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NATIONAL GEOGRAPHIC

SPECIAL ISSUE:
WOMEN IN SCIENCE

Explorer

TEACHERS' CHOICE AWARD TCA FOR THE CLASSROOM 2019 LEARNING MAGAZINE

TRAILBLAZER



Jane Goodall
Primatologist **2**



Sandhya Narayanan
Linguist **10**



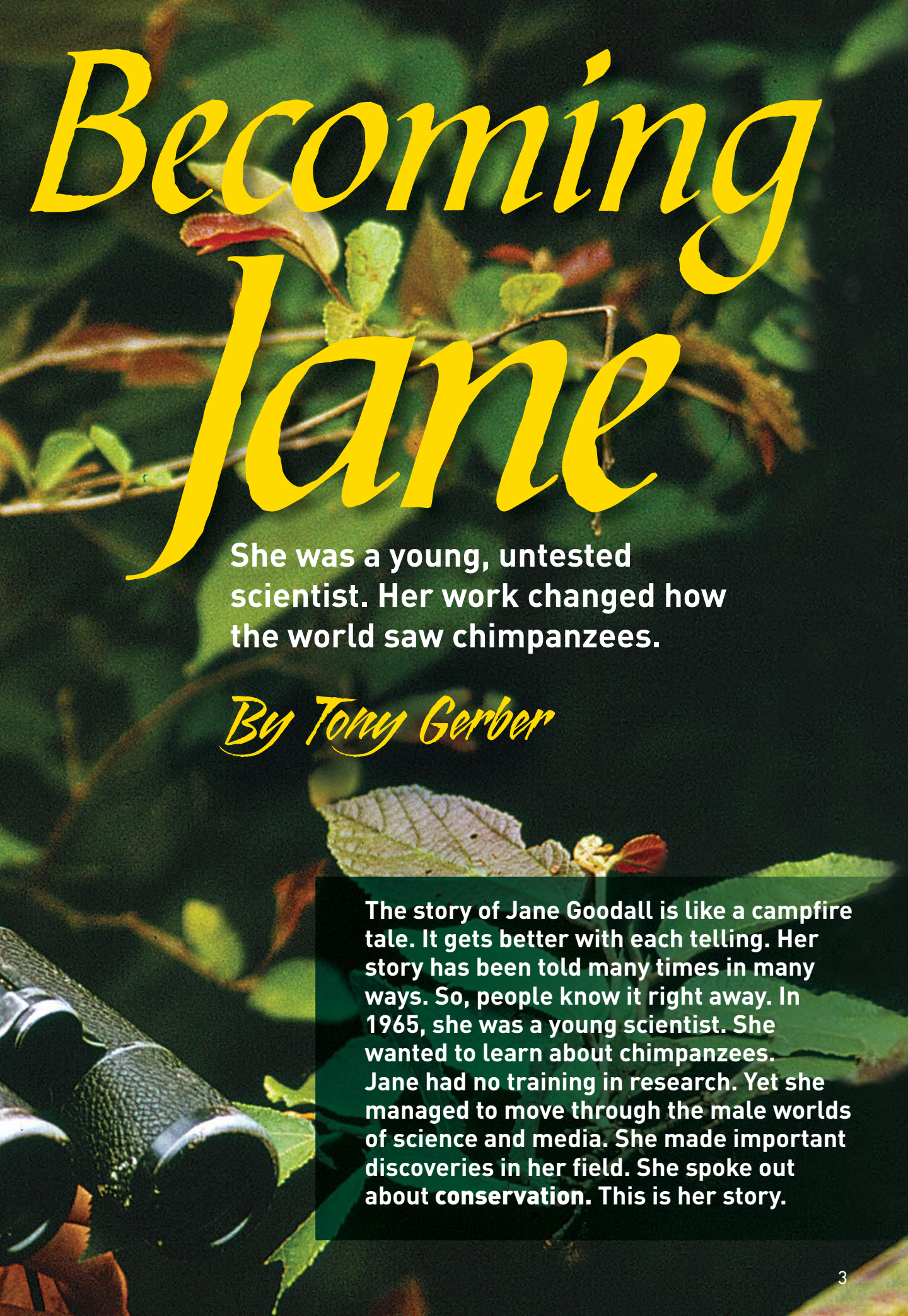
Jade Hameister
Polar Explorer **16**

Wildlife

LIFE SCIENCE

As you read, think about how Jane Goodall used observation to address questions about the natural world.





Becoming Jane

She was a young, untested scientist. Her work changed how the world saw chimpanzees.

By Tony Gerber

The story of Jane Goodall is like a campfire tale. It gets better with each telling. Her story has been told many times in many ways. So, people know it right away. In 1965, she was a young scientist. She wanted to learn about chimpanzees. Jane had no training in research. Yet she managed to move through the male worlds of science and media. She made important discoveries in her field. She spoke out about conservation. This is her story.

Growing Up

Jane Goodall grew up in England. She loved animals and dreamed of living in Africa. Once she began to work, she saved her money. When she had enough saved, she bought a boat ticket to Kenya, a country in Africa.

There, she met Louis Leakey, a **paleoanthropologist.** Leakey was famous for his research on the history of humans and his interest in apes, like chimpanzees and gorillas. He hired Goodall as a secretary. Later, he arranged for her to do field research on chimps in another African country called Tanzania.

Roughing It

It was the summer of 1960. Goodall set up camp in the Gombe Stream Reserve. Leakey had raised money for her to do six months of **fieldwork.**

