

Native American Astronomy: A Refined Understanding of the Universe

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How did Native American understanding of celestial bodies differ from what we know about the universe now? My research focuses on Native North Americans, especially the Plains Indians, who constructed the Big Horn Medicine Wheel; the North Fork Mono Indians in Northern California; as well as the Mayans. By immersing myself in books that delve into Native American Astronomy, I will show that Indigenous Peoples had a much more nuanced understanding of the universe than we know. It is my assertion that Native American Astronomers would have continued to develop their impressive method of tracking and understanding the heavens had Western civilization not interfered with them.

In addition to various research texts, I have also interviewed Ron W. Goode, Tribal Chairman of the North Fork Mono Indian Tribe, in an effort to show how knowledge passed down through oral tradition was done through many generations without losing its effect. By exploring the depth of the astronomical knowledge of Native American prior to contact with Western civilization, I will demonstrate that exploring the knowledge of Native peoples could continue to broaden our knowledge about the universe.

The various researchers who will be discussed in this paper are known as archeoastronomers. Their goal is to discover and investigate the astronomical practices of prehistoric cultures. They have vigorously studied how Indigenous people understood celestial bodies in the sky and how these phenomena played into the development of their cultures. When possible, these researchers work with whatever remnants of the Indigenous people they are studying to understand whether their interpretations of the astronomical knowledge of these people are indeed factual.

We begin our journey by exploring the celestial knowledge of the Plains Indians in Wyoming. The "Plains Indians" is a vague term to describe Indigenous tribes that lived in the areas now known as Wyoming, Montana, North and South Dakota. John A. Eddy explains in his essay, "Medicine Wheels and Plains Indian Astronomy," included in the anthology *Native American*

Astronomy, that the Plains Indians are one of the groups of early inhabitants of the Great Plains region that we know the least about. They are even more elusive when you compare them to any other existing tribes in that region, such as the Shoshone or even “presumed relatives” like the Mesoamericans. Part of the issue is that they were not observed much when they first made contact with Western civilization, so any real knowledge comes from more than 200 years after their first contact with Spaniards (Eddy 147).

The Plains Indians are credited with having built the Big Horn Medicine Wheel. However, while many of their contemporaries are aware of its existence, none claim to know who built it, which makes this specific medicine wheel all the more intriguing. Researchers describe the wheel,

...the 25 yard diameter structure was built from hundreds of boulders gathered from the local area. The Indians laid the stones in a wheel-shaped pattern of straight lines that radiate from a large central cairn. A rim around the outside and smaller cairns placed at seemingly random locations along the rim of the wheel complete the pattern...Much larger and more complex than the hundreds of tipi rings that dot the western plains, its origin and function have been unclear. The wheel is only accessible for two and a half months of the year, since it's exposed to the hazards of late spring snows in mid-June and early autumn storms in late August. It is much too large to have held down the edges of a tipi; its isolated location at the 10,000-foot level of the mountain suggests that it served a more special function. (Williamson 1)

At an altitude of almost 10,000 feet, the Big Horn Medicine wheel is only accessible for 2 months during the year – meaning that it was not very good for year round observation. However, for those two months every year, it is perfect for viewing because it is above the timberline (Williamson 201). Indeed, it was Eddy's research that revealed that the Bighorn Medicine Wheel may have been a simple astronomical observatory whose purpose it was to track and mark the summer solstice as well as the heliacal rising of the stars: Aldebaran, Rigel, Sirius and Fomalhaut. Eddy discovered that cairns E and O were aligned in the direction of summer solstice sunrise and that cairns C and O were aligned in the direction of summer solstice sunset. Additionally, he found that cairn pairs FO, FA, and FB correspond respectively to the rising points of the stars Sirius, Aldebaran and Rigel (Eddy 149-153).

A carbon date for the Bighorn Medicine Wheel comes from a piece of wood found in cairn F, corresponding to an age of no more than 220 years, roughly in the middle of the 18th century. However, this date can only be considered as a minimum age since it is not only possible, but also probable that the wood got lodged in the cairn after the medicine wheel was constructed (Eddy 152).

The rising positions of stars change very slowly over the centuries, due to the movement of the Earth, thus the directions and locations of these cairn pairs can be used to project at what date they aligned best with the rising points of these stars – giving us a much more accurate date of use than carbon dating can provide. The FA Aldebaran alignment would have worked best between 1200 and 1700 AD. The Earth's movement changes the date of first heliacal rise so while today the first heliacal rise of Aldebaran is a few days after the summer solstice, the first heliacal rise of Aldebaran would have been just before the summer solstice between the years 1200 and 1700 AD, permitting the tribesmen to predict that summer was coming (Williamson 204-205). Astronomer Jack Robinson further proposed that cairn pair FD was used to observe the rising of the star Fomalhaut, which would have lined up with its rising point between 1050 and 1450 AD, when Fomalhaut had its first heliacal rise roughly a month before the summer solstice (Williamson 208).

