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# The Environmental Wisdom Encoded in Endangered Languages

Indigeneity Science & Nature Identity & Community

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# As many Indigenous languages are at risk of disappearing, scientists and communities are joining forces to preserve the traditional ecological knowledge they harbor.

Scientists had no idea whether the black-naped pheasant pigeon still existed. The black-golden bird was only known from two specimens collected by British naturalists on Papua New Guinea's Fergusson Island in the late 1880s. Logging has since shrunk its rainforest habitat, and no Western biologist has ever come across it on Fergusson, said ornithologist Jordan Boersma of the Cornell Lab of Ornithology.

But where Western science had no answers, Boersma and his colleagues knew who might. Instead of looking for the ground-dwelling bird themselves—as many Western scientists do—the team sought help from the island's Indigenous communities. And indeed, many elders recognized the animal based on drawings. It even had a name—Auwo—and featured in chants that men would use to woo women they wanted to marry. One particularly knowledgeable hunter led the team to a remote patch of forest where he saw signs that an Auwo had recently walked past. And sure enough, a trail camera the team set out there captured a photo of the bird the very next day. "I think what our finding really tells us," Boersma said, "is that local people are [typically] going to know the birds in these areas better than we do."

After decades of dismissing Indigenous expertise as unscientific, Western scientists are beginning to recognize the immense body of knowledge of animals, plants, and ecosystems that Native peoples have cultivated over thousands of years. But just as nature itself is under threat, so is this intimate understanding of it. Much of this traditional knowledge is passed on through words, songs, and tales—information embedded in languages that are often spoken less and less frequently. Around half of the world's 7,000 recognized languages are endangered, the vast majority of them Indigenous.

Later, the U.S. and Australia even introduced government policies designed to oppress Indigenous identities, for instance 19th-century ones that forced Native American children into "assimilation" boarding schools, where their mouths were washed with soap for speaking their first languages. Today, many Indigenous peoples continue to see their rights violated, and their lands repurposed or destroyed. Cultural change is also pulling Indigenous people out of their traditional ways of life and into Western lifestyles, where they speak dominant languages instead. And as people move away from their land—whether voluntarily or through forced displacement—their knowledge of it fades. "Once a human language develops this incredibly complex system [to describe an environment] over thousands of years, if it's never written down and it's lost," said linguist David Stringer of Indiana University, "then it's lost forever."

These mounting threats have motivated Indigenous communities and Western scientists alike to preserve the environmental knowledge encoded in Indigenous tongues. Finding mutually beneficial ways of doing so isn't straightforward; there's a long history of Western researchers extracting Indigenous science and locking it away in journals or even exploiting it for profit without any benefit to the people. Yet, a number of projects across the world are exploring more ethical ways of safeguarding traditional knowledge, helping to sustain it while growing our collective understanding of the world around us.

When societies derive all their sustenance and medicine from the species around them, they develop sophisticated ways of describing their environment, starting with a rich vocabulary. The Kayapo people in Brazil have 56 different names for local bee species. These names don't match the Western taxonomic framework, but instead reflect more intuitive groupings based on factors like hive geometry, wax production, or aggression. A single species can have many names; the Kwak̓wala language of the Pacific Northwest has more than a hundred words for the Western red cedar, describing each part of the tree and how they can be used to make everything from baskets to canoes. Some plant names in the Wixárika language—spoken in the mountainous regions of western-central Mexico—translate to "deer's food," "roadrunner's maize," "remedy for headaches," and "viper remedy," reflecting deep traditional knowledge yet uninvestigated by Western science. Unlike many Western scientific names, "Indigenous naming systems usually carry ecological information about the thing that they're naming," said Stringer.

