CHAPTER 37 *Trailblazer for Ecology*

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This paper has two aims. First, it highlights Alexander von Humboldt's concern with complex natural processes, going far beyond his time's the descriptive science. He was a farsighted forerunner of today's Ecology and Environmental Science. Secondly, the "Personal Narrative" is incomplete, ending with the landing in Colombia. I present some examples from Humboldt's remaining diaries that cover the years 1801 to 1804 of his "Amerikanische Reise". Margot Faak (1986, 1990) has translated the mostly French entries into German. They cover the journey through Columbia to Lima; the sea voyages to Guayaquil and Acapulco; the Mexican explorations; Humboldt's stay in Cuba; and the final sailing to Philadelphia to see President Jefferson in Washington.

Humboldt's Ambitions

Before leaving Spain, Humboldt wrote on June 5, 1799 in his cabin on the corvette *Pizarro*: "I will collect plants and animals, measure heat, elasticity, magnetic and electric content of the atmosphere, …determine geographic longitudes and latitudes, measure mountains - but all of this is not the purpose of my travel. My real, only purpose is to investigate the mutual interactions ("Zusammen- und Ineinander-Weben") of all forces of Nature, the influence of inanimate nature on the living animal and plant creation." After his travels he wrote:

> I was passionately devoted to botany and certain parts of zoology, and I flattered myself that our investigations might add some new species to those already known, both in the animal and vegetable kingdoms; but preferring the connection of facts which have been long observed, to the knowledge of insulated facts, although new, the discovery of an unknown genus seemed to me far less interesting than an observation on the geographical relations of the

> vegetable world, on the migrations of the social plants and the limit of the height which their different tribes attain on the flanks of the Cordilleres. (PN, p. X).

Humboldt focused on discovery of new species of animals and plants; determining elevations, geographical coordinates, magnetism, electric charges in the air, ocean and river currents; connectedness of abiotic and biotic factors; notably plant distribution and plant geography; effect of landscape, especially vegetation, on people; use and conservation of natural resources; and well-being of people, based on resources and their living and working conditions.

Early Preparations in Freiberg (Fig. 37-1)and elsewhere

FIGURE 37-1. Freiberg in Saxony, a mining town where A.v. Humboldt studied at the Mining Academy and held his first post.

In his 1793 “Florae Fribergensis specimen” Humboldt postulates a new form of plant geography; he wants to go beyond descriptive taxonomy and nomenclature. When Humboldt works as Prussian mining inspector, his detailed reports from Bavaria, Bohemia and Poland foreshadow his later vast scope of the “Amerikanische Reise”. Effects of altitude and topography on climate and vegetation intrigue him in the Swiss and French Alps in 1795 and will for a lifetime.

Humboldt’s Methods

> In our investigations we have considered each phenomenon under different aspects, and classed our remarks according to the relations they bear to each

other. To afford an idea of the method we have followed, I will here add a succinct enumeration of the materials with which we were furnished for describing the volcanos [sic] of Antisana and Pichincha (Fig. 37-2), as well as that of Jorullo: the latter, during the night of the 20th of September, 1795, rose from the earth one thousand five hundred and seventy-eight French feet above the surrounding plains of Mexico. The position of these singular mountains in longitude and latitude was ascertained by astronomical observations. We took the heights of the different parts by the aid of the barometer, and determined the dip of the needle and the intensity of the magnetic forces. Our collections contain the plants which are spread over the flanks of these volcanos, and specimens of different rocks which, superposed one upon another, constitute their external coat. We are enabled to indicate, by measures sufficiently exact, the height above the level of the ocean, at which we found each group of plants, and each volcanic rock. Our journals furnish us with a series of observations on the humidity, the temperature, the electricity, and the degree of transparency of the air on the brinks of the craters of Pichincha and Jorullo; they also contain topographical plans and geological profiles of these mountains, founded in part on the measure of vertical bases, and on angles of altitude. (PN, I, XIII).