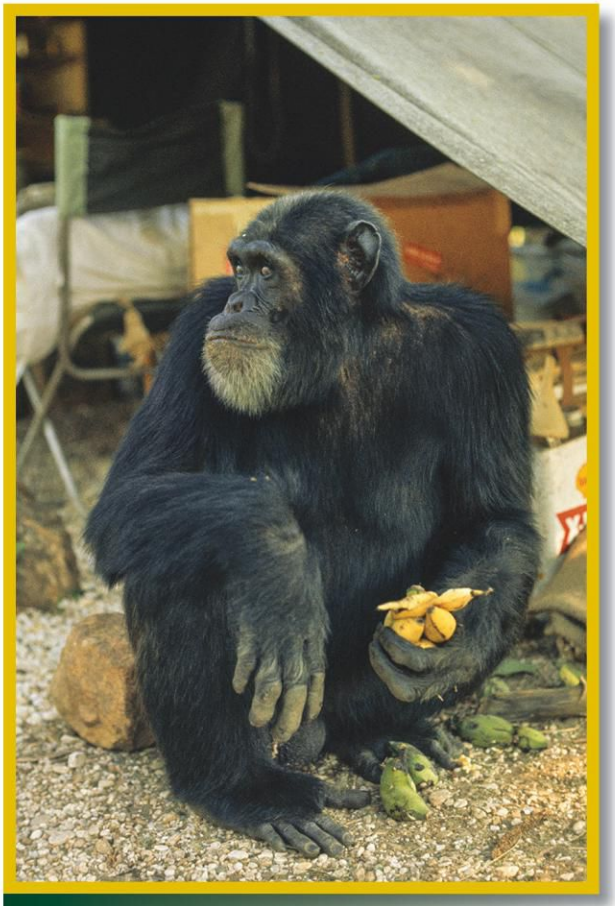
Goodall followed her instincts for her research. Most scientists who studied animals identified them by numbers. Goodall gave the animals names like Fifi, Flo, and Flint. She recorded her observations using those names. Goodall watched the animals through her binoculars and tried to get close to them. But she hadn't made any important discoveries yet.

Turning Point

Then everything changed. Goodall made three discoveries. Each would turn science on its head.

In her first discovery, she observed a chimp eating a dead animal. Until then, scientists thought that apes didn't eat meat. She had named this chimp David Greybeard.

Two weeks later, she saw the same chimp. He was poking a blade of grass into a termite tunnel. He pulled it out. It was covered with termites. Yum.



David Greybeard visits Goodall's camp.



Freud carefully inspects Goodall's hair.

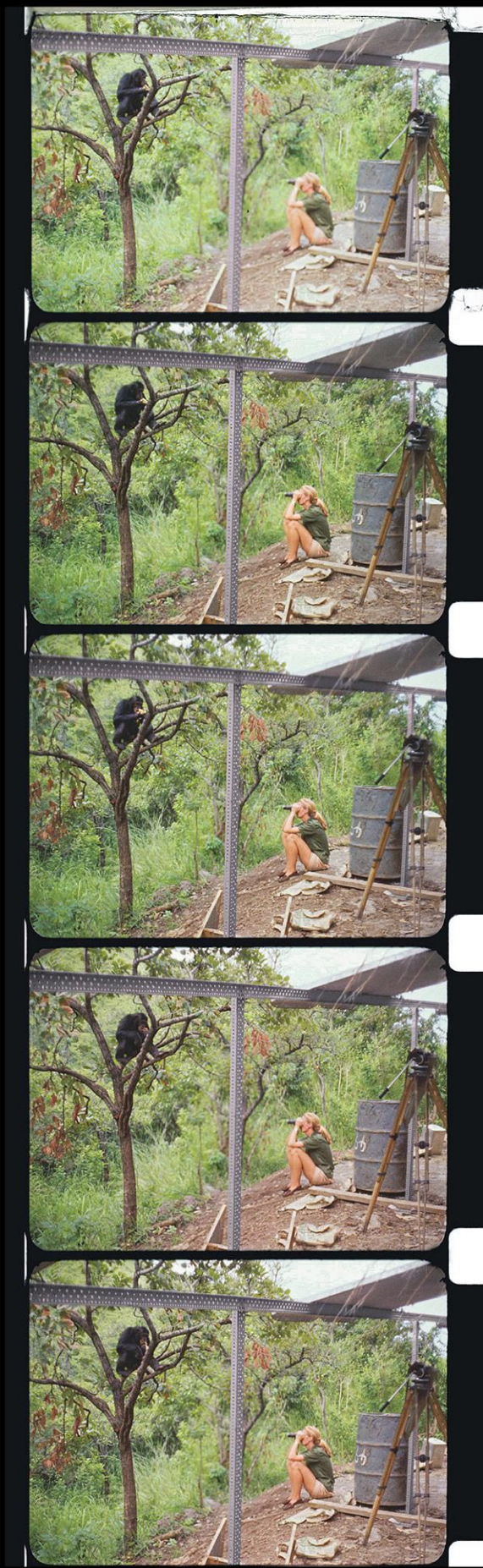
In a third case, Goodall saw the same chimp pick up a twig and strip it of its leaves. He used it to fish for termites. At that time, scientists thought **toolmaking** and tool use were things only humans did. On hearing this news, Leakey sent a telegraph:

NOW WE MUST REDEFINE TOOL STOP
REDEFINE MAN STOP
OR ACCEPT CHIMPANZEES AS HUMAN

Leakey's telegram



Flint takes a peek at Goodall from the top of her tent.



This film shows how Goodall used binoculars to observe chimps.

Spreading the Word

Goodall began to publish her field research. Still, many scientists were doubtful. In 1962, Goodall gave a speech for London's Zoological Society. Some scientists said that her research was guesswork and made no "real contribution to science."

Proof Positive

Goodall needed more evidence of her work. The National Geographic Society suggested she take photos of her discoveries.

The Society hired Hugo van Lawick for the job. He'd had some experience taking photos of wildlife. He reached Gombe in August 1962.

At first, he didn't take pictures of Goodall with the chimps. But the magazine editors wanted photos of her as well. It was unusual for a woman to be a scientist at this time. People were curious about her.

The photos van Lawick took were proof of the chimps' toolmaking, nest building, and other behavior. They also showed Goodall at work. His photographs appeared with her words in *National Geographic's* August 1963 magazine.

A Novel Approach

The issue was a huge success. In 1964, Goodall was set to give her first lecture in the United States.

Jane knew what she wanted to say. She reported on her scientific discoveries. She described Gombe's beauty and peacefulness. She also described the chimps by their personalities and the names she'd given them.

Jane expressed the need to protect the chimps and prevent them from being shot or sold to circuses. She spoke about David Greybeard. He was the chimp who had opened doors to many important discoveries.

Wordwise

conservation: the wise use and protection of nature

fieldwork: work done by a researcher in a natural environment

paleoanthropologist: a person who studies fossils of early humans

toolmaking: making tools to do work; first thought to be a human-only ability

"David Greybeard … has put his complete trust in man," she said. "Shall we fail him? Surely it's up to us . . . to ensure that . . . these fantastic . . . creatures continue to live undisturbed in their natural habitat."