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Environmental information can also be encoded in more complex ways through grammatical structures, time-keeping systems, songs, and tales. Calendars are often based on the changing behavior of species at different times of the year. For some communities on the Woodlark Islands of Papua New Guinea, hearing the call of the rainbow bee-eater—a sound akin to "kelkil" which is also the bird's name in the Muyuw language—means it's time to start digging up yams; the word for yam harvesting, "kil," is reminiscent of the bird's call. The Wajãpi children in northern Brazil sing a song that connects the call of the dark-billed cuckoo with the appearance of a star constellation, a change in season, and the planting of sweet potatoes. "You find in stories and song a deep, rich, powerful understanding of an environment—deeper and richer than what you might find in a scientific-method research study," said linguist Karen Park, a research affiliate at Oxford University.

Many Indigenous communities see in their language not just a rich encyclopedia of their environment, but also a guide of how to treat it. Forests managed by Indigenous people are overall in better shape than those managed by governments, companies, or private individuals; in fact, the vast majority of Earth's biodiversity is found on Indigenous lands. The beliefs, rituals, and sustainable practices that undergird this responsible stewardship are passed on through language, explained Milka Chepkorir of the Indigenous and Communities Conserved Areas Consortium, who coordinates an effort to defend territories of life of Indigenous Peoples and local communities in Kenya.

It's how her community, the Sengwer Peoples of Cherang'any Hills, know not to take more resources from their lands than they need and to treat their environment with respect, for instance, smearing soil or dung onto a tree's bark to help it heal after extracting medicinal substances. Deep cultural ties to wild animals—each clan has an animal totem—encourage their protection, she said. On top of suffering forced evictions from their ancestral lands, threats to language also endanger the Sengwer way of life. In Kenyan schools, speaking Sengwer and other

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While preserving environmental knowledge is a priority for many Indigenous communities, sharing it with outsiders is often a big ask. Throughout history, Indigenous science has been exploited for profit, from big pharma selling drugs derived from local medicinal plants to food companies marketing new "superfoods" based on species domesticated by Indigenous peoples. There's also a risk of researchers dissecting Indigenous knowledge in ways that can harm communities; what linguists may view as an interesting study on, say, how different Indigenous languages evolved could create unnecessary strife among communities around whose language emerged first, said ethnobotanist Carrie Cannon, a member of the Kiowa Tribe of Oklahoma.

Cannon was recently involved in an effort, led by the Hualapai tribe, to explore the possibility of documenting the expressions used in endangered Pai languages to describe botanical knowledge of six Native American tribes in Arizona and Baja California in Mexico. The goal was to assemble their collective botanical wisdom in these languages in the hope of restoring knowledge lost to historical assimilation practices. Some of this knowledge—only that which the tribes wished to share—would have been made public for researchers. The tribes were weary about how outsiders could use their knowledge, and in the end, the Hualapai chose to withdraw from the project, Cannon said. "I think it's an overall sentiment that so much has been lost, so much has been taken, [that] the fear of one more thing being taken again keeps people from wanting to be open to outside entities."

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their rich knowledge of plants, traditional farming practices, and the language they use to describe them. This knowledge is at risk as people increasingly leave the area to pursue wage economy jobs and opt to speak Spanish instead, especially because the country's education systems, medical systems, and legal services are conducted in Spanish. "Wixárika people, like many local and Indigenous groups, heavily manage wild plants by transplanting them, pruning them, encouraging them, protecting them," said Alex McAlvay, an ethnobotanist of the New York Botanical Gardens. The words for those practices, he said, "are also quick to disappear as well as the knowledge they encode."

McAlvay is part of a collaboration of linguists and botanists that is also helping to record the Wixárika names for places, which often reflect gods, animals, or plants associated with them. The word paixarita, for instance, describes the riverine, rocky home of a plant with grape-like acidic fruit, explained Wixárika linguist Gabriel Pacheco of the University of Guadalajara and linguist Stefanie Bierge of the New York Botanical Gardens. Though the plant is seldom found in these areas anymore, the place's name documents its historical presence, providing insights into how the landscape has changed due to forces like climate change.