FIGURE 37-2. Top: Cotopaxi, considered by Humboldt the most beautiful of the Andean peaks. Bottom: Pichincha, as seen today from Quito airport. Humboldt climbed Pichincha several times and studied its volcanic activity.

Humboldt's methods were to describe; measure; compare and contrast; experiment. He tries to see causation of observed facts. For example, he tries to explain fever-producing "Miasma" by peculiar local soil and rocks. Finally, in addition to facts and details he espoused a holistic approach, considering landscapes, describing them in "nature paintings".

Compare and Contrast

One of his most global comparisons is: "In the Old World, nations and the distinctions of their civilization form the principal points in the picture; in the New World, man and his productions almost disappear amidst the stupendous display of wild and gigantic nature."(PN, XXI). Early on in Venezuela, Humboldt compares elevations and plants at the Silla mountain chain near Caracas to the Alps of Switzerland, mentioning specifically Rhododendron. (PN I, 427).

He compares the Lake of Valencia to the Lake of Geneva (PN, II, 2), and the Llanos of Venezuela to steppes in North Germany, Hungary, Russia, etc. (PN II, 85). Humboldt compares the new to the familiar:

> The alpine vegetation is very beautiful. Nothing but shrubs of 1.4 to 2.9 meters height, everything similar to myrtle and juniper, a grand character of the regions I ascended, the Brathys juniperina, decussata...the Lysianthus grandiflorus, the Segesbekia, the Alsonia theiformis, the Espeletia (the Frailejón), the Castilleja, Lobelia, Wintera granadensis, Weinmannia pinnata, Eriocaulon, Hippia, Dichondra, Melastomen with yellow and purple blossoms, the Rotmannia, and numerous other syngenesists on a grassy carpet of cryptogams, of Lichen paschalis...on black humus soil as that of the Swiss Alps. (RM II, 38).

When climbing Cotopaxi (Fig. 37-2) (RM II, 76ff) he describes, compares and contrasts the vegetation: At 3,000 meters elevation: Barnadesia, Duranta, Berberis, Aralia, Vallea, alder, some Melastomae und Calzeolariae (p. 77). Lower, at 2,500 meters: Crotons, Iraca alata, "Signs of Warmth." "In 30 minutes one descends from the climate of Bogotá to that of Cumaná. Nowhere else one can observe more on the geography of plants!" (RM II, 77).

Humboldt compares mountains and rivers. On July 25, 1801 he is impressed by the view of Tolima: "They offer a great vista, these peaks steeped in the snow of the North, while palms and bananas form the foreground"(RM I, 37). When descending Cotopaxi, Humboldt remarks: "Cotopaxi, the most beautiful cone in the world"(RM II, 75). He generalizes that narrows in valleys always follow a wider section: at Gotthard, Maipures, and here in Guáitara Valley: Water accumulates and forms a lake, the accumulated water masses become strong enough to break the dam. A narrows (Angostura) is formed, and the drained lake becomes a plain around the riverbed." (RM II, 163). Furthermore, he compares wind, temperature, and "salubrity" of the 3 rivers Orinoco, Amazon, and Magdalena (PN II, 315).

The party climbs Chimborazo (Fig. 37-3) on June 23, 1802 (RM II, 100). Comparing the Paramo vegetation (Fig. 37-4) of Chimborazo to that of other Andean peaks, he finds it wanting: "But unfortunately, the Chimborazo is also the plant-poorest of all Nevados we visited, unfortunate not only for us

who had already seen the alpine plants of the other volcanoes, but also per se by the low species richness that its green areas offer." "Nothing but grasses, a few Chacuri ("Staehelina"), *Swertia quadricornis*, Saxifrages, Gentian ... a meager vegetation, not matching the beauty of this colossus" (RM II, 108).

FIGURE 37-3. Chimborazo. Humboldt reached his highest altitude here, developed his model of altutudinal plant zones, and considered the Paramo vegetation at Chimborazo impoverished.

FIGURE 37-4. Paramo flowers at Cotopaxi.

