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Cover: Designed by Emilio Ambasz, pyramid-shaped glass grids at the Lucile Halsey Conservatory in San Antonio, Texas, cover sinker spaces that protect plant collections
COURTESY EMILIO AMBASZ & ASSOCIATES INC.
With generations of undisturbed tropical forest growth, Rio Abiseo National Park holds ecological signposts for the future and shrouded monuments to the past.

Recovery and Discovery in Peru
Nature on the Rebound

Text and photographs by
Kenneth R. Young and Blanca León

In Rio Abiseo National Park, in the upper elevations of Peru’s eastern Andes, rivers rise and drop, sometimes in less than an hour. Landslides abruptly peel down slopes. Trees fall and other plants strive to occupy the resulting openings in the forest canopy. Perhaps this dynamism seems counterintuitive because, within the forest, the moss-laden trees and cool temperatures create the illusion of living museums, of ancient landscapes. And, in fact, plant growth is not especially fast here, but it is constant—twelve months a year and with ample moisture. If it does not rain every day, there are at least clouds that at certain elevations touch the forests. These mountainous cloud forests receive the full brunt of moisture arising from the western Amazon basin, condensed into rain clouds by the uprisings and westward-bound trade winds.

It is easy to imagine, then, that botanical exploration might be difficult, but rewarding. Very few scientists have visited these environments and then only for a short time. New species are waiting to be found as well as unique adaptations to the rigors of the environment. The park is a living laboratory that invites us to examine the recovery of ecosystems—following disturbances caused by natural processes and those created by people in the distant and not-so-distant past.

At timberline, above and far left, dense and often impenetrable vegetation appears hardy but can be as short lived as fast-paced tropical rain-forest growth.

Overleaf: Looking north across the heavily forested Monteclisito River Valley, where archaeologists now estimate humans lived for millennia. Artifacts such as this ornamental carved sandstone head were found after fieldwork begun in the mid-1980s.
The boulder-stream bed of the Monterrico River, above, waits to be transformed by rain, as does an endemic Paschia sumatrana, right.

Very few scientists have visited these environs... New species are waiting to be found, as well as unique adaptations to the rigors of the environment.

The fact that the forests of Rio Abiseo National Park can recover is surely one of the few optimistic notes in a chorus of environmental disaster music heard as tropical forests are cut and converted into wastelands. Why and how these forests could regrow is still unknown, but might simply be due to the several centuries that have passed as no person sought to farm or burn these landscapes. Surely the opportunity of examining change after turning over ecosystems to the vagaries of natural processes is one of the principal reasons that a national park should be established. Rio Abiseo provides such “experiments” for researchers to study.

An irony is that although the park’s western boundary is a two-day walk from the nearest house, a careful observer will find evidence that people have contributed to change by affecting the vegetation. Trees grow on top of rock walls that formed houses and ceremonial structures.

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fives hundred to one thousand years ago. And the use of the high-elevation grasslands for raising cattle in this century has left its own marks on the landscape at timberline. Probably this is a general truth about the eastern Andes and western Amazon: Virgin forests do not exist, and some degree of human intervention can be found even in the most isolated of sites.

The only way to identify species and to evaluate species richness is to collect plant specimens. This requires the taking of samples of the leaves and of the flowers or fruits. Each sample is then field pressed until they can be properly dried and prepared as herbarium specimens. The inventory of the park’s plants will surely still be ongoing well into the next century. In the meanwhile, more than a thousand plant species have been provisionally identified, with about 350 growing in the high elevation grasslands and the remainder in the montane forests. More than a dozen are species new to science, and others are rare species restricted to northern Peru.

The study of vegetation also requires determination of what life forms they belong to (such as tree, shrub, or forb) and measurements of how much space they occupy. Above timberline are grasslands dominated by bunch grasses, wetlands of sedges and rushes, and rocky hill slopes upon which other tropical alpine plants survive. Within the montane forests, there is much heterogeneity, with some forests reaching over one hundred feet in height. Other forests are less than ten feet tall and are found at the environmental extremes: at the uppermost elevations at which trees can grow or on rocky ridges with shallow soils. Most forests are intermediate in height and are filled with understory bamboos. Many are also well stocked with massive tree ferns.