According to Anthony Aveni, the primary things which figured in all the early astronomies were the sun, the moon, and the brighter planets and stars. "Sunrise and sunset at equinoxes, solstices and zenith passage dates were marked for use in determining dates and periods of civic, religious, or agricultural significance within the tropical year" (Aveni xiv). We know that Sirius and Aldebaran were significant North American alignments, thanks to the Big Horn Medicine Wheel. However, these incredibly bright stars also figured largely into Mesoamerican architectural configurations based on the horizon as well.

The motion of the sun is incredibly important to understand to fully appreciate how the ability to track the sun without Western technology is so impressive. According to Williamson, "it is the small daily shift of the sun's position with respect to the stars that enabled traditional astronomers with no telescope to guide them that determined an accurate solar calendar" (Williamson 38). Since the daily motion of the sun along the horizon is minute during the winter months, it is difficult to detect its motion as readily using the naked eye. Native Americans feared that this meant that the sun would not come back again, leaving the fields frozen and giving way for all living things to die out. This fear gave way to many myths and ceremonies. The Hopi would say that the sun was prone to wander and, thus, needed to be encouraged to stay on his path (Williamson 39-40).

Now there are quite a few Medicine Wheels throughout the US and Canada, but none that are quite like the Big Horn Wheel. Researchers found when they surveyed other medicine wheel sites in Canada that, unlike the wheel at Big Horn, these sites were all dominated by a central cairn that was typically huge containing rocks that totaled over 100 tons of rocks (whereas Big

Horn had a mere 1000 lb. worth of rocks in its central cairn). In addition to that difference, most other wheels had their number of spokes that widely varied and these spokes did not line up with any specific heliacal risings (Eddy 159). However there was one medicine wheel that was unique, the wheel at Moose Mountain. Moose Mountain, which is actually not a mountain at all, is located in Saskatchewan and is significant as it is almost an identical twin to the Big Horn Medicine Wheel even though they are hundreds of miles apart and on completely different terrain. Like its twin, it was used to mark the rising of Rigel, Sirius and Aldebaran as well as track the summer solstice. However this medicine wheel is much larger and older than the medicine wheel on Big Horn Mountain. Based on the known dates and positions of stars, researchers Tom and Alice Kehoe along with John A. Eddy, date it as being somewhere between 1350-1500 years older than the wheel at Big Horn (Eddy 165). Could it be that the same people who built Moose Mountain moved south due to weather or other difficulties and built another medicine wheel on Big Horn? Perhaps they were a separate tribe, who built their wheel to similar specifications because their brains saw the sky in the same way the "Plains Indians" did. Without further research, we may never know the truth, but considering the striking similarities between these two medicine wheels, similarities that no other medicine wheels known to man share; it is quite possible that they were built by the same people.

After pondering the unique twin medicine wheels, I found that I had many questions that could only be answered by someone belonging to a Native American tribe. Thanks to my professor, Elizabeth Terzakis, I had the unique opportunity to speak with Tribal Chairman of the North Fork Mono Tribe, Ron W. Goode, about stories relating to the stars that have been passed down in his tribe. We also spoke with Ron regarding how he feels about whether their tribal celestial understanding was altered by exposure to Europeans as well as fraternization with other tribes. First, some background about the North Fork Mono Indian Tribe. The North Fork Mono made their homes in the foothills of the San Joaquin Valley. The valley floor was used for hunting, fishing, reed gathering, and trade with other tribes as well as tribal rituals. In the province, tribal groups shared various overlapping territories. Access to specific areas in the region was controlled by a complex, mutually dependent system of social, political, and economic ties between the tribes. The North Fork Mono Indians were key players in this dynamic (North Fork Mono Rancheria).

Goode explained that we must be careful what words we choose when talking about Native stories. "Calling them myths," he said, "says that you, me and we do not believe in what the story is about. We have stories, songs, and knowledge. When my mother told me our people could see the stars in the day time, I believed her. I asked her where these stars are at in the daytime. She pointed up in the sky with her lips" (Goode).

