PROFILES IN SCIENCE ENGAGEMENT WITH FAITH COMMUNITIES

Annette S. LEE

Annette S. Lee is an Associate Professor of Astronomy and Planetarium Director at St. Cloud State University in Minnesota, and Director of Native Skywatchers. *We spoke with her about working to reclaim and revitalize Indigenous star knowledge, the challenges of interdisciplinary work, and the importance of avoiding the "grab and go" research model. Above photo: Annette Lee. Credit: J. Woods/St. Cloud State University.*

How and why did you start working to revitalize Indigenous star knowledge and astronomy?

I am mixed-race Lakota. My tribe is of the Lakota from the *Wanbli Luta* (Red Eagle) family, and my other Indigenous community is Ojibwe. My husband is Ojibwe and our kids are both. I am an astronomer, a scientist, and an artist.

In 2007, I wanted to create a program that would combine my talents and interests and community. This dream was a very old, and an important part of who I am, so I was very deeply motivated. I came up with the idea for a research

and programming initiative called *Native Skywatchers* to revitalize, regrow, and remember our Indigenous astronomy and connection to the stars. It's a grassroots effort, that started with Carl Gawboy (Ojibwe), a retired professor from Bois Forte Reserve who had been working on the Ojibwe star knowledge revitalization effort for about 30 years. He had been interviewing people, starting with his own family and community, and looking at historical records and archives. Then there was William Wilson (Ojibwe), who paints in the x-ray Ojibwe style and is a Knowledge Keeper, an elder.

In 2012, we received a NASA - Minnesota Space Grant to design and deliver a summer workshop for educators, to teach and share the Ojibwe and D/Lakota Indigenous star knowledge. We needed a starting place, and there were very few materials available. It occurred to me that if we combined our talents, we could build a star map and curriculum that we could build the workshops around.

William and I painted the first Ojibwe sky star map from Carl's unpublished work. (This work would not have been possible without Carl's research.) The map is called "*Ojibwe Giizhig Anung Masinaaigan*, (Ojibwe Sky Star Paper)"[1,2,3], and is credited to the three of us. And then I wanted to include the other half of our Indigenous communities (here in Minnesota), so I decided to paint the counterpart to the Ojibwe map—"*Wicaŋȟpi Wowapi Makoće,* (Dakota/Lakota Sky Star Map)"[2,3,4].

One source was the book, "Lakota Star Knowledge" by Ron Goodman, who interviewed elders mostly from South Dakota, many of whom have now passed away. Most importantly, we went to see Arvol Looking Horse, who is Lakota from Cheyenne River and who I've known for quite a while. He travels all over the world and is very involved at the international level, and he said, "Annette, I'm so glad you're doing this. Nobody else is doing anything [like this]." We offered tobacco to Arvol and others like Albert Whitehat and some instructors/elders from Sinte Gleska University to ask for their support of the project.

We started with a handful of people, a handful of elders, tobacco, and a prayer, and just wanted to create something really meaningful.

How did you find funding for this work?

About 10 years ago, there were not many Indigenous resources available for schools, especially in Native communities, and also there was this moment when people started to value Indigenous knowledge. I was doing a planetarium show at St. Cloud State University, where I'm the planetarium director, and there was a group of third graders in which probably two thirds of the class were visibly Native students. They came from a town north of St. Cloud, a smaller town on an Ojibwe Reservation. I was pointing out the different Ojibwe constellations as I went along, "There's *Mishi Bizhiw*, Curly Tail, who is the other lion, right there by Leo the lion." At the end of the show, the teacher was so excited and she said, "Where did you learn any of this? Where can I get all this material and these resources? Nobody [else] has anything."

It turns out that Minnesota state science standards for K-12 have a component about how educators should teach how people from other cultures are doing (and have done) science. One of the benchmarks for third grade specifically mentions Ojibwe and Dakota use of the patterns and knowledge of the stars. So, the demand [for Indigenous knowledge] is really off the charts, really high. This is what led to us getting the Minnesota Space Grant from NASA, which we use to train educators so that they can bring Indigenous knowledge into their classrooms.

