

STRANGE SIGHTS, BOTH LIVING AND INANIMATE, FOUND ON DESERT HIGHWAY OF PERU

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The coastal plain of Peru, between the Andes and the Pacific, though wholly within the tropics, is untropically cool and as untropically barren.

These surprising and important geographic features result from the remarkable Humboldt Current that washes the Peruvian coast—an oceanic current of quite a different and opposite type from our more familiar Gulf Stream. The cold waters from the Humboldt Current well up from the bottom of the Pacific in a narrow belt along the west coast of South America. They bring up with them the fertility of the deep waters and thus become the scene of an extraordinary wealth of marine life. This contrasts the more remarkably with the barrenness of the coastal desert, which is in its turn due to the effect of the current on air temperatures. The combination of desert land and rich marine life results in the extraordinary phenomenon of the guano islands that fringe the Peruvian coast.

On the coastal shelf itself, the alternating rocky ridges and sandy plains form one of the most extreme of desert regions in the world, on which one may travel for miles without seeing a living plant or animal. The more familiar desert of the North American Southwest, with basically the same substratum of sand and rock, is rich with desert plants specifically adjusted to arid conditions, and supports an equally rich and no less remarkable animal life adapted to the desert environment. Thus the Colorado desert (of Arizona, adjacent California, and the Mexican state of Sonora) gives the impression of an ancient desert area, in which time has been available for the evolution of both vegetation and animal life; the Peruvian desert strip, contrariwise, seems to be at least relatively a young desert.

SINGLE LANE HAIRPIN CURVES

The absence of tropical jungle has a conspicuous man-made result, a reflection of our automobile-conscious civilization. The ambitious and romantic project for a highway to link the two Americas—the Pan American Highway—has its Peruvian link completed for the more than a thousand miles from the Ecuadorean border to Bolivia and Chile. The worst difficulty that faced the Peruvian engineers was probably the moving sand dunes produced by the eternally pounding waves of the Pacific. Low but sturdy bridges cross the rivers which, though numerous and subject to flood, are small. Where spurs from the mountains extend to the sea, a winding passage has been blasted, not always wide enough for two cars, and sometimes with a hairpin turn, quite unprotected, above a dizzy drop. The Peruvian oil field in the northwestern part of the country not only provides gasoline at a reasonable price

for the cars that are to run on the roads, but supplies the asphalt to surface them. A ribbon of fine "black top" road extended for hundreds of miles in each direction from Lima in 1939 when the writer traveled over it as a member of the Magellanic Expedition

POST-WAR PICTURE

The dream of driving an automobile from Alaska to the Straits of Magellan is likely to be realized in the post-war period. One long and important link of the Pan American Highway already completed is that extending along the coast of Peru. Something of the interest of the desert region in this section is told in the accompanying article by Mr. Schmidt who has already traversed it.

of Field Museum. It may now well extend the whole length of the country. How would a thinly populated country, like Peru, use its roads, and especially an international highway? And what would one see between Chiclayo at the north and Lima, and between Lima and Arequipa at the south? Would not a trip on the Peruvian highway be unbearably monotonous in this most barren of deserts? The answer to the first question requires a separate essay. The present one will detail a naturalist's impressions of the coastal landscapes.

TRAVEL BY TRUCK

A brief digression may set forth the mode of travel to which my son and I became converts—and not merely converts, but most active propagandists! We had the inevitable problem, as a scientific party, of moving considerable equipment from Lima to Arequipa, some thirteen hundred kilometers. With our varied interests, the expedition baggage (recalling the apt *impedimenta* of the Romans) had grown to half a truck load. The road to Arequipa was officially opened three days after our arrival in Lima. Why not be the first *gringos* to travel over it, and as our equipment required a truck, why not travel with the duffle under our own eyes, as passengers on the truck? An estimable friend and companion predicted that we might not only

be the first *gringo* truck riders over the Arequipa road, but the last as well. We sent him on by airplane to lay plans for our collecting in southern Peru, and John and I joined a caravan of two brand new Detroit-built trucks (two-tonners) with the *Arequipa Express*. We soon learned to avoid the home-made cab, with its flat board seat and vertical back. With a blanket for padding and ropes for hand holds, we rode instead on top of the high-piled load. There could be no better vantage point for anyone whose soul is moved by the glorious panorama of mountain and sea and sky, juxtaposed against desert and cultivated valley.

