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NORMA ORTIZ

Dominique David-Chavez works with Randal Alicea, an Indigenous farmer, in his tobacco-drying shed in Cidra, Borikén (Puerto Rico).

WEAVING THE LORE OF THE LAND INTO THE SCIENTIFIC METHOD

Scientists and funders with close links to Indigenous communities outline how Western teams can collaborate fairly and effectively with those groups.

Many scientists rely on Indigenous people to guide their work — by helping them to find wildlife, navigate rugged terrain or understand changing weather trends, for example. But these relationships have often felt colonial, extractive and unequal. Researchers drop into communities, gather data and leave — never contacting the locals again, and excluding them from the publication process.

Today, many scientists acknowledge the troubling attitudes that have long plagued research projects in Indigenous communities. But finding a path to better relationships has proved challenging. Tensions surfaced last year, for example, when seven University of Auckland academics argued that planned changes to New Zealand's secondary school curriculum, to "ensure parity between mātauranga Māori", or Maori knowledge, and "other bodies of knowledge", could undermine trust in science.

Last month, the University of Auckland's vice-chancellor, Dawn Freshwater, announced a symposium to be held early this year, at which different viewpoints can be discussed. In 2016, the US National Science Foundation (NSF) launched Navigating the New Arctic — a programme that encouraged scientists to explore the wide-reaching consequences of climate change in the north. A key sentence in the programme description reflected a shift in perspective: "Given the deep knowledge held by local and Indigenous residents in the Arctic, NSF encourages scientists and Arctic residents to collaborate on Arctic research projects." The Natural Sciences and Engineering Research Council of Canada and New Zealand's Ministry of Business, Innovation and Employment have made similar statements. So, too, have the United Nations cultural organization UNESCO and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

But some Indigenous groups feel that despite such well-intentioned initiatives, their inclusion in research is only a token gesture to satisfy a funding agency.

There's no road map out of science's painful

past. *Nature* asked three researchers who belong to Indigenous communities in the Americas and New Zealand, plus two funders who work closely with Northern Indigenous communities, how far we've come toward decolonizing science – and how researchers can work more respectfully with Indigenous groups.

DANIEL HIKUROA
WEAVE FOLKLORE INTO MODERN SCIENCE

We all have a world view. Pūrākau, or traditional stories, are a part of Māori culture with great potential for informing science. But what you need to understand is that they're codified according to an Indigenous world view.

For example, in Māori tradition, we have these things called taniwha that are like water serpents. When you think of taniwha, you think, danger, risk, be on your guard! Taniwha as physical entities do not exist. Taniwha are a mechanism for describing how rivers behave and change through time. For example, pūrākau say that taniwha live in a certain part of the Waikato River, New Zealand's longest, running for 425 kilometres through the North Island. That's the part of the river that tends to flood. Fortunately, officials took knowledge of taniwha into account when they were designing a road near the Waikato river in 2002. Because of this, we've averted disasters.

Sometimes, it takes a bit of explanation to convince non-Indigenous scientists that pūrākau are a variation on the scientific method. They're built on observations and interpretations of the natural world, and they allow us to predict how the world will function in the future. They're repeatable, reliable, they have rigour, and they're accurate. Once scientists see this, they have that 'Aha!' moment where they realize how well Western science and pūrākau complement each other.

We're very lucky in New Zealand because our funding agencies help us to disseminate this idea. In 2005, the Ministry of Research, Science and Technology (which has since been incorporated into the Ministry of Business, Innovation and Employment) developed a framework called Vision Mātauranga. Mātauranga is the Māori word for knowledge, but it also includes the culture, values and world view of Māori people. Whenever a scientist applies for funding, they're asked whether their proposal addresses a Māori need or can draw on Māori knowledge. The intent of Vision Mātauranga is to broaden the science sector by unlocking the potential of Māori mātauranga.

In the early days of Vision Mātauranga, some Indigenous groups found themselves inundated with last-minute requests from researchers who just wanted Indigenous people to sign off on their proposals to make their grant applications more competitive. It was enormously frustrating. These days, most researchers are using the policy with a higher degree of sophistication.