Jane Goodall, Continued

Jane Goodall went on to earn her Ph.D. from Cambridge University. She has published many magazine articles and books. In 1991, she founded an organization called "Roots & Shoots" in Tanzania. Its goal is to help young people begin careers in conservation work. Today, her work in conservation continues.



In this film, Goodall observes chimp behavior.

Jane Goodall's Research

Close study of chimpanzees in the wild completely changed the way we see these animals. Here are some of the key discoveries Jane Goodall made.



1960
Eating Meat
In Goodall's first year of study, she observed David Greybeard eating a dead animal. This was proof that chimps eat meat.

1960
Toolmaking
Goodall observed David Greybeard making and using a tool to find and eat termites.



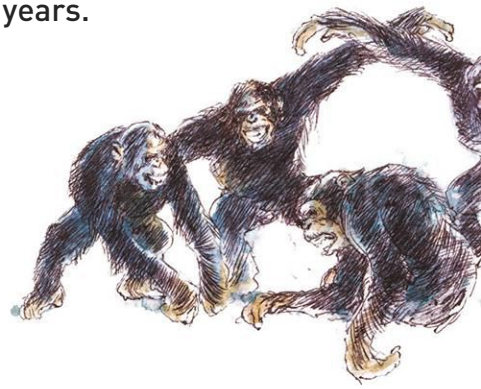
1964
Planning
A chimp named Figan showed planning when he "kidnapped" a chimp named Flint to get the others to follow him to a new location.

1964
Using Man-made Objects
A chimp named Mike showed intelligence by using empty cans to create noise. He banged the cans together to scare larger males away.



1970
Awe
The sight of a waterfall inspired the chimps to perform a joyful dance.

1974
Warfare
In a shocking development, "war" broke out between two groups of chimps. The war lasted four years.





1975
Team Building
Figan's status as a leader was strengthened by his close relationship with his brother, Faben.



1994
Learning from Others
The use of twigs to catch ants had been seen in only one chimp community. Yet after one chimp left that community for another, she began teaching the skill to chimps there.



1987
Adoption
After three-year-old Mel's mother died of an illness, he was "adopted" by a female chimp called Spindle. This was the first time that an unrelated chimp was observed to adopt an orphan youngster.

1995
Medicine
Research suggests that some chimps eat the leaves of a particular plant to help stop stomach pain.







A woman in Puno weaves a colorful cloth on a loom.

As you read, think about how language in Puno may change in the future.

LEAVING WORDS

It started with an idea about language. It led to a long climb into the Andes Mountains in Peru. Once I got there, I realized I would be doing a lot more than collecting words.

By National Geographic Young Explorer
Sandhya K. Narayanan

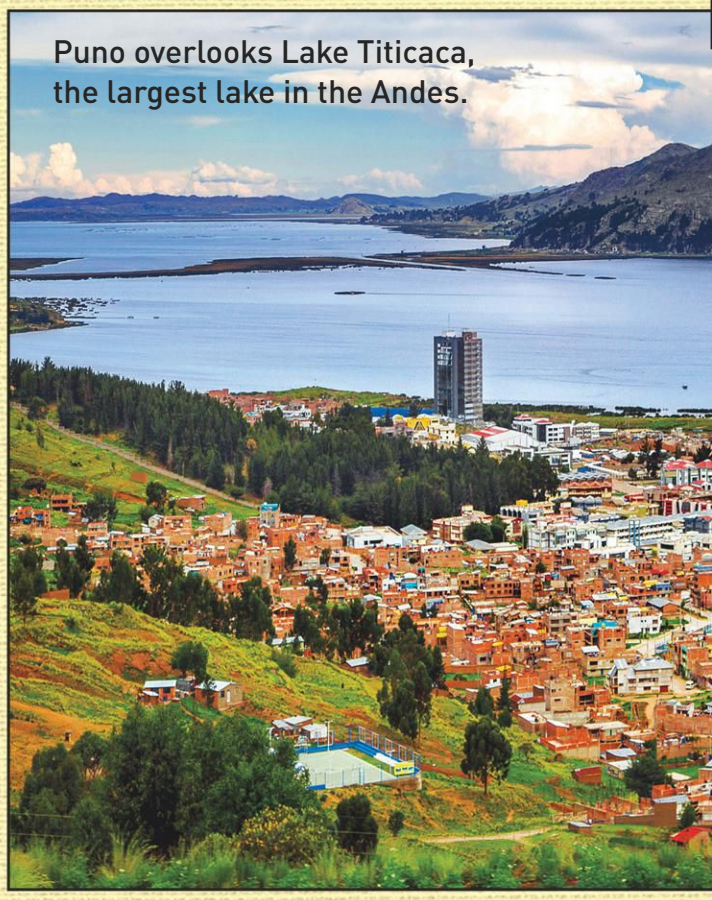


I grew up in Canada and in the United States. I was always interested in languages. In the places where I lived, many languages are spoken all the time. I love languages, so I became a linguistic anthropologist. That's a person who studies languages. I'm interested in how languages are used and how they change.



When I was in college, I had an idea. Wouldn't it be interesting to discover a new language? I know. It sounds crazy. Yet, it's possible.

Languages don't stay the same. Over time, they change. Sometimes a new version is created that is not like any other spoken language. To find it, you must be at the right place at the right time. I decided to look in Peru, in South America. In the Puno region of Peru, people speak two **indigenous** languages. That's a language that is native to a place. Puno's languages are Quechua and Aymara.



