Curing What Ails You

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Curing What Ails You

What can elephants teach us about medicinal plants?

By Alex Greene, ethnobotanist and National Geographic Explorer
As you read, think about what people have learned from observing elephants.
A truck rumbles to a stop in front of a large, open-air pavilion. Elephants stand under the shade of nearby teak trees. Several mahouts, the caretakers of elephants, help unload a pile of spiky vines that fills the truck bed. We are at the Thai Elephant Conservation Center (TECC) in northern Thailand. These vines, the mahouts tell me, will be used to make an herbal medicine for the elephants’ care.

I first came to TECC in 2017, while working as a guide for student groups. I quickly noticed several interesting things. The first was that TECC had one of the most advanced elephant hospitals in the world, and one way the center treated elephants was with herbal medicine. As an ethnobotanist who studies the different ways that people use, rely on, and relate to plants, this caught my attention.

I knew that “traditional” plant-based medicine and biomedicine (or “Western” medicine) aren’t often found together. Why did TECC use herbal medicine alongside biomedicine when caring for their elephants?

Another thing I noticed was how interested the elephants were in their herbal medicine. Elephants love sweet foods, just like humans. At TECC, they are mainly fed elephant grass, but sugarcane and sweet corn are two of their favorite snacks.

One of the mahouts told me that the spiky vines, *Tinospora crispa*, are a powerful medicine for people. He encouraged me to take a tiny nibble of the bitter vine. It was intense! So bitter that I couldn’t swallow it without a drink of water.

Then the mahout tossed pieces of vine to the nearby elephants. They quickly grabbed the pieces with their trunks, crunched them between their massive teeth, and swallowed them down. Why would these sweet-loving elephants happily eat such a bitter plant? Did they know it was medicine? These questions gnawed at me, and a year and a half later, National Geographic Society gave me a grant to return to Thailand to try to find the answers.
Working With Elephants

Elephants have coexisted with people as captives and companions for thousands of years in Thailand. Some cultures have closer relationships with them than others. I decided to work with a group of highland people called the Karen. They live in the mountains of northern Thailand and neighboring Myanmar.

The Karen are famous for their knowledge of elephants. No one knows when this relationship began, but one Karen story tells of how the elephant was originally human. Then it lost its humanity and became a helper of humankind.

Traditionally, elephants played a critical role in nearly every aspect of life here, similar to the role horses play in other parts of the world. Their knowledge of the forest meant that the best way to travel long distances over land was on the back of an elephant.

Their incredible strength allowed them to move heavy objects like stones, logs, and sacks of harvested rice. Many elephants worked in the logging industry, which was very hard work. But as cars, tractors, and machines have replaced older ways of life, elephants’ usefulness has dwindled.

Logging with elephants is often considered more environmentally friendly than using machines, because elephants don’t need roads to access the jungle. But, centuries of overharvesting was threatening Thailand’s last remaining forests, so in 1989, logging was banned.

After the ban, elephants were no longer needed for this type of work. Yet, the ancient relationship between people and elephants remained strong. People tried to find new ways to work with these incredible animals. Most elephants were moved to elephant camps for tourists, where they serve as an attraction for visitors from around the world.
Research Begins
When I returned to Thailand last year, the first goal of the research was to document which plants mahouts were using to treat sick elephants. I wanted to record how they used these plants and for what health complaints. I set out to visit four Karen communities scattered across northern Thailand. At each one, I worked with an interpreter to explain to village leaders, elephant camp owners, and mahouts why I was interested in their knowledge and how I would use the information they provided for me. They agreed to help. So, we set up interviews with the most knowledgeable mahouts. We asked them to describe what plants they used for elephant medicine.

One of the greatest challenges I faced in the research was the language. I speak English and am just starting to learn Thai. The Karen people speak their own language, Pakinyaw. Many also speak Thai, which they learn for school and business. There were many times when my questions had to be translated twice! This can be a difficult way to work. Luckily, I had great interpreters to help. With patience, lots of repetition, and the willingness to rephrase difficult questions, we made progress.

After a series of interviews, I would ask the most knowledgeable mahouts to bring me into the forest. There, I collected samples of key plants and carefully dried them in a plant press. Later, these samples would be prepared as botanical specimens. Then they would be identified and deposited at a local herbarium, which is a kind of library for plant specimens.

Analyzing Data
After several months of work, we had learned about 34 plant species used by the Karen to care for their elephants. Together, these plants were used in more than 40 different treatments.