He even takes a comparative approach to languages and compares Pareni and Maypure tongues (near the Orinoco's Maypure Falls) and speculates about their relationships, based on shared words and "analogies." Pareni might be a mixture of two languages, he suggests. (PN II, 303).

Experimental Analysis

During the sea voyage, Humboldt experiments on swim bladder and fin physiology of Flying Fish by stimulating nerves that innervate pectoral fins (the rays spread in response) and calculates the force for flying. (PN. I, 131). In Venezuela, electric fishes provide an opportunity for self-experiments: Bonpland and Humboldt get shocked many times. The "experimental" horses are driven into the lake with the electric eels: "In less than five minutes two of our horses were drowned. The eel being five feet long, and pressing itself against the belly of the horses, makes a discharge along the whole extent of his electric organ. It attacks at once the heart, the intestines, and the caelic fold of the abdominal nerves." (PN II, 113).

The "cow tree" (*Palo de vaca*), *Chrysophyllum cainito,* of Venezuela has potable milk. Humboldt finds it nourishing, senses a "balsamic odor", and does chemical tests. But he does not ask what the tree may have the milk for (PN II, 4).

Humboldt wonders how baby turtles find their pools and experiments on orientation and homing. His helpers take little turtles in a bag from the river, place them with their tails to the river: they find back. "I confess, that this experiment, of which Father Gumilla speaks, does not always succeed equally well: yet in general it does appear that at great distances from the shore, and even in an island, these little animals feel with extreme delicacy in what direction the most humid air prevails." (PN II, 193). These *tortuguillos* emerge at night, because they fear the heat of the sun, the Indians tell Humboldt. "Reflecting on the almost uninterrupted layer of eggs that extends along the beach, and on the thousands of little turtles that seek the water as soon as they are hatched, it is difficult to admit that the many turtles which have made their nests in the same spot, can distinguish their own young, and lead them, like the crocodiles, to the lakes in the vicinity of the Orinoco. It is certain, however, that the animal passes the first years of its life in pools where the water is shallow, and does not return to the bed of the great river till it is full-grown. How then do the *tortuguillas* find these pools? Are they led thither by female turtles, which adopt the young as by chance? (PN II, 193).

Humboldt was the first to witness a "poison-master" preparing curare from the bark of the liana *Chondrodendrum tomentosum* and tested the effects of curare: He placed curare on the crural nerve of frogs found no change of irritability. But "Galvanic experiments succeeded upon birds, some minutes after I had killed them with a poisoned arrow." (PN II, 445).

Humboldt examines coastal mangrove forests as possible sources of fever-causing *miasma*. West of the mouth of the Rio Capaya on the north coast of Venezuela he noted: "This spot is one of the most unhealthy of the

whole coast." To find an explanation for the "extreme insalubrity of the air" he conducted experiments on decomposition of mangrove wood and roots. He found that mollusks and insects abound in the mangrove. In Caracas, he experiments with mangrove branches and roots he puts in water: "The infusion in warm water had a brown color and an astringent taste. It contained a mixture of extractive matter and tannin." He further describes how mangrove grows seaward, and dies in back, extending land while the mangrove belt does not increase in width. He conducts various decomposition experiments in sun, and in closed glass vessels. He did not observe the formation of sulfur compounds. (PN I, 371ff).

Holistic Views

Upon arrival in Colombia, Humboldt investigates geography and environmental relations of plants, an approach he was the first to suggest and pursue. He complains: "Some botanists have explored the coastal areas and seen nothing but plants" (RM I,1). Including humans, Humboldt notes: "The forms of plants determine the physiognomy of nature; and this physiognomy influences the moral disposition of nations." (PN II, 257) And "A savage's state is primarily modified by the Nature of the climate and soil he inhabits. It is these modifications alone that distinguish the first inhabitants of Greece from shepherd Bedouins, and from Canadian Indians." (FB 54). And "The influence of food, more or less stimulating the character and energy of passions, naval history, and wars undertaken for the dispute of produce of the vegetable kingdom; these link all the Geography of Plants to the political and moral history of man." (FB 55).