Vision Mātauranga is at its best when researchers develop long-term relationships with Indigenous groups so that they know about those groups' dreams and aspirations and challenges, and also about their skill sets. Then the conversation can coalesce around where those things overlap with the researchers' own goals. The University of Waikato in Hamilton has done a great job with this, establishing a chief-to-chief relationship in which the university's senior management meets maybe twice a year with the chiefs of the Indigenous groups in the surrounding area. This ongoing relationship lets the university and the Indigenous groups have high-level discussions that build trust and can inform projects led by individual labs.

We've made great progress towards bridging Māori culture and scientific culture, but attitudes are still evolving – including my own. In 2011, I published my first foray into using Māori knowledge in science, and I used the word 'integrate' to describe the process of combining the two. I no longer use that word, because I think weaving is a more apt description. When you weave two strands together, the integrity of the individual components can remain, but you end up with something that's ultimately stronger than what you started with.

Daniel Hikuroa is an Earth systems and environmental humanities researcher at Te Wānanga o Waipapa, University of Auckland, New Zealand, and a member of the Māori community.

DOMINIQUE DAVID-CHAVEZ
LISTEN AND LEARN WITH HUMILITY

People often ask how can we integrate Indigenous knowledge into Western science. But framing the question in this way upholds the unhealthy power dynamic between Western and Indigenous scientists. It makes it sound as though there are two singular bodies of knowledge, when in fact Indigenous knowledge – unlike Western science – is drawn from thousands of different communities, each with its own knowledge systems.

At school, I was taught this myth that it was European and American white men who discovered all these different physical systems on Earth – on land, in the skies and in the water. But Indigenous people have been observing those same systems for hundreds or thousands of years. When Western scientists claim credit for discoveries that Indigenous people made first, they're stealing Indigenous people's contributions to science. This theft made me angry, but it also drove me. I decided to undertake graduate studies so that I could look critically at how we validate who creates knowledge, who creates science and who are the scientists.

To avoid perpetuating harmful power dynamics, researchers who want to work in an Indigenous people's homeland should first introduce themselves to the community, explain their skills and convey how their research could serve the community. And they should begin the work only if the community invites them to. That invitation might take time to come! The researchers should also build in time to spend in the community to listen, be humbled and learn.

If you don't have that built-in relational accountability, then maybe you're better off in a supporting role.

Overall, my advice to Western researchers is this: always be questioning your assumptions about where science came from, where it's going and what part you should be playing in its development.

Dominique David-Chavez is an Indigenous land and data stewardship researcher at Colorado State University in Fort Collins, and a member of the Arawak Taíno community.

MARY TURNIPSEED
FUND RELATIONSHIP BUILDING AND FOLLOW-UPS

I've been awarding grants in the Arctic since 2015, when I became a marine-conservation programme officer at the Gordon and Betty Moore Foundation. A lesson I learnt early on about knowledge co-production – the term used for collaborations between academics and non-academics – is to listen. In the non-Indigenous parts of North America, we're used to talking, but flipping that on its end helps us to work better with Indigenous communities.

Listening to our Indigenous Alaskan Native partners is often how I know whether a collaboration is working well or not. If the community is supportive of a particular effort, that means they've been able to develop a healthy relationship with the researchers. We have quarterly check-ins with our partners about how projects are going; and, in non-pandemic times, I frequently travelled to Alaska to talk directly with our partners.

One way in which we help to spur productive relationships is by giving research teams a year of preliminary funding – before they even start their research – so that they can work with Indigenous groups to identify the questions their research will address and decide how they're going to tackle them. We really need more funding agencies to set aside money for this type of early relationship-building, so that everyone goes into a project with the same expectations, and with a level of trust for one another.

Developing relationships takes time, so it's

SARAH BETCHER/FARTHEST NORTH FILMS

Members of the Ikaaġvik Sikukun collaboration at the Native Village of Kotzebue, Alaska.

easiest when Indigenous communities have a research coordinator, such as Alex Whiting (environmental programme director for the Native Village of Kotzebue), to handle all their collaborations. I think the number of such positions could easily be increased tenfold, and I'd love to see the US federal government offer more funding for these types of position.

Funding agencies should provide incentives for researchers to go back to the communities that they've worked with and share what they've found. There's always talk among Indigenous groups about researchers who come in, collect data, get their PhDs and never show up again. Every time that happens, it hurts the community, and it hurts the next researchers to come. I think it's essential for funding agencies to prevent this from happening.

Mary Turnipseed is an ecologist and grantmaker at the Gordon and Betty Moore Foundation, Palo Alto, California.

