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THE VOYAGE OF THE BEAGLE

By Charles Darwin

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PREFACE

I have stated in the preface to the first Edition of this work, and in the Zoology of the Voyage of the Beagle, that it was in consequence of a wish expressed by Captain Fitz Roy, of having some scientific person on board, accompanied by an offer from him of giving up part of his own accommodations, that I volunteered my services, which received, through the kindness of the hydrographer, Captain Beaufort, the sanction of the Lords of the Admiralty. As I feel that the opportunities which I enjoyed of studying the Natural History of the different countries we visited, have been wholly due to Captain Fitz Roy, I hope I may here be permitted to repeat my expression of gratitude to him; and to add that, during the five years we were together, I received from him the most cordial friendship and steady assistance. Both to Captain Fitz Roy and to all the Officers of the Beagle [10] I shall ever feel most thankful for the undeviating kindness with which I was treated during our long voyage.

This volume contains, in the form of a Journal, a history of our voyage, and a sketch of those observations in Natural History and Geology, which I think will possess some interest for the general reader. I have in this edition largely condensed and corrected some parts, and have added a little to others, in order to render the volume more fitted for popular reading; but I trust that naturalists will remember, that they must refer for details to the larger publications which comprise the scientific results of the Expedition. The Zoology of the Voyage of the Beagle includes an account of the Fossil Mammalia, by Professor Owen; of the Living Mammalia, by Mr. Waterhouse; of the Birds, by Mr. Gould; of the Fish, by the Rev. L. Jenyns; and of the Reptiles, by Mr. Bell. I have appended to the descriptions of each species an account of its habits and range. These works, which I owe to the high talents and disinterested zeal of the above distinguished authors, could not have been undertaken, had it not been for the liberality of the Lords Commissioners of Her Majesty's Treasury, who, through the representation of the Right Honourable the Chancellor of the Exchequer, have been pleased to grant a sum of one thousand pounds towards defraying part of the expenses of publication.

I have myself published separate volumes on the 'Structure and Distribution of Coral Reefs;' on the 'Volcanic Islands visited during the Voyage of the Beagle;' and on the 'Geology of South America.' The sixth volume of the 'Geological Transactions' contains two papers of mine on the Erratic Boulders and Volcanic Phenomena of South America. Messrs. Waterhouse, Walker, Newman, and White, have published several able papers on the Insects which were collected, and I trust that many others will hereafter follow. The plants from the southern parts of America will be given by Dr. J. Hooker, in his great work on the Botany of the Southern Hemisphere. The Flora of the Galapagos Archipelago is the subject of a separate memoir by him, in the 'Linnean Transactions.' The Reverend Professor Henslow has published a list of the plants collected by me at the Keeling Islands; and the Reverend J. M. Berkeley has described my cryptogamic plants.

I shall have the pleasure of acknowledging the great assistance which I have received from several other naturalists, in the course of this and my other works; but I must be here allowed to return my most sincere thanks to the Reverend Professor Henslow, who, when I was an undergraduate at Cambridge, was one chief means of giving me a taste for Natural History,—who, during my absence, took charge of the collections I sent home, and by his correspondence directed my endeavours,—and who, since my return, has constantly rendered me every assistance which the kindest friend could offer.

DOWN, BROMLEY, KENT, June 9, 1845

THE VOYAGE OF THE BEAGLE

CHAPTER I — ST. JAGO—CAPE DE VERD ISLANDS

Porto Praya—Ribeira Grande—Atmospheric Dust with Infusoria—Habits of a Sea-slug and Cuttle-fish—St. Paul's Rocks, non-volcanic—Singular Incrustations—Insects the first Colonists of Islands—Fernando Noronha—Bahia—Burnished Rocks—Habits of a Diodon—Pelagic Confervae and Infusoria—Causes of discoloured Sea.

AFTER having been twice driven back by heavy southwestern gales, Her Majesty's ship Beagle, a ten-gun brig, under the command of Captain Fitz Roy, R. N., sailed from Devonport on the 27th of December, 1831. The object of the expedition was to complete the survey of Patagonia and Tierra del Fuego, commenced under Captain King in 1826 to 1830,—to survey the shores of Chile, Peru, and of some islands in the Pacific—and to carry a chain of chronometrical measurements round the World. On the 6th of January we reached Teneriffe, but were prevented landing, by fears of our bringing the cholera: the next morning we saw the sun rise behind the rugged outline of the Grand Canary island, and suddenly illuminate the Peak of Teneriffe, whilst the lower parts were veiled in fleecy clouds. This was the first of many delightful days never to be forgotten. On the 16th of January, 1832, we anchored at Porto Praya, in St. Jago, the chief island of the Cape de Verd archipelago.

The neighbourhood of Porto Praya, viewed from the sea, wears a desolate aspect. The volcanic fires of a past age, and the scorching heat of a tropical sun, have in most places rendered the soil unfit for vegetation. The country rises in successive steps of table-land, interspersed with some truncate conical hills, and the horizon is bounded by an irregular chain of more lofty mountains. The scene, as beheld through the hazy atmosphere of this climate, is one of great interest; if, indeed, a person, fresh from sea, and who has just walked, for the first time, in a grove of cocoa-nut trees, can be a judge of anything but his own happiness. The island would generally be considered as very uninteresting, but to anyone accustomed only to an English landscape, the novel aspect of an utterly sterile land possesses a grandeur which more vegetation might spoil. A single green leaf can scarcely be discovered over wide tracts of the lava plains; yet flocks of goats, together with a few cows, contrive to exist. It rains very seldom, but during a short portion of the year heavy torrents fall, and immediately afterwards a light vegetation springs out of every crevice. This soon withers; and upon such naturally formed hay the animals live. It had not now rained for an entire year. When the island was discovered, the immediate neighbourhood of Porto Praya was clothed with trees, [11] the reckless destruction of which has caused here, as at St. Helena, and at some of the Canary islands, almost entire sterility. The broad, flat-bottomed valleys, many of which serve during a few days only in the season as water-courses, are clothed with thickets of leafless bushes. Few living creatures inhabit these valleys. The commonest bird is a kingfisher (Dacelo Iagoensis), which tamely sits on the branches of the castor-oil plant, and thence darts on grasshoppers and lizards. It is brightly coloured, but not so beautiful as the European species: in its flight, manners, and place of habitation, which is generally in the driest valley, there is also a wide difference.

One day, two of the officers and myself rode to Ribeira Grande, a village a few miles eastward of Porto Praya. Until we reached the valley of St. Martin, the country presented its usual dull brown

appearance; but here, a very small rill of water produces a most refreshing margin of luxuriant vegetation. In the course of an hour we arrived at Ribeira Grande, and were surprised at the sight of a large ruined fort and cathedral. This little town, before its harbour was filled up, was the principal place in the island: it now presents a melancholy, but very picturesque appearance. Having procured a black Padre for a guide, and a Spaniard who had served in the Peninsular war as an interpreter, we visited a collection of buildings, of which an ancient church formed the principal part. It is here the governors and captain-generals of the islands have been buried. Some of the tombstones recorded dates of the sixteenth century. 12

The heraldic ornaments were the only things in this retired place that reminded us of Europe. The church or chapel formed one side of a quadrangle, in the middle of which a large clump of bananas were growing. On another side was a hospital, containing about a dozen miserable-looking inmates.

We returned to the Venda to eat our dinners. A considerable number of men, women, and children, all as black as jet, collected to watch us. Our companions were extremely merry; and everything we said or did was followed by their hearty laughter. Before leaving the town we visited the cathedral. It does not appear so rich as the smaller church, but boasts of a little organ, which sent forth singularly inharmonious cries. We presented the black priest with a few shillings, and the Spaniard, patting him on the head, said, with much candour, he thought his colour made no great difference. We then returned, as fast as the ponies would go, to Porto Praya.

Another day we rode to the village of St. Domingo, situated near the centre of the island. On a small plain which we crossed, a few stunted acacias were growing; their tops had been bent by the steady trade-wind, in a singular manner—some of them even at right angles to their trunks. The direction of the branches was exactly N. E. by N., and S. W. by S., and these natural vanes must indicate the prevailing direction of the force of the trade-wind. The travelling had made so little impression on the barren soil, that we here missed our track, and took that to Fuentes. This we did not find out till we arrived there; and we were afterwards glad of our mistake. Fuentes is a pretty village, with a small stream; and everything appeared to prosper well, excepting, indeed, that which ought to do so most—its inhabitants. The black children, completely naked, and looking very wretched, were carrying bundles of firewood half as big as their own bodies.

Near Fuentes we saw a large flock of guinea-fowl—probably fifty or sixty in number. They were extremely wary, and could not be approached. They avoided us, like partridges on a rainy day in September, running with their heads cocked up; and if pursued, they readily took to the wing.

The scenery of St. Domingo possesses a beauty totally unexpected, from the prevalent gloomy character of the rest of the island. The village is situated at the bottom of a valley, bounded by lofty and jagged walls of stratified lava. The black rocks afford a most striking contrast with the bright green vegetation, which follows the banks of a little stream of clear water. It happened to be a grand feast-day, and the village was full of people. On our return we overtook a party of about twenty young black girls, dressed in excellent taste; their black skins and snow-white linen being set off by coloured turbans and large shawls. As soon as we approached near, they suddenly all turned round, and covering the path with their shawls, sung with great energy a wild song, beating time with their hands upon their legs. We threw them some vintems, which were received with screams of laughter, and we left them redoubling the noise of their song.

One morning the view was singularly clear; the distant mountains being projected with the sharpest outline on a heavy bank of dark blue clouds. Judging from the appearance, and from similar cases in England, I supposed that the air was saturated with moisture. The fact, however, turned out quite the contrary. The hygrometer gave a difference of 29.6 degs., between the temperature of the air, and the point at which dew was precipitated. This difference was nearly double that which I had observed on the previous mornings. This unusual degree of atmospheric dryness was accompanied by continual flashes of lightning. Is it not an uncommon case, thus to find a remarkable degree of aerial transparency with such a state of weather?

Generally the atmosphere is hazy; and this is caused by the falling of impalpably fine dust, which was found to have slightly injured the astronomical instruments. The morning before we anchored at Porto Praya, I collected a little packet of this brown-coloured fine dust, which appeared to have been filtered from the wind by the gauze of the vane at the mast-head. Mr. Lyell has also given me four

packets of dust which fell on a vessel a few hundred miles northward of these islands. Professor Ehrenberg [13] finds that this dust consists in great part of infusoria with siliceous shields, and of the siliceous tissue of plants. In five little packets which I sent him, he has ascertained no less than sixty-seven different organic forms! The infusoria, with the exception of two marine species, are all inhabitants of fresh-water. I have found no less than fifteen different accounts of dust having fallen on vessels when far out in the Atlantic. From the direction of the wind whenever it has fallen, and from its having always fallen during those months when the harmattan is known to raise clouds of dust high into the atmosphere, we may feel sure that it all comes from Africa. It is, however, a very singular fact, that, although Professor Ehrenberg knows many species of infusoria peculiar to Africa, he finds none of these in the dust which I sent him. On the other hand, he finds in it two species which hitherto he knows as living only in South America. The dust falls in such quantities as to dirty everything on board, and to hurt people's eyes; vessels even have run on shore owing to the obscurity of the atmosphere. It has often fallen on ships when several hundred, and even more than a thousand miles from the coast of Africa, and at points sixteen hundred miles distant in a north and south direction. In some dust which was collected on a vessel three hundred miles from the land, I was much surprised to find particles of stone above the thousandth of an inch square, mixed with finer matter. After this fact one need not be surprised at the diffusion of the far lighter and smaller sporules of cryptogamic plants.

The geology of this island is the most interesting part of its natural history. On entering the harbour, a perfectly horizontal white band, in the face of the sea cliff, may be seen running for some miles along the coast, and at the height of about forty-five feet above the water. Upon examination this white stratum is found to consist of calcareous matter with numerous shells embedded, most or all of which now exist on the neighbouring coast. It rests on ancient volcanic rocks, and has been covered by a stream of basalt, which must have entered the sea when the white shelly bed was lying at the bottom. It is interesting to trace the changes produced by the heat of the overlying lava, on the friable mass, which in parts has been converted into a crystalline limestone, and in other parts into a compact spotted stone Where the lime has been caught up by the scoriaceous fragments of the lower surface of the stream, it is converted into groups of beautifully radiated fibres resembling arragonite. The beds of lava rise in successive gently-sloping plains, towards the interior, whence the deluges of melted stone have originally proceeded. Within historical times, no signs of volcanic activity have, I believe, been manifested in any part of St. Jago. Even the form of a crater can but rarely be discovered on the summits of the many red cindery hills; yet the more recent streams can be distinguished on the coast, forming lines of cliffs of less height, but stretching out in advance of those belonging to an older series: the height of the cliffs thus affording a rude measure of the age of the streams.

During our stay, I observed the habits of some marine animals. A large Aplysia is very common. This sea-slug is about five inches long; and is of a dirty yellowish colour veined with purple. On each side of the lower surface, or foot, there is a broad membrane, which appears sometimes to act as a ventilator, in causing a current of water to flow over the dorsal branchiae or lungs. It feeds on the delicate sea-weeds which grow among the stones in muddy and shallow water; and I found in its stomach several small pebbles, as in the gizzard of a bird. This slug, when disturbed, emits a very fine purplish-red fluid, which stains the water for the space of a foot around. Besides this means of defence, an acrid secretion, which is spread over its body, causes a sharp, stinging sensation, similar to that produced by the Physalia, or Portuguese man-of-war.

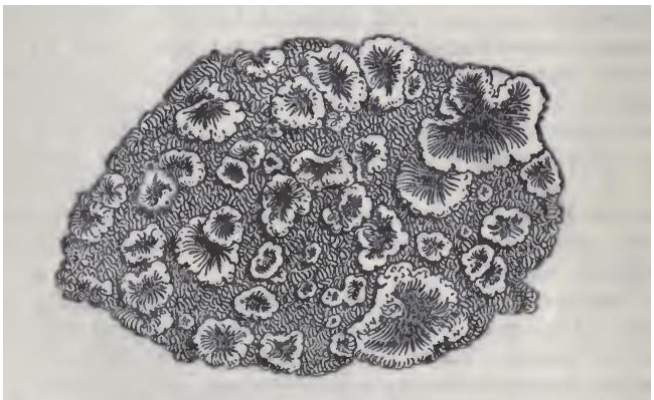
I was much interested, on several occasions, by watching the habits of an Octopus, or cuttle-fish. Although common in the pools of water left by the retiring tide, these animals were not easily caught. By means of their long arms and suckers, they could drag their bodies into very narrow crevices; and when thus fixed, it required great force to remove them. At other times they darted tail first, with the rapidity of an arrow, from one side of the pool to the other, at the same instant discolouring the water with a dark chestnut-brown ink. These animals also escape detection by a very extraordinary, chameleon-like power of changing their colour. They appear to vary their tints according to the nature of the ground over which they pass: when in deep water, their general shade was brownish purple, but when placed on the land, or in shallow water, this dark tint changed into one of a yellowish green. The colour, examined more carefully, was a French grey, with numerous minute spots of bright yellow: the former of these varied in intensity; the latter entirely disappeared and appeared again by turns. These changes were effected in such a manner, that clouds, varying in

tint between a hyacinth red and a chestnut-brown, 14 were continually passing over the body. Any part, being subjected to a slight shock of galvanism, became almost black: a similar effect, but in a less degree, was produced by scratching the skin with a needle. These clouds, or blushes as they may be called, are said to be produced by the alternate expansion and contraction of minute vesicles containing variously coloured fluids. 15

This cuttle-fish displayed its chameleon-like power both during the act of swimming and whilst remaining stationary at the bottom. I was much amused by the various arts to escape detection used by one individual, which seemed fully aware that I was watching it. Remaining for a time motionless, it would then stealthily advance an inch or two, like a cat after a mouse; sometimes changing its colour: it thus proceeded, till having gained a deeper part, it darted away, leaving a dusky train of ink to hide the hole into which it had crawled.

While looking for marine animals, with my head about two feet above the rocky shore, I was more than once saluted by a jet of water, accompanied by a slight grating noise. At first I could not think what it was, but afterwards I found out that it was this cuttle-fish, which, though concealed in a hole, thus often led me to its discovery. That it possesses the power of ejecting water there is no doubt, and it appeared to me that it could certainly take good aim by directing the tube or siphon on the under side of its body. From the difficulty which these animals have in carrying their heads, they cannot crawl with ease when placed on the ground. I observed that one which I kept in the cabin was slightly phosphorescent in the dark.