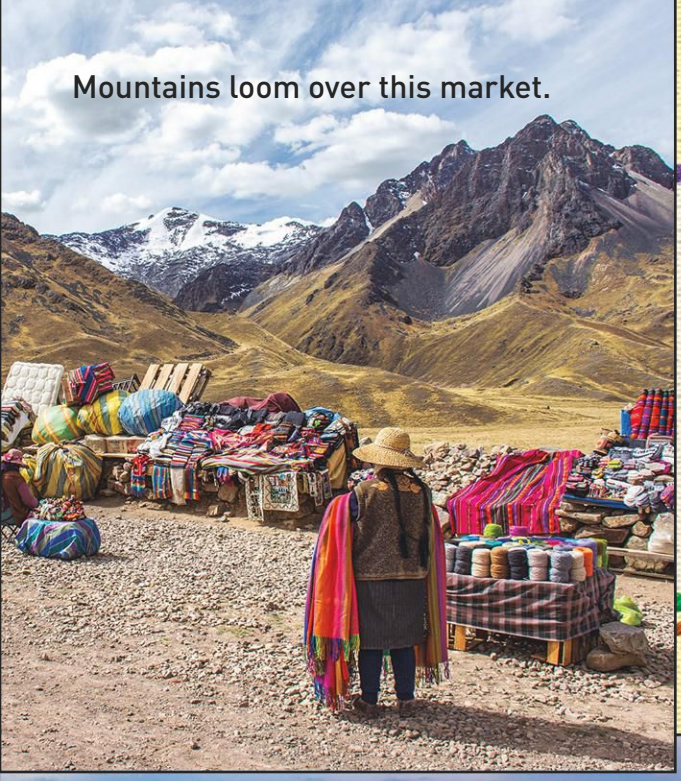
Puno overlooks Lake Titicaca, the largest lake in the Andes.

Learn a little Quechua or Aymara. Try these useful words and phrases:

Quechua: ***Imanaylla kashanki?*** (i-ma-**naa**-ya ka-**shan**-kee)

Aymara: ***Kamisaraki*** (ka-mee-sa-ra-kee)

English: ***How are you?***



Mountains loom over this market.

Quechua:
Allinmi (al-yeen-mee)

Aymara:
Walikiwa (wa-li-kee-wa)

English:
I am good.

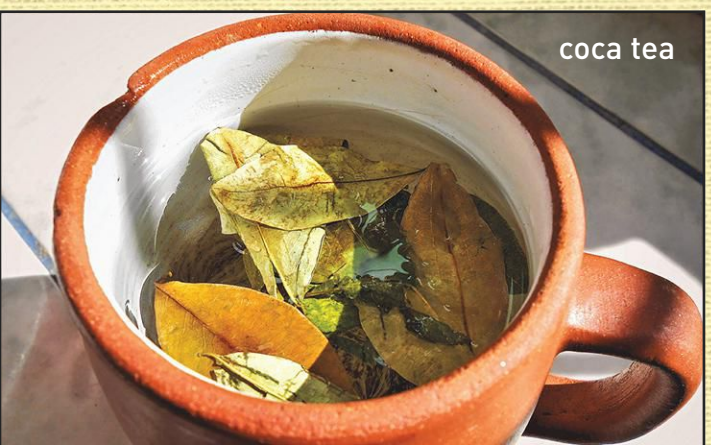


Living the High Life

I wondered if, over time, Quechua and Aymara might have combined into something new. To test my idea, I packed my notebooks, my audio recorder, and a microphone.

It took me a while to adjust to my new surroundings. The communities in Puno are way above sea level. It's so high you can feel the effects on your body. At first, I could feel myself breathing faster and feeling dizzy. Later, I felt sick and had a headache. I had altitude sickness! So, I drank a local tea made from coca leaves. Soon, I felt better.

Being high in the sky also means less ozone in the air. Less ozone means less protection from the sun's ultraviolet rays. Here, people never go out without their sun hats.



coca tea

Fieldwork

As a linguistic anthropologist, I have to do **fieldwork.** That might mean traveling to a far-off location to hear people speak. In Puno, I do actual "field" work. I herd sheep and alpacas. I plant and harvest crops. I work alongside the people I am studying.

For me, this is perfect. I can listen for a sign that what people are saying is different from the languages I already know.

When herding, my new neighbors and I take the animals to a hillside to graze. On these walks, I learn about the people I am with. I also learn about the land where they have lived all their lives. I help families prepare fields to plant the crops they will need all year. And my understanding of these people grows.

Collecting Talk

Part of my studies includes interviewing people. I ask them to speak to me. This is called elicitation.

I ask people to say specific words or sentences into my recorder. Later, I study these to understand how they are spoken.

Other times, I do free-form interviews. People talk about whatever they like. They tell me about their lives. They tell me local folktales or talk about the news. Some talk about the changes in the region and in their languages.

Most of the people who speak with me are 50 years old or older. Many speak their languages well. But many younger people do not. They only speak Spanish.



Everyone in Puno helps raise sheep and alpaca.

Aymara:
Wali luphiwa (wa-li lu-**pee**-wa)
English: ***It is really sunny.***



Actors pretend to be the man and woman who founded Puno.

Celebrating Life

The people here look for ways to celebrate life. I am invited to an annual play about a man and a woman who are said to have founded Puno. This is another chance to listen to the indigenous languages.

I had hoped to hear a new language in Puno. One that I did not know. While the people here do speak a mixture of Quechua and Aymara, I don't hear a new language. Still, I consider my time here well spent. I learned there is much more to discover about these people and their wonderful words.

Quechua:
Tupananchiskama
(tu-pa-**naan**-chis-ka-ma)
English:
See you later!

Wordwise

fieldwork: work done by a researcher in a natural environment

indigenous: coming from a particular place; native

linguistic anthropologist: a person who studies how language influences social life