On esthetics:

> Man's sensitivity to the beauty of Nature also explains the influence vegetation's appearance has on the taste and imagination of people. Man would be advised to examine what the character of vegetation consists of, and the variety of sensations vegetation produces in the soul of those who contemplate it. These considerations are all the more important because they touch upon the means by which the arts of imitation and descriptive poetry act on us. The simple appearance of Nature, the sight of fields and woods, cause a rejoicing that differs essentially from the impression a particular study of the structure of an organized being provides. Here it is the detail that interests us and excites our curiosity; there, it is the whole, whole masses, that agitate our imagination. What more differing impressions between the appearance of a vast prairie bordered by a few trees, and the appearance of a thick and somber wood mixed of oak and fir trees? What is the moral cause of these sensations? Are they produced by Nature, by the grandeur of masses, the contour of forms, or the haven of plants? How can this haven, this view of Nature more

or less rich, more or less pleasant, influence the mores and, primarily, the sensitivities of peoples? (FB55).

Humboldt's Results

To what extent did Humboldt succeed in his synthesis? What were the results? About 60 years before E. Haeckel coined the word *ecology*, Humboldt examined ecological processes. His examples of ecological conservation are most relevant for today. At the Venezuelan coast, intense pearl fishing had depleted the pearl oyster stocks. They were harvested all year, with no protection. One boat collected 35,000 oysters in two to three weeks. 10,000 shells had no pearls. "At present, Spanish America furnishes no other pearls for trade than those of the Gulf of Panama, and the mouth of the Rio de la Hacha"(PN I, 193).

The chicks of the cave-breeding guácharos or oilbirds (*Steatornis caripensis*) of the goatsucker family are killed for their fat. Humboldt visits the Cave of Guacharo in the valley of Caripe in the Sierra del Guácharo (PN I, 255ff). "A mine of fat," he notes. Once per year, in midsummer, the Indians harvest "bird butter" ("Manteca, or aceite, of the guácharo"). They kill several thousand chicks. They render the fat at the entrance to the cave by boiling. The preservation of the guacharo is unplanned: The Indians fear to go deep into the cavern. With Humboldt, they did not go beyond 472 meters. Other, narrow caves also exist. Humboldt follows a 28 to 32 feet wide river into cave. After his visit to the cave, he generalizes on the origins of caves (PN I, 263). As usual, he measures the temperature of the cave as 18.7 degrees centigrade in September. Outside, the hottest temperature of the year was19.5 degrees centigrade (PN I,271).

Humboldt described the Indians' harvest of river turtle eggs for oil on an island in the Orinoco near the missions of Uruana below the Great Cataracts of Apure and Maypure. He worried about the lack of prudent management under the Franciscan monks who succeeded the Jesuits in the Orinoco Missions: "The Jesuits did not suffer the whole beach to be searched; they left a part untouched, from the fear from seeing the breed of *arrau* turtles, if not destroyed, at least considerably diminished. The whole beach is now dug up without reserve; and accordingly it seems to be perceived that the gathering is less productive from year to year." (PN II,189).

In the Páramo (mountain vegetation), normally spectacled bears feed on the pineapple-like achupalla (*Pourretia sp.*). Achupalla that livestock has moderately eaten tips from, produces best cogollo (fresh growth). Because heavy rains and later frost destroyed food plants, particularly maize, in Pastos Province, people had to eat these achupallas. "The people live like bears.

They roam through the Páramos and chop off the tops of Pourretia. The heart of the achupulla resembles palmiche, the young palm leaves." The achapullas were decimated, and "the bears retaliate:" "they attack cattle" in an ecological chain reaction. (RM I,168).

The shrinking of the Lake of Valencia in Venezuela concerned Humboldt:

> The basin presents several other phenomena, and suggests questions, the solution of which is interesting alike to physical science and to the well-being of the inhabitants. What are the causes of the diminution of the waters of the lake? Is this diminution more rapid now than in former ages? Can we presume that an equilibrium between the water flowing in and the waters lost will be shortly re-established, or may we apprehend that the lake will entirely disappear? (PN. II, 5).

