Breaking the ice

Scientists are becoming increasingly open to using local knowledge to understand how climate change could affect the world's most vulnerable, and often inaccessible, regions. But how useful are these data to science? **Dan Whipple** reports.

"People like my grandfather ... could tell the weather, whether there was going to be rain or snow. If it was going to rain all night, it would start in the evening," says an Athabascan woman from Huslia, Alaska. "I don't know how cold they had it in the late 1800s, but you know when it's really cold here because the dogs' tails freeze off while they're traveling …"

Dogs seldom freeze their tails off in the Arctic anymore, but some scientists are beginning to consider whether such observations can help reveal how climate change is affecting the world's most inaccessible regions and communities. Keen to understand how global warming might alter their homelands and livelihoods, indigenous people are also becoming more open to incorporating such local knowledge into traditional scientific frameworks.

The latest in a series of international efforts to encourage such collaborations, the Planning for Seven Generations conference, took place in March in Boulder, Colorado, at the US National Center for Atmospheric Research (NCAR), one of the world's pre-eminent climate research institutes. Speaking at the event, Leroy Little Bear, a Blackfoot American Indian and former director of the American Indian Program at Harvard University, said, "There is a very big difference in worldview, in the paradigms from which we operate. How do we bring about a marriage between western science and native science, if we want to call it that?"

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A report[1] issued March by the International Union for the Conservation of Nature also highlighted the value of merging these seemingly incongruous paradigms, stating "[Many] poor, natural-resource dependent communities … have preserved traditional knowledge about agriculture, hunting, fishing, foraging and the use of medicinal plants … and may therefore have valuable knowledge for future adaptation to and mitigation of climate change."

CLAUDIO APORTA

Sea ice is one gauge of global change where descriptions by natives differ drastically from those of scientists.

Traditionally, the difference in worldview between the communities has been seen as more of a hindrance than an asset, with problems ranging from scepticism among scientists about the reliability of 'qualitative' native knowledge to reluctance in some native communities to share this information at all.

Indigenous people, at least in the Arctic, approach the world in a very different way from the scientific community. Little Bear says, "The native paradigm consists of what I refer to as constant flux. Everything is always moving, changing, forming and reforming." Everything is animate, from stones to humans, and everything is interrelated. "You can't look at things in isolation," he says, "which is what western science does."

NATIVE KNOWLEDGE

But the Arctic Climate Impact Assessment[2], a massive collaborative effort to understand how global warming will affect the Arctic region, marked a watershed in the consideration of native contributions to science. The report, released in 2004, found that indigenous knowledge could be used to confirm some key impacts of climate change, with the chapter "Arctic Tundra and Polar Desert Ecosystems" making extensive use of published indigenous observational evidence. These observations proved useful in chronicling climate impacts such as vegetation growth and rainfall, changes in species distribution, loss of aboveground biomass, changes in snow patches, and animal health and behaviour.

More recently, International Polar Year 2007–2008, the largest ever research effort in the Arctic and Antarctic regions, has funded a dozen indigenous-led research projects. One such project, which geographer Fraser Taylor of Carleton University, Ontario, is involved in, is looking at how detailed local knowledge of sea ice can be used to interpret changes across the Canadian Arctic. "When you look at a map of the sea ice by scientists, it is a flat blue. But when the Inuit map sea ice, they include ridges, valleys and open

areas," says Taylor. "From the outside, sea ice is seen as a barrier to movement in the Arctic, for instance in the opening of the Northwest Passage. To the Inuit, sea ice is not a barrier, it is an enabler."

Taylor has created 'cybercartographic atlases', which he says "empower local people to tell their own story [of climate change] using what they think, not what outsiders think is their story." Taylor's atlases include perspectives from scientists, government officials and indigenous people, each in their own words. "It allows us to present the narratives of each of these groups without privileging any of them," he explains.

WARY EXCHANGES

Such representations could, in theory at least, be used to develop a better all-around view of the changes that are happening. But there are caveats, said Shannon McNeeley, a PhD candidate at the University of Alaska-Fairbanks and a National Science Foundation fellow, speaking at the Seven Generations conference. Each of these groups, McNeely said, may ultimately have to interpret the others' results with caution.

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A case in point is the change in average winter temperatures in Alaska's vast interior, which scientists report has warmed since 1976 by about 5 °C in winter and by much less — several tenths of a degree — in autumn[3]. While working with native Athabascans, McNeeley found that the modest autumn temperature increases had a greater impact on local communities than more dramatic winter changes, owing to their subsistence on moose.

"Moose is the most important subsistence resource," McNeeley says. "And fall is the most important time for subsistence activities in rural Athabascan villages." Early autumn is moose-hunting season, and even the small change in temperature has noticeably affected moose behaviour, she explains. "What might be statistically significant to a scientist may not be significant on a human or ecological scale," she added. "It's a matter then of changing the assumptions, our paradigm of how we look at these problems."

