

# Recognising spring, scientifically

Fig. FE 27316

## Scientists decode the seasonal changes all around us, and reveal some that might not be as easy to detect

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**W**ITH LAST week's vernal equinox, the Northern Hemisphere officially entered spring. But for many of us, the start of the season isn't astronomical. Rather, we see spring's arrival in the form of flowers blooming, birds singing and baby animals prancing. We turned to scientists and asked them to decode the seasonal changes all around us, and reveal some that may not be as easy to detect.

### The smell of bacteria warfare

Even before the flowers bloom, the scent of spring fills the air.

Beneath our feet, countless microbes called *Streptomyces* release chemicals as they awaken and warm up this season. "One of these chemicals is geosmin, which is responsible for the earthy smell of the soil in the spring," says Susan Perkins, a microbiologist at the American Museum of Natural History.

*Streptomyces* bacteria spew geosmin as a weapon against other bacteria in the soil where they live. But to us, that chemical produces a distinct smell known as "petrichor", which we recognise as the earthy scent following a rainstorm.

"If you had a colony of *Streptomyces* in a petri dish and you opened the lid, you'd swear you had your nose in a flower pot," Perkins says.

### The return of the gray whales

Gray whales undertake a mammoth adventure in the spring: the return part of their 10,000-mile, round-trip migration.

Their journey from the Arctic to Baja California, Mexico, and back is the longest of any mammal on the planet, says Ken Peterson of the Monterey Bay Aquarium in California, US. This time of year, the whales leave the warm waters of Mexico with their newborn calves and swim up the West Coast until they reach feeding grounds in the Bering Sea.

"Seeing the gray whales heading north is a great indicator that we are heading into spring," Peterson says.



Starting a second into this video, you see the green plants begin to engulf the land and the teal phytoplankton bloom in the ocean across the Northern Hemisphere, only to recede about four seconds in when fall begins.

### A song-filled greeting

A song and a show welcome bird-watchers to spring.

The clear whistle of a white-throated sparrow and the raspy trill of a red-winged blackbird form a spring greeting in New York City, as do the yellow plumage of the pine warbler and the dark feathers of the rusty blackbird.

"We have a succession of bird species that slowly show up in the air," says Paul Sweet, an ornithologist with the American Museum of Natural History.

Sweet leads nature walks in Central Park. "Rusty blackbird, Eastern phoebe and red-winged blackbirds are some of the first migrants," he says.

The white-throated sparrow spends its winters in New York City, but only starts singing in late February or early March. "When they start singing, it's a good sign that things are starting to change," Sweet says.

### Blossoming on cue

Gardens that were grey and brown a few weeks ago are sprouting patches of pink, yellow and purple. Gardeners who start to see blossoms may know that spring is here. But how do the flowers figure out that it is time to bloom?

Barbara Ambrose, a plant scientist at the New York Botanical Garden, says plants rely partially on environmental cues like temperature and light quality. Another signal, the length of the day, is also very important.

Plants, she says, can sense day length because they have circadian clocks, as people do. In the spring, plants can tell the days are growing longer by measuring how long night lasts, she says. They do this with their leaves, which are photoreceptors that react to sunshine.

"All of these environmental and internal signals feed into the same pathway, and that's where you get

milk a day. To keep their calves safe from hungry orcas, the mothers hug the shoreline near kelp forests, which offer marine researchers and people along the beach the opportunity to see the Leviathans lunging through the water.

### Inchworms in the trees

"It's definitely spring when I go out to sample insects from the trees and these caterpillars fall on my head," says Emily Meinke, an entomologist at North Carolina State University, US. She's referring to cankerworms, or inchworms, which hatch in early spring and dangle from nearly invisible webs attached to trees.

The tiny inchworm can cause big problems when it greets the

trees. Charlotte, North Carolina, US, has struggled with such outbreaks for at least two decades, Meinke says.

"They are targeting those young, delicious leaves," she says. "The tree needs those to photosynthesise in the springtime."

After the inchworms have eaten all of the leaves on a tree, they use their webs to swing to the next one like tiny Tarzans. And when they've had their fill, the inchworms drop to the ground from their threads and

spin their cocoons.

### Playtime for fox pups

Baby foxes frolic outside their dens when spring arrives.

For Roland Kays, a wildlife biologist at North Carolina State University, watching the pups emerge from their holes is a sign that the season has changed. Last year, he set a camera above a den in a forest near a suburban neighbourhood in Raleigh, North Carolina, in hopes of catching the red foxes' first steps.

"When the parents start bring-

ing the prey to the hole," he says, "and then the puppies eventually come out and play and suckle at the entrance, then I know it's spring."

At first, the pups stay in their den nestled next to their warm mother. The narrow hole where they live provides protection from hungry coyotes.

"Eventually, the pups get big enough to venture out to see the real world," Kays says. "It's exciting to capture that on camera."

### The changing view from space

For Woody Turner, a program scientist at NASA, it's the scenes from above that most vividly show the changing seasons.

Satellite imagers that see the same point on earth every day are ideal for

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