ST. PAUL'S ROCKS.—In crossing the Atlantic we hove-to during the morning of February 16th, close to the island of St. Paul's. This cluster of rocks is situated in 0 degs. 58' north latitude, and 29 degs. 15' west longitude. It is 540 miles distant from the coast of America, and 350 from the island of Fernando Noronha. The highest point is only fifty feet above the level of the sea, and the entire circumference is under three-quarters of a mile. This small point rises abruptly out of the depths of the ocean. Its mineralogical constitution is not simple; in some parts the rock is of a cherty, in others of a felspathic nature, including thin veins of serpentine. It is a remarkable fact, that all the many small islands, lying far from any continent, in the Pacific, Indian, and Atlantic Oceans, with the exception of the Seychelles and this little point of rock, are, I believe, composed either of coral or of erupted matter. The volcanic nature of these oceanic islands is evidently an extension of that law, and the effect of those same causes, whether chemical or mechanical, from which it results that a vast majority of the volcanoes now in action stand either near sea-coasts or as islands in the midst of the sea.



The rocks of St. Paul appear from a distance of a brilliantly white colour. This is partly owing to the dung of a vast multitude of seafowl, and partly to a coating of a hard glossy substance with a pearly lustre, which is intimately united to the surface of the rocks. This, when examined with a lens, is found to consist of numerous exceedingly thin layers, its total thickness being about the tenth of an inch. It contains much animal matter, and its origin, no doubt, is due to the action of the rain or spray on the birds' dung. Below some small masses of guano at Ascension, and on the Abrolhos

Islets, I found certain stalactitic branching bodies, formed apparently in the same manner as the thin white coating on these rocks. The branching bodies so closely resembled in general appearance certain nulliporae (a family of hard calcareous sea-plants), that in lately looking hastily over my collection I did not perceive the difference. The globular extremities of the branches are of a pearly texture, like the enamel of teeth, but so hard as just to scratch plate-glass. I may here mention, that on a part of the coast of Ascension, where there is a vast accumulation of shelly sand, an incrustation is deposited on the tidal rocks by the water of the sea, resembling, as represented in the woodcut, certain cryptogamic plants (Marchantiae) often seen on damp walls. The surface of the fronds is beautifully glossy; and those parts formed where fully exposed to the light are of a jet black colour, but those shaded under ledges are only grey. I have shown specimens of this incrustation to several geologists, and they all thought that they were of volcanic or igneous origin! In its hardness and translucency—in its polish, equal to that of the finest oliva-shell—in the bad smell given out, and loss of colour under the blowpipe—it shows a close similarity with living sea-shells. Moreover, in sea-shells, it is known that the parts habitually covered and shaded by the mantle of the animal, are of a paler colour than those fully exposed to the light, just as is the case with this incrustation. When we remember that lime, either as a phosphate or carbonate, enters into the composition of the hard parts, such as bones and shells, of all living animals, it is an interesting physiological fact [16] to find substances harder than the enamel of teeth, and coloured surfaces as well polished as those of a fresh shell, reformed through inorganic means from dead organic matter —mocking, also, in shape, some of the lower vegetable productions.

We found on St. Paul's only two kinds of birds—the booby and the noddy. The former is a species of gannet, and the latter a tern. Both are of a tame and stupid disposition, and are so unaccustomed to visitors, that I could have killed any number of them with my geological hammer. The booby lays her eggs on the bare rock; but the tern makes a very simple nest with sea-weed. By the side of many of these nests a small flying-fish was placed; which I suppose, had been brought by the male bird for its partner. It was amusing to watch how quickly a large and active crab (Graspus), which inhabits the crevices of the rock, stole the fish from the side of the nest, as soon as we had disturbed the parent birds. Sir W. Symonds, one of the few persons who have landed here, informs me that he saw the crabs dragging even the young birds out of their nests, and devouring them. Not a single plant, not even a lichen, grows on this islet; yet it is inhabited by several insects and spiders. The following list completes, I believe, the terrestrial fauna: a fly (Olfersia) living on the booby, and a tick which must have come here as a parasite on the birds; a small brown moth, belonging to a genus that feeds on feathers; a beetle (Quedius) and a woodlouse from beneath the dung; and lastly, numerous spiders, which I suppose prey on these small attendants and scavengers of the water-fowl. The often repeated description of the stately palm and other noble tropical plants, then birds, and lastly man, taking possession of the coral islets as soon as formed, in the Pacific, is probably not correct; I fear it destroys the poetry of this story, that feather and dirt-feeding and parasitic insects and spiders should be the first inhabitants of newly formed oceanic land.

The smallest rock in the tropical seas, by giving a foundation for the growth of innumerable kinds of sea-weed and compound animals, supports likewise a large number of fish. The sharks and the seamen in the boats maintained a constant struggle which should secure the greater share of the prey caught by the fishing-lines. I have heard that a rock near the Bermudas, lying many miles out at sea, and at a considerable depth, was first discovered by the circumstance of fish having been observed in the neighbourhood.

FERNANDO NORONHA, Feb. 20th.—As far as I was enabled to observe, during the few hours we stayed at this place, the constitution of the island is volcanic, but probably not of a recent date. The most remarkable feature is a conical hill, about one thousand feet high, the upper part of which is exceedingly steep, and on one side overhangs its base. The rock is phonolite, and is divided into irregular columns. On viewing one of these isolated masses, at first one is inclined to believe that it has been suddenly pushed up in a semi-fluid state. At St. Helena, however, I ascertained that some pinnacles, of a nearly similar figure and constitution, had been formed by the injection of melted rock into yielding strata, which thus had formed the moulds for these gigantic obelisks. The whole island is covered with wood; but from the dryness of the climate there is no appearance of luxuriance. Half-way up the mountain, some great masses of the columnar rock, shaded by laurel-like trees, and ornamented by others covered with fine pink flowers but without a single leaf, gave a pleasing effect to the nearer parts of the scenery.

BAHIA, OR SAN SALVADOR. BRAZIL, Feb. 29th.—The day has passed delightfully. Delight itself, however, is a weak term to express the feelings of a naturalist who, for the first time, has wandered by himself in a Brazilian forest. The elegance of the grasses, the novelty of the parasitical plants, the beauty of the flowers, the glossy green of the foliage, but above all the general luxuriance of the vegetation, filled me with admiration. A most paradoxical mixture of sound and silence pervades the shady parts of the wood. The noise from the insects is so loud, that it may be heard even in a vessel anchored several hundred yards from the shore; yet within the recesses of the forest a universal silence appears to reign. To a person fond of natural history, such a day as this brings with it a deeper pleasure than he can ever hope to experience again. After wandering about for some hours, I returned to the landing-place; but, before reaching it, I was overtaken by a tropical storm. I tried to find shelter under a tree, which was so thick that it would never have been penetrated by common English rain; but here, in a couple of minutes, a little torrent flowed down the trunk. It is to this violence of the rain that we must attribute the verdure at the bottom of the thickest woods: if the showers were like those of a colder climate, the greater part would be absorbed or evaporated before it reached the ground. I will not at present attempt to describe the gaudy scenery of this noble bay, because, in our homeward voyage, we called here a second time, and I shall then have occasion to remark on it.

Along the whole coast of Brazil, for a length of at least 2000 miles, and certainly for a considerable space inland, wherever solid rock occurs, it belongs to a granitic formation. The circumstance of this enormous area being constituted of materials which most geologists believe to have been crystallized when heated under pressure, gives rise to many curious reflections. Was this effect produced beneath the depths of a profound ocean? or did a covering of strata formerly extend over it, which has since been removed? Can we believe that any power, acting for a time short of infinity, could have denuded the granite over so many thousand square leagues?

On a point not far from the city, where a rivulet entered the sea, I observed a fact connected with a subject discussed by Humboldt. 17 At the cataracts of the great rivers Orinoco, Nile, and Congo, the syenitic rocks are coated by a black substance, appearing as if they had been polished with plumbago. The layer is of extreme thinness; and on analysis by Berzelius it was found to consist of the oxides of manganese and iron. In the Orinoco it occurs on the rocks periodically washed by the floods, and in those parts alone where the stream is rapid; or, as the Indians say, "the rocks are black where the waters are white." Here the coating is of a rich brown instead of a black colour, and seems to be composed of ferruginous matter alone. Hand specimens fail to give a just idea of these brown burnished stones which glitter in the sun's rays. They occur only within the limits of the tidal waves; and as the rivulet slowly trickles down, the surf must supply the polishing power of the cataracts in the great rivers. In like manner, the rise and fall of the tide probably answer to the periodical inundations; and thus the same effects are produced under apparently different but really similar circumstances. The origin, however, of these coatings of metallic oxides, which seem as if cemented to the rocks, is not understood; and no reason, I believe, can be assigned for their thickness remaining the same.

One day I was amused by watching the habits of the Diodon antennatus, which was caught swimming near the shore. This fish, with its flabby skin, is well known to possess the singular power of distending itself into a nearly spherical form. After having been taken out of water for a short time, and then again immersed in it, a considerable quantity both of water and air is absorbed by the mouth, and perhaps likewise by the branchial orifices. This process is effected by two methods: the air is swallowed, and is then forced into the cavity of the body, its return being prevented by a muscular contraction which is externally visible: but the water enters in a gentle stream through the mouth, which is kept wide open and motionless; this latter action must, therefore, depend on suction. The skin about the abdomen is much looser than that on the back; hence, during the inflation, the lower surface becomes far more distended than the upper; and the fish, in consequence, floats with its back downwards. Cuvier doubts whether the Diodon in this position is able to swim; but not only can it thus move forward in a straight line, but it can turn round to either side. This latter movement is effected solely by the aid of the pectoral fins; the tail being collapsed, and not used. From the body being buoyed up with so much air, the branchial openings are out of water, but a stream drawn in by the mouth constantly flows through them.

The fish, having remained in this distended state for a short time, generally expelled the air and water with considerable force from the branchial apertures and mouth. It could emit, at will, a certain portion of the water, and it appears, therefore, probable that this fluid is taken in partly for the sake of regulating its specific gravity. This Diodon possessed several means of defence. It could give a severe bite, and could eject water from its mouth to some distance, at the same time making a curious noise by the movement of its jaws. By the inflation of its body, the papillae, with which the skin is covered, become erect and pointed. But the most curious circumstance is, that it secretes from the skin of its belly, when handled, a most beautiful carmine-red fibrous matter, which stains ivory and paper in so permanent a manner that the tint is retained with all its brightness to the present day: I am quite ignorant of the nature and use of this secretion. I have heard from Dr. Allan of Forres, that he has frequently found a Diodon, floating alive and distended, in the stomach of the shark, and that on several occasions he has known it eat its way, not only through the coats of the stomach, but through the sides of the monster, which has thus been killed. Who would ever have imagined that a little soft fish could have destroyed the great and savage shark?

March 18th.—We sailed from Bahia. A few days afterwards, when not far distant from the Abrolhos Islets, my attention was called to a reddish-brown appearance in the sea. The whole surface of the water, as it appeared under a weak lens, seemed as if covered by chopped bits of hay, with their ends jagged. These are minute cylindrical confervae, in bundles or rafts of from twenty to sixty in each. Mr. Berkeley informs me that they are the same species (Trichodesmium erythraeum) with that found over large spaces in the Red Sea, and whence its name of Red Sea is derived. [18] Their numbers must be infinite: the ship passed through several bands of them, one of which was about ten yards wide, and, judging from the mud-like colour of the water, at least two and a half miles long. In almost every long voyage some account is given of these confervae. They appear especially common in the sea near Australia; and off Cape Leeuwin I found an allied but smaller and apparently different species. Captain Cook, in his third voyage, remarks, that the sailors gave to this appearance the name of sea-sawdust.

Near Keeling Atoll, in the Indian Ocean, I observed many little masses of confervae a few inches square, consisting of long cylindrical threads of excessive thinness, so as to be barely visible to the naked eye, mingled with other rather larger bodies, finely conical at both ends. Two of these are shown in the woodcut united together. They vary in length from .04 to .06, and even to .08 of an inch in length; and in diameter from .006 to .008 of an inch. Near one extremity of the cylindrical part, a green septum, formed of granular matter, and thickest in the middle, may generally be seen. This, I believe, is the bottom of a most delicate, colourless sac, composed of a pulpy substance, which lines the exterior case, but does not extend within the extreme conical points. In some specimens, small but perfect spheres of brownish granular matter supplied the places of the septa; and I observed the curious process by which they were produced. The pulpy matter of the internal coating suddenly grouped itself into lines, some of which assumed a form radiating from a common centre; it then continued, with an irregular and rapid movement, to contract itself, so that in the course of a second the whole was united into a perfect little sphere, which occupied the position of the septum at one end of the now quite hollow case. The formation of the granular sphere was hastened by any accidental injury. I may add, that frequently a pair of these bodies were attached to each other, as represented above, cone beside cone, at that end where the septum occurs.

I will add here a few other observations connected with the discoloration of the sea from organic causes. On the coast of Chile, a few leagues north of Concepcion, the Beagle one day passed through great bands of muddy water, exactly like that of a swollen river; and again, a degree south of Valparaiso, when fifty miles from the land, the same appearance was still more extensive. Some of the water placed in a glass was of a pale reddish tint; and, examined under a microscope, was seen to swarm with minute animalcula darting about, and often exploding. Their shape is oval, and contracted in the middle by a ring of vibrating curved ciliae. It was, however, very difficult to examine them with care, for almost the instant motion ceased, even while crossing the field of vision, their bodies burst. Sometimes both ends burst at once, sometimes only one, and a quantity of coarse, brownish, granular matter was ejected. The animal an instant before bursting expanded to half again its natural size; and the explosion took place about fifteen seconds after the rapid progressive motion had ceased: in a few cases it was preceded for a short interval by a rotatory movement on the longer axis. About two minutes after any number were isolated in a drop of water, they thus perished. The animals move with the narrow apex forwards, by the aid of their vibratory

ciliae, and generally by rapid starts. They are exceedingly minute, and quite invisible to the naked eye, only covering a space equal to the square of the thousandth of an inch. Their numbers were infinite; for the smallest drop of water which I could remove contained very many. In one day we passed through two spaces of water thus stained, one of which alone must have extended over several square miles. What incalculable numbers of these microscopical animals! The colour of the water, as seen at some distance, was like that of a river which has flowed through a red clay district, but under the shade of the vessel's side it was quite as dark as chocolate. The line where the red and blue water joined was distinctly defined. The weather for some days previously had been calm, and the ocean abounded, to an unusual degree, with living creatures. 19

In the sea around Tierra del Fuego, and at no great distance from the land, I have seen narrow lines of water of a bright red colour, from the number of crustacea, which somewhat resemble in form large prawns. The sealers call them whale-food. Whether whales feed on them I do not know; but terns, cormorants, and immense herds of great unwieldy seals derive, on some parts of the coast, their chief sustenance from these swimming crabs. Seamen invariably attribute the discoloration of the water to spawn; but I found this to be the case only on one occasion. At the distance of several leagues from the Archipelago of the Galapagos, the ship sailed through three strips of a dark yellowish, or mud-like water; these strips were some miles long, but only a few yards wide, and they were separated from the surrounding water by a sinuous yet distinct margin. The colour was caused by little gelatinous balls, about the fifth of an inch in diameter, in which numerous minute spherical ovules were imbedded: they were of two distinct kinds, one being of a reddish colour and of a different shape from the other. I cannot form a conjecture as to what two kinds of animals these belonged. Captain Colnett remarks, that this appearance is very common among the Galapagos Islands, and that the directions of the bands indicate that of the currents; in the described case, however, the line was caused by the wind. The only other appearance which I have to notice, is a thin oily coat on the water which displays iridescent colours. I saw a considerable tract of the ocean thus covered on the coast of Brazil; the seamen attributed it to the putrefying carcase of some whale, which probably was floating at no great distance. I do not here mention the minute gelatinous particles, hereafter to be referred to, which are frequently dispersed throughout the water, for they are not sufficiently abundant to create any change of colour.

There are two circumstances in the above accounts which appear remarkable: first, how do the various bodies which form the bands with defined edges keep together? In the case of the prawn-like crabs, their movements were as co-instantaneous as in a regiment of soldiers; but this cannot happen from anything like voluntary action with the ovules, or the confervae, nor is it probable among the infusoria. Secondly, what causes the length and narrowness of the bands? The appearance so much resembles that which may be seen in every torrent, where the stream uncoils into long streaks the froth collected in the eddies, that I must attribute the effect to a similar action either of the currents of the air or sea. Under this supposition we must believe that the various organized bodies are produced in certain favourable places, and are thence removed by the set of either wind or water. I confess, however, there is a very great difficulty in imagining any one spot to be the birthplace of the millions of millions of animalcula and confervae: for whence come the germs at such points?—the parent bodies having been distributed by the winds and waves over the immense ocean. But on no other hypothesis can I understand their linear grouping. I may add that Scoresby remarks that green water abounding with pelagic animals is invariably found in a certain part of the Arctic Sea.