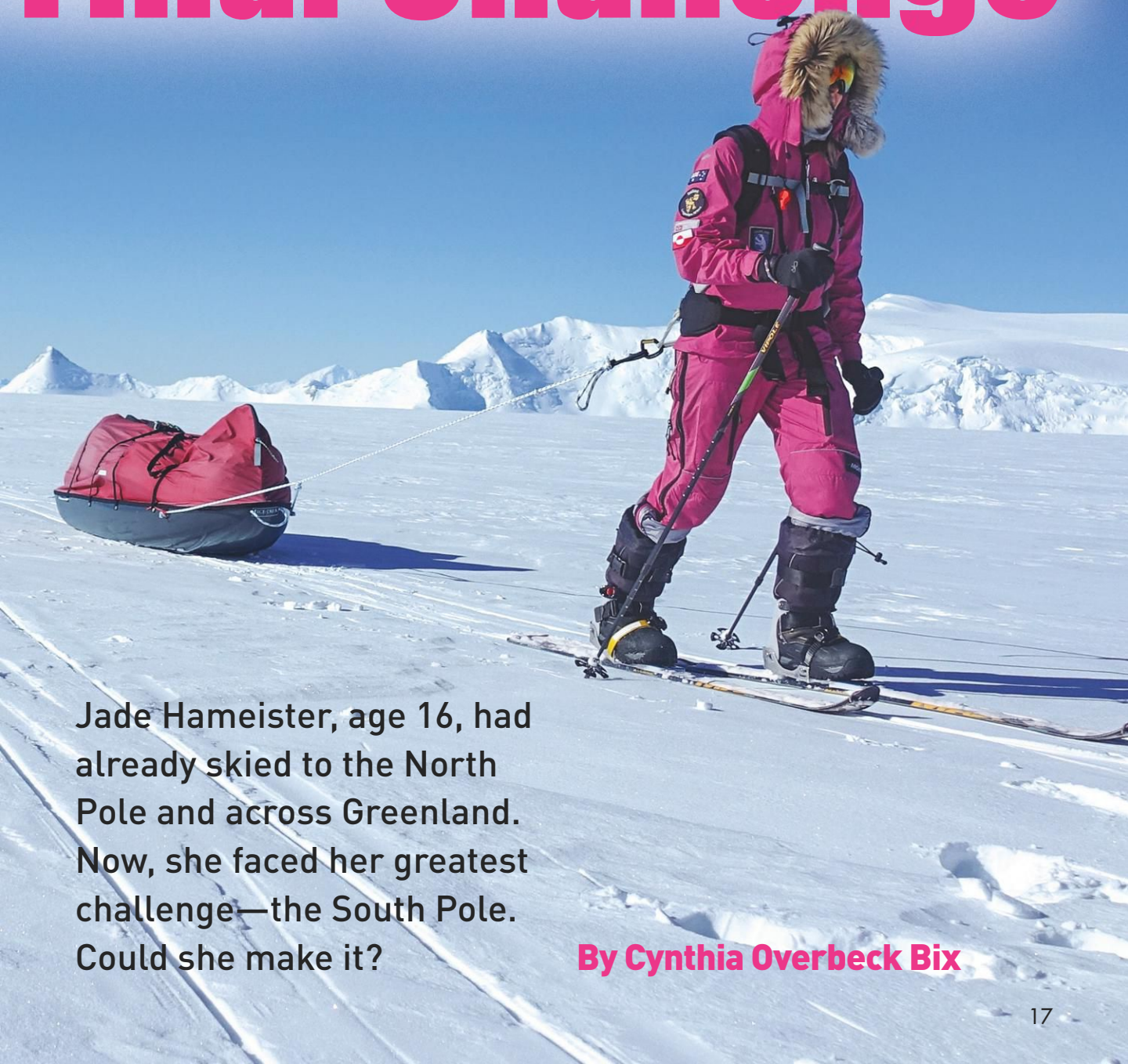
Froze

The



As you read, look at the map of Jade's route. Find the places on the map that are mentioned in the article.

South Pole: Final Challenge



Jade Hameister, age 16, had already skied to the North Pole and across Greenland. Now, she faced her greatest challenge—the South Pole. Could she make it?

By Cynthia Overbeck Bix

Bottomless ice pits under thin layers of snow. Sharp ice ridges, like frozen waves across the land. Howling winds. Blowing ice crystals.

Jade Hameister knew her South Pole journey would be hard. But she never imagined it would be *this* hard. She bent into the wind. She strained to pull the heavy sled strapped to her waist. All she could do was put one ski in front of the other—one small step at a time.

Forging a Path

Jade had already completed two parts of the Polar Hat Trick. She had skied to the North Pole and across Greenland. This South Pole adventure would be the final challenge. Hardly anyone had tried to do what Jade was trying now. And she was only 16.

Jade's team would travel, using their own muscle power. No sled dogs. No vehicles. No supplies would be airlifted to them. Everything they needed for the estimated 40 days had to be loaded onto sleds and hauled. Each sled had food, clothing, and equipment. Each sled weighed more than 80 kilograms (176 pounds).

To this, Jade and her team added one more challenge. They wanted to take a new route to the South Pole. They studied maps and found a coast-to-pole route. No one had ever taken it. It would go through steep terrain. They'd ski across glaciers and through mountains.



The team had to carry everything they needed.

