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J. Barichivich

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# LAÑILAWAL

*by*

*Jonathan Barichivich Henríquez*

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## *Lañilawal*

*“While the steam from a hot cup of tea rose in the kitchen, outside, the wind and rain had not stopped for days. But once the sun came out, it all ceased. The damp sound of the forest whispered to Aníbal, you have to go. He had to find it. It had been waiting for it for thousands of years. Aníbal wasn't quite sure how he found the right path, but an ancestral compass led him to it. There it was, as it had always been. Silent, unnoticed in the landscape. It had endured tempestuous winds and snowstorms. It had sheltered birds, and plants and even trees had grown on it. When Aníbal saw it, he couldn't believe it—it was the ancient Lañilawal. Aníbal wondered why him. Lañilawal answered, you will be the guide and protector, and you will teach the importance and fragility of all what inhabit here. Aníbal fulfilled his promise. He took his grandson's hand and showed him every path and plant, with simple gestures and words. What seemed impossible, had finally happened. Aníbal departed, and his grandson followed in his footsteps, going further. Now he climbs a tower, measures the wind, and listens to the whispering of the trees. He gathers scientific data and speaks in foreign languages. He says that the paths of life are shaped by loving the past.”*

The encounter. Juan Diego Maldonado, Santiago, Chile.

**T**HERE are about three trillion trees across the forests of the planet. Some of these trees are exceptional because they can live for thousands of years. Yet, very few can reach 4,000 to 5,000 years and even fewer of them have survived the destruction brought by the Anthropocene. Among this handful of surviving ancient trees is Lañilawal, an exceptional individual of *Fitzroya cupressoides* (alerce cypress) growing in the cool temperate rainforests of southern Chile. This remarkable tree holds a deep connection to my family and has profoundly shaped my journey as an Earth scientist. As its human ambassador, I am committed to its protection and to raising global awareness about the importance of understanding and safeguarding the last remnants of ancient trees and forests in the planet.

## GONDWANAN HERITAGE

Since woody trees first appeared around 380 million years ago, tree species have come and gone as continents shifted and the climate and the biosphere evolved. The southern cypress alerce or *lawal* diverged from its closest relatives approximately 30–40 million years ago when South America was separating from a freezing Antarctica and drying Australia as part of the final breakup of the supercontinent Gondwana. Since its early days, the species has persisted in ever-wet, cool temperate environments that have shifted, expanded, and contracted dramatically over time in regions that today correspond to northern Patagonia in southern South America. Its evolutionary history has paralleled the uplift of the Andes, which began around the same time and significantly influenced its habitat and distribution.

Because of its ancient Gondwanan heritage and wider distribution in the past —similar to several other conifers of the Southern Hemisphere—alerce is considered a paleoendemic or relict conifer now restricted to a much smaller, isolated geographic area.

## AT THE RHYTHM OF THE ICE AGES

In more recent geological times, the glacial cycles of the Pleistocene (2.6 million to 11,700 years ago) had a profound impact on the habitat and biogeography of alerce within its already narrow range. As ice sheets advanced northward and descended from the Andes, populations retreated northward towards the lowlands of the Central Depression and the foothills of the Coastal Range in Chile, and possibly to some lowlands east of the Andes. During the warmer interglacial periods, the species recolonized new areas as the ice receded towards the south. These cycles of range contraction and expansion shaped the current disjunct distribution of the species in the temperate Andes and summits of the Coastal Range in south-central Chile and left a lasting mark on its genetic diversity.

## LIVING AT COSMIC FREQUENCIES

Unlike any other living organism, ancient trees live closer to the rhythms of cosmic time. Only alerce and a select few other species such as bristlecone pines and sequoias attain lifespans measured in millennia, connecting their present to a deep and distant past. Their enduring presence allows them to witness and record Earth's grandest cycles and rare cataclysmic events. Before human activity began shaping the remote southern forests, alerce trees often lived to their full potential, reaching colossal sizes if they managed to escape catastrophic volcanic eruptions or occasional wildfires.