We also received three consecutive different grants in the span of about five years through the Minnesota State Arts grants. They were interdisciplinary, and we were able to do a lot of workshops and hands-on art-making. We did art and science and culture workshops, many of which were on reservations with young people in Native communities, and there was some really meaningful work that was done in these workshops. We also did presentations in the classroom[5].

You continued to paint more Star Maps—how did the first two grow into a larger project?

We painted the first two native Star Maps in 2012. In 2015, an Ininew elder from Winnipeg, Manitoba by the name of Wilfred Buck showed up at our doorstep, offered us tobacco, and asked us to paint a similar map for the Ininew star knowledge. He had been doing very similar work to Carl, going into Indigenous communities with an inflatable planetarium and working to inspire people to remember. He talks about how elders would say they don't remember anything before the show; then, while they were in the show, it would awaken some memories, and after the show they would have memories to share. He could then collect the star knowledge straight from

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Annette Lee presenting at the Native Skywatchers *annual educator workshop, Fond du Lac Tribal & Community College in 2018. Credit: J. Tibbetts.*

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Annette S. Lee presenting at the annual Native Skywatchers *Workshop, Fond du Lac Tribal & Community College, Cloquet, MN, in 2016. Credit: Jeffrey Tibbetts.*

the source, the oral tradition. By 2016, we had the third map, the Ininew/Cree Sky Star Map, "*Ininew Achakos Masinikan*".

Then I decided to paint the fourth map, which is the Greek star map. Some of our programming is in non-Native classes or mixed classes, and some of those students really know and love the so-called "Greek" constellations. They represent a common ground for everyone. Interestingly, when I asked experts in the history of astronomy about the actual origins of those constellations, a lot of it is not well known. What we think of as the "Greek" constellations that have been passed down through Western science—actually, many of those are borrowed from the Babylonian culture and there was also some borrowing and mixing-in with the Egyptian culture.

So [the constellations] are shared among those civilizations along the Mediterranean. That's really important—I'll often ask kids, "Where is Babylonia today?" And a lot of people don't know; it's present day Iraq. These days, where there are so many things that divide us, we can all become more culturally agile and connected through the sky and through the idea that we're all looking at the same stars. One sky, but many voices… many ways of knowing.

What challenges do you encounter trying to revitalize this Indigenous knowledge?

The first challenge comes from the history of colonization; basically, there's a lot that has been lost.

Wilfred gives a beautiful example. If you look at the Greek star map, it's very dense with constellations. When you look at it, and then you look at the three Indigenous star maps, they are much less crowded. People ask, "Why are these spaces open? Are there constellations that are missing?" Wilfred says, "Let's say you had 100 people in a room, and we all learned a song, but each of the 100 people learned only one word to the song. Together, we could sing that song. But some time goes by, and when we meet again, only 15 people show up. That's like our star map; we're trying to put together the song with the 15 people, only the 15 remaining words." There's a lot that has been lost, but it's not completely gone. One person remembers one piece, another person, another piece, and then we try to put together the pieces.

Another challenge is that parts that were written down are often mistranslated or are corrupted versions. Take, for example, the dictionaries—they were written mostly by academics who were not Indigenous and didn't have firsthand experience with the culture or anything even close. Many of the words were over-simplified or changed a little bit to fit the Western way of living, as opposed to keeping them in the cultural context.

So, some challenges have to do with loss of knowledge, loss of culture, to historical trauma, to the history of colonization, and trying to rebuild from what's left. Allowing the Indigenous voice to be the lead voice is an important part of this. There are many parts to the rebuilding, and I'm proud that, as a person who is a scientist and an artist and culturally-based, I have fought hard to keep the art part of this alive and intact.

One of the challenges has also been that I am a person who is clearly rooted in art and science and culture. Everyone acknowledges, there's a crisis in STEM, and not enough young people are going into STEM. People think about ways to widen participation, especially for underrepresented students, and this idea of interdisciplinary work has gotten more recognition recently. Most scholars agree this idea of "interdisciplinary" is a good thing, but the university and academia work in the silo system, and the silos are very old, very stable, and not moving. Saying that interdisciplinary is good and healthy and needed is completely different than actually making that happen, especially within traditional physics and astronomy research.

Why is this work so important to you?