He saw forests as important for the lake's level: Cutting down forests leads to 1) lack of fuel; 2) erosion; 3) lack of water. Finally, reduction of Lake of Valencia results. (PN, II, 9). And:

> Several parts of the vast forests that surround the mountain, had taken fire…The inhabitants set fire to the forests, to improve the pasturage, and to destroy shrubs that choke the grass. Enormous conflagrations, too, are caused by the carelessness of the Indians, who neglect, when they travel, o extinguish the fires by which they have dressed their food. These accidents contribute to diminish the number of old trees in the road from Cumana to Cumanacoa; and the inhabitants observe justly, that, in several parts of their province, the dryness has increased, not only because every year the frequency of earthquakes causes more crevices in the soil, but also because it is now less thickly wooded than it was at the time of the conquest (PN I, 210).

Humboldt inspects the Royal Water Drainage at Mexico City more than once, and with the greatest interest. He finds that the draining of Mexico City made soil and water more saline, the soil less fertile, and the air drier. Water plants shallow water and liberate hydrogen sulfide that one can smell in Mexico City. He was very critical of the layout, planning, execution, and the human cost of the Royal Draining Works. (RM II, 256).

Humboldt even engaged in what we now call Chemical Ecology and consider a rather modern scientific discipline. On chemical diversity of plants he observes:

> We see that specimens of sugar and tannin extracted from plants, not of the same family, present numerous differences: while the comparative analysis of sugar, gum, and starch; the discovery of the radical of the prussic acid (the effects of which are so powerful on the organization), and many other phenomena of vegetable chemistry, clearly prove that substances composed of identical elements, few in number and proportional in quantity, exhibit the most heterogeneous properties, on account of that particular mode of combi-

> nation which corpuscular chemistry calls the arrangement of the particles. (PNI, 214/215).

This discussion started with the medicinal properties of the Cinchona tree.

"Geophagy" in different regions of the world fascinated Humboldt: Women at Rio Magdalena, who make pottery, regularly ate clay, even though not pregnant. Blacks in Guinea eat yellowish earth called *caouac*. Slaves taken to America continue this habit, even though the soil in the West Indies is not as good. (PN II, 497). Workmen in the sandstone quarries of the Kiffhauser, Germany, "spread a very fine clay upon their bread, instead of butter, which they call "stein"-butter (stone butter)" (PNII, 502). As for geophagy counteracting hunger, Humboldt compares different cultures' coping with hunger: "We visited the Mission of Uruana on our return from the Rio Negro, and saw with our own eyes those heaps of earth which the Ottomacs eat, and which have become the subject of such lively discussion in Europe." Humboldt's footnote: On chemicals common to animals and plants: "the chemical principles that were believed to be peculiar to animals are found in plants; a common chain links together all organic nature." He lists wax in pollen, the varnish of leaves, "and the whitish dust of our plums and grapes, the inhabitants of the Andes of Quindiu made tapers with the thick layer of wax that covers the trunk of the palm-tree"(PN, II, 50).

> This earth is a greasy kind of clay, which, in seasons of scarcity, the natives use to assuage the cravings of hunger; it having been proved by their experience as well as by physiological researches, that want of food can be more easily borne by filling the cavity of the stomach with some substance, even although it may be in itself very nearly or totally innutritious. The Indian hunters of North America, for the same purpose, tie boards tightly across the abdomen; and most savage races are found to have recourse to expedients that answer the same end. (PN II, 196).

Humboldt notes that not all clays are alike. Earth eaters are selective. At the Orinoco, near Falls of Maypure, he noted:

> During the period of these inundations, which last two or three months, the Ottomacs swallow a prodigious quantity of earth. We found heaps of earth-balls in their huts, piled up in pyramids three or four feet high. These balls were five or six inches in diameter. The earth which the Ottomacs eat, is very fine and unctuous clay, of a yellowish grey colour; and, when being slightly baked at the fire, the hardened crust has a tint inclining to red, owing to the oxide of iron which is mingled with it.... The Ottomacs do not eat every kind of clay indifferently; they choose the alluvial beds or strata, which contain the most unctuous earth, and the smoothest to the touch. (PN II, 495).