Around 12,800 years ago, alerce trees likely witnessed a catastrophic cosmic event —the impact of a disintegrating meteorite that is believed to have caused widespread defaunation and climate change across the Americas, including the lands where alerce thrived.

## DISASTROUS ENCOUNTERS WITH SETTLERS AND COLONIZERS

For millions of years, the evolutionary history of alerce and the austral temperate rainforests unfolded without human presence. The eventual "encounters" with early settlers and later with European colonizers had profound and devastating consequences. Humans may have reached the coastal regions of southern South America, where alerce occurs, as early as 14,500 to 18,500 years ago. These early settlers encountered forests dominated by ancient trees, untouched by human influence. Such first encounter initiated a complex and transformative relationship between people and the once-wild southern lands, the last land mass on the planet to be colonized by early humans. Direct evidence of alerce use by these hunter-gatherers comes from the archaeological site of Monte Verde, near the coastal city of Puerto Montt. Artifacts from this site suggest that populations living in cold, post-glacial envi-

ronments utilized alerce wood for domestic purposes, hut construction, and tool-making at least 12,500 years ago.

As human populations expanded and adapted over millennia, the cultural landscape of southern South America evolved along with the warming climate and shifting environments. Around 5,000 years ago, the ancestors of Mapuche people began to emerge as a genetically distinct population in what is now south-central Chile and parts of Argentina. Over time, they developed into the Mapuche culture we recognize today, characterized by a profound spiritual connection to the forests of the region, particularly with the araucaria and alerce forests.

For the Mapuche, forests are sacred spaces where the spiritual and physical worlds coexist. Animals, plants, rivers, wind, mountains and humans all have a spirit, and these spirits are all interconnected. The Mapuche concept of *Itrofillmongen* embodies the interconnectedness and balance of all material and spiritual forms of life in coexistence. *Itrofillmongen* can be seen as the Mapuche equivalent of biodiversity, but it extends into the spiritual realm, encompassing the unseen forces that govern nature. Central to this balance are the *Ngen*, powerful guardian spirits that inhabit and protect specific elements of nature. Each *Ngen* is responsible for a particular domain, such as water (*Ngen Ko*) or alerce forests (*Ngen Lawal*). These spirits ensure that the *Itrofillmongen* is in balance.

The Mapuche people who coexisted with the alerce rainforests in their southern territories or *Butabuillimapu*, including the Chiloé Archipelago, were known as the *Huilliche*, or “people of the south”. The Huilliche used the wood from alerce forests at lower altitudes near the coast for crafting utensils, tools, and weapons for defence. Their lands and way of life remained free of European influence until the mid-16th century, when the Spanish invaders entered the *Butabuillimapu* and established the first cities. Spanish exploration of these southern territories began under campaigns of Pedro de Valdivia, who in 1552 founded the city of Valdivia near the northern range of the coastal alerce forests. Shortly after, in 1567, the Spaniards established Castro, the cap-

ital of Chiloé Island, marking one of the first permanent European settlements in proximity to the core region of alerce forests in the Andes.

The Spanish did not find gold in Chiloé, but instead discovered a rich mine of alerce wood. They quickly recognized its unique durability and extreme water-resistance, and began exploiting the ancient alerce forests to construct buildings and infrastructure in their newly founded cities. Alerce shingles became a defining architectural feature of the southern settlements, lending a distinct character to the towns and cities of the region. On Chiloé Island, these wooden shingles were essential to the construction of its iconic churches, many of which are now celebrated as UNESCO World Heritage sites. The wood of alerce itself became a form of currency within the emerging colonial economy of the province. The demand for alerce soon extended beyond the region, as a lucrative trade in alerce wood emerged, including exports to Peru. By the late 18th century, however, intense exploitation had severely depleted the more accessible forests in the lowlands closer to the cities and along the Andean shoreline. The logging areas started to progressively move farther and upward in the mountains and by then they were owned by the king of Spain.