CHAPTER II — RIO DE JANEIRO

Rio de Janeiro—Excursion north of Cape Frio—Great Evaporation—Slavery—Botofogo Bay—Terrestrial Planariae—Clouds on the Corcovado—Heavy Rain—Musical Frogs—Phosphorescent

Insects—Elater, springing powers of—Blue Haze—Noise made by a Butterfly—Entomology—Ants—Wasp killing a Spider—Parasitical Spider—Artifices of an Epeira—Gregarious Spider—Spider with an unsymmetrical Web.

APRIL 4th to July 5th, 1832.—A few days after our arrival I became acquainted with an Englishman who was going to visit his estate, situated rather more than a hundred miles from the capital, to the northward of Cape Frio. I gladly accepted his kind offer of allowing me to accompany him.

April 8th.—Our party amounted to seven. The first stage was very interesting. The day was powerfully hot, and as we passed through the woods, everything was motionless, excepting the large and brilliant butterflies, which lazily fluttered about. The view seen when crossing the hills behind Praia Grande was most beautiful; the colours were intense, and the prevailing tint a dark blue; the sky and the calm waters of the bay vied with each other in splendour. After passing through some cultivated country, we entered a forest, which in the grandeur of all its parts could not be exceeded. We arrived by midday at Ithacaia; this small village is situated on a plain, and round the central house are the huts of the negroes. These, from their regular form and position, reminded me of the drawings of the Hottentot habitations in Southern Africa. As the moon rose early, we determined to start the same evening for our sleeping-place at the Lagoa Marica. As it was growing dark we passed under one of the massive, bare, and steep hills of granite which are so common in this country. This spot is notorious from having been, for a long time, the residence of some runaway slaves, who, by cultivating a little ground near the top, contrived to eke out a subsistence. At length they were discovered, and a party of soldiers being sent, the whole were seized with the exception of one old woman, who, sooner than again be led into slavery, dashed herself to pieces from the summit of the mountain. In a Roman matron this would have been called the noble love of freedom: in a poor negress it is mere brutal obstinacy. We continued riding for some hours. For the few last miles the road was intricate, and it passed through a desert waste of marshes and lagoons. The scene by the dimmed light of the moon was most desolate. A few fireflies flitted by us; and the solitary snipe, as it rose, uttered its plaintive cry. The distant and sullen roar of the sea scarcely broke the stillness of the night.

April 9th.—We left our miserable sleeping-place before sunrise. The road passed through a narrow sandy plain, lying between the sea and the interior salt lagoons. The number of beautiful fishing birds, such as egrets and cranes, and the succulent plants assuming most fantastical forms, gave to the scene an interest which it would not otherwise have possessed. The few stunted trees were loaded with parasitical plants, among which the beauty and delicious fragrance of some of the orchideae were most to be admired. As the sun rose, the day became extremely hot, and the reflection of the light and heat from the white sand was very distressing. We dined at Mandetiba; the thermometer in the shade being 84 degs. The beautiful view of the distant wooded hills, reflected in the perfectly calm water of an extensive lagoon, quite refreshed us. As the venda [21] here was a very good one, and I have the pleasant, but rare remembrance, of an excellent dinner, I will be grateful and presently describe it, as the type of its class. These houses are often large, and are built of thick upright posts, with boughs interwoven, and afterwards plastered. They seldom have floors, and never glazed windows; but are generally pretty well roofed. Universally the front part is open, forming a kind of verandah, in which tables and benches are placed. The bed-rooms join on each side, and here the passenger may sleep as comfortably as he can, on a wooden platform, covered by a thin straw mat. The venda stands in a courtyard, where the horses are fed. On first arriving it was our custom to unsaddle the horses and give them their Indian corn; then, with a low bow, to ask the senhor to do us the favour to give up something to eat. "Anything you choose, sir," was his usual answer. For the few first times, vainly I thanked providence for having guided us to so good a man. The conversation proceeding, the case universally became deplorable. "Any fish can you do us the favour of giving ?"—"Oh! no, sir."—"Any soup?"—"No, sir."—"Any bread?"—"Oh! no, sir."—"Any dried meat?"—"Oh! no, sir." If we were lucky, by waiting a couple of hours, we obtained fowls, rice, and farinha. It not unfrequently happened, that we were obliged to kill, with stones, the poultry for our own supper. When, thoroughly exhausted by fatigue and hunger, we timorously hinted that we should be glad of our meal, the pompous, and (though true) most unsatisfactory answer was, "It will be ready when it is ready." If we had dared to remonstrate any further, we should have been told to proceed on our journey, as being too impertinent. The hosts are most ungracious and disagreeable in their manners; their houses and their persons are often filthily

dirty; the want of the accommodation of forks, knives, and spoons is common; and I am sure no cottage or hovel in England could be found in a state so utterly destitute of every comfort. At Campos Novos, however, we fared sumptuously; having rice and fowls, biscuit, wine, and spirits, for dinner; coffee in the evening, and fish with coffee for breakfast. All this, with good food for the horses, only cost 2s. 6d. per head. Yet the host of this venda, being asked if he knew anything of a whip which one of the party had lost, gruffly answered, "How should I know? why did you not take care of it?—I suppose the dogs have eaten it."

Leaving Mandetiba, we continued to pass through an intricate wilderness of lakes; in some of which were fresh, in others salt water shells. Of the former kinds, I found a Limnaea in great numbers in a lake, into which, the inhabitants assured me that the sea enters once a year, and sometimes oftener, and makes the water quite salt. I have no doubt many interesting facts, in relation to marine and fresh water animals, might be observed in this chain of lagoons, which skirt the coast of Brazil. M. Gay [22] has stated that he found in the neighbourhood of Rio, shells of the marine genera solen and mytilus, and fresh water ampullariae, living together in brackish water. I also frequently observed in the lagoon near the Botanic Garden, where the water is only a little less salt than in the sea, a species of hydrophilus, very similar to a water-beetle common in the ditches of England: in the same lake the only shell belonged to a genus generally found in estuaries.

Leaving the coast for a time, we again entered the forest. The trees were very lofty, and remarkable, compared with those of Europe, from the whiteness of their trunks. I see by my note-book, "wonderful and beautiful, flowering parasites," invariably struck me as the most novel object in these grand scenes. Travelling onwards we passed through tracts of pasturage, much injured by the enormous conical ants' nests, which were nearly twelve feet high. They gave to the plain exactly the appearance of the mud volcanos at Jorullo, as figured by Humboldt. We arrived at Engenhodo after it was dark, having been ten hours on horseback. I never ceased, during the whole journey, to be surprised at the amount of labour which the horses were capable of enduring; they appeared also to recover from any injury much sooner than those of our English breed. The Vampire bat is often the cause of much trouble, by biting the horses on their withers. The injury is generally not so much owing to the loss of blood, as to the inflammation which the pressure of the saddle afterwards produces. The whole circumstance has lately been doubted in England; I was therefore fortunate in being present when one (Desmodus d'orbignyi, Wat.) was actually caught on a horse's back. We were bivouacking late one evening near Coquimbo, in Chile, when my servant, noticing that one of the horses was very restive, went to see what was the matter, and fancying he could distinguish something, suddenly put his hand on the beast's withers, and secured the vampire. In the morning the spot where the bite had been inflicted was easily distinguished from being slightly swollen and bloody. The third day afterwards we rode the horse, without any ill effects.

April 13th.—After three days' travelling we arrived at Socego, the estate of Senhor Manuel Figureda, a relation of one of our party. The house was simple, and, though like a barn in form, was well suited to the climate. In the sitting-room gilded chairs and sofas were oddly contrasted with the whitewashed walls, thatched roof, and windows without glass. The house, together with the granaries, the stables, and workshops for the blacks, who had been taught various trades, formed a rude kind of quadrangle; in the centre of which a large pile of coffee was drying. These buildings stand on a little hill, overlooking the cultivated ground, and surrounded on every side by a wall of dark green luxuriant forest. The chief produce of this part of the country is coffee. Each tree is supposed to yield annually, on an average, two pounds; but some give as much as eight. Mandioca or cassada is likewise cultivated in great quantity. Every part of this plant is useful; the leaves and stalks are eaten by the horses, and the roots are ground into a pulp, which, when pressed dry and baked, forms the farinha, the principal article of sustenance in the Brazils. It is a curious, though well-known fact, that the juice of this most nutritious plant is highly poisonous. A few years ago a cow died at this Fazenda, in consequence of having drunk some of it. Senhor Figureda told me that he had planted, the year before, one bag of feijao or beans, and three of rice; the former of which produced eighty, and the latter three hundred and twenty fold. The pasturage supports a fine stock of cattle, and the woods are so full of game that a deer had been killed on each of the three previous days. This profusion of food showed itself at dinner, where, if the tables did not groan, the guests surely did; for each person is expected to eat of every dish. One day, having, as I thought, nicely calculated so that nothing should go away untasted, to my utter dismay a roast turkey and a pig appeared in all their substantial reality. During the meals, it was the employment of a man to drive

out of the room sundry old hounds, and dozens of little black children, which crawled in together, at every opportunity. As long as the idea of slavery could be banished, there was something exceedingly fascinating in this simple and patriarchal style of living: it was such a perfect retirement and independence from the rest of the world.

As soon as any stranger is seen arriving, a large bell is set tolling, and generally some small cannon are fired. The event is thus announced to the rocks and woods, but to nothing else. One morning I walked out an hour before daylight to admire the solemn stillness of the scene; at last, the silence was broken by the morning hymn, raised on high by the whole body of the blacks; and in this manner their daily work is generally begun. On such fazendas as these, I have no doubt the slaves pass happy and contented lives. On Saturday and Sunday they work for themselves, and in this fertile climate the labour of two days is sufficient to support a man and his family for the whole week.

April 14th.—Leaving Socego, we rode to another estate on the Rio Macae, which was the last patch of cultivated ground in that direction. The estate was two and a half miles long, and the owner had forgotten how many broad. Only a very small piece had been cleared, yet almost every acre was capable of yielding all the various rich productions of a tropical land. Considering the enormous area of Brazil, the proportion of cultivated ground can scarcely be considered as anything, compared to that which is left in the state of nature: at some future age, how vast a population it will support! During the second day's journey we found the road so shut up, that it was necessary that a man should go ahead with a sword to cut away the creepers. The forest abounded with beautiful objects; among which the tree ferns, though not large, were, from their bright green foliage, and the elegant curvature of their fronds, most worthy of admiration. In the evening it rained very heavily, and although the thermometer stood at 65 degs., I felt very cold. As soon as the rain ceased, it was curious to observe the extraordinary evaporation which commenced over the whole extent of the forest. At the height of a hundred feet the hills were buried in a dense white vapour, which rose like columns of smoke from the most thickly wooded parts, and especially from the valleys. I observed this phenomenon on several occasions. I suppose it is owing to the large surface of foliage, previously heated by the sun's rays.

While staying at this estate, I was very nearly being an eye-witness to one of those atrocious acts which can only take place in a slave country. Owing to a quarrel and a lawsuit, the owner was on the point of taking all the women and children from the male slaves, and selling them separately at the public auction at Rio. Interest, and not any feeling of compassion, prevented this act. Indeed, I do not believe the inhumanity of separating thirty families, who had lived together for many years, even occurred to the owner. Yet I will pledge myself, that in humanity and good feeling he was superior to the common run of men. It may be said there exists no limit to the blindness of interest and selfish habit. I may mention one very trifling anecdote, which at the time struck me more forcibly than any story of cruelty. I was crossing a ferry with a negro, who was uncommonly stupid. In endeavouring to make him understand, I talked loud, and made signs, in doing which I passed my hand near his face. He, I suppose, thought I was in a passion, and was going to strike him; for instantly, with a frightened look and half-shut eyes, he dropped his hands. I shall never forget my feelings of surprise, disgust, and shame, at seeing a great powerful man afraid even to ward off a blow, directed, as he thought, at his face. This man had been trained to a degradation lower than the slavery of the most helpless animal.

April 18th.—In returning we spent two days at Socego, and I employed them in collecting insects in the forest. The greater number of trees, although so lofty, are not more than three or four feet in circumference. There are, of course, a few of much greater dimensions. Senhor Manuel was then making a canoe 70 feet in length from a solid trunk, which had originally been 110 feet long, and of great thickness. The contrast of palm trees, growing amidst the common branching kinds, never fails to give the scene an intertropical character. Here the woods were ornamented by the Cabbage Palm —one of the most beautiful of its family. With a stem so narrow that it might be clasped with the two hands, it waves its elegant head at the height of forty or fifty feet above the ground. The woody creepers, themselves covered by other creepers, were of great thickness: some which I measured were two feet in circumference. Many of the older trees presented a very curious appearance from the tresses of a liana hanging from their boughs, and resembling bundles of hay. If the eye was turned from the world of foliage above, to the ground beneath, it was attracted by the extreme

elegance of the leaves of the ferns and mimosae. The latter, in some parts, covered the surface with a brushwood only a few inches high. In walking across these thick beds of mimosae, a broad track was marked by the change of shade, produced by the drooping of their sensitive petioles. It is easy to specify the individual objects of admiration in these grand scenes; but it is not possible to give an adequate idea of the higher feelings of wonder, astonishment, and devotion, which fill and elevate the mind.

April 19th.—Leaving Socego, during the two first days, we retraced our steps. It was very wearisome work, as the road generally ran across a glaring hot sandy plain, not far from the coast. I noticed that each time the horse put its foot on the fine siliceous sand, a gentle chirping noise was produced. On the third day we took a different line, and passed through the gay little village of Madre de Deos. This is one of the principal lines of road in Brazil; yet it was in so bad a state that no wheeled vehicle, excepting the clumsy bullock-wagon, could pass along. In our whole journey we did not cross a single bridge built of stone; and those made of logs of wood were frequently so much out of repair, that it was necessary to go on one side to avoid them. All distances are inaccurately known. The road is often marked by crosses, in the place of milestones, to signify where human blood has been spilled. On the evening of the 23rd we arrived at Rio, having finished our pleasant little excursion.

During the remainder of my stay at Rio, I resided in a cottage at Botofogo Bay. It was impossible to wish for anything more delightful than thus to spend some weeks in so magnificent a country. In England any person fond of natural history enjoys in his walks a great advantage, by always having something to attract his attention; but in these fertile climates, teeming with life, the attractions are so numerous, that he is scarcely able to walk at all.

The few observations which I was enabled to make were almost exclusively confined to the invertebrate animals. The existence of a division of the genus Planaria, which inhabits the dry land, interested me much. These animals are of so simple a structure, that Cuvier has arranged them with the intestinal worms, though never found within the bodies of other animals. Numerous species inhabit both salt and fresh water; but those to which I allude were found, even in the drier parts of the forest, beneath logs of rotten wood, on which I believe they feed. In general form they resemble little slugs, but are very much narrower in proportion, and several of the species are beautifully coloured with longitudinal stripes. Their structure is very simple: near the middle of the under or crawling surface there are two small transverse slits, from the anterior one of which a funnel-shaped and highly irritable mouth can be protruded. For some time after the rest of the animal was completely dead from the effects of salt water or any other cause, this organ still retained its vitality.

I found no less than twelve different species of terrestrial Planariae in different parts of the southern hemisphere. 23 Some specimens which I obtained at Van Dieman's Land, I kept alive for nearly two months, feeding them on rotten wood. Having cut one of them transversely into two nearly equal parts, in the course of a fortnight both had the shape of perfect animals. I had, however, so divided the body, that one of the halves contained both the inferior orifices, and the other, in consequence, none. In the course of twenty-five days from the operation, the more perfect half could not have been distinguished from any other specimen. The other had increased much in size; and towards its posterior end, a clear space was formed in the parenchymatous mass, in which a rudimentary cup-shaped mouth could clearly be distinguished; on the under surface, however, no corresponding slit was yet open. If the increased heat of the weather, as we approached the equator, had not destroyed all the individuals, there can be no doubt that this last step would have completed its structure. Although so well-known an experiment, it was interesting to watch the gradual production of every essential organ, out of the simple extremity of another animal. It is extremely difficult to preserve these Planariae; as soon as the cessation of life allows the ordinary laws of change to act, their entire bodies become soft and fluid, with a rapidity which I have never seen equalled.