Finally, an entry in March 1803 deals with landscape odor:

> In the morning (of the 22) we were 9 miles from the coast and perceived a pleasant earth odor that excited the attention of our dog Cachi (the pigs are the animals on board that notice the vicinity of land from the greatest distance; but what a snout nature has given them! When approaching the narrows of San Bernadino, where aromatic plants fill the air with their scent, the pigs become restless and sniff toward the side of the land, even when still 30 to 40 miles distant). This earthy smell completely resembles the pleasant odor one perceives after a minor thunderstorm rain in spring in Europe… (RM II, 200).

Other ecological questions

Among a myriad of ecological questions, Humboldt asked, for example, what caused "black water" (*aquas negras*) so typical for many rivers? The missionaries told him "waters are coloured by washing the roots of the sarsaparilla." (PN II, 323).

Humboldt ordered vegetation into plant zones and successions: "In the northern part of temperate zone, the cryptogamous plants are the first that cover the stony crust of the globe." Lichens and mosses, "succeeded by gramina and other phanerogamous plants." On the island of Teneriffe Humboldt distinguished five zones of plants from sea level to the mountains: vines, laurels, pines, retama (*Spartium nubigenum*, a 9-foot "beautiful shrub", with odoriferous flowers; goatherds decorate their hats with it), and grasses. (PN I, 115). Humboldt saw single trees outside "palmar" or "pinar" (stands of palms or pines) as "colonists", i.e. pioneers (PN II, 408).

Humboldt noted that plants are peculiar to regions: "...1st, that the New World possesses spices, aromatics and very active vegetable poisons, peculiar to itself, and differing specifically from those of the Old World; 2ndly, that the primitive distribution of species in the torrid zone cannot be explained by the influence of climate solely,..Analogy of climates is often found in the two continents, without identity of productions." (PN II, 320).

Humboldt was less systematically interested in animals as he was in geology, mining and plants. Especially in his *Views of Nature*, Humboldt tries to convey to the general reader the impressions animals and their nocturnal sounds made on the travelers. For instance, "On the Casiquiare the tigers roar from the trees" (PNI, 74). He mentions poisonous snakes, jaguars in passing (PN I, 189); habits of caymans feeding on capybaras (PN II, 156); nocturnal noises in the tropical forest may indicate disturbances; Humboldt speculates on causes of animal calls and interactions of species (PNII,163); describes piranhas in relation to danger to people (PNII,167); and dissected a manatee (PN II,169). Many of the collected animals did not survive the shipping. We have mostly his drawings of animals such as fish or monkeys. He describes two tortoise species in the Orinoco: The "arraus" are social, and "terekays"

more solitary when laying eggs. “Terekay” tastes good and is much pursued in Spanish Guiana (PN II, 187).

Humboldt. notes the lack of fish in mountain streams. “All these mountain streams are very devoid of organic creatures, of the fish only Pescado Negro” (Faak I, 156). Río Pita at Cotopaxi has no fish. Humboldt asks why. The temperature seems sufficient. But sulfur in water from Cotopaxi eruptions may be the culprit? Only the “Preñadilla,” a two- to three-inch fish, exists in slow stretches of small streams. “Did Quito have fish 3000 years ago? Did alone the “Preñadillas” survive? (RM II, 55). He knew of only two fish species in the high plain of Bogota: “Capitán” and “Guapucha.” The Highlands of Popayán and Pasto only have “Pescado Negro.”

On Cotopaxi: “The highest point we reached is “Suniguaicu” in the southeast of the volcano with 2263 toises [4390m] elevation, where the corrected barometer at 10 am stood at 6 degrees Reaumur [4.8 degrees] by 201.3 lines [402.6 mm]. We spent the rest of the day hunting deer of which there are many and very big ones. I saw no difference to the European deer.” (RM II, 84).