The method of free and selective exploitation of alerce forests during the colonial centuries changed dramatically following the establishment of the Republic of Chile in 1818. Private land ownership was formally established. This prompted a surge in often fraudulent land purchases from Mapuches, auctions, and large-scale concessions, particularly to foreign companies, fostering land speculation and facilitating indiscriminate exploitation of the forests. By the mid-19th century, the Chilean government actively promoted large-scale colonization of the territories between Chiloé and Valdivia, primarily by German settlers. Vast tracts of densely forested land were allocated to these new colonizers, who employed fire to clear the forests, converting them into arable land for agriculture and pasturelands. The forests, once home to trees of extraordinary size of up to 4 meters in diameter, were rapidly exterminated,

leaving behind only scattered stumps and some trophy photographs that are today silent witnesses to their former grandeur.

After four centuries of exploitation, only around 40% of the original pre-Hispanic alerce forest area remains. In the 1970s, alerce received national and international protection as an endangered species. Today, several National Parks safeguard alerce forests, however, much of what remains today consists of secondary forests, regenerated after repeated fires and multiple cycles of exploitation. Despite these measures, many alerce populations in Chile remain at risk of extinction. Illegal logging continues to threaten the species, driven by the high market value of its exceptionally durable timber. Road construction, including projects cutting through the Alerce Costero National Park, and urban development further encroach on its habitat, fragmenting already vulnerable forest areas. Intentional wildfires, exacerbated by climate change, pose an additional and growing threat.

## NATURALIST IDENTITY

Known as *Lawal* or *Labual* by the Huilliche people, the species was named *Alerce* by the Spanish colonizers, as it reminded them of the European larch. Early accounts of British explorers passing through the west coast of South America in the late 18<sup>th</sup> and early 19<sup>th</sup> centuries noticed the species due to the quality, beauty and value of its wood.

In 1782, the Chilean Jesuit botanist Juan Ignacio Molina provided the first formal scientific description of the species, naming it *Pinus cupressoides*. Despite this, the species remained poorly known in British botanical circles well into the 19th century. Captains Robert Fitzroy and Phillip King, in their narratives of the HMS Beagle and Adventure voyage published in 1839, described the use of Alerce for shingles and boards. Fitzroy noted that “The forests of Alerce are like mines to the Calbucano, or native, and nothing but old age or accident can check him from making boards after he has had one season of good luck.” He described trees measuring up to 30 feet in girth (approximately 2.9

meters in diameter) in the mainland Chiloé region and speculated that even larger specimens reaching diameters up to 3.9 m might exist in the Cordillera out of reach of local woodsmen.

Charles Darwin, who accompanied Fitzroy on the voyage of *Beagle*, visited Chiloé in 1834 and explored the Chilean rainforests. However, Darwin himself admitted to having little botanical knowledge. In his 1839 publication *The Voyage of the Beagle*, he briefly mentioned seeing alerce during a failed expedition in Chiloé but provided no details. Later, in a letter to the botanist Joseph Dalton Hooker in 1843, Darwin confessed, “From my entire ignorance of Botany, I am sorry to say that I cannot answer any of the questions which you ask me. . . I saw the Alerce on mountains of Chiloe (on the mainland it grows to an enormous size, and I always believed Alerce and *Araucaria imbricata* to be identical), but I am ashamed to say I absolutely forget all about its appearance.”

After several revisions, the final scientific name, *Fitzroya cupressoides*, was assigned by the American botanist Ivan Murray Johnston in 1924. The genus *Fitzroya* was named in honour of Captain Robert Fitzroy, possibly more as a gesture of admiration than as a recognition of any significant contribution to documenting the tree.