When the rivers are at flood stage, huge boulders grind loudly as they are shifted downstream by the force of the water. Rain lashes the tops of the trees and winds roar. It is during such moments that catastrophic changes can occur. The river’s force can shift from one bank to another, causing erosion on the outer bank and deposition on the inner. In a matter of hours, forest once perched above the river channel can be destroyed, uprooting trees and sending them downstream, accompanied by the soil and any small organism unable to escape. Left behind is a raw surface of pebbles and rocks that provides a substrate for plants with vigorous growth and pioneer instincts.

Simultaneously, up on the forested hillsides, weight can overcome resistance and the slope fails, taking everything down to the subsoil in long landslides. Over time, these catastrophes will be healed by nature. The bamboo seem to be especially well adapted to participate as they spread out into the landscape scars from the forest edges. Over several years, the scars turn a bright green from the spread and growth of the bamboo and other opportunistic plants. Over decades, the former landslides become brownish green in color as trees recolonize and forest redevelops.

The vegetation patchwork created by these natural disturbances can be seen in landscape views. Animals found in these forests are probably well prepared to take advantage of the shifting habitat mosaic. In a small area, a bird such as the rare yellow-browed toucanet can find a diversity of vegetation types and ages, due to disturbance and the steep vertical drop of the terrain. Tree frogs living in the branches of tall trees can coexist with those species.
that prefer the dense thickets formed by the bamboos.

According to archaeologists, the park's forests have been free from direct human influence for at least four centuries. But to put this into perspective, imagine that the average tree lives a century, with some individuals reaching five hundred years or even more. That means the forests have only been regrowing for four tree generations or fewer. Some areas will still be recovering from the original human-caused disturbance four centuries ago.

Timberline is a contact zone between forest and nonforest, between trees and herbs. Natural disturbances are caused by climatic phenomena: lightning bolts, forceful winds, heavy rains, frosts. As a result, trees fall, landslides form, and nonresistant plants are killed. But the influence of people is also present and both more direct and less subtle. It turns out that though the grasslands are a two-day walk from the nearest farmer, livestock are often left to graze in this area. After a year or two, the bunch grasses become too tough and unappetizing for cattle. Waiting

rrium set by the climatic processes that keep trees from surviving in very high elevations. However, grassland burning had been keeping the forest at a slightly lower elevation because grasses resear roots after fires, while tree often die. Since the park managers took possession, the trees have begun to invade the grasslands, and the shrubs once kept small by repeated fires have grown over our heads.

There is much to be optimistic about in the shifting, dynamic landscapes of Río Abiseo National Park. Although nothing here is static, native plants and animals have adaptations that permit them to take advantage of disturbances, or to shift to other habitats where conditions are more to their liking. Given that change occurs constantly, it makes sense for living creatures to accommodate, even require, those permutations. Over long time periods, even deforested or burned areas recover as opportunistic species settle and prosper.

Outside of the national parks and nature reserves, though, there is much to worry about in the eastern Andes. Deforestation, burning, and other impacts are visible, even from space. We remember the days in 1991 when the Cuzco airport was closed due to smoke from out-of-control fires. We have seen landscapes where soil erosion has left little soil and denuded hillsides. There are locales where scant vegetation now grows, even though previously cloud forests once stood proud. The montane forests of the Andes have often been overlooked by those pushing international agendas on nature conservation. This neglect is especially worrisome in the Andean countries where deforestation causes loss to biodiversity and disrup- tion of hydrological cycles in steep mountainous areas.

The flora and fauna of the high eleva- tions of Río Abiseo National Park doubt- less have much more to teach us about how life can be sustained despite the rigors and disturbances of a cold, wet environment. As its recovery is documented and analyzed, Río Abiseo might also suggest more appropriate ways for modern peoples to coexist with natural systems in the eastern Andes and the western Amazon.

By the rules that regulate national parks in Peru, cattle and the accompanying burning is forbidden for a few days without rain, agriculturalists enter and burn the grasslands, causing the rapid growth of fresh, green, and (appar- ently) delicious grass blades that nourish the cattle.