The most common use was as a tonic. It keeps the elephants healthy, increases their energy, and helps with digestion. Many kinds of roots, barks, leaves, and stems are mashed together to make this tonic.
Raw or cooked rice is added to the tonic, as well as tamarind fruits and bananas. The mahouts make balls or pellets of this mixture. They feed one or more to the elephants each day. If an elephant is old, sick, or pregnant, it is given more doses of the tonic.

Other plants were used to treat wounds, eye problems, indigestion, broken bones, skin problems, fatigue, snakebites, and to help elephant mothers produce more milk for their babies. The medicines are given to the elephants in different ways. For instance, the plants that help a mother produce more milk—banana flower and ginger root—are fed directly to a mother elephant. Plants to help eye problems are ground up and placed directly in the eye. Other plants are boiled in water for a long time (just like tea!) and then given to the elephants to drink or rubbed onto their skin.

Recording Data

Number of plants used for medical treatments of elephants:

- Skin: 1
- Fatigue: 1
- Snakebites: 2
- Milk production: 2
- Broken bones: 2
- Indigestion: 3
- Eye problems: 5
- Internal injuries: 5
- Wounds: 8
- Health tonic: 13

Here is some of the data I collected.

These plant parts are the most commonly used for elephant medicine:

- Bark: 32%
- Stems: 18%
- Roots: 15%
- Whole plants: 15%
- Fruits: 15%
- Leaves: 12%
- Seeds: 3%
- Flowers: 3%
My colleagues and I discuss our work.

**Asking More Questions**
After documenting the plants, we turned our attention to a much more difficult question: Where did this medicinal knowledge come from? I knew that in ancient India, whole books were written about how to care for elephants. But, many of the plants we learned about from the Karen were not in those books. Was the knowledge of how to use these plants coming from human medicine, which people then applied to elephants?

After interviewing the mahouts further, we learned that many of these plants are used for people in the same way that they are used for the elephants. The plants used to treat elephant eye infections and cataracts, for example, were the same remedies used for eye infections and cataracts in people. In fact, there was a surprising overlap: Fifty-five percent of the elephant medicines had the same use for people! It seemed clear that much of the veterinary knowledge was coming from human medicine.

Yet, despite this clear connection, there seemed to be another source of knowledge—the elephants themselves! Several of the elephant medicinal plants didn’t have any uses in human medicine. And many medicinal plants were sought out by elephants.

Mahouts reported that 84 percent of these plants were eaten by elephants when they were free to choose their own diet in the forest. So, the elephants were independently eating many of these medicines. Did they know that these plants were medicinal? Was it possible that they might be eating some of these plants because they were medicinal, the same way that we sometimes eat things because we know they are good for our health?

We identify and label each specimen, such as this plant used to treat elephants’ broken bones.
Going Further
To prove scientifically that elephants eat medicinal plants on purpose would be challenging. It would require feeding observations, health assessments, and laboratory analysis. But, the Karen mahouts weren’t interested in having their knowledge scientifically validated. After generations of observing elephants in the jungle, many of them believed that the elephants did eat specific plants to treat specific problems.

Karen mahouts reported 19 plant species that were used by the elephants themselves to treat constipation, indigestion, or intestinal parasites. They found plants to strengthen their teeth and to increase milk production after giving birth. Quite a few of these plants were the same ones used by the mahouts when they prepared medicine for the elephants!

Things were becoming clearer. Many of the medicines used to treat elephants had come first from human medicine. But, some plants were used by the elephants first. Only later did people observe this and start to gather them. Other medicines were used in both human medicine and elephant diets, so it was hard to tell if they originated from human knowledge, elephant knowledge, or both.

Learning From Others
In our human-centered world, it can be hard to remember that other species have their own knowledge, which sometimes can be even greater than our own. We learned how to build dams from beavers. We saw how to survive the cold from fur-bearing animals. We copy the shapes of airplanes from birds. A whole branch of design called “biomimicry” is devoted to using the forms and processes of nature to design new human technologies.

In the forests of Southeast Asia, Karen mahouts have lived alongside Asian elephants for so long that they have borrowed from elephant knowledge. Like so many other animals, elephants seem to have a detailed knowledge of the plants they consume.

The next time you see your dog or cat chew up strange plants in the yard, watch closely, and ask yourself: “Do they know what they’re doing?” Maybe. There are many things about even our closest animal companions that we don’t yet know. There is much to be discovered!

I’m excited about the work we’ve done so far and look forward to the work ahead.