And although scientists may want to incorporate native knowledge into their data, the natives themselves can be ambivalent about the idea. Historical interactions with European colonizers have left a legacy of mistrust. "Sometimes our people don't want to share knowledge," said Little Bear. "We're gun shy, if I can put it that way.… A lot of the time we don't want to come out with the knowledge because it may be abused or misused," he said.

Tropical indigenous people are also sensitive to such infringements. In 2005, the International Alliance of Indigenous and Tribal Peoples of Tropical Forests issued a declaration in response to the UN Framework Convention on Climate Change, stating, "The modalities and procedures for activities under the Clean Development Mechanisms do not respect and guarantee our right to lands, territories and self-determination."

This issue is so sensitive in the Arctic that McNeeley, who videoed the native woman quoted in the first paragraph, declined to identifwwy the speaker by name. "This is a very sticky issue when working with tribes," McNeeley said. "In Alaska they are in a phase of really trying to protect their intellectual property."

ANECDOTAL VALUE

Even if locals are willing to share information with scientists, native knowledge can often be classified as 'anecdotal evidence', and anecdote has a poor reputation in scientific circles.

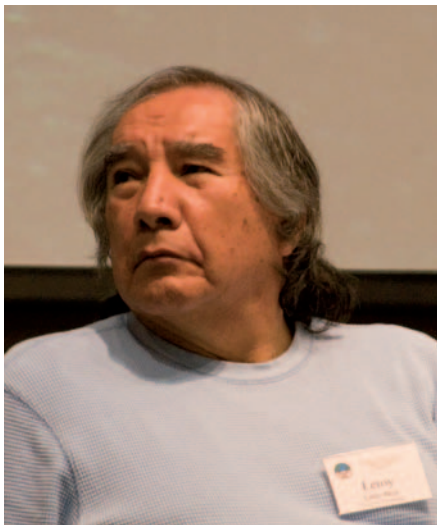
But certain types of knowledge from natives who spend their lives interacting directly with the environment can add an important new dimension to the understanding of climate change, especially in the study of climate impacts on ecosystems and people. "I don't see the geese flying south anymore," Little Bear says. "They're staying home. The mean temperature is up only about a degree and half Celsius, but that's enough for those geese not to fly south."

In certain areas of climate research, such as identifying past changes, however, native knowledge may be less helpful. Caspar Ammann, a paleoclimatologist at NCAR, says that even if indigenous oral tradition could provide qualitative information about climate, it would be very difficult to associate a date with that information. "If we are talking, for instance, about the last time the Northwest Passage was open, perhaps there could be some oral history that suggests it has happened before," Ammann says. "But for an oral history to distinguish between, say, 1350 and 1100 A.D., there are huge uncertainties."

Igor Krupnik, curator of Arctic and northern ethnology at the Smithsonian Institution, says that there are three essential guidelines for use of local information by the scientific community. First is to "keep creating documentation of indigenous knowledge. That will pay off," he says. Second is to find, and use, insights from indigenous information that are not obvious from the scientific record, such as the multidimensional view of ice taken by native hunters. And third is to use the links offered by a different way of looking at things.

"Indigenous people see different links than scientists do," Krupnik says. "Scientists go after time series and statistical average, which are hardly applicable to indigenous knowledge. There is nothing in the indigenous folder that qualifies for this."

"The issue is not just how to collect indigenous knowledge," he adds, but "to find a way to put this knowledge next to extensive time series of scientific records."



CARLYE CALVIN/NCAR

Leroy Little Bear, a Blackfoot American Indian and former director of the American Indian Program at Harvard University.

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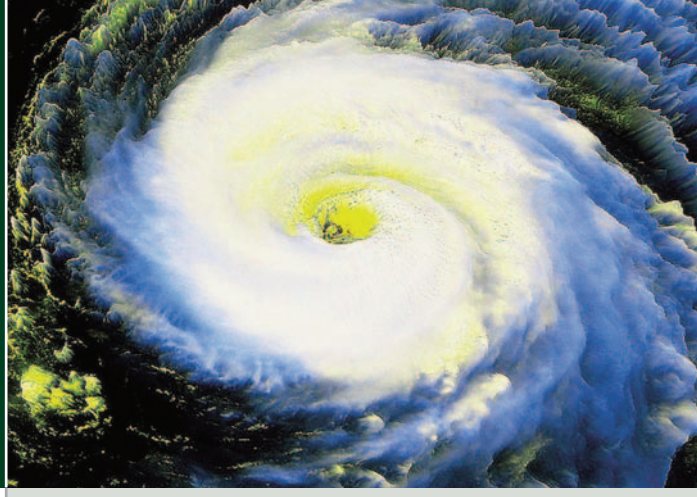

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