By modern economic and agronomic standards, these are inappropriate places to be raising cattle. By the rules that regulate national parks in Peru, cattle and the burning that accompanies their husbandry is forbidden, enforcement of which began almost a decade ago in Río Abiseo. In that time, some of the uppermost watersheds of the park have been without livestock and fire for ten years. Human influence was adding to the natural disturbance regime, and keeping the timberline at lower elevations than would otherwise be the case. In unburned valleys, the upper edge of the montane forest has been creeping up slope, while the grasslands have been becoming taller and shubbier than before.

Timberline will reach a dynamic equilib-
In the last decade, the study of pre-Hispanic archaeology in South America seems to have become the science of the unexpected. Surprising discoveries and counterintuitive explanations have become commonplace. Long-cherished interpretations of major prehistoric events and ancient cultures have been overturned.

Ten years ago, few among us would have predicted the discovery of Clovis-age foraging cultures in the Amazon Basin, or the hemisphere’s earliest pottery in the Amazon’s “green hell.” Likewise, the recent rescue of mummies and artifacts from looted cliff tombs at the Lake of the Condors in northern Peru yielded the kinds of wool and cloth artifacts that most of us assumed had rotted away centuries ago in the wet jungle soils of Chachapoyas. As finds like these are unearthed our western twentieth-century preconceptions fall victim. The forest-cloaked eastern slopes of the central Andes, I have long believed, are especially pregnant with surprises.

Discoveries that have revolutionized our view of human occupation and prehistoric societies on the eastern Andean slopes have been made both in the cloud forests of Rio Abiseo National Park and in the laboratory, and often under odd circumstances. The first of these came in 1986 when headlines circled the world announcing the discovery of a spectacular mountaintop “lost city” belonging to a “lost civilization.” The lost city became known as Gran Pajatén, and its discovery triggered one of many such media events that characterize archaeology on the eastern slopes of the Central Andean cordillera. The most famous of these was, of course, Hiram Bingham’s 1911 unveiling of the Inca citadel at Machu Picchu.

These discoveries capture the public imagination like few other scientific events. That the remains of high civilization could exist in such a setting and elude detection for centuries, hidden only by a forest, seems astonishing. After all, Peru’s Spanish conquerors left few stones unturned in their zeal to possess native gold and silver and to conquer the Inca empire.

At Gran Pajatén, below, the overgrown plaza in front of Building I shows a huaca, a stela-like structure of undetermined function. Masonic friezes, laid in slate slabs, and a central stairway distinguish the building, which dates to the Inca occupation.
extirpate “pagan” idols throughout the Andes. In the Moche Valley the Spaniards diverted an entire river to help “muñe” the Pyramid of the Sun, while thousands of conquis- tadores and their native porters died searching the eastern slopes for the mythical treasures of El Dorado. How could such a vibrant and cosmopolitan pre-Hispanic center as Gran Pajatén escape notice and remain lost for centuries?

The eastern Andes is a precipitous, rain-soaked world marked by the constant cycling of exuberant tropical vegetation, catastrophic river erosion, and sudden landslides. So, where did Gran Pajatén’s builders come from, and why did they choose to build such an elaborate, even ostentatious, settlement at 9,350 feet, within one of the earth’s most remote and forbidding environments? Before the 1960s, most archaeologists perceived of the dense eastern slope forests as a barrier to interregional communication, virtually empty of pre-Columbian population. Their conclusions were reinforced by contemporary government assessments of the high cloud forests as useless for agricultural purposes.

Zoomorphic images, such as the condor, below, and the appliquéd serpent decorating a potehered, right, show the Chachapoyas’ connection to their natural environment.

It seems logical then that quests of origins have guided initial scientific inquiry at Gran Pajatén, although enthused armchair archaeologists with fertile imaginations have suggested population sources ranging from Vineland to Phoenicia to distant planets. Based on data collected during the first expeditions to the site, archaeologists theorized that Gran Pajatén’s builders migrated from populated highland regions to the west shortly before the Spanish conquest. These intruders were purportedly either colonizing lower altitudes to grow corn and coca to fill the Inca state storehouses, or being pushed into the forested frontiers by overpopulation.