I first visited the forest in which these Planariae were found, in company with an old Portuguese priest who took me out to hunt with him. The sport consisted in turning into the cover a few dogs, and then patiently waiting to fire at any animal which might appear. We were accompanied by the son of a neighbouring farmer—a good specimen of a wild Brazilian youth. He was dressed in a tattered old shirt and trousers, and had his head uncovered: he carried an old-fashioned gun and a

large knife. The habit of carrying the knife is universal; and in traversing a thick wood it is almost necessary, on account of the creeping plants. The frequent occurrence of murder may be partly attributed to this habit. The Brazilians are so dexterous with the knife, that they can throw it to some distance with precision, and with sufficient force to cause a fatal wound. I have seen a number of little boys practising this art as a game of play and from their skill in hitting an upright stick, they promised well for more earnest attempts. My companion, the day before, had shot two large bearded monkeys. These animals have prehensile tails, the extremity of which, even after death, can support the whole weight of the body. One of them thus remained fast to a branch, and it was necessary to cut down a large tree to procure it. This was soon effected, and down came tree and monkey with an awful crash. Our day's sport, besides the monkey, was confined to sundry small green parrots and a few toucans. I profited, however, by my acquaintance with the Portuguese padre, for on another occasion he gave me a fine specimen of the Yagouaroundi cat.

Every one has heard of the beauty of the scenery near Botofogo. The house in which I lived was seated close beneath the well-known mountain of the Corcovado. It has been remarked, with much truth, that abruptly conical hills are characteristic of the formation which Humboldt designates as gneiss-granite. Nothing can be more striking than the effect of these huge rounded masses of naked rock rising out of the most luxuriant vegetation.

I was often interested by watching the clouds, which, rolling in from seaward, formed a bank just beneath the highest point of the Corcovado. This mountain, like most others, when thus partly veiled, appeared to rise to a far prouder elevation than its real height of 2300 feet. Mr. Daniell has observed, in his meteorological essays, that a cloud sometimes appears fixed on a mountain summit, while the wind continues to blow over it. The same phenomenon here presented a slightly different appearance. In this case the cloud was clearly seen to curl over, and rapidly pass by the summit, and yet was neither diminished nor increased in size. The sun was setting, and a gentle southerly breeze, striking against the southern side of the rock, mingled its current with the colder air above; and the vapour was thus condensed; but as the light wreaths of cloud passed over the ridge, and came within the influence of the warmer atmosphere of the northern sloping bank, they were immediately re-dissolved.

The climate, during the months of May and June, or the beginning of winter, was delightful. The mean temperature, from observations taken at nine o'clock, both morning and evening, was only 72 degs. It often rained heavily, but the drying southerly winds soon again rendered the walks pleasant. One morning, in the course of six hours, 1.6 inches of rain fell. As this storm passed over the forests which surround the Corcovado, the sound produced by the drops pattering on the countless multitude of leaves was very remarkable, it could be heard at the distance of a quarter of a mile, and was like the rushing of a great body of water. After the hotter days, it was delicious to sit quietly in the garden and watch the evening pass into night. Nature, in these climes, chooses her vocalists from more humble performers than in Europe. A small frog, of the genus Hyla, sits on a blade of grass about an inch above the surface of the water, and sends forth a pleasing chirp: when several are together they sing in harmony on different notes. I had some difficulty in catching a specimen of this frog. The genus Hyla has its toes terminated by small suckers; and I found this animal could crawl up a pane of glass, when placed absolutely perpendicular. Various cicidae and crickets, at the same time, keep up a ceaseless shrill cry, but which, softened by the distance, is not unpleasant. Every evening after dark this great concert commenced; and often have I sat listening to it, until my attention has been drawn away by some curious passing insect.

At these times the fireflies are seen flitting about from hedge to hedge. On a dark night the light can be seen at about two hundred paces distant. It is remarkable that in all the different kinds of glowworms, shining elaters, and various marine animals (such as the crustacea, medusae, nereidae, a coralline of the genus Clytia, and Pyrosma), which I have observed, the light has been of a well-marked green colour. All the fireflies, which I caught here, belonged to the Lampyridae (in which family the English glowworm is included), and the greater number of specimens were of Lampyris occidentalis. 24 I found that this insect emitted the most brilliant flashes when irritated: in the intervals, the abdominal rings were obscured. The flash was almost co-instantaneous in the two rings, but it was just perceptible first in the anterior one. The shining matter was fluid and very adhesive: little spots, where the skin had been torn, continued bright with a slight scintillation, whilst the uninjured parts were obscured. When the insect was decapitated the rings remained

uninterruptedly bright, but not so brilliant as before: local irritation with a needle always increased the vividness of the light. The rings in one instance retained their luminous property nearly twenty-four hours after the death of the insect. From these facts it would appear probable, that the animal has only the power of concealing or extinguishing the light for short intervals, and that at other times the display is involuntary. On the muddy and wet gravel-walks I found the larvae of this lampyris in great numbers: they resembled in general form the female of the English glowworm. These larvae possessed but feeble luminous powers; very differently from their parents, on the slightest touch they feigned death and ceased to shine; nor did irritation excite any fresh display. I kept several of them alive for some time: their tails are very singular organs, for they act, by a well-fitted contrivance, as suckers or organs of attachment, and likewise as reservoirs for saliva, or some such fluid. I repeatedly fed them on raw meat; and I invariably observed, that every now and then the extremity of the tail was applied to the mouth, and a drop of fluid exuded on the meat, which was then in the act of being consumed. The tail, notwithstanding so much practice, does not seem to be able to find its way to the mouth; at least the neck was always touched first, and apparently as a guide.

When we were at Bahia, an elater or beetle (Pyrophorus luminosus, Illig.) seemed the most common luminous insect. The light in this case was also rendered more brilliant by irritation. I amused myself one day by observing the springing powers of this insect, which have not, as it appears to me, been properly described. [25] The elater, when placed on its back and preparing to spring, moved its head and thorax backwards, so that the pectoral spine was drawn out, and rested on the edge of its sheath. The same backward movement being continued, the spine, by the full action of the muscles, was bent like a spring; and the insect at this moment rested on the extremity of its head and wing-cases. The effort being suddenly relaxed, the head and thorax flew up, and in consequence, the base of the wing-cases struck the supporting surface with such force, that the insect by the reaction was jerked upwards to the height of one or two inches. The projecting points of the thorax, and the sheath of the spine, served to steady the whole body during the spring. In the descriptions which I have read, sufficient stress does not appear to have been laid on the elasticity of the spine: so sudden a spring could not be the result of simple muscular contraction, without the aid of some mechanical contrivance.

On several occasions I enjoyed some short but most pleasant excursions in the neighbouring country. One day I went to the Botanic Garden, where many plants, well known for their great utility, might be seen growing. The leaves of the camphor, pepper, cinnamon, and clove trees were delightfully aromatic; and the bread-fruit, the jaca, and the mango, vied with each other in the magnificence of their foliage. The landscape in the neighbourhood of Bahia almost takes its character from the two latter trees. Before seeing them, I had no idea that any trees could cast so black a shade on the ground. Both of them bear to the evergreen vegetation of these climates the same kind of relation which laurels and hollies in England do to the lighter green of the deciduous trees. It may be observed, that the houses within the tropics are surrounded by the most beautiful forms of vegetation, because many of them are at the same time most useful to man. Who can doubt that these qualities are united in the banana, the cocoa-nut, the many kinds of palm, the orange, and the bread-fruit tree?

During this day I was particularly struck with a remark of Humboldt's, who often alludes to "the thin vapour which, without changing the transparency of the air, renders its tints more harmonious, and softens its effects." This is an appearance which I have never observed in the temperate zones. The atmosphere, seen through a short space of half or three-quarters of a mile, was perfectly lucid, but at a greater distance all colours were blended into a most beautiful haze, of a pale French grey, mingled with a little blue. The condition of the atmosphere between the morning and about noon, when the effect was most evident, had undergone little change, excepting in its dryness. In the interval, the difference between the dew point and temperature had increased from 7.5 to 17 degs.

On another occasion I started early and walked to the Gavia, or topsail mountain. The air was delightfully cool and fragrant; and the drops of dew still glittered on the leaves of the large liliaceous plants, which shaded the streamlets of clear water. Sitting down on a block of granite, it was delightful to watch the various insects and birds as they flew past. The humming-bird seems particularly fond of such shady retired spots. Whenever I saw these little creatures buzzing round a

flower, with their wings vibrating so rapidly as to be scarcely visible, I was reminded of the sphinx moths: their movements and habits are indeed in many respects very similar.

Following a pathway, I entered a noble forest, and from a height of five or six hundred feet, one of those splendid views was presented, which are so common on every side of Rio. At this elevation the landscape attains its most brilliant tint; and every form, every shade, so completely surpasses in magnificence all that the European has ever beheld in his own country, that he knows not how to express his feelings. The general effect frequently recalled to my mind the gayest scenery of the Opera-house or the great theatres. I never returned from these excursions empty-handed. This day I found a specimen of a curious fungus, called Hymenophallus. Most people know the English Phallus, which in autumn taints the air with its odious smell: this, however, as the entomologist is aware, is, to some of our beetles a delightful fragrance. So was it here; for a Strongylus, attracted by the odour, alighted on the fungus as I carried it in my hand. We here see in two distant countries a similar relation between plants and insects of the same families, though the species of both are different. When man is the agent in introducing into a country a new species, this relation is often broken: as one instance of this I may mention, that the leaves of the cabbages and lettuces, which in England afford food to such a multitude of slugs and caterpillars, in the gardens near Rio are untouched.

During our stay at Brazil I made a large collection of insects. A few general observations on the comparative importance of the different orders may be interesting to the English entomologist. The large and brilliantly coloured Lepidoptera bespeak the zone they inhabit, far more plainly than any other race of animals. I allude only to the butterflies; for the moths, contrary to what might have been expected from the rankness of the vegetation, certainly appeared in much fewer numbers than in our own temperate regions. I was much surprised at the habits of Papilio feronia. This butterfly is not uncommon, and generally frequents the orange-groves. Although a high flier, yet it very frequently alights on the trunks of trees. On these occasions its head is invariably placed downwards; and its wings are expanded in a horizontal plane, instead of being folded vertically, as is commonly the case. This is the only butterfly which I have ever seen, that uses its legs for running. Not being aware of this fact, the insect, more than once, as I cautiously approached with my forceps, shuffled on one side just as the instrument was on the point of closing, and thus escaped. But a far more singular fact is the power which this species possesses of making a noise. [26] Several times when a pair, probably male and female, were chasing each other in an irregular course, they passed within a few yards of me; and I distinctly heard a clicking noise, similar to that produced by a toothed wheel passing under a spring catch. The noise was continued at short intervals, and could be distinguished at about twenty yards' distance: I am certain there is no error in the observation.

I was disappointed in the general aspect of the Coleoptera. The number of minute and obscurely coloured beetles is exceedingly great. [27] The cabinets of Europe can, as yet, boast only of the larger species from tropical climates. It is sufficient to disturb the composure of an entomologist's mind, to look forward to the future dimensions of a complete catalogue. The carnivorous beetles, or Carabidae, appear in extremely few numbers within the tropics: this is the more remarkable when compared to the case of the carnivorous quadrupeds, which are so abundant in hot countries. I was struck with this observation both on entering Brazil, and when I saw the many elegant and active forms of the Harpalidae re-appearing on the temperate plains of La Plata. Do the very numerous spiders and rapacious Hymenoptera supply the place of the carnivorous beetles? The carrion-feeders and Brachelytra are very uncommon; on the other hand, the Rhyncophora and Chrysomelidae, all of which depend on the vegetable world for subsistence, are present in astonishing numbers. I do not here refer to the number of different species, but to that of the individual insects; for on this it is that the most striking character in the entomology of different countries depends. The orders Orthoptera and Hemiptera are particularly numerous; as likewise is the stinging division of the Hymenoptera the bees, perhaps, being excepted. A person, on first entering a tropical forest, is astonished at the labours of the ants: well-beaten paths branch off in every direction, on which an army of never-failing foragers may be seen, some going forth, and others returning, burdened with pieces of green leaf, often larger than their own bodies.

A small dark-coloured ant sometimes migrates in countless numbers. One day, at Bahia, my attention was drawn by observing many spiders, cockroaches, and other insects, and some lizards, rushing in the greatest agitation across a bare piece of ground. A little way behind, every stalk and

leaf was blackened by a small ant. The swarm having crossed the bare space, divided itself, and descended an old wall. By this means many insects were fairly enclosed; and the efforts which the poor little creatures made to extricate themselves from such a death were wonderful. When the ants came to the road they changed their course, and in narrow files reascended the wall. Having placed a small stone so as to intercept one of the lines, the whole body attacked it, and then immediately retired. Shortly afterwards another body came to the charge, and again having failed to make any impression, this line of march was entirely given up. By going an inch round, the file might have avoided the stone, and this doubtless would have happened, if it had been originally there: but having been attacked, the lion-hearted little warriors scorned the idea of yielding.

Certain wasp-like insects, which construct in the corners of the verandahs clay cells for their larvae, are very numerous in the neighbourhood of Rio. These cells they stuff full of half-dead spiders and caterpillars, which they seem wonderfully to know how to sting to that degree as to leave them paralysed but alive, until their eggs are hatched; and the larvae feed on the horrid mass of powerless, half-killed victims—a sight which has been described by an enthusiastic naturalist [28] as curious and pleasing! I was much interested one day by watching a deadly contest between a Pepsis and a large spider of the genus Lycosa. The wasp made a sudden dash at its prey, and then flew away: the spider was evidently wounded, for, trying to escape, it rolled down a little slope, but had still strength sufficient to crawl into a thick tuft of grass. The wasp soon returned, and seemed surprised at not immediately finding its victim. It then commenced as regular a hunt as ever hound did after fox; making short semicircular casts, and all the time rapidly vibrating its wings and antennae. The spider, though well concealed, was soon discovered, and the wasp, evidently still afraid of its adversary's jaws, after much manoeuvring, inflicted two stings on the under side of its thorax. At last, carefully examining with its antennae the now motionless spider, it proceeded to drag away the body. But I stopped both tyrant and prey. [29]

The number of spiders, in proportion to other insects, is here compared with England very much larger; perhaps more so than with any other division of the articulate animals. The variety of species among the jumping spiders appears almost infinite. The genus, or rather family, of Epeira, is here characterized by many singular forms; some species have pointed coriaceous shells, others enlarged and spiny tibiae. Every path in the forest is barricaded with the strong yellow web of a species, belonging to the same division with the Epeira clavipes of Fabricius, which was formerly said by Sloane to make, in the West Indies, webs so strong as to catch birds. A small and pretty kind of spider, with very long fore-legs, and which appears to belong to an undescribed genus, lives as a parasite on almost every one of these webs. I suppose it is too insignificant to be noticed by the great Epeira, and is therefore allowed to prey on the minute insects, which, adhering to the lines, would otherwise be wasted. When frightened, this little spider either feigns death by extending its front legs, or suddenly drops from the web. A large Epeira of the same division with Epeira tuberculata and conica is extremely common, especially in dry situations. Its web, which is generally placed among the great leaves of the common agave, is sometimes strengthened near the centre by a pair or even four zigzag ribbons, which connect two adjoining rays. When any large insect, as a grasshopper or wasp, is caught, the spider, by a dexterous movement, makes it revolve very rapidly, and at the same time emitting a band of threads from its spinners, soon envelops its prey in a case like the cocoon of a silkworm. The spider now examines the powerless victim, and gives the fatal bite on the hinder part of its thorax; then retreating, patiently waits till the poison has taken effect. The virulence of this poison may be judged of from the fact that in half a minute I opened the mesh, and found a large wasp quite lifeless. This Epeira always stands with its head downwards near the centre of the web. When disturbed, it acts differently according to circumstances: if there is a thicket below, it suddenly falls down; and I have distinctly seen the thread from the spinners lengthened by the animal while yet stationary, as preparatory to its fall. If the ground is clear beneath, the Epeira seldom falls, but moves quickly through a central passage from one to the other side. When still further disturbed, it practises a most curious manoeuvre: standing in the middle, it violently jerks the web, which it attached to elastic twigs, till at last the whole acquires such a rapid vibratory movement, that even the outline of the spider's body becomes indistinct.