Alerce did not share the fortune of its northern coniferous neighbour, *Araucaria araucana*, whose scientific name honours the Arauco region and its indigenous people. Perhaps the scientific name of alerce should be revised in the future to free it from botanical colonialism and better reflect its true cultural heritage. A name such as *Lawalia chiloensis* or *Lawalia mawidensis* would embrace the ancient identity bestowed by the Huilliche people.

## AN UNCONVENTIONAL SOUTHERN ECOLOGY

The long-lived rainforest conifers of the Southern Hemisphere have historically defied conventional ecological understanding due to their ex-

ceptional lifespans and slow growth, with alerce being an extreme case. Their life cycles unfold in rhythms alien to the temperate paradigms of Europe that long ruled ecological thinking. By the mid-20<sup>th</sup> century, four centuries of relentless exploitation and repeated burning had changed the geography and ecology of the alerce forests forever. Foresters and biogeographers of the time observed a startling absence of seedlings and young regeneration in many forests, especially in areas heavily logged and burned or shaded by dense canopies. This apparent inability to regenerate naturally, combined with its slow growth, gave rise to a prevailing belief: alerce was a living fossil, a relict of a colder and wetter past climate. Under this view, it was destined to natural extinction or to be displaced to infertile sites by faster-growing broadleaved species of the Valdivian rainforest. This paradigm embodied the earlier ecological misunderstanding of alerce, casting it as a species out of pace with the modern natural world.

Alerce, however, is a shade intolerant species that relies on open spaces for its regeneration. Such open spaces are mostly created by generally rare natural and anthropogenic disturbances, such as volcanic eruptions, landslides, windthrow, fire, and logging. In old-growth forests, alerce's extreme longevity is a strength, because it allows the species to persist for centuries while waiting for rare disturbance opportunities to regenerate. In the early 1990s, Chilean forest ecologist Antonio Lara tested this disturbance hypothesis and found that in the Andes, natural disturbances can be highly sporadic, leading to gaps of up to five to six centuries between recruitment events.

This clarified the observed lack of regeneration in virgin closed-canopy forests and the profuse regeneration following natural disturbances and low-intensity fires. While natural regeneration in heavily logged or burned areas is exceedingly slow and often dominated by faster-growing species in the short term, the remarkable lifespan of alerce enables it to recover over centuries if seed sources or isolated surviving trees remain. Ultimately, the paradigm of alerce as a climatic relict

was overturned by recognizing that slow growth and longevity are the very cause of its resilience rather than its demise.

With its slow growth and millenary longevity, alerce challenges another mid-20<sup>th</sup> century prevailing paradigm, this time of North American origin. According to the "longevity under adversity" paradigm, maximum longevity is thought to occur only in harsh, dry and cold environments like those found in the mountains of the U.S. Southwest. In 1950, Edmund Schulman collected alerce samples throughout Chile and Argentina, including an 1800-year-old tree from Argentina and a 1600-year-old tree from Chile. Based on the 'longevity under adversity' paradigm, Schulman expected to find the oldest trees and the narrowest rings in the arid, cool regions of his collection. But to his surprise, he found record-low growth rates in the healthy, 1600-year old Chilean alerce, which he sampled in a temperate, extremely wet environment with more than 3000 mm rainfall per year. Why and how this occurs remains an enduring ecological mystery until today, shrouded in scientific questions we have yet to answer or even pose.

## OPENING AN ANCIENT TIME CAPSULE

The very slow growth and extreme longevity of alerce trees have long been acknowledged. To the naked eye, it is evident from the tightly packed growth rings in stumps and boards, and maximum diameters of up to 3 or even 5 meters. A popular myth was that alerce trees grow about 1 mm in diameter per year. It was a simple yet often misleading way for early observers to estimate the age of large trees. While this rule of thumb may have frequently led to overestimations due to varying growth rates and the faster growth during early life, it fits well with a reliable early ring count from a felled alerce tree in Argentina in 1956. The tree was 3 meters in diameter and had 3,000 annual rings.