With few exceptions, archaeologists concluded that human occupation at Gran Pajatén (and elsewhere in the eastern Andean cloud forests) was intrusive and late in age. The high humidity, steep terrain, and poor soils supposedly ensured the rapid and complete failure of what some characterize as a pre-Columbian agricultural experiment. For nearly two decades, many scholars considered the case as good as closed, and that further research would have little impact on world, South American, or even Andean archaeology. However, these scholars failed to consider that Gran Pajatén’s discovery was so shocking primarily because there are virtually no ruins in the bordering highlands that potentially signaled the existence of major pre-Columbian monuments in the forest below. These monuments fascinate because they indicate these people preferred to live in the cloud forest. Discovering the reasons for this preference is as important a task as finding out where the people came from.

Since the 1985 inception of the University of Colorado-Boulder’s Rio Abiseo National Park Research Project, the park has become something of a living laboratory for biological and ecological studies, slowly revealing its promise as a time capsule sealed and concealed by four hundred years and four “tree generations” of tropical forest growth since the region’s abandonment.

Unlike most of Peru’s archaeological heritage, sites within the park have been spared the attrition of steady looting and destruction by virtue of their isolation. The region was still unmapped when the Colorado project began. Not only is the park situated far from Peru’s contemporary population centers and communication infrastructure, but some sites within the park remain inaccessible, even to the trained and well-equipped mountaineers who first accompanied the Colorado group. During this century, at least four expeditions have failed to cut a trail connecting highland Páez and the Central Huallaga lowlands some forty miles to the east. Numerous explorers and one whole early twentieth-century expedition perished in the attempt; one casualty (the mayor of highland Páez) made headlines less than a year ago.

Gran Pajatén was first encountered not by archaeologists, but by local farmers reportedly searching for arable land. More than a ruined settlement, these farmers discovered a monumental pre-Columbian masterpiece of sophisticated stone masonry, embellished with slate mosaic friezes and carved sandstone panels depicting humans...
and animals. Gran Pajatén’s sudden appearance began a long series of extraordinary finds in the park’s Montecristo River Valley.

Ten years later another accidental encounter, this time by local treasure hunters, uncovered a row of chamber tombs set into the cliffs above Gran Pajatén. While Andean cliff burials are common, the unusually dry conditions rendered by protective rock overhangs allowed the excellent preservation of original mud plaster and white, yellow, and red paints applied to slate mosaic friezes similar to those at Gran Pajatén.

Most unusual, even unprecedented, is the presence of six wooden statues hanging under the eaves at equal intervals around the perimeter of the main chamber. Who could have predicted finding virtually the only preserved example of an ancient Andean woodcarving tradition in the most humid eastern Andean rain forests? Peruvian archaeologist Federico Kaufmann Doig, who first studied the site, labeled it "Los Pinchudos," a reference to the statues' prominent male anatomical features.

Dating to the half century between A.D. 1470 and 1530, Gran Pajatén and Los Pinchudos feature some of the greatest aesthetic achievements of eastern slope societies just prior to the Spanish conquest. Yet neither the scope nor the age of human occupation in the Montecristo Valley forests was fully appreciated until Gran Pajatén and the surrounding sites were intensively studied between 1985 and 1990.

During 1985 fieldwork we observed that all the entryways and decorated panels at Gran Pajatén faced north toward a long prominent ridge extending from the other side of the valley. For five days in July archaeologist David Ayers and three Peruvian assistants laboriously cut their way to the top, but were disappointed to encounter only a few scattered buildings and terrace walls. On the fifth day of exploring the ridge, Ayers wrote in his field notes, "suddenly the site became huge!" Not only were many buildings decorated as at Gran Pajatén, but Ayers estimated a total of 150 to 200 structures at the site. As there was no local name for this previously unknown settlement, it became referred to simply as Cerro Central.

Further up the valley, archaeologists mapped and excavated a small portion of an architectural complex with an estimated one hundred circular and semicircular buildings constructed on platforms and terraces that cascade down the mountainside. Called Las Pampas, the settlement was first located by Peruvian biologist Mariella Leopoldo while conducting faunal inventories in the

The Rio Abiseo National Park was established in 1983 and includes over one thousand square miles of natural environments located on the eastern slopes of the Andes of northern Peru, from 2,200 to 13,800 feet elevation. The principal goals were to protect cloud forest, the extremely rare yellow-tailed woolly monkey, and the extensive pre-Columbian archaeological sites.

