

Time Line

It has taken hours to get here but the payoff is sweet. Our four-wheel-drive bumps and winds past hundreds of bristlecone pines before stopping on a barren, windy limestone cliff atop Great Basin National Park's Mount Washington. I walk to the 11,658-foot peak, peer down a heart-stopping precipice, and drop to my knees. Lightheaded, I crawl back from the edge and stare at the bristlecones below me.

Twisted with time, unspoiled and austere, the planet's oldest living inhabitants have lured me across Nevada amid summer thunderstorms and through spring snow to timberline in eastern California's White Mountains. My simple curiosity about this odd relic of nature has become a fascination spurred by the role bristlecone pines have played in science and culture, and by what they still have to teach us.

Twisted with time, unspoiled and austere, the planet's oldest living inhabitants offer insights to environmental conditions back to the last Ice Age. Survivors of inconceivable eons and all-but-uninhabitable surroundings, they provoke a wonder about our own time and place and purpose. —By Jane Braxton Little.

Virtually disregarded until the 1950s, bristlecone pines are now venerated. Historians treasure the 10,000-year chronology they have provided, a record that has rewritten history. Climatologists value the insights they offer to environmental conditions as far back as the last Ice Age. But when I wander through bristlecone groves, what galvanizes me is the perspective these trees inspire. Survivors of inconceivable eons and all-but-uninhabitable surroundings, they provoke a wonder about our own time and place and purpose.

It takes mettle to see bristlecones at all. Great Basin National Park on Nevada's eastern border is one of a handful of places in the arid West that offer the triple hardships of drought, exposure, and elevation that bristlecones seem to crave. The several-hour trip from Nevada Route 894 to the Mount Washington grove takes us over protruding rocks and switchbacks so tight we have to back up to go forward. The first bristlecones I see are in an uneven-aged grove sprinkled among juniper, pinyon pine, and limber pine. Upright and symmetrical, they range from knee-high to more than 40 feet. Compared to the contorted trunks and bent branches of their 3,000-year-old relatives on nearby Wheeler Peak, these bristlecones seem young and vibrant. They probably won't live 500 years.

As I ascend, the slope becomes rockier, the soil drier, and the wind stronger. The bristlecones become straggly, warped, and more sparsely spaced. This is their niche. Give these trees the comforts of nutrition, water, and shelter and they simply grow faster and die younger. But on these alkaline mountainsides so inhospitable to most plants, bristlecones grow without competition. The sites are too cold for most fungi and too barren for most insects, freeing bristlecones from the infestations that kill other trees. That the species thrives on adversity is but one of its many intrigues.



The largest bristlecone pine grows at 11,500 feet just below timberline on the Inyo National Forest in the White Mountains of California. Here, scientists like to say, the climate ranges from cold to frigid and from droughty to arid. I hike in an early June chill across a patch of graying snow, the sun just lighting the Sierra Nevada behind me.

The biggest bristlecone, the national champion Patriarch, so named in 1947 by a U.S. Forest Service district ranger, is squat, barely 41 feet tall. But its girth is so gigantic it makes me laugh. I spread my arms wide and try to guess how many others it would take to join hands around the Patriarch. Six women? Ten? This tree is as fat as a house!

A fluttering breaks my train of thought as a mountain bluebird lands on a top branch. It is a house, I mutter aloud. The bluebird preens while chickadees work the lower branches and golden-

mantled ground squirrels skitter about the seven-stemmed trunk. I try to imagine how many other species this tree hosts—the ones I am too impatient to wait for and those too microscopic for my eyes.

Aside from the primitive dirt road and a few thousand visitors a year, there is little to disturb the Patriarch and its neighboring bristlecone pines. This land has never been grazed; there's no forage. No one suppresses wildfires; there's no forest litter to carry flames. Except for designated wilderness areas, the 28,000-acre Ancient Bristlecone Pine Forest may be the least managed of any land in the Forest Service's 191-million-acre system. The primary threat of human

intervention here is global warming, and that is on such a long-term scale it is almost incomprehensible. With no commercial value—and no value at all until recently—bristlecones have escaped our attention. This may be their most enduring significance.

Most of what we know about bristlecones was learned in the last half-century. *Pinus aristata* sprout from egg-sized cones whose scales are tipped with claw-like bristles. The tree's branches are covered with lustrous needles so dense they look like furry green tails. In fact, until the late 1800s bristlecones were classified as foxtail pine. Stroke their

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JANE BEATON LITTLE



branches in one direction and they are tingly soft; in reverse they are as prickly as porcupines. The inch-long needles live up to 40 years, saving the energy of constant needle replacement and providing a stable supply of chlorophyll.