Wordwise
biomedicine: the branch of medicine concerned with the application of biology and biochemistry to medical research or practice
ethnobotanist: a person who studies how communities traditionally use plants
herbarium: a systematically arranged collection of dried plants
mahout: a person who works with, rides, or takes care of an elephant

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This stone moved on its own. How?

Come along as scientists try to solve this and more of Nature’s Mysteries.

By Lynn Brunelle
A dragon stirs deep beneath a desert. It slithers through the sandy dirt, breathing a fiery, poisonous gas as it moves. The gas bubbles up to the surface. There, it burns circles of bare dirt in the grass.

Or so the story goes. No one has seen this mythical beast. Yet, some people in southern Africa say it’s there. It’s how they explain the mysterious circles that appear on the eastern edge of the Namib Desert.

Thousands of circles stretch as far as the eye can see. Some are small, just one meter (three feet) wide. Others are as wide as 50 meters (164 feet). It would seem that the dragon has been busy.

Searching for a Cause
Not everyone believes in dragons. So, scientists have looked for other causes for the circles.

Some think that, like the mythical dragon’s fiery breath, a gas bubbles up. Others think that ants may chew the roots of the grasses. Still others think that toxic plants may spread their poisons. Any of these actions could have the same effect. They could kill the grasses.

These are all theories, or ideas. They seem possible. Yet, scientists have to prove a theory before it’s accepted as fact.

Desert Discoveries
One scientist thinks he may have solved this mystery. Biologist Norbert Juergens has visited this desert 40 times. He’s studied 1,200 circles, looking for evidence of what caused them. He’s looked for patterns among the circles, trying to discover what they have in common.

The biologist sifted through the dirt inside the circles. He tested the dirt for chemicals and measured how much water was in it. He recorded the animals he saw in the circles. He wrote down the names of plants growing nearby. He tracked changes in the weather.

Then Juergens studied all his data. He found some differences between the circles. Colonies of ants crawl through some. Spiders spin webs in the grasses growing around others. Aardvarks even visit some circles.
Common Clues

Juergens didn’t just find differences among the circles. He also found similarities. Each circle had dry, sandy soil in its center. He also found something surprising. Even in the dry season when it barely rains, the grasses around the circles stayed alive. To find out why, he dug deep into the soil. He discovered wet sand under each circle. The grass roots tapped into the water to keep the grasses alive.

Juergens also found something else in every circle. He found sand termites. These termites tunnel through dirt. They chew on plant roots.

Juergens studied these common clues. He looked for ways they could connect. Then he came up with his own theory.

Mystery Solved?

Juergens thinks that termites eat some grass roots. That kills the grass growing above the roots and forms a circle of bare dirt.

When it rains, water soaks into the dirt. It’s saved in a pool under the dirt. The termites drink this water. The grasses around the circle soak it up. It’s how these insects and plants survive in the desert during the dry season.

Juergens will have to study more circles to prove if his theory is correct. Yet, he may be one step closer to solving the mystery of the circles in the sand. The termites aren’t fire-breathing dragons. Still, they’re pretty remarkable. These tiny insects may have created one of nature’s strangest mysteries.
SOMETHING FISHY

Yoji Okato pulled on his dive gear. The underwater photographer gathered his waterproof cameras. Then he dove into the sea off southern Japan.

When he reached the seafloor, he saw something odd. It was a giant circle in the sand that was two meters (six feet) wide. The sand in the center looked smooth. A pattern of symmetrical ridges piled up around the edge of the circle.

Okato took pictures of the sand sculpture. When he shared his photos, other divers said they’d seen these mysterious circles, too. Yet, no one had ever seen what made them.

A pufferfish swims back and forth as it makes a sand circle.
Searching for a Cause
Soon, people came up with theories about these sea circles. Some said they formed when a UFO landed on the seafloor. The spaceship left a mark in the sand, they said.
Others thought ocean currents sculpted the sand. The moving water could push the sand into ridges. But, the circles seem too perfectly round to be formed by shifting water currents.
To solve the mystery, Okato teamed up with scientists and filmmakers. Time after time, they returned to the dive site where he first saw a sand circle.
The team watched and waited to see how the circles formed. Dive after dive, they saw nothing and swam away without any clues.

Seeing Is Believing
Finally, the team caught the artist in the act. It wasn’t an alien, and it wasn’t an ocean current. It was a male pufferfish small enough to fit in a person’s cupped hands.
The fish swam back and forth. His motion made tiny waves in the water. These waves moved the sand, forming a circle. Then the fish used his fins to dig into the sand. He flipped fine sand into the center of the circle. He dug dips and built ridges around the edge. Finally, he collected bits of shells in his mouth and carefully placed them on the ridges.
The pufferfish worked on his project for more than a week. Bit by bit, he built a sand sculpture hundreds of times bigger than him.