VIVID GREEN OASES

The great central ranges of the Andes wall off the coastal desert from the vast and dense tropical forest of the Amazonian side of Peru. The Andes themselves are barren for the lowermost ten thousand feet; but, as they rise to the zone of ice and snow, some thousands of feet of the upper levels of the mountains below the snow line are well watered. The run-off from the snow fields and mountain lakes gathers to form the more than fifty rivers that cross the desert plain to the Pacific. These are insufficient to water the plain, but they supply sufficient water to convert the valley floors themselves into oases of vivid green. These, nursed by irrigation, sometimes extended upward on the sides of the valleys in rock-walled terraces, mementos of the Inca civilization.

The irrigated valleys may spread out in a broad and fertile delta plain, as at Ica and Pisco, supporting a considerable population on the *haciendas*, and often a city of some size as well. Or they may be confined to a steep-walled canyon, whose flat bottom forms a ribbon-like linear oasis, invisible



HOW HIGHWAY MASTERS ANDEAN SLOPES

After the war many North Americans may drive their cars over this road on their way to still farther regions of South America.

until the truck arrives at the very canyon brim. Or, perhaps most charming of all, we may skirt a valley so small that it supports only a single family, with a single hut, a tiny field of corn, a single goat, and a single burro; evidently it is inhabited to its full human carrying capacity, although there may be no other habitation within forty miles. Such a self-sufficient human

lypts, interspersed with fields of small grain and of the staple corn.

North of Lima the valleys are still different. Many are devoted mainly to sugarcane, in vast flourishing plantations. South of Chiclayo one may see fields laid off in tiny squares for aquatic rice culture like that of the Orient. The last great valley to the south, that of the Majes River, is

A few minutes stroll along the beach yields a curious insight into this graveyard zone. The beach may be watched over by a row of gigantic condors, properly inhabitants of the dizzyest mountain heights, but remarkably able to adjust to the enormous differences of air pressure between sea level and the snow line at 16,000 feet.

SCAVENGER LIZARDS

The carcasses of dead fishes, cormorants, and sea lions are promptly fly-blown, and the carrion flies and their maggots afford food for insect eaters. The most conspicuous living creature in this trash proves to be a good-sized lizard, *Tropidurus peruvianus*, found here in countless hundreds, in a nearly continuous ribbon of population from the equator to temperate Chile. The large males are richly colored with brown bars and a dark throat, and are as much as eighteen inches long. The much smaller females are gray. Juvenile males, gray like the females, have a vivid flash-mark of orange or yellow in the groin, a most curious kind of "recognition-mark" the function of which is not evident. While this lizard may range inland onto the mountain slopes to as much as ten thousand feet altitude, it nowhere develops such a dense population as in the beach zone.

AWESOME VISTAS

While our chauffeurs gather a boxfull of sea urchins, which we crack open like eggs and eat raw, we may be charmed by the aquatic gamboling of a marine otter—an animal which, happily, is not quite so near extinction as its relative, the sea otter of the northern Pacific.

The desert itself, aside from an intrinsic interest for the extreme of barrenness, exhibits numerous memorable landscapes. The spurs of mountain that buttress the first Andean chain, themselves rising to great altitudes, are mostly of reddish rock. They divide and subdivide in an endless series of arroyos and crests that somehow make me think of some vast crashing chord of music with all of its harmonics frozen into physiography.