Goode continued to explain that sometime later he was able to help a friend adjust his telescope to find a daytime star. This friend told others during a later daytime star viewing about his "Native American Indian friend who could see the stars in the daytime." Naturally, they didn't believe him, but Ron was actually there. He walked over, looked up in the sky then adjusted his friend's telescope and found what was described as "a beautiful star" (Goode).

"Some stories are hard to believe so we call them myths," Ron continued to explain, "[These stories are] something someone believes in but most others don't so it becomes a fictional story, or myth for a more polite way of saying you're full of you know what." What stories Ron's tribe have are often incorporated into one another and he said that all of their narratives are this way. Their purpose is often to tell many things at once. They have an "earth-moon" song that is sung to bring rain. The North Fork Mono Indians have performed this song three times this year and it has rained or snowed each time it was sung (Goode).

Another story that Goode shared with me was about when the first Americans landed on the moon. "When this finally happened, Native People said, 'that's good. It's about time. We've already been there.' This is because when the first space ship orbited the Earth, the Aborigine built large fires that sent sparks up to the ship as it passed over Australia." Indeed, the astronauts reported fireflies bussing their capsule (Goode).

Goode acknowledges that his tribe's knowledge is different than Euro-Americans, but not that different. He explains, "We studied the stars, we knew where we were at per the constellation movement, how everything seemed to all move around the tip of the big dipper, how the big dipper lined up with the little dipper, how each other constellation came up and where they were at in relationship to all the others." Like his tribe, many Native People have myths tied to the Big Dipper in Great Bear (Ursa Major), but if you are not familiar with the Greek story tied to this constellation it is challenging to understand how they differ.

The Greek myth comprises both Great Bear (Ursa Major) and Little Bear (Ursa Minor).

According to Miller, the myth began when the Greek god Zeus fell in love with a mortal named Callisto. Zeus's wife, Hera, was very jealous, so she turned Callisto into a bear to keep Zeus

from her. Due to this unfortunate turn of events, Callisto's son, Arcas almost kills her in bear form. Zeus intervened and placed Callisto in the sky as the Great Bear and later he placed Arcas near her as Little Bear (Miller 8).

Interestingly enough, many tribes in the eastern part of the Northeast United States, including the Delaware and Iroquois, also saw the bear-like shape that the stars in Ursa Major made and, thus, their myths often included bears. While these Native myths may seem somewhat in line with the Greek story, the inclusion of bears is where the similarities end. Most Native star myths do without the interference of gods and are more about survival; their legends were mostly about hunters chasing after and feasting on bears (Miller 49-51).

Conversely, tribes in the western part of the region such as the Chippewa (also known as Ojibway), the Menominee, and the East Cree saw something quite different. The Big Dipper is The Fisher Stars to these tribes. The Ojibway version of the Fisher Stars (*Ojeeg Annung* in Ojibway) explains how tribes in cold northern climates acquired summer. According to Miller's research, the fisher is an "elusive member of the weasel family that can travel on the ground as well as climb trees (Miller 61)." In the Chippewa story, The Fisher (known as *Ojeeg*), is a great hunter that some also consider a manitou (spirit). Fisher lives on the southern shore of Lake Superior. In this star myth, Fisher is an expert hunter who tries to teach his son to hunt. Snow has covered their lands for years, which makes hunting difficult. The son is convinced by a squirrel to ask his father to find and bring back summer.

Fisher gets a group of his friends (Otter, Beaver, Lynx, Badger, and Wolverine) to help him in this undertaking.

Fisher says goodbye to his wife and son, for he knows he will not return, and he and his companions set out on the search for summer. After a time they come to the lodge of a manitou, who gives Fisher advice about where to find the birds of summer and about how they should act once there. (Miller 61)

After that Fisher and his friends attempt to enter the heavens above them once they get to a very tall mountain as described by the manitou. Only Wolverine and Fisher succeed and there they see "very long lodges and celestial inhabitants." Inside the lodges, Wolverine and Fisher find cages full of birds (Miller 62). Remembering the promise he made to his son, Fisher starts letting all of the birds out. These birds represent spring, summer and autumn. The celestial spirits see what is happening and violently react to the birds being let out.

Fisher is distracted, but Wolverine escapes as the way home closes behind him. The celestial inhabitants chase Fisher around the heavens until they have him cornered up a tree and begin to shoot arrows at him. Fisher has become invincible “except the space of about an inch near the tip of his tail...for he had in this chase taken the shape of the Fisher for which he was named” (Miller 63). An arrow hits that spot and Fisher slowly begins to bleed out. The celestial beings stop attacking him at nightfall, and Fisher climbs down from the tree. Too weak from the loss of blood from his tail, Fisher lies down to die. His body is returned to Earth. “Fisher was found dead the following morning, but his people left them as he was found, with the arrow sticking in his tail, as it can be plainly seen at this time in the heavens” (Miller 63). Miller explains, “The handle of the dipper is the fisher’s tail and the arrow is the little star Alcor that lies next to the middle star in the tail” (Miller 61).