It is well known that most of the British spiders, when a large insect is caught in their webs, endeavour to cut the lines and liberate their prey, to save their nets from being entirely spoiled. I once, however, saw in a hothouse in Shropshire a large female wasp caught in the irregular web of a quite small spider; and this spider, instead of cutting the web, most perseveringly continued to

entangle the body, and especially the wings, of its prey. The wasp at first aimed in vain repeated thrusts with its sting at its little antagonist. Pitying the wasp, after allowing it to struggle for more than an hour, I killed it and put it back into the web. The spider soon returned; and an hour afterwards I was much surprised to find it with its jaws buried in the orifice, through which the sting is protruded by the living wasp. I drove the spider away two or three times, but for the next twenty-four hours I always found it again sucking at the same place. The spider became much distended by the juices of its prey, which was many times larger than itself.

I may here just mention, that I found, near St. Fe Bajada, many large black spiders, with ruby-coloured marks on their backs, having gregarious habits. The webs were placed vertically, as is invariably the case with the genus Epeira: they were separated from each other by a space of about two feet, but were all attached to certain common lines, which were of great length, and extended to all parts of the community. In this manner the tops of some large bushes were encompassed by the united nets. Azara 210 has described a gregarious spider in Paraguay, which Walckanaer thinks must be a Theridion, but probably it is an Epeira, and perhaps even the same species with mine. I cannot, however, recollect seeing a central nest as large as a hat, in which, during autumn, when the spiders die, Azara says the eggs are deposited. As all the spiders which I saw were of the same size, they must have been nearly of the same age. This gregarious habit, in so typical a genus as Epeira, among insects, which are so bloodthirsty and solitary that even the two sexes attack each other, is a very singular fact.

In a lofty valley of the Cordillera, near Mendoza, I found another spider with a singularly-formed web. Strong lines radiated in a vertical plane from a common centre, where the insect had its station; but only two of the rays were connected by a symmetrical mesh-work; so that the net, instead of being, as is generally the case, circular, consisted of a wedge-shaped segment. All the webs were similarly constructed.

CHAPTER III — MALDONADO

Monte Video—Excursion to R. Polanco—Lazo and Bolas—Partridges— Absence of Trees—Deer —Capybara, or River Hog—Tucutuco—Molothrus, cuckoo-like habits—Tyrant-flycatcher— Mocking-bird—Carrion Hawks— Tubes formed by Lightning—House struck.

JULY 5th, 1832—In the morning we got under way, and stood out of the splendid harbour of Rio de Janeiro. In our passage to the Plata, we saw nothing particular, excepting on one day a great shoal of porpoises, many hundreds in number. The whole sea was in places furrowed by them; and a most extraordinary spectacle was presented, as hundreds, proceeding together by jumps, in which their whole bodies were exposed, thus cut the water. When the ship was running nine knots an hour, these animals could cross and recross the bows with the greatest of ease, and then dash away right ahead. As soon as we entered the estuary of the Plata, the weather was very unsettled. One dark night we were surrounded by numerous seals and penguins, which made such strange noises, that the officer on watch reported he could hear the cattle bellowing on shore. On a second night we witnessed a splendid scene of natural fireworks; the mast-head and yard-arm-ends shone with St. Elmo's light; and the form of the vane could almost be traced, as if it had been rubbed with phosphorus. The sea was so highly luminous, that the tracks of the penguins were marked by a fiery wake, and the darkness of the sky was momentarily illuminated by the most vivid lightning.

When within the mouth of the river, I was interested by observing how slowly the waters of the sea and river mixed. The latter, muddy and discoloured, from its less specific gravity, floated on the surface of the salt water. This was curiously exhibited in the wake of the vessel, where a line of blue water was seen mingling in little eddies, with the adjoining fluid.

July 26th.—We anchored at Monte Video. The Beagle was employed in surveying the extreme southern and eastern coasts of America, south of the Plata, during the two succeeding years. To prevent useless repetitions, I will extract those parts of my journal which refer to the same districts without always attending to the order in which we visited them.

MALDONADO is situated on the northern bank of the Plata, and not very far from the mouth of the estuary. It is a most quiet, forlorn, little town; built, as is universally the case in these countries, with the streets running at right angles to each other, and having in the middle a large plaza or square, which, from its size, renders the scantiness of the population more evident. It possesses scarcely any trade; the exports being confined to a few hides and living cattle. The inhabitants are chiefly landowners, together with a few shopkeepers and the necessary tradesmen, such as blacksmiths and carpenters, who do nearly all the business for a circuit of fifty miles round. The town is separated from the river by a band of sand-hillocks, about a mile broad: it is surrounded, on all other sides, by an open slightly-undulating country, covered by one uniform layer of fine green turf, on which countless herds of cattle, sheep, and horses graze. There is very little land cultivated even close to the town. A few hedges, made of cacti and agave, mark out where some wheat or Indian corn has been planted. The features of the country are very similar along the whole northern bank of the Plata. The only difference is, that here the granitic hills are a little bolder. The scenery is very uninteresting; there is scarcely a house, an enclosed piece of ground, or even a tree, to give it an air of cheerfulness Yet, after being imprisoned for some time in a ship, there is a charm in the unconfined feeling of walking over boundless plains of turf. Moreover, if your view is limited to a small space, many objects possess beauty. Some of the smaller birds are brilliantly coloured; and the bright green sward, browsed short by the cattle, is ornamented by dwarf flowers, among which a plant, looking like the daisy, claimed the place of an old friend. What would a florist say to whole tracts, so thickly covered by the Verbena melindres, as, even at a distance, to appear of the most gaudy scarlet?

I stayed ten weeks at Maldonado, in which time a nearly perfect collection of the animals, birds, and reptiles, was procured. Before making any observations respecting them, I will give an account of a little excursion I made as far as the river Polanco, which is about seventy miles distant, in a northerly direction. I may mention, as a proof how cheap everything is in this country, that I paid only two dollars a day, or eight shillings, for two men, together with a troop of about a dozen riding-horses. My companions were well armed with pistols and sabres; a precaution which I thought rather unnecessary but the first piece of news we heard was, that, the day before, a traveller from Monte Video had been found dead on the road, with his throat cut. This happened close to a cross, the record of a former murder.

On the first night we slept at a retired little country-house; and there I soon found out that I possessed two or three articles, especially a pocket compass, which created unbounded astonishment. In every house I was asked to show the compass, and by its aid, together with a map, to point out the direction of various places. It excited the liveliest admiration that I, a perfect stranger, should know the road (for direction and road are synonymous in this open country) to places where I had never been. At one house a young woman, who was ill in bed, sent to entreat me to come and show her the compass. If their surprise was great, mine was greater, to find such ignorance among people who possessed their thousands of cattle, and "estancias" of great extent. It can only be accounted for by the circumstance that this retired part of the country is seldom visited by foreigners. I was asked whether the earth or sun moved; whether it was hotter or colder to the north; where Spain was, and many other such questions. The greater number of the inhabitants had an indistinct idea that England, London, and North America, were different names for the same place; but the better informed well knew that London and North America were separate countries close together, and that England was a large town in London! I carried with me some promethean matches, which I ignited by biting; it was thought so wonderful that a man should strike fire with his teeth, that it was usual to collect the whole family to see it: I was once offered a dollar for a single one. Washing my face in the morning caused much speculation at the village of Las Minas; a superior tradesman closely cross-questioned me about so singular a practice; and likewise why on board we wore our beards; for he had heard from my guide that we did so. He eyed me with much suspicion; perhaps he had heard of ablutions in the Mahomedan religion, and knowing me to be a heretick, probably he came to the conclusion that all hereticks were Turks. It is the general custom in this country to ask for a night's lodging at the first convenient house. The astonishment at the

compass, and my other feats of jugglery, was to a certain degree advantageous, as with that, and the long stories my guides told of my breaking stones, knowing venomous from harmless snakes, collecting insects, etc., I repaid them for their hospitality. I am writing as if I had been among the inhabitants of central Africa: Banda Oriental would not be flattered by the comparison; but such were my feelings at the time.

The next day we rode to the village of Las Minas. The country was rather more hilly, but otherwise continued the same; an inhabitant of the Pampas no doubt would have considered it as truly Alpine. The country is so thinly inhabited, that during the whole day we scarcely met a single person. Las Minas is much smaller even than Maldonado. It is seated on a little plain, and is surrounded by low rocky mountains. It is of the usual symmetrical form, and with its whitewashed church standing in the centre, had rather a pretty appearance. The outskirting houses rose out of the plain like isolated beings, without the accompaniment of gardens or courtyards. This is generally the case in the country, and all the houses have, in consequence an uncomfortable aspect. At night we stopped at a pulperia, or drinking-shop. During the evening a great number of Gauchos came in to drink spirits and smoke cigars: their appearance is very striking; they are generally tall and handsome, but with a proud and dissolute expression of countenance. They frequently wear their moustaches and long black hair curling down their backs. With their brightly coloured garments, great spurs clanking about their heels, and knives stuck as daggers (and often so used) at their waists, they look a very different race of men from what might be expected from their name of Gauchos, or simple countrymen. Their politeness is excessive; they never drink their spirits without expecting you to taste it; but whilst making their exceedingly graceful bow, they seem quite as ready, if occasion offered, to cut your throat.

On the third day we pursued rather an irregular course, as I was employed in examining some beds of marble. On the fine plains of turf we saw many ostriches (Struthio rhea). Some of the flocks contained as many as twenty or thirty birds. These, when standing on any little eminence, and seen against the clear sky, presented a very noble appearance. I never met with such tame ostriches in any other part of the country: it was easy to gallop up within a short distance of them; but then, expanding their wings, they made all sail right before the wind, and soon left the horse astern.

At night we came to the house of Don Juan Fuentes, a rich landed proprietor, but not personally known to either of my companions. On approaching the house of a stranger, it is usual to follow several little points of etiquette: riding up slowly to the door, the salutation of Ave Maria is given, and until somebody comes out and asks you to alight, it is not customary even to get off your horse: the formal answer of the owner is, "sin pecado concebida"—that is, conceived without sin. Having entered the house, some general conversation is kept up for a few minutes, till permission is asked to pass the night there. This is granted as a matter of course. The stranger then takes his meals with the family, and a room is assigned him, where with the horsecloths belonging to his recado (or saddle of the Pampas) he makes his bed. It is curious how similar circumstances produce such similar results in manners. At the Cape of Good Hope the same hospitality, and very nearly the same points of etiquette, are universally observed. The difference, however, between the character of the Spaniard and that of the Dutch boer is shown, by the former never asking his guest a single question beyond the strictest rule of politeness, whilst the honest Dutchman demands where he has been, where he is going, what is his business, and even how many brothers sisters, or children he may happen to have.

Shortly after our arrival at Don Juan's, one of the largest herds of cattle was driven in towards the house, and three beasts were picked out to be slaughtered for the supply of the establishment. These half-wild cattle are very active; and knowing full well the fatal lazo, they led the horses a long and laborious chase. After witnessing the rude wealth displayed in the number of cattle, men, and horses, Don Juan's miserable house was quite curious. The floor consisted of hardened mud, and the windows were without glass; the sitting-room boasted only of a few of the roughest chairs and stools, with a couple of tables. The supper, although several strangers were present, consisted of two huge piles, one of roast beef, the other of boiled, with some pieces of pumpkin: besides this latter there was no other vegetable, and not even a morsel of bread. For drinking, a large earthenware jug of water served the whole party. Yet this man was the owner of several square miles of land, of which nearly every acre would produce corn, and, with a little trouble, all the common vegetables. The evening was spent in smoking, with a little impromptu singing, accompanied by the guitar. The signoritas all sat together in one corner of the room, and did not sup with the men.

So many works have been written about these countries, that it is almost superfluous to describe either the lazo or the bolas. The lazo consists of a very strong, but thin, well-plaited rope, made of raw hide. One end is attached to the broad surcingle, which fastens together the complicated gear of the recado, or saddle used in the Pampas; the other is terminated by a small ring of iron or brass, by which a noose can be formed. The Gaucho, when he is going to use the lazo, keeps a small coil in his bridle-hand, and in the other holds the running noose which is made very large, generally having a diameter of about eight feet. This he whirls round his head, and by the dexterous movement of his wrist keeps the noose open; then, throwing it, he causes it to fall on any particular spot he chooses. The lazo, when not used, is tied up in a small coil to the after part of the recado. The bolas, or balls, are of two kinds: the simplest, which is chiefly used for catching ostriches, consists of two round stones, covered with leather, and united by a thin plaited thong, about eight feet long. The other kind differs only in having three balls united by the thongs to a common centre. The Gaucho holds the smallest of the three in his hand, and whirls the other two round and round his head; then, taking aim, sends them like chain shot revolving through the air. The balls no sooner strike any object, than, winding round it, they cross each other, and become firmly hitched. The size and weight of the balls vary, according to the purpose for which they are made: when of stone, although not larger than an apple, they are sent with such force as sometimes to break the leg even of a horse. I have seen the balls made of wood, and as large as a turnip, for the sake of catching these animals without injuring them. The balls are sometimes made of iron, and these can be hurled to the greatest distance. The main difficulty in using either lazo or bolas is to ride so well as to be able at full speed, and while suddenly turning about, to whirl them so steadily round the head, as to take aim: on foot any person would soon learn the art. One day, as I was amusing myself by galloping and whirling the balls round my head, by accident the free one struck a bush, and its revolving motion being thus destroyed, it immediately fell to the ground, and, like magic, caught one hind leg of my horse; the other ball was then jerked out of my hand, and the horse fairly secured. Luckily he was an old practised animal, and knew what it meant; otherwise he would probably have kicked till he had thrown himself down. The Gauchos roared with laughter; they cried out that they had seen every sort of animal caught, but had never before seen a man caught by himself.

During the two succeeding days, I reached the furthest point which I was anxious to examine. The country wore the same aspect, till at last the fine green turf became more wearisome than a dusty turnpike road. We everywhere saw great numbers of partridges (Nothura major). These birds do not go in coveys, nor do they conceal themselves like the English kind. It appears a very silly bird. A man on horseback by riding round and round in a circle, or rather in a spire, so as to approach closer each time, may knock on the head as many as he pleases. The more common method is to catch them with a running noose, or little lazo, made of the stem of an ostrich's feather, fastened to the end of a long stick. A boy on a quiet old horse will frequently thus catch thirty or forty in a day. In Arctic North America [31] the Indians catch the Varying Hare by walking spirally round and round it, when on its form: the middle of the day is reckoned the best time, when the sun is high, and the shadow of the hunter not very long.

On our return to Maldonado, we followed rather a different line of road. Near Pan de Azucar, a landmark well known to all those who have sailed up the Plata, I stayed a day at the house of a most hospitable old Spaniard. Early in the morning we ascended the Sierra de las Animas. By the aid of the rising sun the scenery was almost picturesque. To the westward the view extended over an immense level plain as far as the Mount, at Monte Video, and to the eastward, over the mammillated country of Maldonado. On the summit of the mountain there were several small heaps of stones, which evidently had lain there for many years. My companion assured me that they were the work of the Indians in the old time. The heaps were similar, but on a much smaller scale, to those so commonly found on the mountains of Wales. The desire to signalize any event, on the highest point of the neighbouring land, seems an universal passion with mankind. At the present day, not a single Indian, either civilized or wild, exists in this part of the province; nor am I aware that the former inhabitants have left behind them any more permanent records than these insignificant piles on the summit of the Sierra de las Animas.

The general, and almost entire absence of trees in Banda Oriental is remarkable. Some of the rocky hills are partly covered by thickets, and on the banks of the larger streams, especially to the north of Las Minas, willow-trees are not uncommon. Near the Arroyo Tapes I heard of a wood of palms; and one of these trees, of considerable size, I saw near the Pan de Azucar, in lat. 35 degs.

These, and the trees planted by the Spaniards, offer the only exceptions to the general scarcity of wood. Among the introduced kinds may be enumerated poplars, olives, peach, and other fruit trees: the peaches succeed so well, that they afford the main supply of firewood to the city of Buenos Ayres. Extremely level countries, such as the Pampas, seldom appear favourable to the growth of trees. This may possibly be attributed either to the force of the winds, or the kind of drainage. In the nature of the land, however, around Maldonado, no such reason is apparent; the rocky mountains afford protected situations; enjoying various kinds of soil; streamlets of water are common at the bottoms of nearly every valley; and the clayey nature of the earth seems adapted to retain moisture. It has been inferred with much probability, that the presence of woodland is generally determined [32] by the annual amount of moisture; yet in this province abundant and heavy rain falls during the winter; and the summer, though dry, is not so in any excessive degree. [33] We see nearly the whole of Australia covered by lofty trees, yet that country possesses a far more arid climate. Hence we must look to some other and unknown cause.