As they age, bristlecones' crowns spread and their trunks thicken. Few are taller than 40 feet. Their emblematic spiraling branches may be a genetic adaptation, rather than the result of constant winds that batter their exposed perches. Simply put, twisted grain is stronger than straight grain, and over millennia bristlecones genetically programmed to twist may have been better adapted to survive.

Most of the species' root development is a system of laterals less than a foot below the surface. With time, erosion gradually exposes these roots to the air, which dries and eventually kills them.

When roots die, a section of trunk goes with them. Then the bark sloughs off, exposing bare trunkwood that weathers with time and produces the picturesque golden-grained slabs. But bristlecones have a remarkable ability to stay alive through thin strips of bark that continue to connect roots to branches. In old trees, the live wood grows inside the



JANE BRATTON LITTLE; MOUNTAIN BLUEBIRD: D. ROBERT & LOREI FRANZ/CORBIS

*Older than imaginable:
the Patriarch Grove in
the White Mountains of
California. Below, the
mountain bluebird is*

dead, encased and protected by it. Scientists have found apparently healthy specimens with less than 8 percent of their surface still living. This results in trees that are literally more dead than alive.

Bristlecone lore is steeped with contradictions like this, but the ultimate irony is an infamous version of slaying the goose that lays the golden egg. In 1964 a young geographer searching for evidence of Ice Age glaciers was taking core samples from bristlecone pines on Wheeler Peak when he broke his increment borer. To retrieve it and salvage his research project, he asked the Forest Service officials who then managed the area for permission to fell the tree. Astonishingly, they granted it. The rest is legendary: The now-dead tree, which is named Prometheus, was 4,950 years old—the oldest living thing ever recorded. The geographer not only found the oldest tree; he killed it.

The most studied bristlecone pines are in the Schulman Grove, 1,000 feet lower in the White Mountains than the Patriarch Tree. Here scientists have collected, measured, bored, and cut. The first scientific dating of bristlecones was done by Edmund P. Schulman, who was working for the University of



Arizona's Laboratory of Tree-Ring Research. Schulman conducted climate research throughout the western states at a time when records extended only a few centuries. He studied stunted trees that grew under stressful conditions in Colorado, Nevada, and Idaho and that showed sensitive records of drought in their growth-ring sequences. By overlapping the tree-ring patterns of various conifers, he established a chronology that extended back 3,000 years.

Schulman was searching for trees that would break the 3000-year barrier when he made a detour to the White Mountains in 1953. The weather-beaten

*among the many
species that benefit
from the trees.*

trees that cling to the arid slopes in the southwestern corner of the Great Basin provided data he could only have dreamed of. Schulman's samples surpassed the 3,000-year mark, surpassed the 4,000 mark, and more. "It was like hoping to win the

Kentucky Derby and winning the Triple Crown," says John Louth, manager of the Inyo Forest's Ancient Bristlecone Forest.

In 1957, Schulman discovered a bristlecone with growth rings extending back more than 4,723 years. It sprouted more than 2 millennia before the birth of Jesus and 1,500 years before the fall of Troy, about the time the Egyptians began building the pyramids. Schulman named it Methuselah, after the oldest man in the Bible.

A 4-mile trail leaves a visitor center in the White Mountains and loops through the grove where Schulman found Methuselah and more than 20 others older than 4,000 years. I hike past bristlecone and limber pines, inhaling the scent of sage where the trail drops into mountain mahogany, Indian paintbrush, and pennyroyal. Bees buzz in penstemon as ground squirrels chirp warnings.

Halfway around the trail enters the Forest of Ancients. As if on cue, the Clark's nutcrackers cease their squawking, the cicadas their click-clicking. I pick a seat of soft dolomite in the middle of the trail and settle in. A breeze whispers up from the west, briefly stirring the grove before the hush returns. Surrounded by silent ancients, I try to picture the world of their youth. The slopes still emerging from the Ice Age would have been more barren, the trees much younger. Ornithologists say I would have been as likely to see a golden eagle then as today, and the nutcrackers would have been almost as ubiquitous. Paiute and Western Shoshone tribes must have ventured into this grove, but they have left no stories they are willing to tell.

Which tree is Methuselah? Is it the grandfather behind me with wind-polished limbs coiling halfway

around its pot-bellied girth? Is it the ancient one at my feet, a sawed-off survivor lifting weathered gray branches like fingers toward the heavens? It is the relic up the hill whose gnarled and pockmarked roots hold back the rocky soil in a series of snakelike buttresses? The trees don't tell and neither do Inyo Forest officials who supervise the Methuselah Grove. Soil erosion and compaction are major threats to these bristlecones, they say. If they identified Methuselah, it would be loved to death.

