

THE HUMBOLDT CURRENT

BY KARL P. SCHMIDT

CURATOR OF AMPHIBIANS AND REPTILES

(*Editor's Note: Mr. Schmidt at present is in South America as a member of the Magellanic Expedition of Field Museum. The following article, written aboard ship en route to Lima, has just been received from him.*)

The sudden change of temperature encountered as one's ship passes the Gulf of Guayaquil and rounds Cape Blanco, the westernmost point of Peru, is one of the surprises of a voyage to western South America from the north. The oppressive heat of the Canal Zone and of the Colombian port of Buenaventura is only a little relieved at sea, where the daily temperature range is from about 82° to 90°. As the ship enters Peruvian waters the temperature drops more than ten degrees, to a daily range of 70° to 76°. Coats and sweaters make their appearance on deck, and covers are required at night. We find ourselves in the climate dominated by the cold Humboldt Current, the major oceanographic feature of the southeastern Pacific.

Alexander von Humboldt, first of the great scientific travelers, described the geographic effects of the vast current of cold water named for him. The Humboldt Current turns out to be a phenomenon very different from the more familiar river-like ocean currents, like our Atlantic Gulf Stream. On the western borders of the continents, in the middle latitudes, the steady trade winds drive the surface waters of the ocean before them, and the water thus removed is replaced by vertically upwelling waters from the depths of the ocean. The slow creep of the glacial waters from the poles maintains the bottom waters of all oceans at temperatures near freezing, and an upwelling current accordingly draws on this source of cold.

JUNGLE CHANGES TO DESERT

The upwelling strip of cold water along the coast of Chile and southern Peru is about forty miles wide, and as it accumulates it flows away northward, becoming river-like as it is deflected westward by the trend of the Peruvian coast to wash the shores of the equatorial Galapagos Islands before it is swamped by the warm waters of the tropics.

The effect of the Humboldt Current on the adjacent tropical coasts is profound. Instead of the forest and jungle of Panama and the Colombian coast, which one naturally associates with the tropics, the Peruvian coast is a desert of barren cliffs and hills, often so extremely arid that not a spear of vegetation is to be seen for miles. The cool winds coming in from the Pacific are warmed as they reach the heated land, and since this increase in temperature increases their capacity for moisture, no rain falls near the coast—winds from the east have had to drop their moisture in crossing the Andean ranges. The result is the

Chilean and Peruvian desert coast, which contrasts as remarkably with the jungles and rain forests proper to the tropics as does the temperature at sea with the familiar connotation of the word tropical.

The biological effects of the upwelling oceanic waters are of even greater importance than the effect on the adjacent land. Every living surface creature in this part of the vast Pacific must die, and sinking slowly to the bottom, must slowly decay and leave the simple chemical compounds so vital to the growth of plant life. But since plants in general require sunlight, and since sunlight penetrates only a few hundred feet of the upper stratum of the ocean, this vast store of accumulating plant food is withdrawn from the normal plant-animal-plant circulation.

THE WEB OF LIFE REVEALED

In the strip of upwelling water along the South American coast, this stored-up nitrogen and phosphorus is brought into the lighted zone, where it becomes available to plants, while the coldness of the water, with its increased capacity for carbon dioxide and oxygen is an additional factor to both plants and animals. With a basic and

inexhaustible food supply, the microscopic plants of the open ocean flourish in inconceivable numbers, and the stalked algae along the coast grow to an unparalleled size. As on land, the plant life of the sea in its turn forms the basic food supply of animals. Microscopic animals feed on the myriad diatoms, to be eaten in turn by large though still minute crustaceans and other floating animals. These are fed upon by the smaller fishes, which become the food of the larger fishes and other marine creatures. Myriads of sea birds are attracted by the never-failing food supply, and sharks, sea lions, and whales end this greatest of all "food chains." We may even add man, with his fisheries, to this series; and it must be remembered that New England sailors frequented these waters for generations in search of whales.

Climate, plant life, animal life, and human relations to the environment are all inter-related and dependent in last analysis on the revolution of the earth (which produces the winds and ocean currents), and the earth's intake of sunlight. But it is only in a few regions like the Peruvian coast that the major outlines of the vast complex web of life are so simplified that we can trace cause and effect backward to the physical sources.

THINGS YOU MAY HAVE MISSED

A Rolling Stove

A way of taking a coal or charcoal fire right to bed with one on chilly nights, without endangering either oneself or the bed-clothes, was devised by an ingenious Chinese hundreds of years ago. It was done by means of a cleverly contrived bed-warmer, which might be described as a rolling stove. An example dating from the seventeenth century is to be seen in the Chinese collections in George T. and Frances Gaylord Smith Hall (Hall 24, Case 24).

The device consists of a hollow sphere of brass, cut out in rosette-like designs to let

air in and heat out. The sphere is composed of halves which may be fastened together for use, or separated for loading. Utilizing the same principle upon which a ship's compass is suspended on gimbals so that in whatever direction the ship may pitch or roll the compass face always comes to normal level, a round brass bowl is suspended on two hoops inside the sphere, one hoop within and perpendicular to the other. The outer hoop is riveted to two lugs, projecting from the inside of the lower hemisphere, and the inner loop moves on a pivot which connects it with the outer hoop. The bowl, which holds the burning coal or charcoal, is encircled by the inner loop.

After the halves of the sphere are fastened together, it may be rolled or kicked about at will, and the fire-laden bowl swings freely and independently of the sphere's motion, never turning upside down. The Chinese styled the device "brazier-reclining-on-the-mattress" and "brazier-in-the-bed-clothes." Its original invention is believed to go back to a clever mechanic who lived in the first century of our era.

The late Dr. Berthold Laufer, former Curator of the Department of Anthropology, pointed out that the suspension principle used, known as "Cardan's suspension" through the erroneous attribution of its invention to Girolamo Cardano, scientific and philosophical dilettante who lived in Italy from 1501 to 1576, thus was actually known hundreds of years before him. Not only the ancient Chinese used it, but it was known to the earlier Hellenic mechanics of the Alexandrian epoch.



Chinese Bedwarmer

The tops of the brazier, and of the gimbals-supported fire bowl, have been removed to show the ingenious construction of this device for safely taking a coal or charcoal fire to bed where it can be rolled around.



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