Minnesota has some of the worst statistics for Native youth. Minnesota is always ranked in the top three, often the top in the nation for the greatest disparity in K-12 education between majority kids and minority kids[6]. Minnesota has about a 50% dropout rate for high school Native youth, and near reservations where I do a lot of work, it's a 60% dropout rate. Minnesota also has a Native youth suicide rate (ages 24 and under) that is nearly three times higher than that of other youth races (17.3 American Indian versus Whites 6.0 per 100,000)[7]. This is 29% higher than the national average of youth suicide rates[8,9]. These are my kids—I have two boys. At the same time, Minnesota is looked at as a nice Midwest place to live, a high quality of life, and good education[10]. There are some deep, ingrained racist things that we can talk about, colorblind racism, and other things, but the statistics are right there.

I started out in mathematics. That is my first identity in science, and the bar is high. I'm not trying to make science warm and fuzzy, like, "This is just about these fun ideas." We call what I'm trying to do dual learning or

two-eyed seeing[11]. There's a beautiful quote by a Mi'kmaq elder, Albert Marshall, and it says, "Learn to see from your one eye with the best or the strengths in the Indigenous knowledges and ways of knowing ... and learn to see from your other eye with the best or the strengths in the mainstream (Western or Eurocentric) knowledges and ways of knowing ... but most importantly, learn to see with both these eyes together, for the benefit of all"[11]. It's really difficult because we're trying to do both with the highest rigor and the highest quality, and to not leave anybody out. It is not an easy thing to do.

I'm also very thankful to organizations like the AAAS, the AAS, ASP, IAU, INSAP, and ISSAC...cultural astronomy community and all the conferences. It's these conferences and these organizations that have recognized and valued my work in a way that has equally balanced or even outdone the negativity that I've gotten in other areas of academia. Between getting beaten down and being held up as a rock star, having these organizations that see and practice the bigger picture has been my lifeline to keep going. Even though I don't really like being in the spotlight, it gives me great hope to feel that sense of value.

Does this work on Indigenous knowledge have wider cultural or societal relevance?

I think people are starting to recognize that there is a place for art and science together, and maybe even art and science and culture. There's a quote by Einstein that I like: "The most beautiful thing we can experience is the mysterious. It is the source of all true art and science"[12]. I feel like this is a moment where science is rethinking its own identity, where we're thinking about what we've been doing and what science means to us. This strategy of divide and conquer, it's gotten us far, right? We have laser focus, for example we can send people to Mars, to the Moon....we can take pictures of galaxies that are 13.4 billion years old, galaxies that existed just 400 million years after the Big Bang. But then it reaches a limit.

Right now, we're acknowledging the limits to science and reexamining science and its identity. We have to consider the bigger picture, which is to make those connections between art and science and culture. Then we can begin to work on the solutions and move forward.

What advice would you give to someone interested in working with their own community to gather this kind of knowledge and connect it to their science?

With Indigenous science and astronomy, it really is best when it's built as much as possible on relationships with the Indigenous communities. There are people that are knowledge keepers and knowledge holders. If you want to do something on Maya star knowledge or Aboriginal star knowledge, it would be appropriate to find a network of Indigenous people that might already exist and team up with them.

What we have to avoid is the outsider dropping in, the "grab-and-go" model that has been used by science, by anthropologists, by academia. It's still happening all over the place, but we need to create models that will directly work against this and set a new model. Right now, one of the major projects that we're working on is a collaboration with the Canada Science and Technology Museum in Ottawa. In 2017, Wilfred Buck, David Pantalony (the regular museum curator), and I co-curated a permanent exhibit on Indigenous astronomy, called "One Sky, Many Astronomies". And we are now working on a traveling exhibit (opening May 2022) and an Indigenous star knowledge symposium. This prestigious national science museum has made a very clear choice that, although they have the power and the privilege to be in the driver's seat and to practice the "grab-and-go", they have done exactly the opposite. They have invited Wilfred and me to not just have a seat at the table, but to be the lead voice, in the driver's seat developing the exhibits and the programming. It still amazes me that such an organization with that kind of power would do such a thing.

So, I think that there's definitely hope. There are people out there, there are ways to get involved, and there's a lot of work to do.

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