Native star stories are interesting to explore and read because they give context to the stars and the tribes’ understanding of the heavenly bodies. The fascination that Native People had with the stars explains why they were so intent on tracking and recognizing these constellations, planets and their ever changing paths.

Indeed, the North Fork Mono tribe’s seasons are calculated according to the stars and the moon; therefore they do not “line-up” with the Euro-American calendar. Goode continues, “Planting was done by the moon. Mono Wind was forecast by the stars. How big the wind storm would be and [how] long before it got to us [was all] based on the twinkling of the stars.” However, Goode does admit that Mono star stories did get mixed a little according to the white man's star stories and other Indian tribal stories as well. Especially the more racially mixed they got (Goode).

However these tales are only part of the knowledge that the North Fork Mono Indians possessed. Goode also described locations on their land that are of celestial importance,

Our old rocks and caves had stars drawn on them. In the lower foothills the Yokutch have full constellations in their caves and on their rocks. Both the Mono and Yokutch have aliens drawn on the rocks and in caves....We have a Solstice site thousands of years old carved out on the rock; mortar holes that are thought to be some connection to the stars or constellation versus a processing station. The marks on the rock line up perfectly with the solstice times, but also are in line to an even larger configuration of mountain saddles, peaks and bolder features including ancient sites; some one to five miles away. (Goode)

This use of the land to mark the solstice is not unusual as it brings us to the next tribe; the Mayan Indians located in Mexico and Guatemala. According to the Canadian Museum of History, Mayan civilization existed from 2600 BC until about 1400-1500's AD when the first Spanish colonists began to pour onto their shores (Canadian Museum of History).

Anthony Aveni asserts that there is little doubt that astronomy was connected with the site planning in Mesoamerica. He accumulated data covered in the anthology *Native American Astronomy* that shows that "Mesoamerican astronomer-priests named the fixed stars and followed the courses of planets moving among them." Additionally most calendar practices were based off of their astronomical observations and the orientations of buildings in Mexico and Guatemala were aligned with many significant celestial risings (Aveni xii-xiv).

The most fascinating thing to come out of my research was the discovery that most, if not all, Mayan ruins were not just planned out for sacrifices and agriculture (although they were definitely used for these things as well). Famous sites across Mexico and Guatemala such as Teotihuacan, Chichén Itzá, Tulum, Tikal, and Coba were found to have "pecked cross petroglyphs and were oriented along polar axes" (Aveni 15). The only possible explanation for this is that these sites must have been used as early astronomical observatories.

These sites are some of the oldest known and largest cities of Ancient America. These Native People had no telescopes to guide them. The telescope was not even invented until the 17th century, but we know that Chichén Itzá was built around roughly 60 AD. The technology available to Mayan civilization at this time was limited at best and yet they were able to construct glorious cities that were used to observe the sun, moon, stars and planets from various sites around cities that were peppered across what we now call Mexico. This is in large part due to years of observations made only with the naked eye as recorded in the Dresden Codex.

Before we delve into the extraordinary practices of the Mayan civilization it is essential to understand how we've gained the knowledge we have about this Indigenous group. The key is the Dresden Codex. The Dresden Codex is a Pre-Columbian Mayan book dating back to the eleventh or twelfth century of the Yucatecan Maya (Aveni 221). It is believed to have been found in Chichén Itzá. This codex is thought to be a copy of an original text created approximately three or four hundred years earlier (Ruggles 133-4). It is the oldest book written in the Americas that we know of today. Sadly, it is one of only fifteen books that were able to survive the Spanish conquest of the Americas.

The codex has played an integral role in deciphering Mayan hieroglyphs. Knowledge of the Codex's existence in more recent history is traced to 18th century Germany. According to the Foundation for the Advancement of Mesoamerican Studies, the Director of the Royal Library acquired the Codex from a private collector. How that person acquired it prior to this time period is unknown. The Dresden Codex contains a total of 39 sheets with writing on both sides and stands at the staggering total length of more than eleven and a half feet. When it was first found, it was folded into accordion folds. Thankfully researchers in the Royal Library, who understood its importance, rescued it and it was displayed in two parts laid out straight until it sustained water damage during World War II. Luckily, multiple copies of the Codex were made prior to this, which means that the Codex can still be studied and utilized for translation (FAMSI).