"HANGING DUNES"

Where sand sweeps inland from the sea beach, it may rise into great dunes, and into dunes of astonishing variety. The familiar types of coastal dunes are especially abundant in northern Peru and at some places between Pisco and Lima. Occasionally the steady winds from the Pacific carry sand far inland, resulting in vast "hanging dunes" like the one at Nasca which covers the top of a mountain spur at several thousand feet of elevation, without any very evident source. Such wind-borne sand is carried up the escarpment at the coast to the nearly level plateau below Arequipa at four thousand feet altitude. There the sand gathers in the marvelous "Barkhan Dunes" that march inland to the main



FIELD MUSEUM EXPEDITION ON PAN AMERICAN HIGHWAY

Traveling in this truck, Chief Curator Schmidt and his companions were the first North American travelers to motor from Lima to Arequipa. Note curious desert vegetation at roadside.

unit may draw in part on the sea, with a private sheltered beach for a fishing boat between jutting walls of rock pounded by Pacific surf on either side.

APPLES AND BANANAS GROW SIDE BY SIDE

The valley oases not only afford the most welcome and delightful relief from the intervening stretches of rock and sand, but offer a succession of surprises in the contrasts between the products which appear from each one to the next. Long-staple cotton is the principal product in the broad valley mouths south of Lima. A succeeding valley will be found to be wholly devoted to apples, the rectangular orchards bordered by lines of banana plants. Such a juxtaposition of temperate and tropical fruits at sea level is scarcely to be found beyond the influence of the Humboldt Current. Then there may be a broad valley entirely devoted to olive trees, their gnarled trunks attesting their great age, and their gray-green foliage a delight to the eye. The more remote the valley from Lima, the more diversified and self-sufficient will be its agriculture. Such valleys will have adobe-walled pastures, often set off by rows of willows or of euca-

famous for its oranges—"camanetas"—taking their name from the town of Camaná, at the sea.

WHALE HUNTING RECALLED

The Pan American Highway sometimes parallels the coast at a considerable distance inland, but it frequently comes close to the sea, and thus brings the traveler into contact with the remarkable beach zone. Bleaching skeletons of whales remind us that our North American forbears hunted the leviathan in these waters a hundred years ago. This hunting was as much conditioned by the presence of the Humboldt Current as are the geographic features already mentioned. The numerous carcasses of guano-birds attest that the great current is not in its normal cycle, and dying cormorants, apparently too weak to fly, may be seen moving inland to contribute to the wave-washed zone of flotsam and jetsam which consists of sticks, pumice, kelp, and the bones of a great variety of marine creatures.

Our caravan stops at intervals to permit rest for the drivers, to let us all stretch our legs, and to test and cool the precious new tires, pride of the *Arequipa Express*.



"THE BARKHANS"—TRAVELING DUNES

Strange sand formations of nearly equal size which move across the Peruvian desert, holding their shape as the wind propels them. After reaching normal height of six to eight feet, they "give birth" to "infant dunes" instead of growing larger.

Andean range. These curious dunes are of nearly equal size, of crescentic form, with the horns pointing forward in the direction of travel. As the sand accumulates in them, instead of increasing beyond their normal size (with a height of six or eight feet), crescentic infant dunes are given off at the horns. These have long attracted the attention of travelers by rail from Mollendo to Arequipa. They are vastly more numerous along the road from Arequipa to Camaná, before the road drops steeply into the valley of the Majes.

SEA FOG ENCOURAGES PLANTS

Where the fog sweeps in from the sea a strange bromeliad vegetation may develop, covering the ground with great mats of a curious rootless ground plant, whose relatives are everywhere familiar in the humid tropics as epiphytes on trees. Our familiar "Spanish moss," *Tillandsia*, belongs to this group of plants. The ground bromeliads are so gray that they scarcely appear to be living. These mats of tillandsia lie at right angles to the direction of the wind, and apparently grow toward it, dying off at the leeward edge.

Occasional valleys, for no superficially evident reason, develop a uniform growth of a columnar cactus on their steep walls. In still other places the rocks may be covered with a delicate film of green, perhaps of lichen or of alga, dependent on the fog from the sea. One or two valleys only, in all the long series south of Lima, are uninhabited, and exhibit no trace of former habitation by man. In these the valley floor has a sparse vegetation of bushes, and occasionally displays the mesquite-like algaroba tree.