ALEX WHITING
DEVELOP A TOOLKIT TO DECOLONIZE RELATIONSHIPS

A lot of the time, researchers who operate in a colonial way aren't aware of the harm they're doing. But many people are realizing that taking knowledge without involving local people is not only unethical, but inefficient. In 1997, the Native Village of Kotzebue — a federally recognized seat of tribal government representing the Qikiktagrukmiut, northwest Alaska's original inhabitants — hired me as its environmental programme director. I helped the community to develop a research protocol that lays out our expectations of scientists who work in our community, and an accompanying questionnaire.

By filling in the one-page questionnaire, researchers give us a quick overview of what they plan to do; its relevance and potential benefit to our community; the need for local involvement; and how we'll be compensated financially. This provides us with a tool through which to develop relationships with researchers, make sure that our priorities and rights are addressed, and hold researchers accountable. Making scientists think about how they'll engage with us has helped to make research a more equitable, less extractive activity.

We cannot force scientists to deal with us. It's a free country. But the Qikiktagrukmiut are skilled at activities such as boating, travelling on snow and capturing animals — and those skills are extremely useful for fieldwork, as is our deep historical knowledge of the local environment. It's a lot harder for scientists to accomplish their work without our involvement. Many scientists realize this, so these days we get 6–12 research proposals per year. We say yes to most of them.

The NSF's Navigating the New Arctic programme has definitely increased the number of last-minute proposals that communities such as ours get swamped with a couple of weeks before the application deadline. Throwing an Indigenous component into a research proposal at the last minute is definitely not an ideal way to go about things, because it doesn't give us time to fully consider the research before deciding whether we want to participate. But at least the NSF has recognized that working with Indigenous people is a thing! They're just in the growing-pains phase.

Not all Indigenous groups have had as much success as we have, and some are still experiencing the extractive side of science. But incorporating Indigenous knowledge into science can create rapid growths in understanding, and we're happy we've helped some researchers do this in a respectful way.

Alex Whiting is an environmental specialist in Kotzebue, Alaska, and a formally adopted member of the Qikiktagrukmiut community.

NATAN OBED
FUND RESEARCH ON INDIGENOUS PRIORITIES

Every year, funding agencies devote hundreds of millions of dollars to work that occurs in the Inuit homeland in northern Canada. Until very recently, almost none of those agencies considered Inuit peoples' priorities.

These Indigenous communities face massive social and economic challenges. More than 60% of Inuit households are food insecure, meaning they don't always have enough food to maintain an active, healthy life. On average, one-quarter as many doctors serve Inuit communities as serve urban Canadian communities. Our life expectancy is ten years less than the average non-Indigenous Canadian's. The list goes on. And yet, very little research is devoted to addressing these inequities.

Last year, the Inuit advocacy organization Inuit Tapiriit Kanatami (the name means 'Inuit are united in Canada') collaborated with the research network ArcticNet to start its own funding programme, which is called the Inuit Nunangat Research Program (INRP). Funding decisions are led entirely by Inuit people to ensure that all grants support research on Inuit priorities. Even in the programme's first year, we got more requests than we could fund. We selected 11 proposals that all relate directly to the day-to-day lives of Inuit people. For example, one study that we're funding aims to characterize a type of goose that has newly arrived in northern Labrador; another focuses on how social interactions spread disease in Inuit communities.

Our goal with the INRP is twofold: first, we want to generate knowledge that addresses Inuit concerns, and second, we want to create an example of how other granting agencies can change so that they respect the priorities of all groups. We've been moderately successful in getting some of the main Canadian granting agencies, such as the Canadian Institutes of Health Research, to allocate more resources to things that matter to Inuit people. I'd like to think that the INRP gives them a model for how to become even more inclusive.

We hope that, over the next ten years, it will become normal for granting agencies to consider the needs of Indigenous communities. But we also know that institutions change slowly. Looking back at where we've been, we have a lot to be proud of, but we still have a huge task ahead of us.

Natan Obed is president of Inuit Tapiriit Kanatami, and a member of the Inuit community.

Interviews by Saima May Sidik.
These interviews have been edited for length and clarity.

Correction

This Career feature erroneously implied that Natan Obed works with Alaskans. In fact, he works in Canada. It is also implied that Mary Turnipseed is the only marine-conservation programme officer at the Gordon and Betty Moore Foundation, whereas she specializes in Arctic programmes.

Corrected 24 January 2022