Researchers in the nineteen seventies found that significant astronomical phenomena matched both the directions of arrows on and the perpendiculars of the fronts of various buildings at these sites, such as the heliacal rising of Venus in the Caracol Tower in Chichén Itzá (Aveni 16). Aveni explains that the accuracy of the Venus tables contained within the Dresden Codex was often questioned throughout his research, but they were finally proven as true by matching them with the architecture of the Mayan cities themselves. By comparing the Venus tables with the building called Caracol, they found proof that the building itself was perfectly aligned when the "horizon-based Venus alignments" were integrated with the "584-day period and 8-year cycle as depicted within the Dresden Codex" (Aveni xiv).

The various Temples of Venus in Tulum and Chichén Itzá were used to track the movements of Venus, which Mayans considered to be a planet of great importance. Venus would have been even easier to see without any light pollution since it is the planet closest to the Earth. Even today Venus can easily be seen with the naked eye unless it is too close to the sun. Indeed nearly every Indigenous tribe that I researched for this project, with the exception of the North Fork Mono Indian Tribe, had some star story relating to Venus.

Judith A. Remington's essay entitled "Current Astronomical Practices among the Maya," included in the anthology *Native American Astronomy*, covers information collected regarding still living Mayans in the late nineteen seventies and early nineteen eighties. Her research focused on the two groups of Mayan language speakers located in Guatemala since the Guatemalan government has not attempted to assimilate these people into their culture as much other North and South American countries did. The importance of this was that it made

the possibility of finding less “non-Western concepts” in their understanding of astronomy (Remington 75).

Remington explains that many different Guatemalan Mayan speakers were in Central Guatemala. These people spoke Quiche, Cakchiquel, Tzutuhil, Rabinal, and Uspantec. However, there were especially large numbers of Quiche (pronounced “Key-chay”) and Cakchiquel (pronounced “Cahk-chee-kell”) speakers located in the Midwest highlands in 1961. Remington goes on to elucidate that as she continued to look for astronomical-astrological-cosmological data the information was split between: data that was mostly astronomical-astrological came from the towns with the highest concentration of Quiche speakers and data that was mostly astronomical-cosmological came from towns rich in speakers of Cakchiquel (Remington 76). Astronomical-astrological data refers to information that was more mythical in its understanding of the heavens; whereas astronomical-cosmological data was focused solely on the tracking and understanding of the heavens without any personal bias or mythical context being attached to the information being shared.

According to Remington’s investigation, Mayans still consider Venus to be a planet of “most importance.” The Cakchiquel call it *locera macami*, which is derived from a Castellano word “lucero” or “morning star” and Cakchiquel *macamil* or “very bright star.” The Quiche call Venus “Santiago” when it is the morning star and raskap, ‘thing of night’ or ‘something late’, when it is the evening star. According to the Quiche people, Venus was raskap when it “passed from behind the sun” and was Santiago when it moved in front of the Sun in January 1974. The Quiche told Remington that Venus would not appear again as raskap until January of 1975. Indeed, she was able to verify that all of the information reported to her was accurate, but Remington was incapable of determining whether the Quiche people calculated these risings using the Dresden Codex’s typical eight-year intervals or if merely “running observations were kept” (Remington 81).

It is imperative to acknowledge the impressive ability that these Indigenous Tribes had to construct these massive cities and medicine wheels that were aligned with the heliacal movements of celestial bodies in addition to being able to track the movements of the sun and moon. All of this was done without any modern tools and without the use of a telescope, which as we know was not even invented yet!

Rather the Mayans, the Plains, and the North Fork Mono Indians were able to do so by making observations with the naked eye over the course of years and using brute strength and resourcefulness to build impressive cities which revolved around celestial alignments.

Ray Williamson questions how “Native American astronomy would have developed had Western Europeans not conquered the land and enforced their own already highly developed view of the external world on the native population” (Williamson 10-11).

Think about this for a moment. These people had no understanding of mathematics as we know it other than what they may have gleaned for themselves. This was long before the Spaniards had arrived. Yet the Westerners who eventually “discovered” these Indigenous People thought of them as savages merely because they did not understand their ways. Sacrifices were the way of some of these Indigenous people and yes they were brutal and perhaps unnecessary, but had these people been given time to evolve on their own, without Europeans forcing their customs and traditions upon them, they may have given way to wonderful discoveries even greater than their Western counterparts and perhaps even earlier!

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