Confining our view to South America, we should certainly be tempted to believe that trees flourished only under a very humid climate; for the limit of the forest-land follows, in a most remarkable manner, that of the damp winds. In the southern part of the continent, where the western gales, charged with moisture from the Pacific, prevail, every island on the broken west coast, from lat. 38 degs. to the extreme point of Tierra del Fuego, is densely covered by impenetrable forests. On the eastern side of the Cordillera, over the same extent of latitude, where a blue sky and a fine climate prove that the atmosphere has been deprived of its moisture by passing over the mountains, the arid plains of Patagonia support a most scanty vegetation. In the more northern parts of the continent, within the limits of the constant south-eastern trade-wind, the eastern side is ornamented by magnificent forests; whilst the western coast, from lat. 4 degs. S. to lat. 32 degs. S., may be described as a desert; on this western coast, northward of lat. 4 degs. S., where the trade-wind loses its regularity, and heavy torrents of rain fall periodically, the shores of the Pacific, so utterly desert in Peru, assume near Cape Blanco the character of luxuriance so celebrated at Guyaquil and Panama. Hence in the southern and northern parts of the continent, the forest and desert lands occupy reversed positions with respect to the Cordillera, and these positions are apparently determined by the direction of the prevalent winds. In the middle of the continent there is a broad intermediate band, including central Chile and the provinces of La Plata, where the rain-bringing winds have not to pass over lofty mountains, and where the land is neither a desert nor covered by forests. But even the rule, if confined to South America, of trees flourishing only in a climate rendered humid by rain-bearing winds, has a strongly marked exception in the case of the Falkland Islands. These islands, situated in the same latitude with Tierra del Fuego and only between two and three hundred miles distant from it, having a nearly similar climate, with a geological formation almost identical, with favourable situations and the same kind of peaty soil, yet can boast of few plants deserving even the title of bushes; whilst in Tierra del Fuego it is impossible to find an acre of land not covered by the densest forest. In this case, both the direction of the heavy gales of wind and of the currents of the sea are favourable to the transport of seeds from Tierra del Fuego, as is shown by the canoes and trunks of trees drifted from that country, and frequently thrown on the shores of the Western Falkland. Hence perhaps it is, that there are many plants in common to the two countries but with respect to the trees of Tierra del Fuego, even attempts made to transplant them have failed.

During our stay at Maldonado I collected several quadrupeds, eighty kinds of birds, and many reptiles, including nine species of snakes. Of the indigenous mammalia, the only one now left of any size, which is common, is the Cervus campestris. This deer is exceedingly abundant, often in small herds, throughout the countries bordering the Plata and in Northern Patagonia. If a person crawling close along the ground, slowly advances towards a herd, the deer frequently, out of curiosity, approach to reconnoitre him. I have by this means, killed from one spot, three out of the same herd. Although so tame and inquisitive, yet when approached on horseback, they are exceedingly wary. In this country nobody goes on foot, and the deer knows man as its enemy only when he is mounted and armed with the bolas. At Bahia Blanca, a recent establishment in Northern Patagonia, I was surprised to find how little the deer cared for the noise of a gun: one day I fired ten times from within eighty yards at one animal; and it was much more startled at the ball cutting up the ground than at the report of the rifle. My powder being exhausted, I was obliged to get up (to my shame as a sportsman be it spoken, though well able to kill birds on the wing) and halloo till the deer ran away.

The most curious fact with respect to this animal, is the overpoweringly strong and offensive odour which proceeds from the buck. It is quite indescribable: several times whilst skinning the specimen which is now mounted at the Zoological Museum, I was almost overcome by nausea. I tied up the skin in a silk pocket-handkerchief, and so carried it home: this handkerchief, after being well washed, I continually used, and it was of course as repeatedly washed; yet every time, for a space of one year and seven months, when first unfolded, I distinctly perceived the odour. This appears an astonishing instance of the permanence of some matter, which nevertheless in its nature must be most subtile and volatile. Frequently, when passing at the distance of half a mile to leeward of a herd, I have perceived the whole air tainted with the effluvium. I believe the smell from the buck is most powerful at the period when its horns are perfect, or free from the hairy skin. When in this state the meat is, of course, quite uneatable; but the Gauchos assert, that if buried for some time in fresh earth, the taint is removed. I have somewhere read that the islanders in the north of Scotland treat the rank carcasses of the fish-eating birds in the same manner.

The order Rodentia is here very numerous in species: of mice alone I obtained no less than eight kinds. [34] The largest gnawing animal in the world, the Hydrochaerus capybara (the water-hog), is here also common. One which I shot at Monte Video weighed ninety-eight pounds: its length from the end of the snout to the stump-like tail, was three feet two inches; and its girth three feet eight. These great Rodents occasionally frequent the islands in the mouth of the Plata, where the water is quite salt, but are far more abundant on the borders of fresh-water lakes and rivers. Near Maldonado three or four generally live together. In the daytime they either lie among the aquatic plants, or openly feed on the turf plain. [35] When viewed at a distance, from their manner of walking and colour they resemble pigs: but when seated on their haunches, and attentively watching any object with one eye, they reassume the appearance of their congeners, cavies and rabbits. Both the front and side view of their head has quite a ludicrous aspect, from the great depth of their jaw. These animals, at Maldonado, were very tame; by cautiously walking, I approached within three yards of four old ones. This tameness may probably be accounted for, by the Jaguar having been banished for some years, and by the Gaucho not thinking it worth his while to hunt them. As I approached nearer and nearer they frequently made their peculiar noise, which is a low abrupt grunt, not having much actual sound, but rather arising from the sudden expulsion of air: the only noise I know at all like it, is the first hoarse bark of a large dog. Having watched the four from almost within arm's length (and they me) for several minutes, they rushed into the water at full gallop with the greatest impetuosity, and emitted at the same time their bark. After diving a short distance they came again to the surface, but only just showed the upper part of their heads. When the female is swimming in the water, and has young ones, they are said to sit on her back. These animals are easily killed in numbers; but their skins are of trifling value, and the meat is very indifferent. On the islands in the Rio Parana they are exceedingly abundant, and afford the ordinary prey to the Jaguar.

The Tucutuco (Ctenomys Brasiliensis) is a curious small animal, which may be briefly described as a Gnawer, with the habits of a mole. It is extremely numerous in some parts of the country, but it is difficult to be procured, and never, I believe, comes out of the ground. It throws up at the mouth of its burrows hillocks of earth like those of the mole, but smaller. Considerable tracts of country are so completely undermined by these animals, that horses in passing over, sink above their fetlocks. The tucutucos appear, to a certain degree, to be gregarious: the man who procured the specimens for me had caught six together, and he said this was a common occurrence. They are nocturnal in their habits; and their principal food is the roots of plants, which are the object of their extensive and superficial burrows. This animal is universally known by a very peculiar noise which it makes when beneath the ground. A person, the first time he hears it, is much surprised; for it is not easy to tell whence it comes, nor is it possible to guess what kind of creature utters it. The noise consists in a short, but not rough, nasal grunt, which is monotonously repeated about four times in quick succession: [36] the name Tucutuco is given in imitation of the sound. Where this animal is abundant, it may be heard at all times of the day, and sometimes directly beneath one's feet. When kept in a room, the tucutucos move both slowly and clumsily, which appears owing to the outward action of their hind legs; and they are quite incapable, from the socket of the thigh-bone not having a certain ligament, of jumping even the smallest vertical height. They are very stupid in making any attempt to escape; when angry or frightened they utter the tucutuco. Of those I kept alive several, even the first day, became quite tame, not attempting to bite or to run away; others were a little wilder.

The man who caught them asserted that very many are invariably found blind. A specimen which I preserved in spirits was in this state; Mr. Reid considers it to be the effect of inflammation in the nictitating membrane. When the animal was alive I placed my finger within half an inch of its head, and not the slightest notice was taken: it made its way, however, about the room nearly as well as the others. Considering the strictly subterranean habits of the tucutuco, the blindness, though so common, cannot be a very serious evil; yet it appears strange that any animal should possess an organ frequently subject to be injured. Lamarck would have been delighted with this fact, had he known it, when speculating [37] (probably with more truth than usual with him) on the gradually *acquired* blindness of the Asphalax, a Gnawer living under ground, and of the Proteus, a reptile living in dark caverns filled with water; in both of which animals the eye is in an almost rudimentary state, and is covered by a tendinous membrane and skin. In the common mole the eye is extraordinarily small but perfect, though many anatomists doubt whether it is connected with the true optic nerve; its vision must certainly be imperfect, though probably useful to the animal when it leaves its burrow. In the tucutuco, which I believe never comes to the surface of the ground, the eye is rather larger, but often rendered blind and useless, though without apparently causing any inconvenience to the animal; no doubt Lamarck would have said that the tucutuco is now passing into the state of the Asphalax and Proteus.

Birds of many kinds are extremely abundant on the undulating, grassy plains around Maldonado. There are several species of a family allied in structure and manners to our Starling: one of these (Molothrus niger) is remarkable from its habits. Several may often be seen standing together on the back of a cow or horse; and while perched on a hedge, pluming themselves in the sun, they sometimes attempt to sing, or rather to hiss; the noise being very peculiar, resembling that of bubbles of air passing rapidly from a small orifice under water, so as to produce an acute sound. According to Azara, this bird, like the cuckoo, deposits its eggs in other birds' nests. I was several times told by the country people that there certainly is some bird having this habit; and my assistant in collecting, who is a very accurate person, found a nest of the sparrow of this country (Zonotrichia matutina), with one egg in it larger than the others, and of a different colour and shape. In North America there is another species of Molothrus (M. pecoris), which has a similar cuckoo-like habit, and which is most closely allied in every respect to the species from the Plata, even in such trifling peculiarities as standing on the backs of cattle; it differs only in being a little smaller, and in its plumage and eggs being of a slightly different shade of colour. This close agreement in structure and habits, in representative species coming from opposite quarters of a great continent, always strikes one as interesting, though of common occurrence.

Mr. Swainson has well remarked, [38] that with the exception of the Molothrus pecoris, to which must be added the M. niger, the cuckoos are the only birds which can be called truly parasitical; namely, such as "fasten themselves, as it were, on another living animal, whose animal heat brings their young into life, whose food they live upon, and whose death would cause theirs during the period of infancy." It is remarkable that some of the species, but not all, both of the Cuckoo and Molothrus, should agree in this one strange habit of their parasitical propagation, whilst opposed to each other in almost every other habit: the molothrus, like our starling, is eminently sociable, and lives on the open plains without art or disguise: the cuckoo, as every one knows, is a singularly shy bird; it frequents the most retired thickets, and feeds on fruit and caterpillars. In structure also these two genera are widely removed from each other. Many theories, even phrenological theories, have been advanced to explain the origin of the cuckoo laying its eggs in other birds' nests. M. Prevost alone, I think, has thrown light by his observations [39] on this puzzle: he finds that the female cuckoo, which, according to most observers, lays at least from four to six eggs, must pair with the male each time after laying only one or two eggs. Now, if the cuckoo was obliged to sit on her own eggs, she would either have to sit on all together, and therefore leave those first laid so long, that they probably would become addled; or she would have to hatch separately each egg, or two eggs, as soon as laid: but as the cuckoo stays a shorter time in this country than any other migratory bird, she certainly would not have time enough for the successive hatchings. Hence we can perceive in the fact of the cuckoo pairing several times, and laying her eggs at intervals, the cause of her depositing her eggs in other birds' nests, and leaving them to the care of foster-parents. I am strongly inclined to believe that this view is correct, from having been independently led (as we shall hereafter see) to an analogous conclusion with regard to the South American ostrich, the females of which are parasitical, if I may so express it, on each other; each female laying several eggs in the

nests of several other females, and the male ostrich undertaking all the cares of incubation, like the strange foster-parents with the cuckoo.

I will mention only two other birds, which are very common, and render themselves prominent from their habits. The Saurophagus sulphuratus is typical of the great American tribe of tyrant-flycatchers. In its structure it closely approaches the true shrikes, but in its habits may be compared to many birds. I have frequently observed it, hunting a field, hovering over one spot like a hawk, and then proceeding on to another. When seen thus suspended in the air, it might very readily at a short distance be mistaken for one of the Rapacious order; its stoop, however, is very inferior in force and rapidity to that of a hawk. At other times the Saurophagus haunts the neighbourhood of water, and there, like a kingfisher, remaining stationary, it catches any small fish which may come near the margin. These birds are not unfrequently kept either in cages or in courtyards, with their wings cut. They soon become tame, and are very amusing from their cunning odd manners, which were described to me as being similar to those of the common magpie. Their flight is undulatory, for the weight of the head and bill appears too great for the body. In the evening the Saurophagus takes its stand on a bush, often by the roadside, and continually repeats without a change a shrill and rather agreeable cry, which somewhat resembles articulate words: the Spaniards say it is like the words "Bien te veo" (I see you well), and accordingly have given it this name.

A mocking-bird (Mimus orpheus), called by the inhabitants Calandria, is remarkable, from possessing a song far superior to that of any other bird in the country: indeed, it is nearly the only bird in South America which I have observed to take its stand for the purpose of singing. The song may be compared to that of the Sedge warbler, but is more powerful; some harsh notes and some very high ones, being mingled with a pleasant warbling. It is heard only during the spring. At other times its cry is harsh and far from harmonious. Near Maldonado these birds were tame and bold; they constantly attended the country houses in numbers, to pick the meat which was hung up on the posts or walls: if any other small bird joined the feast, the Calandria soon chased it away. On the wide uninhabited plains of Patagonia another closely allied species, O. Patagonica of d'Orbigny, which frequents the valleys clothed with spiny bushes, is a wilder bird, and has a slightly different tone of voice. It appears to me a curious circumstance, as showing the fine shades of difference in habits, that judging from this latter respect alone, when I first saw this second species, I thought it was different from the Maldonado kind. Having afterwards procured a specimen, and comparing the two without particular care, they appeared so very similar, that I changed my opinion; but now Mr. Gould says that they are certainly distinct; a conclusion in conformity with the trifling difference of habit, of which, of course, he was not aware.

The number, tameness, and disgusting habits of the carrion-feeding hawks of South America make them pre-eminently striking to any one accustomed only to the birds of Northern Europe. In this list may be included four species of the Caracara or Polyborus, the Turkey buzzard, the Gallinazo, and the Condor. The Caracaras are, from their structure, placed among the eagles: we shall soon see how ill they become so high a rank. In their habits they well supply the place of our carrion-crows, magpies, and ravens; a tribe of birds widely distributed over the rest of the world, but entirely absent in South America. To begin with the Polyborus Brasiliensis: this is a common bird, and has a wide geographical range; it is most numerous on the grassy savannahs of La Plata (where it goes by the name of Carrancha), and is far from unfrequent throughout the sterile plains of Patagonia. In the desert between the rivers Negro and Colorado, numbers constantly attend the line of road to devour the carcasses of the exhausted animals which chance to perish from fatigue and thirst. Although thus common in these dry and open countries, and likewise on the arid shores of the Pacific, it is nevertheless found inhabiting the damp impervious forests of West Patagonia and Tierra del Fuego. The Carranchas, together with the Chimango, constantly attend in numbers the estancias and slaughtering-houses. If an animal dies on the plain the Gallinazo commences the feast, and then the two species of Polyborus pick the bones clean. These birds, although thus commonly feeding together, are far from being friends. When the Carrancha is quietly seated on the branch of a tree or on the ground, the Chimango often continues for a long time flying backwards and forwards, up and down, in a semicircle, trying each time at the bottom of the curve to strike its larger relative. The Carrancha takes little notice, except by bobbing its head. Although the Carranchas frequently assemble in numbers, they are not gregarious; for in desert places they may be seen solitary, or more commonly by pairs.

The Carranchas are said to be very crafty, and to steal great numbers of eggs. They attempt, also, together with the Chimango, to pick off the scabs from the sore backs of horses and mules. The poor animal, on the one hand, with its ears down and its back arched; and, on the other, the hovering bird, eyeing at the distance of a yard the disgusting morsel, form a picture, which has been described by Captain Head with his own peculiar spirit and accuracy. These false eagles most rarely kill any living bird or animal; and their vulture-like, necrophagous habits are very evident to any one who has fallen asleep on the desolate plains of Patagonia, for when he wakes, he will see, on each surrounding hillock, one of these birds patiently watching him with an evil eye: it is a feature in the landscape of these countries, which will be recognised by every one who has wandered over them. If a party of men go out hunting with dogs and horses, they will be accompanied, during the day, by several of these attendants. After feeding, the uncovered craw protrudes; at such times, and indeed generally, the Carrancha is an inactive, tame, and cowardly bird. Its flight is heavy and slow, like that of an English rook. It seldom soars; but I have twice seen one at a great height gliding through the air with much ease. It runs (in contradistinction to hopping), but not quite so quickly as some of its congeners. At times the Carrancha is noisy, but is not generally so: its cry is loud, very harsh and peculiar, and may be likened to the sound of the Spanish guttural g, followed by a rough double r r; when uttering this cry it elevates its head higher and higher, till at last, with its beak wide open, the crown almost touches the lower part of the back. This fact, which has been doubted, is quite true; I have seen them several times with their heads backwards in a completely inverted position. To these observations I may add, on the high authority of Azara, that the Carrancha feeds on worms, shells, slugs, grasshoppers, and frogs; that it destroys young lambs by tearing the umbilical cord; and that it pursues the Gallinazo, till that bird is compelled to vomit up the carrion it may have recently gorged. Lastly, Azara states that several Carranchas, five or six together, will unite in chase of large birds, even such as herons. All these facts show that it is a bird of very versatile habits and considerable ingenuity.