Mystery Solved
Okato’s team didn’t just find out what builds the mysterious sea circles. They learned why the pufferfish builds it.
When a female pufferfish swam by, the male zipped back and forth inside the circle. He stirred up the fine sand. He tried to get the female fish’s attention. It worked. She decided to lay her eggs in the center of the circle.
It took patience and a lot of observation. Yet, years after his discovery, Okato finally solved the mystery of the sea circles.
A big boulder sticks out of the dried mud. This rock is too heavy to pick up. Yet, it has mysteriously moved. A few days ago, it was 250 meters (820 feet) away. A trail shows where it moved across the dirt.

This isn’t the only rock on the move here. Many of the rocks in this part of Death Valley in North America don’t stay in one place. Their trails crisscross the cracked mud of a dried lake.

Some glide in straight lines, then stop and settle into the dry mud. Some rocks move in pairs. Others zigzag this way and that, leaving a jagged trail. How did they move?

No one has ever seen it. It’s a mystery.

Searching for a Cause

Over the years, people have come up with wild ways to explain how the rocks move. Some people say the rocks are magical and move on their own. Others say aliens from space are moving them. Still others think pranksters are playing tricks, moving the rocks when no one is looking.

Scientists want to find a better answer than magic or aliens or pranksters. So they’ve looked for evidence in nature for answers.

Looking to Nature

An early theory was that gravity moves the rocks. This force could tug on the rocks and pull them downhill. Even though this area looks flat, it actually slopes a little.

So scientists looked for patterns in which direction the rocks moved. That’s when the gravity theory fell apart. Most of the rocks had moved uphill. Gravity is a strong force, but it pulls things down, not up. Another theory was that winds pushed the rocks. The winds here are strong. Some gust up to 113 kilometers (70 miles) per hour through Death Valley. Windstorms called dust devils also whirl.

The scientists did experiments to test the wind theory. One even used the wind from a plane propeller to try to move the rocks. The tests showed that winds aren’t strong enough to move the biggest boulders.

Cold Clue

Finally, scientists noticed that the rocks seem to move only in the winter. That’s when this area sometimes floods. A thin layer of water covers it and surrounds the base of the rocks.

Studying the water led scientists to new theories. Geologist Paula Messina observed a thin layer of slimy bacteria growing in the water. The slime makes the ground really slippery, so the rocks can slide easily. Even a small wind may be able to push the rocks.

An Experiment

The water gave scientist Ralph Lorenz a different idea. He thought that it might get cold enough in the winter for rings of ice to form around the rocks. Since ice floats on water, the ice might lift even the biggest rocks a little. Then a light wind could push them.

Lorenz did an experiment to see if his theory worked. He made a model of his idea. First, he put a rock and some water in his freezer. As soon as a ring of ice froze around the rock, he placed it in a tray of water with sand on the bottom. The rock floated a little bit. Then Lorenz blew lightly on the rock. It moved! Its bottom scraped along the sand, leaving a trail.

So it seems that ice and wind could help the rocks move. So could bacteria and wind. Both theories are possible. Yet no one’s ever seen the rocks move, so this mystery remains unsolved.
Boulders mysteriously zig and zag in Death Valley, California, U.S.A.
LAKE TOUR
Pink, poisonous, or ... polka dot? Take a tour of some of the planet’s most peculiar lakes.

By Beth Geiger
Ah, lakes! Great for fishing, swimming, and paddling. Or… maybe not. From creature features to melt-your-skin salty, these lakes are among Earth’s weirdest bodies of water.

**Seeing Spots**

One peek at Spotted Lake, British Columbia, and you’ll think about your favorite old pajamas. Such pretty polka dots! But on a lake?

Spotted Lake fills a low spot in Canada’s Nk’Mip Desert. The lake is endorheic—that’s geo-speak for “dead end.” Mineral-rich water from rain and melting snow flows in, but nothing flows out. In summer, most of the water evaporates. All that’s left is a rainbow of small, mineral-filled pools. One mineral, magnesium sulfate, forms a white crust that surrounds the pools like a patio.