The Polar Hat Trick

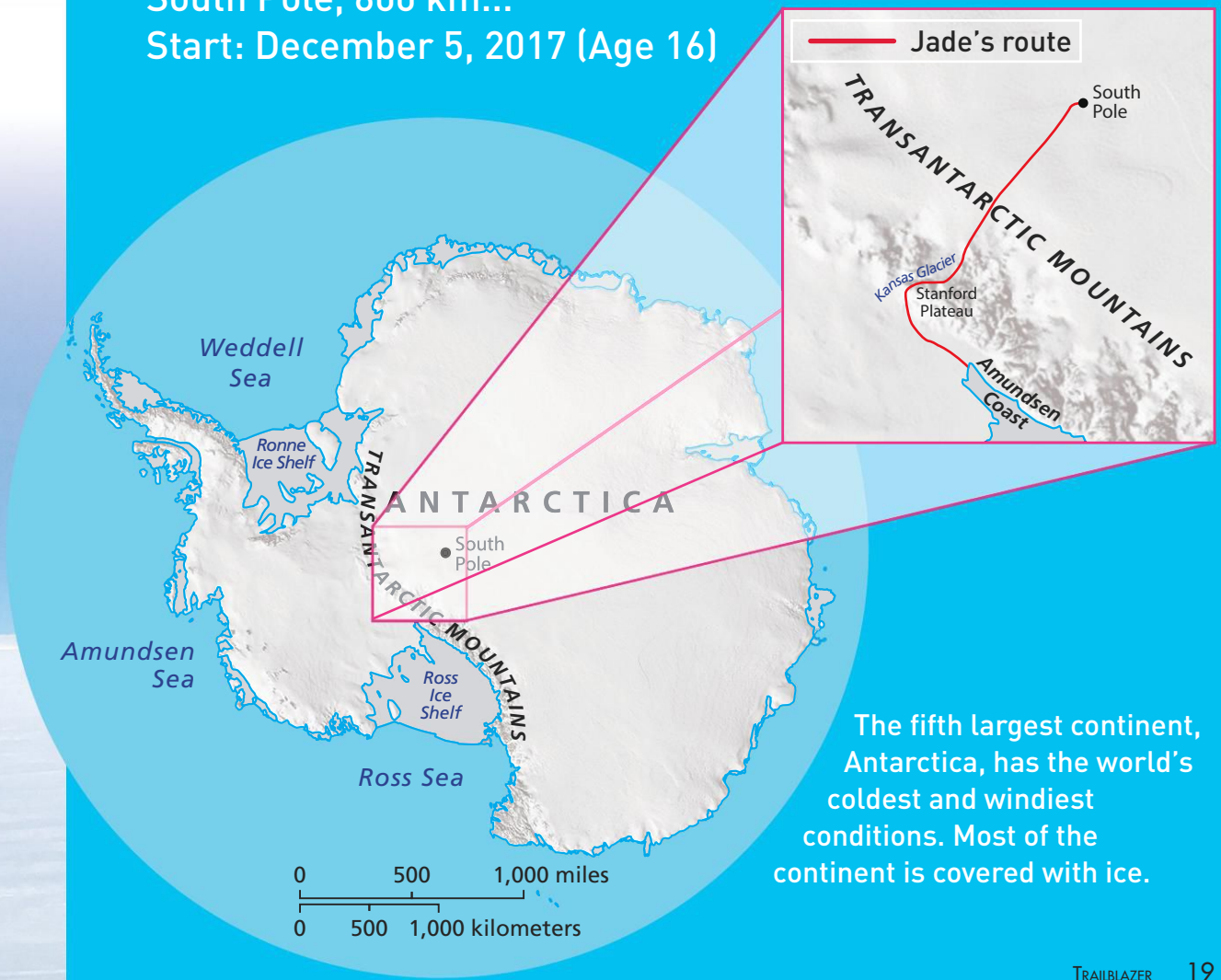
In several sports, a "hat trick" refers to three individual achievements in a single game. For example, a player might score three goals in one soccer game. Jade's Polar Hat Trick called for three challenging expeditions. Together, they covered about 1,300 kilometers.



EXPEDITION 1
North Pole, 150 km... Success!
Completed April 4, 2016 (Age 14)

EXPEDITION 2
Greenland Crossing, 550 km... Success!
Completed June 4, 2017 (Age 15)

EXPEDITION 3
South Pole, 600 km...
Start: December 5, 2017 (Age 16)



The fifth largest continent, Antarctica, has the world's coldest and windiest conditions. Most of the continent is covered with ice.



With the expedition cameraman behind her, Jade slowly made her way across the ice.

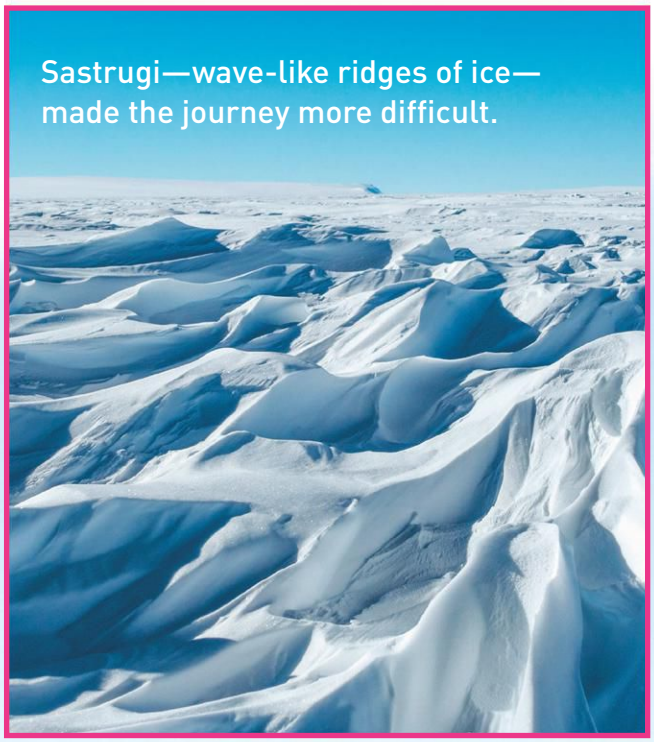
Hard-won Gains

Jade's team included her father, Paul Hameister; polar guide Eric Philips; cameraman Ming d'Arcy; and assistant cameraman Heath Jamieson.

From the beginning, the setting was brutal. The route started uphill and was hardly ever flat. Jade struggled with her sled up icy slopes.

She headed into wind so strong and so loud that she had to scream to be heard. Jade felt like she was standing still. Yet, she was pulling with all her might. The steep hills were slick with blue ice. It was hard and slippery, like glass. Jade's skis couldn't move smoothly over the ice. When they weren't skiing, she and the team wore spiked metal plates on the bottoms of their boots to help them walk.

Higher and higher they climbed, across the Kansas Glacier. A steep climb took them through the Transantarctic Mountains. The going got even harder as they came upon sastrugi. These are wave-like ridges of ice formed by the wind. Ahead, the far wall of the glacier looked like a giant wave. At 3,000 meters (9,842 feet) above sea level, they finally reached the Stanford Plateau. But, they still had a long way to go.



Sastrugi—wave-like ridges of ice—made the journey more difficult.

Man Down!

The greatest dangers on the route were the crevasses across the landscape. These deep cracks are covered by snow bridges that hide them. Jade and her team knew they had to watch out!

The team carried long ropes. When they suspected there was a crevasse, they roped themselves together, in case somebody fell.

One afternoon, Jade heard a wild yell. What was that? She knew the others had gone on ahead. A short distance away, she saw cameraman Ming chest-deep in a crevasse. He was hanging onto the edge with his fingers! Ming was able to pull himself up and out of the crevasse. Whew!



As Jade trudged forward, the ice looked ready to attack!

Hitting the Wall

Jade and her team had made it onto the plateau. The high altitude made her dizzy and short of breath. The wind was so harsh, five layers of clothing barely kept her warm.

Daily lunches were a nightmare. Jade sat on a piece of foam with her back to the wind. She tried to get frozen salami, cheese, and crackers into her mouth with her mittened hands. Snow covered her food. Sometimes, she just gave up trying to eat.