The Polyborus Chimango is considerably smaller than the last species. It is truly omnivorous, and will eat even bread; and I was assured that it materially injures the potato crops in Chiloe, by stocking up the roots when first planted. Of all the carrion-feeders it is generally the last which leaves the skeleton of a dead animal, and may often be seen within the ribs of a cow or horse, like a bird in a cage. Another species is the Polyborus Novae Zelandiae, which is exceedingly common in the Falkland Islands. These birds in many respects resemble in their habits the Carranchas. They live on the flesh of dead animals and on marine productions; and on the Ramirez rocks their whole sustenance must depend on the sea. They are extraordinarily tame and fearless, and haunt the neighborhood of houses for offal. If a hunting party kills an animal, a number soon collect and patiently await, standing on the ground on all sides. After eating, their uncovered craws are largely protruded, giving them a disgusting appearance. They readily attack wounded birds: a cormorant in this state having taken to the shore, was immediately seized on by several, and its death hastened by their blows. The Beagle was at the Falklands only during the summer, but the officers of the Adventure, who were there in the winter, mention many extraordinary instances of the boldness and rapacity of these birds. They actually pounced on a dog that was lying fast asleep close by one of the party; and the sportsmen had difficulty in preventing the wounded geese from being seized before their eyes. It is said that several together (in this respect resembling the Carranchas) wait at the mouth of a rabbit-hole, and together seize on the animal when it comes out. They were constantly flying on board the vessel when in the harbour; and it was necessary to keep a good look out to prevent the leather being torn from the rigging, and the meat or game from the stern. These birds are very mischievous and inquisitive; they will pick up almost anything from the ground; a large black glazed hat was carried nearly a mile, as was a pair of the heavy balls used in catching cattle. Mr. Usborne experienced during the survey a more severe loss, in their stealing a small Kater's compass in a red morocco leather case, which was never recovered. These birds are, moreover, quarrelsome and very passionate; tearing up the grass with their bills from rage. They are not truly gregarious; they do not soar, and their flight is heavy and clumsy; on the ground they run extremely fast, very much like pheasants. They are noisy, uttering several harsh cries, one of which is like that of the English rook, hence the sealers always call them rooks. It is a curious circumstance that, when crying out, they throw their heads upwards and backwards, after the same manner as the Carrancha. They build in the rocky cliffs of the sea-coast, but only on the small adjoining islets, and not on the two main islands: this is a singular precaution in so tame and fearless a bird. The sealers say that the

flesh of these birds, when cooked, is quite white, and very good eating; but bold must the man be who attempts such a meal.

We have now only to mention the turkey-buzzard (Vultur aura), and the Gallinazo. The former is found wherever the country is moderately damp, from Cape Horn to North America. Differently from the Polyborus Brasiliensis and Chimango, it has found its way to the Falkland Islands. The turkey-buzzard is a solitary bird, or at most goes in pairs. It may at once be recognised from a long distance, by its lofty, soaring, and most elegant flight. It is well known to be a true carrion-feeder. On the west coast of Patagonia, among the thickly-wooded islets and broken land, it lives exclusively on what the sea throws up, and on the carcasses of dead seals. Wherever these animals are congregated on the rocks, there the vultures may be seen. The Gallinazo (Cathartes atratus) has a different range from the last species, as it never occurs southward of lat. 41 degs. Azara states that there exists a tradition that these birds, at the time of the conquest, were not found near Monte Video, but that they subsequently followed the inhabitants from more northern districts. At the present day they are numerous in the valley of the Colorado, which is three hundred miles due south of Monte Video. It seems probable that this additional migration has happened since the time of Azara. The Gallinazo generally prefers a humid climate, or rather the neighbourhood of fresh water; hence it is extremely abundant in Brazil and La Plata, while it is never found on the desert and arid plains of Northern Patagonia, excepting near some stream. These birds frequent the whole Pampas to the foot of the Cordillera, but I never saw or heard of one in Chile; in Peru they are preserved as scavengers. These vultures certainly may be called gregarious, for they seem to have pleasure in society, and are not solely brought together by the attraction of a common prey. On a fine day a flock may often be observed at a great height, each bird wheeling round and round without closing its wings, in the most graceful evolutions. This is clearly performed for the mere pleasure of the exercise, or perhaps is connected with their matrimonial alliances.

I have now mentioned all the carrion-feeders, excepting the condor, an account of which will be more appropriately introduced when we visit a country more congenial to its habits than the plains of La Plata.

In a broad band of sand-hillocks which separate the Laguna del Potrero from the shores of the Plata, at the distance of a few miles from Maldonado, I found a group of those vitrified, siliceous tubes, which are formed by lightning entering loose sand. These tubes resemble in every particular those from Drigg in Cumberland, described in the Geological Transactions. 310 The sand-hillocks of Maldonado not being protected by vegetation, are constantly changing their position. From this cause the tubes projected above the surface, and numerous fragments lying near, showed that they had formerly been buried to a greater depth. Four sets entered the sand perpendicularly: by working with my hands I traced one of them two feet deep; and some fragments which evidently had belonged to the same tube, when added to the other part, measured five feet three inches. The diameter of the whole tube was nearly equal, and therefore we must suppose that originally it extended to a much greater depth. These dimensions are however small, compared to those of the tubes from Drigg, one of which was traced to a depth of not less than thirty feet.

The internal surface is completely vitrified, glossy, and smooth. A small fragment examined under the microscope appeared, from the number of minute entangled air or perhaps steam bubbles, like an assay fused before the blowpipe. The sand is entirely, or in greater part, siliceous; but some points are of a black colour, and from their glossy surface possess a metallic lustre. The thickness of the wall of the tube varies from a thirtieth to a twentieth of an inch, and occasionally even equals a tenth. On the outside the grains of sand are rounded, and have a slightly glazed appearance: I could not distinguish any signs of crystallization. In a similar manner to that described in the Geological Transactions, the tubes are generally compressed, and have deep longitudinal furrows, so as closely to resemble a shrivelled vegetable stalk, or the bark of the elm or cork tree. Their circumference is about two inches, but in some fragments, which are cylindrical and without any furrows, it is as much as four inches. The compression from the surrounding loose sand, acting while the tube was still softened from the effects of the intense heat, has evidently caused the creases or furrows. Judging from the uncompressed fragments, the measure or bore of the lightning (if such a term may be used) must have been about one inch and a quarter. At Paris, M. Hachette and M. Beudant 311 succeeded in making tubes, in most respects similar to these fulgurites, by passing very strong shocks of galvanism through finely-powdered glass: when salt was added, so as to increase its

fusibility, the tubes were larger in every dimension. They failed both with powdered felspar and quartz. One tube, formed with pounded glass, was very nearly an inch long, namely .982, and had an internal diameter of .019 of an inch. When we hear that the strongest battery in Paris was used, and that its power on a substance of such easy fusibility as glass was to form tubes so diminutive, we must feel greatly astonished at the force of a shock of lightning, which, striking the sand in several places, has formed cylinders, in one instance of at least thirty feet long, and having an internal bore, where not compressed, of full an inch and a half; and this in a material so extraordinarily refractory as quartz!

The tubes, as I have already remarked, enter the sand nearly in a vertical direction. One, however, which was less regular than the others, deviated from a right line, at the most considerable bend, to the amount of thirty-three degrees. From this same tube, two small branches, about a foot apart, were sent off; one pointed downwards, and the other upwards. This latter case is remarkable, as the electric fluid must have turned back at the acute angle of 26 degs., to the line of its main course. Besides the four tubes which I found vertical, and traced beneath the surface, there were several other groups of fragments, the original sites of which without doubt were near. All occurred in a level area of shifting sand, sixty yards by twenty, situated among some high sand-hillocks, and at the distance of about half a mile from a chain of hills four or five hundred feet in height. The most remarkable circumstance, as it appears to me, in this case as well as in that of Drigg, and in one described by M. Ribbentrop in Germany, is the number of tubes found within such limited spaces. At Drigg, within an area of fifteen yards, three were observed, and the same number occurred in Germany. In the case which I have described, certainly more than four existed within the space of the sixty by twenty yards. As it does not appear probable that the tubes are produced by successive distinct shocks, we must believe that the lightning, shortly before entering the ground, divides itself into separate branches.

The neighbourhood of the Rio Plata seems peculiarly subject to electric phenomena. In the year 1793, [312] one of the most destructive thunderstorms perhaps on record happened at Buenos Ayres: thirty-seven places within the city were struck by lightning, and nineteen people killed. From facts stated in several books of travels, I am inclined to suspect that thunderstorms are very common near the mouths of great rivers. Is it not possible that the mixture of large bodies of fresh and salt water may disturb the electrical equilibrium? Even during our occasional visits to this part of South America, we heard of a ship, two churches, and a house having been struck. Both the church and the house I saw shortly afterwards: the house belonged to Mr. Hood, the consul-general at Monte Video. Some of the effects were curious: the paper, for nearly a foot on each side of the line where the bell-wires had run, was blackened. The metal had been fused, and although the room was about fifteen feet high, the globules, dropping on the chairs and furniture, had drilled in them a chain of minute holes. A part of the wall was shattered, as if by gunpowder, and the fragments had been blown off with force sufficient to dent the wall on the opposite side of the room. The frame of a looking-glass was blackened, and the gilding must have been volatilized, for a smelling-bottle, which stood on the chimney-piece, was coated with bright metallic particles, which adhered as firmly as if they had been enamelled.

CHAPTER IV — RIO NEGRO TO BAHIA BLANCA

Rio Negro—Estancias attacked by the Indians—Salt-Lakes—Flamingoes— R. Negro to R. Colorado—Sacred Tree—Patagonian Hare—Indian Families— General Rosas—Proceed to Bahia

Blanca—Sand Dunes—Negro Lieutenant— Bahia Blanca—Saline Incrustations—Punta Alta—Zorillo.

JULY 24th, 1833.—The Beagle sailed from Maldonado, and on August the 3rd she arrived off the mouth of the Rio Negro. This is the principal river on the whole line of coast between the Strait of Magellan and the Plata. It enters the sea about three hundred miles south of the estuary of the Plata. About fifty years ago, under the old Spanish government, a small colony was established here; and it is still the most southern position (lat. 41 degs.) on this eastern coast of America inhabited by civilized man.

The country near the mouth of the river is wretched in the extreme: on the south side a long line of perpendicular cliffs commences, which exposes a section of the geological nature of the country. The strata are of sandstone, and one layer was remarkable from being composed of a firmly-cemented conglomerate of pumice pebbles, which must have travelled more than four hundred miles, from the Andes. The surface is everywhere covered up by a thick bed of gravel, which extends far and wide over the open plain. Water is extremely scarce, and, where found, is almost invariably brackish. The vegetation is scanty; and although there are bushes of many kinds, all are armed with formidable thorns, which seem to warn the stranger not to enter on these inhospitable regions.

The settlement is situated eighteen miles up the river. The road follows the foot of the sloping cliff, which forms the northern boundary of the great valley, in which the Rio Negro flows. On the way we passed the ruins of some fine "estancias," which a few years since had been destroyed by the Indians. They withstood several attacks. A man present at one gave me a very lively description of what took place. The inhabitants had sufficient notice to drive all the cattle and horses into the "corral" 41 which surrounded the house, and likewise to mount some small cannon. The Indians were Araucanians from the south of Chile; several hundreds in number, and highly disciplined. They first appeared in two bodies on a neighbouring hill; having there dismounted, and taken off their fur mantles, they advanced naked to the charge. The only weapon of an Indian is a very long bamboo or chuzo, ornamented with ostrich feathers, and pointed by a sharp spearhead. My informer seemed to remember with the greatest horror the quivering of these chuzos as they approached near. When close, the cacique Pincheira hailed the besieged to give up their arms, or he would cut all their throats. As this would probably have been the result of their entrance under any circumstances, the answer was given by a volley of musketry. The Indians, with great steadiness, came to the very fence of the corral: but to their surprise they found the posts fastened together by iron nails instead of leather thongs, and, of course, in vain attempted to cut them with their knives. This saved the lives of the Christians: many of the wounded Indians were carried away by their companions, and at last, one of the under caciques being wounded, the bugle sounded a retreat. They retired to their horses, and seemed to hold a council of war. This was an awful pause for the Spaniards, as all their ammunition, with the exception of a few cartridges, was expended. In an instant the Indians mounted their horses, and galloped out of sight. Another attack was still more quickly repulsed. A cool Frenchman managed the gun; he stopped till the Indians approached close, and then raked their line with grape-shot: he thus laid thirty-nine of them on the ground; and, of course, such a blow immediately routed the whole party.

The town is indifferently called El Carmen or Patagones. It is built on the face of a cliff which fronts the river, and many of the houses are excavated even in the sandstone. The river is about two or three hundred yards wide, and is deep and rapid. The many islands, with their willow-trees, and the flat headlands, seen one behind the other on the northern boundary of the broad green valley, form, by the aid of a bright sun, a view almost picturesque. The number of inhabitants does not exceed a few hundreds. These Spanish colonies do not, like our British ones, carry within themselves the elements of growth. Many Indians of pure blood reside here: the tribe of the Cacique Lucanee constantly have their Toldos 42 on the outskirts of the town. The local government partly supplies them with provisions, by giving them all the old worn-out horses, and they earn a little by making horse-rugs and other articles of riding-gear. These Indians are considered civilized; but what their character may have gained by a lesser degree of ferocity, is almost counterbalanced by their entire immorality. Some of the younger men are, however, improving; they are willing to labour, and a short time since a party went on a sealing-voyage, and behaved very well. They were now enjoying the fruits of their labour, by being dressed in very gay, clean clothes, and by being very

idle. The taste they showed in their dress was admirable; if you could have turned one of these young Indians into a statue of bronze, his drapery would have been perfectly graceful.

One day I rode to a large salt-lake, or Salina, which is distant fifteen miles from the town. During the winter it consists of a shallow lake of brine, which in summer is converted into a field of snow-white salt. The layer near the margin is from four to five inches thick, but towards the centre its thickness increases. This lake was two and a half miles long, and one broad. Others occur in the neighbourhood many times larger, and with a floor of salt, two and three feet in thickness, even when under water during the winter. One of these brilliantly white and level expanses in the midst of the brown and desolate plain, offers an extraordinary spectacle. A large quantity of salt is annually drawn from the salina: and great piles, some hundred tons in weight, were lying ready for exportation. The season for working the salinas forms the harvest of Patagones; for on it the prosperity of the place depends. Nearly the whole population encamps on the bank of the river, and the people are employed in drawing out the salt in bullock-waggons, This salt is crystallized in great cubes, and is remarkably pure: Mr. Trenham Reeks has kindly analyzed some for me, and he finds in it only 0.26 of gypsum and 0.22 of earthy matter. It is a singular fact, that it does not serve so well for preserving meat as sea-salt from the Cape de Verd islands; and a merchant at Buenos Ayres told me that he considered it as fifty per cent. less valuable. Hence the Cape de Verd salt is constantly imported, and is mixed with that from these salinas. The purity of the Patagonian salt, or absence from it of those other saline bodies found in all sea-water, is the only assignable cause for this inferiority: a conclusion which no one, I think, would have suspected, but which is supported by the fact lately ascertained, 43 that those salts answer best for preserving cheese which contain most of the deliquescent chlorides.