Spotted Lake is no surprise to Canada’s First Nations people. They call it Kliluk, and they’ve known about it for centuries. Each little pool, according to tradition, has its own powerful healing properties. Feeling ill? There’s a pool for that. Poison ivy? Got it covered. One legend even says that during a battle, both sides took a break to heal their wounds together in the medicinal waters. Now, that’s powerful.

**Poison or Paradise?**

Don’t bother taking a dip in Lake Natron, Tanzania. In the dry season, most of the water evaporates anyway. What’s left is hotter than bathwater, red from bacteria, and super salty from minerals. The water is so harsh it will burn your skin.

Besides, you’d have to compete with millions of loud, smelly lesser flamingos. What’s a nightmare for most animals is a flamingo’s dream. Little islands of salt stick up from the lake bed. The islands are great places to build flamingo nests. The toxic water surrounding them keeps the nests safe. The flamingos themselves have leathery legs that protect them from the water. But if predators try to splash across it for a flamingo snack, they could end up dead.

Every year, most of the world’s lesser flamingos flock to Lake Natron to build their nests on these mini-islands. They turn this hot, deadly lake into a sea of fluttery pink.
Extreme Lake

Big, bold, cold, and beautiful. That’s Lake Baikal, Russia: Earth’s deepest. It’s more than 1,000 meters (3,280 feet) deep and 636 kilometers (395 miles) long. More than 300 rivers feed it. During the summer, this huge lake contains a fifth of the planet’s liquid freshwater. Besides being enormous, Lake Baikal is also Earth’s oldest lake. It dates back 25 million years.

Animals here have had a long time to evolve, or change, apart from the rest of the world. Of Lake Baikal’s 1,500 species, many are found nowhere else on Earth.

Lake Baikal’s most famous animal is the nerpa. The nerpa is the only seal on Earth that lives only in freshwater. One of the nerpa’s favorite foods is a little pink fish called golomyanka. The golomyanka is partly transparent! Look carefully and you might spot one, since Lake Baikal is also one of Earth’s clearest lakes.
Jellyfish Central
Gliding globes of golden jellies. Gobs of them! That’s what you’ll find in Ongeim’l Tketau, on Eil Malk Island, Palau. This tiny lake on a tiny island in the Pacific Ocean is known around the world as “Jellyfish Central.” In fact, many people don’t even know this lake’s real name.

Over thousands of years, the jellies here have lost most of their sting. Where else can you swim among clouds of jellies without getting stung? But here’s the kicker: You’ll have to keep up with the jellies’ busy schedule.

In the morning, the jellies float to the east side of the lake. In the afternoon, they bob back to the west side. At bedtime, they head toward the middle. Why the commute? Sunlight is one reason. Tiny algae live in the jellies’ bodies. The algae get their energy from the sun, and the jellies get their energy from the algae. Scientists think the jellies are also avoiding shadows along the shoreline, where their archenemy, the anemone, lives.

What’s Cooking?
Everyone likes nice warm water. But Boiling Lake, Dominica, is extreme. It boils, just like a pot of soup on a stove.

Dominica, like other islands in the Caribbean Sea, is a volcano. Where there are volcanoes, there are often fumaroles: searing hot holes where heat and gas escape. Boiling Lake fills a fumarole. No wonder it’s boiling. There’s hot magma underneath!

Getting to Boiling Lake requires a tough hike through a muddy rainforest. Even so, the lake is a hot spot for adventurous tourists. They scramble up a slippery trail. They trek through the eerie Valley of Desolation, where the air is filled with steam and sulfur that smells like rotten eggs. Finally, they reach a cliff overlooking Boiling Lake. They peer through the mist, trying to get a look at the lake’s churning water, and they try hard not to fall in.
Down the Drain

It’s summer on Greenland’s vast, miles-thick ice sheet. Lakes, formed from melting water, dot the frozen surface. They sparkle like blue jewels. The darker the blue, the deeper the lake.

But some of Greenland’s meltwater lakes play a little game of now-you-see me, now-you-don’t. One, called North Lake, sometimes drains all at once. One year, all 45 billion liters (12 billion gallons) of it disappeared in two hours! That’s about 18,000 times more water than an Olympic swimming pool.

Scientists figured out what happens. As temperatures warm, the ice shifts. That opens huge cracks. The lakes drain down through the cracks. It’s like someone pulled the plug on a bathtub. The water runs all the way to the base of the ice sheet. Then it flows toward the sea.

Scientists have figured out something else, too. The flowing water makes the ice above it move toward the sea faster. They are worried that if summers get too warm, Greenland’s whole ice sheet might eventually slip-slide away. Here today, gone tomorrow.