Humboldt describes fossil elephant bones at “Campo de Gigantes” near Bogotá:

> The disorder the animal parts are found in proves that the animal did not graze there (as in Burgtonna), but that it was washed up there, almost as in the cave of Gailenreuth. Is there another spot on Earth where there are elephant bones in 2633 m (1357 toises)? The bones were mixed with those of calves and humans from Indio cemeteries, and horns of cattle. We have sent beautiful pieces of these elephants to Cuvier in Paris (RM I, 42).

What Humboldt could not know

Frequently Humboldt describes valleys where people contract what was then called the “three-day recurring fever.” Still before the age of microbiology, he postulates “Miasma” as cause. Today we know he talked about malaria. He speculated about rocks and soils that might be at the root of the “miasma,” e.g. in the valley between Popayán and Pasto:

> The natives of the valley suffer from Carate (rash), “hot fever,” tercianas, do not reach a high age, and the village Patía is still more enclosed in a bowl than the rest of the valley. Winds are very rare. No vegetation, therefore no decomposition in the valley, hence difficult to understand the miasmas. Air still, therefore, since chemical, miasma forming mixtures form more easily in still than moving air, particularly facilitated by solar radiation that reverberates great heat (RM I, 150).

On evolution, he is cautious, as there were few links known between fossils of different ages. Speaking of fossils, he deems them:

> The characteristic forms of plants and animals presented on the current surface of the globe do not appear to have been subjected to any changes since those ancient times. The ibis buried in the catacombs of Egypt, a bird whose antiquity goes almost as far back as the pyramids, is identical to that which fishes on the shores of the Nile today; its identity evidently proves that the enormous casts of fossil animals held in the bosom of the earth, not belonging to the variety of current species, in fact belong to a very different order of things than we currently live under, far too ancient for our traditions to include them. (FB 54).

Humboldt's Humanism

In the mangrove on Cayo Buenito, on the South coast of Cuba, an event disturbs Humboldt: "On Cayo Buenito was a dense forest of laurel-like *Rhizophora* mangrove, the soil-stabilizing *Avicenna nitida*, small-leaved euphorbias, syngenesists, and a beautiful, succulent, grey-green (fol[iis] incanis) *Tournefortia* which spread a pleasant fragrance. Numerous pelicans had nested on the trees. A sloppy nest of a few twigs, in keeping with the stupidity, carelessness of large aquatic birds. The sailors, angry not to find lobsters, climbed the trees and fought with the pelicans, who defended themselves with their enormous, 22cm ("8 Zoll") long baggy bill. When we left the island, bleeding and mutilated pelicans were writhing all over the trees. The adults croaked around the boat, bewailing their young. So man leaves everywhere the traces of his destructiveness, causing misery wherever he sets his foot. (RM I, 44).

Other Quotes from the Log of *Amerikanische Reise* (transl. & edited by M. Faak)

The highlight of this "missing part of the Narrative" is the exploration of the "Avenue of the Volcanoes" in mostly Ecuador, followed by Humboldt's work in Mexico, where, among other things, he measured the height of the Popocatepetl (Fig. 35-5), but did not climb it.

Humboldt marvels at the unique physiognomic character of the Paramo. He finds the shrubs and flowers not comparable to any alpine vegetation in temperate zones (RM I, p. 439).

At the foot of Cotopaxi he measures and draws the Inca palace at Callo. (RM I, 440). It was a way station (Caravanserei, hotellerie) on the 20 feet wide Inca Trail that went 12,440 feet high. "I have drawn three pictures of the palace," (RM I, 79. l. 23). The house is a large square the sides of which are 98 feet long" … "These windows are in the style of the doors, wider at the bottom than at the top." "The inner ones are closed, 'blind windows,' and seem to have served only as recesses to store things. Between the windows, and above them, protrudes a cylindrical rock. This seems to be the only deco-

ration on this edifice." (RM I, 80) Humboldt stayed at the Hazienda San Augustín de Callo, which was built onto the old Inca palace. Today, Hazienda San Augustín de Callo (Fig. 35-6) is a tourist lodge that emphasizes the Humboldt legacy.