Yet, the first crossdated and well-replicated alerce tree-ring chronology was not developed until 1985, after which alerce tree-ring research

advanced significantly in the 1990s and 2000s, led by dendrochronologists Ricardo Villalba in Argentina and Antonio Lara in Chile.

I first met Antonio in the summer of 1993, during his visit to the nowadays Alerce Costero National Park, in the summit of the Coastal Range near Valdivia, to study the fire history of these enigmatic alerce forests. As an intrepid 11-year-old kid that grew up in the park with my family of rangers, I guided Antonio and his colleagues to alerce stands suitable for study. Antonio showed me how the dates of ancient fire scars were recorded in the eroded growth rings of unassuming alerce stumps. From that moment on, I could never look at a stump or an alerce tree the same way again—each one became a time capsule, holding blurry messages from the past. This unexpected encounter became a defining event in shaping my scientific journey, a path that probably began when I took my first step among ancient alerce trees, holding my mother's hand under the watchful presence of my grandparents.

Six years later, as I stood at the crossroads of choosing a possible university career, Antonio reappeared in my path. He encouraged me to study forestry at the Universidad Austral de Chile in nearby Valdivia, where he had recently founded the first Tree-ring laboratory in the country. However, the tuition fees were far beyond my means. Moved by my particular family story with the alerce forests, the director of the Forestry School, helped me to obtain a highly competitive full scholarship. It felt as if the very ancient trees that had shaped my childhood were now secretly guiding my destiny.

During my busy student life, I began dating alerce tree-ring samples in the Lab late into the night. The quiet of those hours allowed me to immerse myself into learning the intricate patterns of the language of ancient trees. From time to time, Antonio and I would cross each other in the corridor, the only two people in the building at that late hour, or he would stop by to see who was still working in the lab. Though brief, these moments always sparked inspiring conversations, where we recognized in each other a shared scientific passion for looking into the secret messages hidden inside the time capsules of ancient alerces.

Antonio went on to co-supervise my undergraduate thesis, where I used tree rings to understand the dieback of alerce trees that I knew in the very park where I had grown up. This work was an early investigation into a phenomenon that has since become increasingly prevalent around the world due to climate change. For me, it was a first glimpse into the unconventional ecology and the fragility of these ancient trees.

The collaborative efforts of Antonio and Ricardo Villalba led to the creation of a network of over 20 ring-width chronologies spanning the entire range of the species and several millennia, some of which I helped to collect, and to the study of alerce tree rings as a multimillennial record of summer temperatures. Before retiring in 2023, Antonio used Chilean alerces to reconstruct 5,680 years of summer temperatures for the southern Andes (3672 BCE–2009). Today, this stands as the longest tree-ring record for the Southern Hemisphere.

## FROM ANCIENT FORESTS TO GLOBAL MODELS

After a PhD and postdoc in Europe, where I complemented my earlier tree-ring experience with earth system model expertise to study global forest ecology, I returned to Chile to complete the retribution time required by the scholarship that funded my PhD. What first felt like an interruption to my scientific career ultimately proved to be a meaningful call back home from the ancient trees that had guided my path from the start.

Two years before my return, Antonio had launched a pioneering project to measure carbon and water fluxes in an alerce forest using an eddy covariance flux tower in the Alerce Costero National Park, the very place where we had first met 20 years earlier. After an unfortunate lightning strike left the costly tower inoperable, my return became an opportunity to reconnect with Antonio and restart the project. We joined forces with my longtime friend and colleague, Rocio Urrutia, whose

research had revealed that alerce forests are among the most massive and long-lived carbon stores in the world, with the highest wood residence times reported for any species. On average, a molecule of carbon captured by photosynthesis and stored in alerce wood takes 1400 years to return to the atmosphere through decomposition. As a result, alerce forests are unique long-term carbon sinks due to their exceptionally low mortality rates and the ability to slowly accumulate highly durable biomass for millennia.