"SPRING" IN OCTOBER

The most wonderful vegetational phenomenon in Peru is the rich seasonal herbage known as the "lomas," produced on certain slopes close to the sea and watered by the condensation of fogs sweeping inland. Of

all the contrasts in the Peruvian landscape, this is the most startling. On our trip to Arequipa early in August we encountered the wholly plantless ridges and plains, the sparse coastal vegetation, the occasional areas covered with tillandsias, and the occasional cactus-covered slopes between the succession of oasis-like irrigated valleys. We were told that the port of Chala served as a cattle shipping center; and we expressed some polite skepticism as to where cattle might come from

for shipment. On our return in mid-October, after crossing the ever barren plateau with its Barkhan Dunes, dipping down into the orange grove oasis at Camaná and again approaching Chala, we suddenly found ourselves on seaward-facing slopes covered with knee-deep herbaceous plants, rich with a great variety of flowers. Lilies were especially beautiful and varied. The air was filled for miles with an odor like that of heliotrope. Birds courted and sang in these meadows; especially memorable were vivid vermilion flycatchers. We seemed suddenly to have come out of an age-long winter into the full bloom of a northern spring. As we descended the slopes, the barren sand and rock reappeared at about three hundred feet above the sea; a few miles beyond Chala we drove out of the flower-scented atmosphere into a long stretch of the most barren desert.

This charming and curious phenomenon of the lomas vegetation is limited to the coastal region of Peru, more especially of the region from Lima southward. It forms only in an altitude zone between three hundred and three thousand feet above sea level. It is rather exactly governed by topographic and climatic conditions, so that it will be richly developed in one valley and absent or feebly developed in an adjacent one that seems little different. The Chala region is known as the richest of these lomas areas. A few miles inland however, desert conditions prevail throughout the year.

LAND OF THE INCAS

The shadow of the Inca and pre-Inca civilizations lies everywhere upon the Peruvian landscape. The cultivated valleys are ter-

raced far above the present level of cultivation, often into tiny rock walled shelves that could only have been watered by hand. The desert plains often bear the most astonishing adobe ruins; vast citadels on hilltops, some doubtless temples and others fortresses; great cities that must have hummed with life; and mortuary cities that seem to have been used by the living only to bury their dead. All these attest to the once dense populations of the coastal region.

The traveler on the highway, who is hurried past the ruins, and who cannot delve into the panoramic story of pre-colonial Peru, is afforded an even more impressive evidence of the populations of past ages by the incredible abundance of human remains. In the mortuary city of Cajamarquilla, above Lima, scattered arm and leg bones are to be seen everywhere, with an occasional skull left in a niche in the adobe wall. In a road cut, a whole skeleton is seen exposed, the bones rolling down into the roadway to be ground under the wheels of the passing vehicles. On top of a hill one may see a grave neatly dug out for its pottery (the chief materials of study for archaeologists), the skeletons left neatly laid out beside the pit. Or in a sandy stretch the wind may have uncovered a helter-skelter tangle of human skulls, limb-bones, pelvises, and vertebrae.

CREVICE JAMMED WITH SKELETONS

Lest one think that this is a phenomenon only of the coastal region, I may mention a rock crevice on the side of the mountain in the far off valley of the Urubamba (beyond Cuzco), ten thousand feet above sea level, which was crammed with human skeletons. Thus the Peruvian past, with its irrigation civilization, is visibly linked to the modernity of automobile traffic on an asphalt-covered highway.

Such are the glimpses of Peru to be had from the top of a swaying load on a two-ton truck on this thousand-mile link in the *Carretera Pan-Americana*—destined to see great caravans of freight and travelers in the not too distant future.



AREQUIPA AND MOUNT MISTI

Part of Peruvian city at end of desert highway. Note snowcap atop symmetrical cone of the volcano in background.



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