(L)akota elders and knowledge holders will share teachings of Sunka Wakan Oyate (Horse Nation) and Cansasa (Red Willow). Students and their teachers from the third grade class at Dr. Bernard Harris Sr. Elementary School in Baltimore will share the South African celestial teachings of the healing star, the crocodile who swallows the Sun, the giraffe stars, and the hopeless hunter.

Presented by: Annette S. Lee, Carl Gawboy, William Wilson, Jeffrey Tibbetts, Jim Knutson-Kolodzne, Janice Bad Moccasin, Ida Downwind, Ramona Kitto Stately, Tavia La Follette, Mrs. Venzen-Hall, and Ms. Richardson. Our lead school is the Dr. Bernard Harris Sr. Elementary School in Baltimore, Maryland. Supporting organizations are Native Skywatchers, Minnesota State Arts Board (MSAB) and NASA. Funded by Minnesota State Arts Board-Creative Support for Organizations & Individuals FY21 and NASA-Next Gen STEM.

<https://nativeskywatchers.com/two-eyed-nasa-art.html>



Funded by NASA and MSAB



Two-Eyed Seeing: NASA & Indigenous Astronomy for the Benefit of All

Principle Investigator (PI): Dr. Annette S. Lee

Proposed Program Goal:	☑	Comments
a. Serve students in grades K-12	☑	Yes. All seven live events (Webinars) in the series had 2-4 lead K-12 educators that directly involved their K-12 students in this programming. In addition to the live event, they did at least one additional NASA-focused activity in their classroom over the project (Sept. 2020 to May 2021). Some educators did multiple NASA activities throughout the project dates.
b. Integrate Next Gen STEM educational content from NASA mission-focused activities including STEM on Station and/or Moon to Mars	☑	Yes. Teachers were allowed to pick the activity that was best suited to their students' interests and that correlated with their existing schedules. All teachers involved in this project used NASA resources, particularly those in NASA-Next Gen STEM, especially Moon to Mars and STEM on Station.
c. Meet or exceed stated goal of reaching 50,000 students	☑	Yes.*(including internet reach)
d. Meet or exceed stated goals of reaching underrepresented/underserved groups	☑	Yes. Absolutely achieved in all respects. See Participation data. This included both schools on the reservations; and both rural and urban schools.
e. Be conducted during the implementation period of September 1, 2020 to May 31, 2021.	☑	Yes. Done.

Actual Data:	Total Students	Total Educators	% Indigenous (Black/Hispanic/Native)	% Girls/ Women	Total Users
1. Ojibwe Event					
Lead -1	10	1	100	67	
Lead -2	16	1	25	69	
Lead -3	59	1	100	50	
Online Attendees	2017	424	31.5	50	2375
2. Dakota Event					
Lead -1	43	1	76	49	
Lead -2	75	2	100	49	
Online Attendees	982	324	33	50	1278
3. Maya Event					
Lead -1	60	2	100	50	
Online Attendees	479	262	21	50	1937
4. Navajo Event					
Lead -1	15	2	100	50	
Lead -2	88	2	30	45	
Lead -3					
Online Attendees	1930	352	23	50	2473
5. African Event					
Lead -1	150	2	41	47	
Lead -2	80	2	56	50	
Online Attendees	1183	165	13	50	1306
6. Hawaiian Event					
Lead -1	40	3	45	58	
Online Attendees	562	323	13	50	908
7. Art/Indig.Astr. Event					
Lead -1	40	2	100	53	
Online Attendees	505	158	29	50	650
Totals	8334	2029	55%	51%	10927