The third day on the plateau was also the 27th day of the journey. Jade hit her personal "wall." A pain in her hip nearly crippled her. Her ears were ringing. She felt like throwing up. Her fingers and toes had lost all feeling. Maybe it was all too much. She wrote a lot in her journal that night. Could she go on? How badly did she want to succeed? Jade knew there was only one answer. She *had* to make it.

Success!

True grit paid off. On the morning of January 10th, Jade and her team woke to blue skies. Climbing a ridge, they spotted the South Pole station.

As evening came, they skied into the Amundsen-Scott Station at the South Pole. After a hard 37-day journey, they had made it. Here she was, at last.

Records Set

In arriving at the South Pole at age 16, Jade became:

- ☑ the youngest person to ski coast-to-South Pole unsupported and unassisted
- ☑ the first woman—and part of the first all-Australian team—to set a new route from the coast to the South Pole
- ☑ the youngest person to ski to both the North and South poles
- ☑ the youngest person to complete the Polar Hat Trick!

VICTORY!

“This was the highlight of all my trips for me—going where no human had ever been before and truly exploring our planet. My 1,300 kilometer journey on skis, dragging a heavy sled to the frozen ends of the Earth to chase my Polar Hat Trick dream, is finally complete!”



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Mesoamerica

Mesoamer
Olmec, Ma
North Ame

Ancient Mesoamer-



Teotihuacan was built almost 1,000 years before the **Aztec** reclaimed it. Many buildings still stand today.



This **Olmec** stone altar at **La Venta** depicts a figure emerging from a cave or a creature's mouth.

Using skillful farming methods, the **Maya** grew crops in the jungles near **El Mirador.**



Key:
- Olmec range
- Maya range
- Aztec range
- • city
- ▲ temple or site

GULF OF MEXICO

CARIBBEAN SEA

YUCATÁN PENINSULA

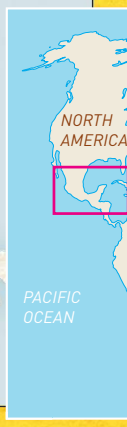
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Tenochtitlan
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Aztec
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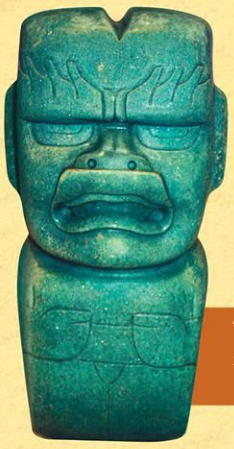
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OLMEC

Around 1500 B.C., the Olmec became the earliest civilization to develop in Mesoamerica. Their capital, La Venta, was abandoned in 400 B.C. This marked the end of their civilization. Wars, drought, or too much farming may have led to their collapse.



The Olmec traded small statues like this one for items from other cultures.



MA

Arou
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Yuca
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make up th

1500 B.C.
The Olmec became the first civilization in Mesoamerica.

400 B.C.
The Olmec abandon their capital at La Venta and disappear.

900 B.C.
The Maya settle around the Yucatan Peninsula.

A.D. 25
The Maya
reaches it

ica is a historical region in the Americas. The ancient
ya, and Aztec peoples lived here. **Today,** Mexico is part of
rica. The other countries are part of Central America.

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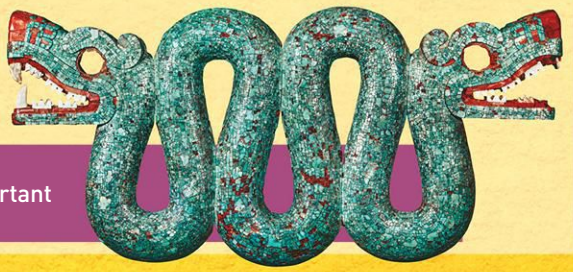
AYA

und 900 B.C., people known as Maya began to settle on the atan Peninsula. By 900 A.D., Maya culture began to decline. between royal families made ning difficult. Many people may e died from hunger.

200 jade pieces his Maya mask.

AZTEC

In 1200 A.D., a group of hunters called the Aztec moved to Mesoamerica. By 1500 A.D., they had a large empire. In 1519, Spanish invaders arrived in Mexico. The Aztec fought them. Their ruler was killed; their cities were destroyed; and the empire was taken over by the Spanish. Millions of Aztec died of European diseases.



This turquoise serpent was probably worn during important Aztec ceremonies.

50
civilization
s peak.

A.D. 900
The Maya decline and disappear.

A.D. 1200
The Aztec settle around present-day central Mexico.

A.D. 1500
The Aztec Empire reaches its peak.

A.D. 1519
The Aztec are conquered by Spanish invaders.

Life in Mesoamerica

The Olmec, Maya, and Aztec of ancient
influenced the people who live in that r



The **Olmec** head shown here is 2.84 meters (9.3 ft) high.



Bold Building

Magnificent temples, palaces, and step pyramids were
by the ancient Mesoamericans. Many still stand **today**
are studied by scientists and visited by travelers.

Artistic Expression

Much of the art created by the ancient Mesoamericans was to honor their gods. The **Olmec** carved huge stone heads to honor their leaders. The **Maya** decorated their buildings and made objects from stone, wood, ceramics, jade, and bone. The **Aztec** decorated the walls of their temples with jade, quartz, and feathers from parrots and macaws. **Today,** many people in the region are skilled craftspeople. Some follow traditional ways to make pottery and textiles. Others create new, more modern styles.