FIGURE 37-5. Popocatépetl. Humboldt did not visit Popocatépetl, but measured its height from Mexico City. The pines are Pinus hartwegii.

In Chapter 5 of Faak's 2nd volume, entitled "In Quito," Humboldt marvels at Cotopaxi: "Cotopaxi – this is a perfect cone, the most beautiful of all Nevados."(RM II, 81). Below Cotopaxi, near Machachi, Humboldt describes a slow ridge which separates the waters of the Pacific Ocean from those of the Atlantic Ocean: "This little dam separates the waters of the Pacific Ocean from those that flow into the Atlantic." (RM I, 78).

On April 28, 1802 they climb Cotopaxi, "to study the streams or stretches of volcanic matter from close up. It had snowed heavily during the night from the 27th to the 28th, so that we met with snow below 3705 m ('1900 toises') which hampered our botanical research very much." "Poor Joseph [presumably José de la Cruz] who carried the barometer, suffered endlessly. He walked barefoot for 3 hrs on snow and never lost his good humor." (RM II, 83) Further south, Humboldt stays with a catholic priest in Penibe near Riobamba: "Nothing is in this land as commonplace as married catholic priests. His predecessor had lost his job, because he had let made undergarments for his girlfriend from church vestments; this one introduced without hesitation one of his sons (This not for publication)." (RM II, 98). Humboldt visits the Cerro del Azufre (Sulfur mountain) ¼ mile South of Tixán and recommends more efficient operation of the mine. He notes: "Strange arrival in Tixán. More than 30 barefoot farm workers greeted us. The priest hard of hearing with the French Disease (a consequence of Syphilis)." (RM II, 112). Similarly, a priest's assistant in Ayabaca on the border of Ecuador with Peru complains about his French disease (Syphilis) upon meeting on 2 August 1802, "within less then 3 minutes." (RM II,132)

The “swimming mailman:” At Río Huancabamba (where it is called Río Chamaya) the mailman ties letters, his pants and knife in a turban on his head, and then swims 36 miles downriver from Pomahuaca to Tomependa. A piece of Ceiba wood on his chest makes him lighter. “This is the way Indios of the Province of Jaén travel, in their own water vehicle.” “In the Orinoco or Río Apure the caimans do not permit this navigation.” (RM II,143)

(In Mexico, Humboldt emphasizes mines and mountains. On 20 Nov. 1803 he measures Popocatépetl and Iztaccihuatl from the roof of Mexico City’s mining academy (RM I, 337).

FIGURE 37-6. San Augustín de Callo, Humboldt’s headquarters at Cotopaxi. Today a tourist lodge, the hazienda is built onto the old Callo Palace of the Incas. Humboldt measured and described in detail the Inca Palace.

Personal feelings

When sailing to Mexico, after crossing the equator: “When will we see again the southern hemisphere? My southern constellations sink with every step. It seems I become poorer from day to day. The idea to cross the equator during the night arouses in me very melancholy feelings.” (RM II, 190) At the end of his 5-year “Reise,” Humboldt fears for his life. Near the southeast coast of the United States a storm batters their ship from May 2 to 13, 1804. Humboldt thinks about death and loss of the results of his expedition: “I have never been more concerned with my impending death than in the early morning of May 9. I felt very excited. To see myself go under on the eve of so many joys, to see perish with me all fruits of my labors, to be responsible for the death of two people who accompanied me, on a trip to Philadelphia which was not even necessary (although it was undertaken to save our manuscripts and collections from the perfidious Spanish politics)…On the other hand, I consoled myself to have lived a more fortunate life than most mortals.” (RM II, 300ff)

In summary, Humboldt prefigured Ecology, and was even broader than that since he included humans as both affected by Nature and shapers of landscapes.

FIGURE 37-7. The Humboldt family's Tegel Castle in Berlin. Top: The mansion. Bottom: The family cemetery, A.v. Humboldt's final resting place. The column is in honor of A.v. Humboldt