I returned to my family land near the park, living with my mother just a short walk from the flux tower to manage its complex operations. Immersed once again in the alerce forests of my childhood and removed from the scientific hustle of Europe, I found a unique space of inspiration to mature my scientific vision. Measuring the pulse of the ancient alerces became a family affair. My mother monitored cambial activity and shoot elongation of alerces on a weekly base, continuing a long family tradition of supporting scientific research in the park, but this time the scientist was at home.

To me, the time spent in the forest was not just about data collection, but about reconnecting with the source of inspiration of my career. The quiet, immersive presence in the ancient alerce forests allowed me to reflect on how the detailed, traditional methods of studying tree rings could complement the real-time, ecosystem-level data from the flux tower. The synergy between the deep past and present gave me a fresh perspective on how we might better predict the future. Through the mysterious language of inspiration, the alerces revealed to me that this could be achieved through a scientific model that weaves together the depth of historical tree-ring data with the biophysical pulse recorded by continuous forest monitoring. This idea became the foundation of a successful career-starting grant proposal, which took me back to Europe, this time as a senior scientist.

## LAÑILAWAL

In the early 1970s, my grandfather, Aníbal Henríquez, came across a massive, ancient alerce tree while working as the first ranger of the Alerce Costero National Park. This unexpected encounter marked the beginning of a profound connection between my family and this tree, the largest and oldest living individual in the rainforest. Initially, he chose to keep the finding to himself, reluctant to reveal the location of the tree. A few years later, he shared the news with the rest of the family and the park manager. He eventually cleared a small trail to the tree, which became not only the main attraction of the park but also one of the most iconic trees of the Chilean rainforest and the world.

The tree is commonly known as “Alerce Milenario”, but its true name is *Lañilawal*, a Mapuche word of uncertain meaning. This mysterious name connects the tree to the *Lañilawal* river at the bottom of the valley and the broader material and immaterial world it inhabits. Beyond being an ancient living being, we consider it to be a *Ngen Lawal*, a powerful guardian spirit of the alerce forests of all times. Over three generations of park rangers, my family—beginning with Aníbal and my grandmother Rufina, and then joined by my mother Nancy, uncle Jorge, and cousins Marcelo and Deborah—has protected *Lañilawal* during half a century. Today, the legacy of safeguarding it has been passed to me, not only as a descendant but as an Earth scientist, committed to ensuring its wellbeing, freedom and survival for the centuries to come.

When my grandfather first met *Lañilawal*, it was a marvel of untouched nature, with its 4.2 meters in diameter and 28 meters height. The massive tree was draped in a living cloak of mosses and epiphytic plants, so dense that even a large tree had taken root on top of one of its branches. This intricate ecosystem gave *Lañilawal* a mythical appearance, like a cascading waterfall of lush green and brown hues that camouflaged it within the rainforest. However, as its fame grew, so did the pressure from uncontrolled tourism. Even after a wooden viewing platform was constructed to protect it, visitors easily trespassed, tram-

pling its last living roots, compacting the soil and suffocating the tree. They peeled away its bark and stripped all the mosses and plants that once adorned it. Decades of neglect and overtourism took their toll, and by the time I returned to Chile from Europe in 2016, Lañilawal stood in a diminished state, like a caged lion, stripped of its former wild majesty.

When I saw Lañilawal in such a poor condition, it was clear that overtourism had left it vulnerable. Compounding the issue, I noticed signs of climate change stress affecting the surrounding forest, including dying trees, desiccated mosses, and the mortality of high epiphytes, once permanently soaked in moisture. It was a worrying sight of how rapidly the vital space around the tree and the surrounding ecosystem were deteriorating. In the winter of 2019, with these concerns in mind, together with Antonio Lara, we decided to carefully extract a tree-ring sample from the ancient Lañilawal to evaluate its health condition. Accompanied by the park managers and rangers, we approached the task with utmost care, ensuring the process was respectful and minimized any potential harm.