Implementation of park protection programs began in 1983 and the park has long had a director and park guards. However, completely lacking is appropriate infrastructure, such as trails and shelters. This makes research difficult and limited. It also means that tourism is still not permitted.

Currently government officials, planners, and scientists are studying how this area can be made more accessible. Obviously this must be done with much caution, so that the integrity of both cultural and natural resources can be guaranteed.

Despite always ambiguous building counts hampered by the thick vegetation, project personnel have since located other extensive settlements above and below Gran Pajatén, while just last year the Associated Press reported the accidental discovery by lost explorers of yet another large ruined settlement further down the valley. The size of sites like Las Pampas and sprawling Cerro Central overshadows Gran Pajatén’s tight cluster of twenty-four documented buildings. If most of these settlements were occupied simultaneously, as we suspect they were, then the Montecristo Valley population surely numbered in many thousands. How could this environment have supported such a large population?

After the 1986 fieldwork, radiocarbon testing of charcoal samples from deposits beneath Gran Pajatén’s late pre-Hispanic constructions yielded two dates establishing human presence at the site during the third century B.C.—about two thousand years earlier than most archaeologists would have expected! Meanwhile, systematic analysis of architectural and pottery styles from the different time periods has led to the conclusion that these styles had both developed locally on the eastern slopes and could no longer be simplistically ascribed to the remains of late prehistoric highland colonists. These sophisticated pre-Columbian societies thrived within what most scholars have presumed to be the harshest of tropical forest environments—a counterintuitive, yet now inescapable, conclusion.

Since Gran Pajatén’s discovery, expedition after expedition of archaeologists (including ours) had followed the remains of pre-Hispanic roads across the alpine divide to the forest edge, stopping to spend the night at one of two caves or rock shelters. On the journey eastward, groups usually camped at Manachauqui Cave, where local villagers from Putaz habitually camp during their periodic hunting or cattle-herding forays. Because expeditions to the park were becoming regular events by this time, it occurred to some villagers to dig out some of the shelter’s interior to create more sleeping space. Imagine our surprise when we arrived at Manachauqui Cave en route for our 1988 field campaign and found pottery, stone tools, and charcoal strewn downslope from the shelter’s mouth. By camping at Manachauqui on our way from the highlands to the cloud forest we were following the footprints left by native travelers over millennia. Later, we also learned that one translation of the Quechua language name Manachauqui is mana = mother/protector + chaki = dry foot, or perhaps “protector of foot-travelers.” Our subsequent excavations during 1988 and

These remarkable wood carvings, left on crumbling structures high above the valley floors, if the buildings collapse, these rare finds will be lost forever.

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1990 confirmed that the shelter had been used by wayfarers since the end of the last ice age ten thousand years ago.

Further artifact analysis, especially of the wide variety of trade pottery from Gran Pajatén and Munachoay, has shown that camels and horses, mostly llama and alpaca from Gran Pajatén, strongly suggest the penetration of trade routes into the upper Amazon rain forests. These kinds of information lead us to conclude that, rather than a barrier, the Río Abiseo cloud forests that initially served to shield the ruins in secrecy makes vigilance against illegal entry and looting nearly impossible. Since their respective discoveries, Gran Pajatén and Los Pincudos have both been victims of looting and vandalism, and the latter site—without immediate emergency intervention—is on the verge of utter collapse.

Opening the Río Abiseo time capsule has provided a fascinating window into a "lost" pre-Columbian world, yet it has also opened Pandora's box of conservation dilemmas. The same wilderness location

Archaeologists dig in the lower levels of Munachoay Cave, right, whose finds include this small pot, above, dating to 800 B.C., showing a stylistic relationship to lower Amazon cultures. The cave mouth is in shadow on the right, top, where a pre-Hispanic paved road can also be seen in the distance.

Ulike most of Peru's archaeological heritage, sites within the park have been spared the attrition of steady looting by virtue of their isolation.