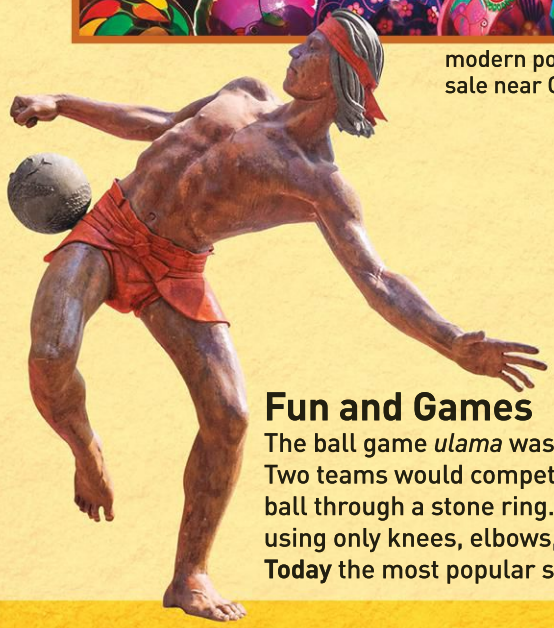
modern pottery for sale near Chichén Itzá



the god Huitzilopochtli from an **Aztec** book

Religion

Religion was very impor
the ancient Mesoamerici
They believed that the g
needed to be kept happy
through human sacrifice
Today, people no longer
these practices. Most pe
the region are Christian



Fun and Games

The ball game *ulama* was played throughout Mesoamerica. Two teams would compete against each other to get a rubber ball through a stone ring. The ball had to be kept off the ground, using only knees, elbows, or hips—never hands or feet. **Today** the most popular sport is soccer.

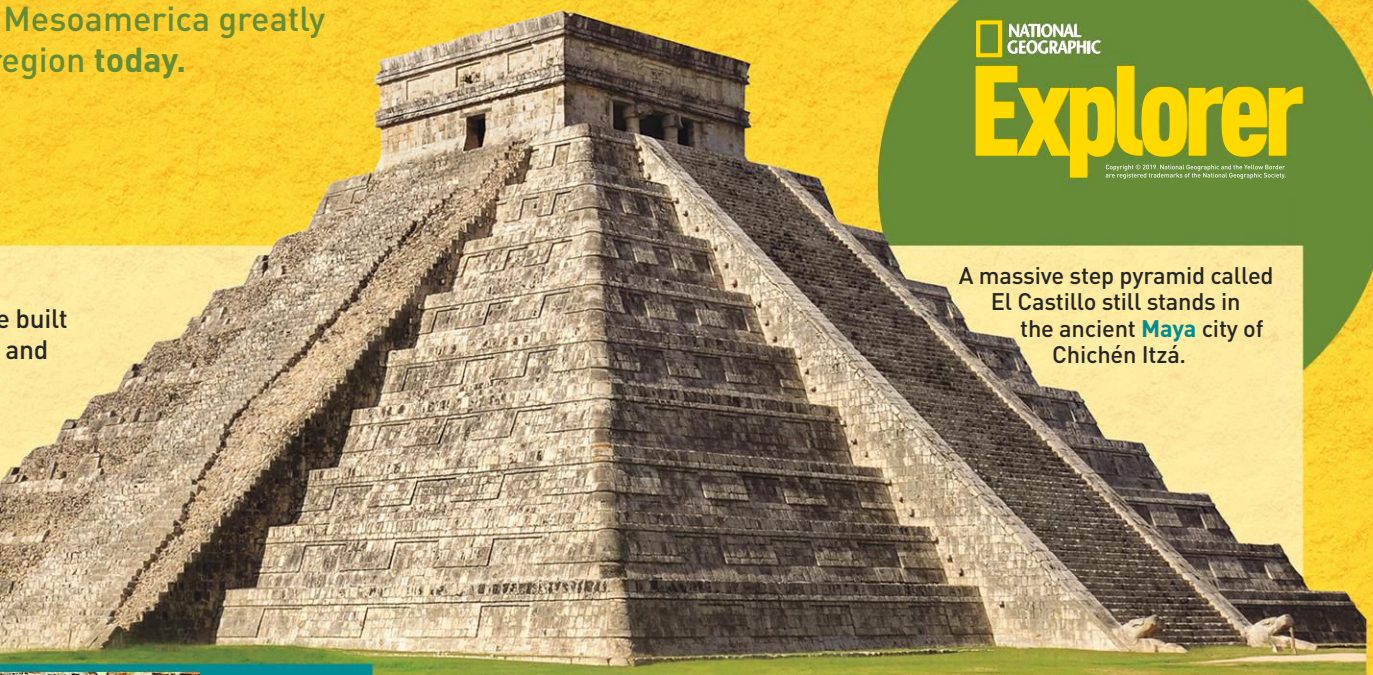


CREDITS: (BACKGROUND) PRAPANN/SHUTTERSTOCK; (OLMEC HEAD) DE AGOSTINI PICTURE LIBRARY/ARCHIVIO J. LANGE/BRIDGEMAN IMAGES; (EL CASTILLO) DAVID LAZAR/MOMENT EDITORIAL/GETTY IMAGES; (MODERN POTTERY) PERFORMANCE IMAGE/ALAMY STOCK PHOTO; (ANCIEN
STOCK PHOTO; (ULAMA GAME) JOHN MITCHELL/ALAMY STOCK PHOTO; (HUITZILOPOCHTLI) ART COLLECTION/ALAMY STOCK PHOTO; (SOCCER BALL) IAKOV FILIMONOV/SHUTTERSTOCK; (AZTEC CALENDAR) FELIX LIPOV/ALAMY STOCK PHOTO; (CORN) DESIGNS6/SHUTTERSTOCK.

Mesoamerica greatly
region **today.**

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e built
and



A massive step pyramid called El Castillo still stands in the ancient **Maya** city of Chichén Itzá.



Maya writing

The Written Word

Ancient Mesoamericans used glyphs, or symbols, to represent important events. The **Maya** system was very advanced. Some of these writings still exist. They were carved into stone or written in books made of tree bark. It took a long time for **modern** people to understand the meanings behind this beautiful form of writing.

Today, the language spoken and written most in Mesoamerican countries is Spanish.

Hoy en día, el idioma hablado y escrito más en los países de Mesoamérica es el español.

rtant to
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follow
eople in
.

Marking Time

Today's annual calendar is made up 365 days. The ancient Mesoamericans followed two calendars—one was made up of 260 days. The other had 365 days. Both calendars worked together to help them record time.



The **Aztec** calendar was a circle, like this one carved in stone.

What's for Dinner?

All three ancient cultures ate simple foods. Corn (maize) was central to their diet. It was made into a porridge called *atole.* Corn pancakes, known as *tortillas,* were eaten with nearly every meal. **Today,** many people still eat these ancient foods. And tortillas are enjoyed around the world.



corn (maize)

T GLYPHS) PHOTO 12/ALAMY