Lost in silent speculation I'm just as happy not knowing. I give in to the urge to anthropomorphize and consider whether senior citizen quality-of-life questions apply to bristlecones. Probably not. Scientists have found no evidence of aging in their xylem and phloem, leading them to conclude that conventional concepts of senescence do not apply to these trees. I give in to sheer awe at their time on this earth, a longevity that dwarfs the most impressive human accomplishments. Pretensions and ambitions drop before the simple dignity of this strangely regal species, which has flourished without human intervention. I question whether the persistent giddiness I feel around bristlecones is the altitude or a sense of their profound preeminence.

The scientists who followed Schulman here were engaged in more productive speculation. They assembled a sequence of cross-sections from living and dead trees that provide a continuous tree-ring chronology of nearly 10,000 years. Working in the late 1950s with tape measures, increment borers, and other hand tools in use at least since Leonardo da Vinci, these dendrochronologists contributed information that has proven far more significant than even Schulman could have imagined. Using overlapping tree-ring patterns from bristlecone pines, they established a continuous chronology back to the end of the last Ice Age. This has enabled dendroclimatologists to recognize patterns in climate and environmental conditions. It has forced a reevaluation of the ages of ancient sites and artifacts, and resulted in a reevaluation of history itself.



JAMES A. SUGAN/CORBIS

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Since the 1950s, scientists have dated wood, bone, and other organic materials by measuring the amount of radioactive carbon-14 remaining in their cells. But when they measured the carbon in bristlecone pine rings of known ages, they found startling discrepancies. That wood helped correct radiocarbon dating by providing samples that could be precisely dated through growth rings and then measuring the amount of carbon-14 in those samples.

The corrected dates have caused archaeologists to rethink how civilization developed. Before bristlecone dating, historians assumed cultural advances were conceived in Egypt and Mesopotamia, the traditional cradles of civilization. Europe, according to accepted theory, was a barbarian fringe. When archaeologists found carvings, buildings, or other emblems of culture, they assumed the artifacts resulted from new ideas carried north and west by colonists and traders until they gradually diffused throughout Europe.

Bristlecone pine rings refuted this theory of cultural diffusion. Once scientists knew that Stonehenge in southern England was completed before the advent of Mycenaean civilization, they had to accept that its architects were the indigenous people previously considered barbarians. Tree-ring calibrations date Spanish tombs to 3,100 BC, centuries earlier than the tombs in Crete from which they were supposed to derive. Archaeologists no longer explain

European prehistory by referencing early civilizations of the eastern Mediterranean.

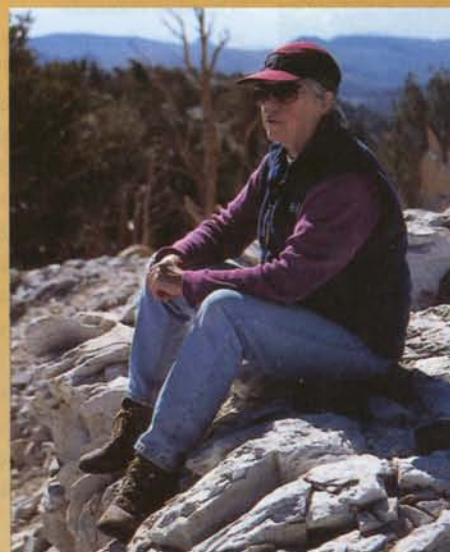
In clarifying human history and illuminating climatic changes through simple growth rings, bristlecones represent "the triumph of the primitive," says Michael P. Cohen, author of *A Garden of Bristlecones*. How they could make such significant contributions to our understanding of the past is a lesson in humility.

A species with no commercial value, bristlecones have prospered unknown and undisturbed for millennia. It is precisely because they have been left alone that they have become so important. Bristlecone pines are an eloquent argument for non-management—for respecting what we don't know about a place and its ecosystems.

Walking out of the Methuselah Grove, I try to regain my equilibrium. Even if I could identify every wildflower I pass, every bird I hear, every insect that brushes by, even then I could not capture the spirit of the bristlecones. They embody what is unknown. They teach us the value of patience, of waiting for wisdom about the things we can't name, can't explain, and can't even imagine. **AF**

Jane Braxton Little writes from her home in Greenville, California.

Hundreds of boxes of tree ring samples are archived at far left; at left, a dendrochronology tag on a bristlecone



trunk. Above, the author in California's White Mountains.



GALEN ROWELL/CORBIS, SELF-PORTRAIT, JANE BRAXTON LITTLE