The analysis of the tree-ring sample confirmed the external signs of vulnerability of Lañilawal to increased dryness and warming. It showed that its radial growth increased steadily with rising concentrations of carbon dioxide in the atmosphere during the 20th century, but this growth stimulation halted in 1990 as atmospheric dryness and maximum temperatures rose in the region. With climate change projections indicating further increases in dryness and warming, the vulnerability of Lañilawal and the surrounding ecosystem are likely to intensify, threatening its survival.

Looking towards the future, with the help of my brother Diego, we started monitoring the immediate habitat of Lañilawal in 2021, measuring soil and air temperature and moisture every half hour. These measurements are integrated with the broader monitoring of the alerce ecosystem at our flux tower, located just 2.5 km away. The data revealed a concerning issue: the large wooden viewing platform, installed just 2 meters from the trunk of Lañilawal and directly above its last living

roots, acts as a barrier to precipitation, reducing soil moisture to nearly half the levels found in the surrounding forest. Rather than protecting the tree, the platform inadvertently intensifies drought stress. We have urged park authorities to promptly relocate the platform at least 15-20 meters away from the tree to minimize disturbance and better preserve its growing environment as droughts intensify with climate change.

For many years, a popular belief circulated that this ancient alerce was around 3,500 years old, a claim displayed on a wooden information sign beside the tree. However, the origin of this estimate is unknown. It is likely based on the popular belief that alerces grow in diameter at a rate of approximately 1 millimetre per year. With a trunk diameter of 4.2 meters, an average growth rate of 1.2 millimetres per year over bark would have to be assumed to arrive to the age estimate of 3,500 years. Estimating the age of Lañilawal using traditional tree-ring counting is challenging because of its immense size. Doing it was not the purpose of our sampling. However, after finding 2,465 tightly spaced rings within the 90 cm-long core we sampled, we decided to explore the possibility of estimating the total age. This sample, though significant, represents only 43% of the tree trunk radius. The scientific challenge then became how to estimate the rings in the remaining 57% of the trunk radius to provide a more complete age estimate with its uncertainty.

To do this, we developed a statistical growth model to estimate thousands of possible growth trajectories from seedling to adult, consistent with measurements for the species and the tree itself. We found an 80% chance that Lañilawal is more than 5,000 years old, suggesting it may be one of the oldest living, non-clonal trees in the world. This preliminary finding was highlighted in the scientific journal *Science* in 2022, attracting worldwide attention but also skepticism from some North American dendrochronology colleagues who believe that tree age must be determined solely by counting all the rings. We are in the process of publishing our methodology, but for now, our focus has been directed towards other aspects of the tree that required more urgent action.

While these findings offer a plausible age estimate, the exact number holds little significance when compared to the true importance of Lañilawal. The focus should not be on the age of this ancient being, which is merely a number for humans to measure. Instead, we should turn our attention to the deeper meaning of its existence at a cosmic time—its enduring role as a guardian spirit, its connection to the land and the cosmos, and its continued resilience in the face of ever shifting challenges. The true value of Lañilawal lies not in its age, but in the messages it carries for all of us who are willing to listen.

## LIFE CONTINUES

In its spiritual role as *Ngen*, Lañilawal chose to reveal itself to humanity in a timely act to protect itself from the destructive power of civilization. Fate chose my grandfather and family to be its human kin, a bond that has deepened over generations and inspired my scientific career. The human family of Lañilawal grows, it now extends to Antonio, Rocío, committed park rangers, and all those who stand in solidarity for its protection and freedom. But there will come a moment when Lañilawal must be left in peace, a time when it should not be visited, allowing it to heal and continue carrying its silent messages for the humans and spirits of the future. It must not be reduced to a mere tourism attraction, nor should its genome be desecrated, stealing its most intimate secrets before their time. There are frontiers that scientific colonialism must not cross to respect the cosmivision of its ancestral people. Instead of being commodified and exploited, it should be revered, protected and understood. The story of Lañilawal and that of its species reminds us that despite adversity, life continues and the future is always uncertain.