Not all of the Wixárika knowledge will be made available to researchers. A select, community-approved subset will be shared in the form of audio and video recordings through a database of endangered languages. Instead, the bulk of the project will focus on creating resources for the community: an online database, a botanical handbook, educational materials on botanical knowledge, audio and video recordings of Indigenous speakers, and herbaria collections of dried plants. For the Wixárika people involved in the project, the goal is to preserve and revitalize their knowledge and encourage younger generations to learn about traditional practices. "Even if we're probably not using the knowledge on an everyday basis," Bierge said, translating a statement spoken in Spanish by Pacheco, "this kind of work is vital to preserve the knowledge."

In Australia, some documentation efforts are even further along. A few years ago, the Atlas of Living Australia, which catalogs the country's species, launched a project to incorporate Aboriginal ecological knowledge alongside the Western scientific data it contains. One focus, for instance, has been documenting the ancestral knowledge of elders from Noongar communities of the southwestern corner of the country, much of which has been lost to government assimilation policies. For the Noongar clan Wudjari, "two that I work with are the last speakers of the traditional language," said Denise Smith-Ali, a Noongar linguist at the Noongar Boodjar Language Center in Perth who participated in the documentation efforts.

[Western scientists] what we do know."

The Atlas's page for "emu," for instance, now includes roughly two dozen Indigenous names for the species and connects to more Aboriginal knowledge—such as a Noongar encyclopedia entry that details the uses of feathers for art and ceremonies, what its meat smells like, and that the protective males won't leave the nest, even during a bushfire. Compared to Western science, Indigenous science considers species more holistically, how they link to the land and to people, said Nat Raisbeck-Brown, a spatial scientist at Australia's Commonwealth Scientific and Industrial Research Organization who leads this project. For example, one subdialect of Noongar describes a eucalyptus species as "Widjaarap Ngaank Yok," which includes the mountain where it grows, the shape of the nut and flower, and the term for "woman."

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Raisbeck-Brown hopes the effort will encourage Western scientists to take heed of Aboriginal science. While Aboriginal peoples have long known that short-beaked echidnas whistle—in fact, it's in the Atlas—this wasn't widely known among Western scientists, who only recently recorded the sound for the first time. "I think it's a good example that going forward, Western scientists will ... start to realize there's knowledge here that they didn't know," she said.

There are many other efforts to document the knowledge held in Indigenous languages—in the Pacific Northwest, Vanuatu, the Amazon, and Papua New Guinea. Some of them are global in scope, like Talking Dictionaries, a database that collects Indigenous ecological knowledge. FishBase has

University of British Columbia. A lot of cultural knowledge can be gleaned from species names alone; many First Nations communities have given fish different names depending on how they are consumed, traded, or harvested, she added. Meanwhile, the Ethno-Ornithology Atlas (EWA), an initiative between Oxford University and the nonprofit BirdLife International, allows communities from around the world to collect or share their cultural knowledge about birds—for instance, not only how they can foretell changes in weather, but also act as omens for bad things about to happen, or symbolize mythical figures.

Databases like EWA convey a deeper message about the rich relationships people can have with other species— an important takeaway for post-industrial societies that have become increasingly disconnected from nature, said Oxford ornithologist and EWA research director Andrew Gosler, whose research has found that nearly half of British university students can't name five local bird species. It's not up to academics to decide whether a language should be documented. But by providing documentation resources and a global platform for traditional knowledge, places like EWA can affirm the value of preserving it and help Indigenous communities be recognized for their role as responsible, knowledgeable stewards of their environment, Gosler said. "There needs to be a recognition that something really important is being lost."

Of course, while documentation efforts can serve as a backup under the worst-case scenario that knowledge is lost, the goal isn't to preserve languages for scientists to gaze at like long-lost specimens of extinct species in a museum. A language is only truly preserved if spoken; many deep elements like beliefs and rituals are hard to document, let alone translate into other languages, Chepkorir said.

The Sengwer community in Kenya understands this and is working to revitalize their knowledge —by creating language learning materials, making videos of the remaining elders talking about Sengwer culture, and having them sit with children during school holidays to learn traditional ways of life. The hope is to nurture a new generation of Sengwer speakers who know who they are, their relationship to the forest, and how to take care of it. "A loss of our language," Chepkorir said, would be "the first step to us losing ourselves. Because it's how we understand our environment."

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