The border of this lake is formed of mud: and in this numerous large crystals of gypsum, some of which are three inches long, lie embedded; whilst on the surface others of sulphate of soda lie scattered about. The Gauchos call the former the "Padre del sal," and the latter the "Madre;" they state that these progenitive salts always occur on the borders of the salinas, when the water begins to evaporate. The mud is black, and has a fetid odour. I could not at first imagine the cause of this, but I afterwards perceived that the froth which the wind drifted on shore was coloured green, as if by confervae; I attempted to carry home some of this green matter, but from an accident failed. Parts of the lake seen from a short distance appeared of a reddish colour, and this perhaps was owing to some infusorial animalcula. The mud in many places was thrown up by numbers of some kind of worm, or annelidous animal. How surprising it is that any creatures should be able to exist in brine, and that they should be crawling among crystals of sulphate of soda and lime! And what becomes of these worms when, during the long summer, the surface is hardened into a solid layer of salt? Flamingoes in considerable numbers inhabit this lake, and breed here, throughout Patagonia, in Northern Chile, and at the Galapagos Islands, I met with these birds wherever there were lakes of brine. I saw them here wading about in search of food—probably for the worms which burrow in the mud; and these latter probably feed on infusoria or confervae. Thus we have a little living world within itself adapted to these inland lakes of brine. A minute crustaceous animal (Cancer salinus) is said 44 to live in countless numbers in the brine-pans at Lymington: but only in those in which the fluid has attained, from evaporation, considerable strength—namely, about a quarter of a pound of salt to a pint of water. Well may we affirm that every part of the world is habitable! Whether lakes of brine, or those subterranean ones hidden beneath volcanic mountains—warm mineral springs—the wide expanse and depths of the ocean—the upper regions of the atmosphere, and even the surface of perpetual snow—all support organic beings.

To the northward of the Rio Negro, between it and the inhabited country near Buenos Ayres, the Spaniards have only one small settlement, recently established at Bahia Blanca. The distance in a straight line to Buenos Ayres is very nearly five hundred British miles. The wandering tribes of horse Indians, which have always occupied the greater part of this country, having of late much harassed the outlying estancias, the government at Buenos Ayres equipped some time since an army under the command of General Rosas for the purpose of exterminating them. The troops were now encamped on the banks of the Colorado; a river lying about eighty miles northward of the Rio Negro. When General Rosas left Buenos Ayres he struck in a direct line across the unexplored plains: and as the country was thus pretty well cleared of Indians, he left behind him, at wide intervals, a small party of soldiers with a troop of horses (a posta), so as to be enabled to keep up a communication with the capital. As the Beagle intended to call at Bahia Blanca, I determined to

proceed there by land; and ultimately I extended my plan to travel the whole way by the postas to Buenos Ayres.

August 11th.—Mr. Harris, an Englishman residing at Patagones, a guide, and five Gauchos who were proceeding to the army on business, were my companions on the journey. The Colorado, as I have already said, is nearly eighty miles distant: and as we travelled slowly, we were two days and a half on the road. The whole line of country deserves scarcely a better name than that of a desert. Water is found only in two small wells; it is called fresh; but even at this time of the year, during the rainy season, it was quite brackish. In the summer this must be a distressing passage; for now it was sufficiently desolate. The valley of the Rio Negro, broad as it is, has merely been excavated out of the sandstone plain; for immediately above the bank on which the town stands, a level country commences, which is interrupted only by a few trifling valleys and depressions. Everywhere the landscape wears the same sterile aspect; a dry gravelly soil supports tufts of brown withered grass, and low scattered bushes, armed with thorns.

Shortly after passing the first spring we came in sight of a famous tree, which the Indians reverence as the altar of Walleechu. It is situated on a high part of the plain; and hence is a landmark visible at a great distance. As soon as a tribe of Indians come in sight of it, they offer their adorations by loud shouts. The tree itself is low, much branched, and thorny: just above the root it has a diameter of about three feet. It stands by itself without any neighbour, and was indeed the first tree we saw; afterwards we met with a few others of the same kind, but they were far from common. Being winter the tree had no leaves, but in their place numberless threads, by which the various offerings, such as cigars, bread, meat, pieces of cloth, etc., had been suspended. Poor Indians, not having anything better, only pull a thread out of their ponchos, and fasten it to the tree. Richer Indians are accustomed to pour spirits and mate into a certain hole, and likewise to smoke upwards, thinking thus to afford all possible gratification to Walleechu. To complete the scene, the tree was surrounded by the bleached bones of horses which had been slaughtered as sacrifices. All Indians of every age and sex make their offerings; they then think that their horses will not tire, and that they themselves shall be prosperous. The Gaucho who told me this, said that in the time of peace he had witnessed this scene, and that he and others used to wait till the Indians had passed by, for the sake of stealing from Walleechu the offerings.

The Gauchos think that the Indians consider the tree as the god itself, but it seems far more probable that they regard it as the altar. The only cause which I can imagine for this choice, is its being a landmark in a dangerous passage. The Sierra de la Ventana is visible at an immense distance; and a Gaucho told me that he was once riding with an Indian a few miles to the north of the Rio Colorado when the Indian commenced making the same loud noise which is usual at the first sight of the distant tree, putting his hand to his head, and then pointing in the direction of the Sierra. Upon being asked the reason of this, the Indian said in broken Spanish, "First see the Sierra." About two leagues beyond this curious tree we halted for the night: at this instant an unfortunate cow was spied by the lynx-eyed Gauchos, who set off in full chase, and in a few minutes dragged her in with their lazos, and slaughtered her. We here had the four necessaries of life "en el campo,"—pasture for the horses, water (only a muddy puddle), meat and firewood. The Gauchos were in high spirits at finding all these luxuries; and we soon set to work at the poor cow. This was the first night which I passed under the open sky, with the gear of the recado for my bed. There is high enjoyment in the independence of the Gaucho life—to be able at any moment to pull up your horse, and say, "Here we will pass the night." The death-like stillness of the plain, the dogs keeping watch, the gipsy-group of Gauchos making their beds round the fire, have left in my mind a strongly-marked picture of this first night, which will never be forgotten.

The next day the country continued similar to that above described. It is inhabited by few birds or animals of any kind. Occasionally a deer, or a Guanaco (wild Llama) may be seen; but the Agouti (Cavia Patagonica) is the commonest quadruped. This animal here represents our hares. It differs, however, from that genus in many essential respects; for instance, it has only three toes behind. It is also nearly twice the size, weighing from twenty to twenty-five pounds. The Agouti is a true friend of the desert; it is a common feature of the landscape to see two or three hopping quickly one after the other in a straight line across these wild plains. They are found as far north as the Sierra Tapalguen (lat. 37 degs. 30'), where the plain rather suddenly becomes greener and more humid; and their southern limit is between Port Desire and St. Julian, where there is no change in the nature of

the country. It is a singular fact, that although the Agouti is not now found as far south as Port St. Julian, yet that Captain Wood, in his voyage in 1670, talks of them as being numerous there. What cause can have altered, in a wide, uninhabited, and rarely-visited country, the range of an animal like this? It appears also, from the number shot by Captain Wood in one day at Port Desire, that they must have been considerably more abundant there formerly than at present. Where the Bizcacha lives and makes its burrows, the Agouti uses them; but where, as at Bahia Blanca, the Bizcacha is not found, the Agouti burrows for itself. The same thing occurs with the little owl of the Pampas (Athene cunicularia), which has so often been described as standing like a sentinel at the mouth of the burrows; for in Banda Oriental, owing to the absence of the Bizcacha, it is obliged to hollow out its own habitation.

The next morning, as we approached the Rio Colorado, the appearance of the country changed; we soon came on a plain covered with turf, which, from its flowers, tall clover, and little owls, resembled the Pampas. We passed also a muddy swamp of considerable extent, which in summer dries, and becomes incrusted with various salts; and hence is called a salitral. It was covered by low succulent plants, of the same kind with those growing on the sea-shore. The Colorado, at the pass where we crossed it, is only about sixty yards wide; generally it must be nearly double that width. Its course is very tortuous, being marked by willow-trees and beds of reeds: in a direct line the distance to the mouth of the river is said to be nine leagues, but by water twenty-five. We were delayed crossing in the canoe by some immense troops of mares, which were swimming the river in order to follow a division of troops into the interior. A more ludicrous spectacle I never beheld than the hundreds and hundreds of heads, all directed one way, with pointed ears and distended snorting nostrils, appearing just above the water like a great shoal of some amphibious animal. Mare's flesh is the only food which the soldiers have when on an expedition. This gives them a great facility of movement; for the distance to which horses can be driven over these plains is quite surprising: I have been assured that an unloaded horse can travel a hundred miles a day for many days successively.

The encampment of General Rosas was close to the river. It consisted of a square formed by waggons, artillery, straw huts, etc. The soldiers were nearly all cavalry; and I should think such a villainous, banditti-like army was never before collected together. The greater number of men were of a mixed breed, between Negro, Indian, and Spaniard. I know not the reason, but men of such origin seldom have a good expression of countenance. I called on the Secretary to show my passport. He began to cross-question me in the most dignified and mysterious manner. By good luck I had a letter of recommendation from the government of Buenos Ayres [45] to the commandant of Patagones. This was taken to General Rosas, who sent me a very obliging message; and the Secretary returned all smiles and graciousness. We took up our residence in the *rancho*, or hovel, of a curious old Spaniard, who had served with Napoleon in the expedition against Russia.

We stayed two days at the Colorado; I had little to do, for the surrounding country was a swamp, which in summer (December), when the snow melts on the Cordillera, is over-flowed by the river. My chief amusement was watching the Indian families as they came to buy little articles at the rancho where we stayed. It was supposed that General Rosas had about six hundred Indian allies. The men were a tall, fine race, yet it was afterwards easy to see in the Fuegian savage the same countenance rendered hideous by cold, want of food, and less civilization. Some authors, in defining the primary races of mankind, have separated these Indians into two classes; but this is certainly incorrect. Among the young women or chinas, some deserve to be called even beautiful. Their hair was coarse, but bright and black; and they wore it in two plaits hanging down to the waist. They had a high colour, and eyes that glistened with brilliancy; their legs, feet, and arms were small and elegantly formed; their ankles, and sometimes their wrists, were ornamented by broad bracelets of blue beads. Nothing could be more interesting than some of the family groups. A mother with one or two daughters would often come to our rancho, mounted on the same horse. They ride like men, but with their knees tucked up much higher. This habit, perhaps, arises from their being accustomed, when travelling, to ride the loaded horses. The duty of the women is to load and unload the horses; to make the tents for the night; in short to be, like the wives of all savages, useful slaves. The men fight, hunt, take care of the horses, and make the riding gear. One of their chief indoor occupations is to knock two stones together till they become round, in order to make the bolas. With this important weapon the Indian catches his game, and also his horse, which roams free over the plain. In fighting, his first attempt is to throw down the horse of his adversary with the bolas, and when

entangled by the fall to kill him with the chuzo. If the balls only catch the neck or body of an animal, they are often carried away and lost. As the making the stones round is the labour of two days, the manufacture of the balls is a very common employment. Several of the men and women had their faces painted red, but I never saw the horizontal bands which are so common among the Fuegians. Their chief pride consists in having everything made of silver; I have seen a cacique with his spurs, stirrups, handle of his knife, and bridle made of this metal: the head-stall and reins being of wire, were not thicker than whipcord; and to see a fiery steed wheeling about under the command of so light a chain, gave to the horsemanship a remarkable character of elegance.

General Rosas intimated a wish to see me; a circumstance which I was afterwards very glad of. He is a man of an extraordinary character, and has a most predominant influence in the country, which it seems he will use to its prosperity and advancement. 46 He is said to be the owner of seventy-four square leagues of land, and to have about three hundred thousand head of cattle. His estates are admirably managed, and are far more productive of corn than those of others. He first gained his celebrity by his laws for his own estancias, and by disciplining several hundred men, so as to resist with success the attacks of the Indians. There are many stories current about the rigid manner in which his laws were enforced. One of these was, that no man, on penalty of being put into the stocks, should carry his knife on a Sunday: this being the principal day for gambling and drinking, many quarrels arose, which from the general manner of fighting with the knife often proved fatal. One Sunday the Governor came in great form to pay the estancia a visit, and General Rosas, in his hurry, walked out to receive him with his knife, as usual, stuck in his belt. The steward touched his arm, and reminded him of the law; upon which turning to the Governor, he said he was extremely sorry, but that he must go into the stocks, and that till let out, he possessed no power even in his own house. After a little time the steward was persuaded to open the stocks, and to let him out, but no sooner was this done, than he turned to the steward and said, "You now have broken the laws, so you must take my place in the stocks." Such actions as these delighted the Gauchos, who all possess high notions of their own equality and dignity.

General Rosas is also a perfect horseman—an accomplishment of no small consequence In a country where an assembled army elected its general by the following trial: A troop of unbroken horses being driven into a corral, were let out through a gateway, above which was a cross-bar: it was agreed whoever should drop from the bar on one of these wild animals, as it rushed out, and should be able, without saddle or bridle, not only to ride it, but also to bring it back to the door of the corral, should be their general. The person who succeeded was accordingly elected; and doubtless made a fit general for such an army. This extraordinary feat has also been performed by Rosas.

By these means, and by conforming to the dress and habits of the Gauchos, he has obtained an unbounded popularity in the country, and in consequence a despotic power. I was assured by an English merchant, that a man who had murdered another, when arrested and questioned concerning his motive, answered, "He spoke disrespectfully of General Rosas, so I killed him." At the end of a week the murderer was at liberty. This doubtless was the act of the general's party, and not of the general himself.

In conversation he is enthusiastic, sensible, and very grave. His gravity is carried to a high pitch: I heard one of his mad buffoons (for he keeps two, like the barons of old) relate the following anecdote. "I wanted very much to hear a certain piece of music, so I went to the general two or three times to ask him; he said to me, 'Go about your business, for I am engaged.' I went a second time; he said, 'If you come again I will punish you.' A third time I asked, and he laughed. I rushed out of the tent, but it was too late—he ordered two soldiers to catch and stake me. I begged by all the saints in heaven he would let me off; but it would not do,—when the general laughs he spares neither mad man nor sound." The poor flighty gentleman looked quite dolorous, at the very recollection of the staking. This is a very severe punishment; four posts are driven into the ground, and the man is extended by his arms and legs horizontally, and there left to stretch for several hours. The idea is evidently taken from the usual method of drying hides. My interview passed away, without a smile, and I obtained a passport and order for the government post-horses, and this he gave me in the most obliging and ready manner.

In the morning we started for Bahia Blanca, which we reached in two days. Leaving the regular encampment, we passed by the toldos of the Indians. These are round like ovens, and covered with hides; by the mouth of each, a tapering chuzo was stuck in the ground. The toldos were divided into separate groups, which belong to the different caciques' tribes, and the groups were again divided into smaller ones, according to the relationship of the owners. For several miles we travelled along the valley of the Colorado. The alluvial plains on the side appeared fertile, and it is supposed that they are well adapted to the growth of corn. Turning northward from the river, we soon entered on a country, differing from the plains south of the river. The land still continued dry and sterile: but it supported many different kinds of plants, and the grass, though brown and withered, was more abundant, as the thorny bushes were less so. These latter in a short space entirely disappeared, and the plains were left without a thicket to cover their nakedness. This change in the vegetation marks the commencement of the grand calcareo argillaceous deposit, which forms the wide extent of the Pampas, and covers the granitic rocks of Banda Oriental. From the Strait of Magellan to the Colorado, a distance of about eight hundred miles, the face of the country is everywhere composed of shingle: the pebbles are chiefly of porphyry, and probably owe their origin to the rocks of the Cordillera. North of the Colorado this bed thins out, and the pebbles become exceedingly small, and here the characteristic vegetation of Patagonia ceases.

Having ridden about twenty-five miles, we came to a broad belt of sand-dunes, which stretches, as far as the eye can reach, to the east and west. The sand-hillocks resting on the clay, allow small pools of water to collect, and thus afford in this dry country an invaluable supply of fresh water. The great advantage arising from depressions and elevations of the soil, is not often brought home to the mind. The two miserable springs in the long passage between the Rio Negro and Colorado were caused by trifling inequalities in the plain, without them not a drop of water would have been found. The belt of sand-dunes is about eight miles wide; at some former period, it probably formed the margin of a grand estuary, where the Colorado now flows. In this district, where absolute proofs of the recent elevation of the land occur, such speculations can hardly be neglected by any one, although merely considering the physical geography of the country. Having crossed the sandy tract, we arrived in the evening at one of the post-houses; and, as the fresh horses were grazing at a distance we determined to pass the night there.

The house was situated at the base of a ridge between one and two hundred feet high—a most remarkable feature in this country. This posta was commanded by a negro lieutenant, born in Africa: to his credit be it said, there was not a ranche between the Colorado and Buenos Ayres in nearly such neat order as his. He had a little room for strangers, and a small corral for the horses, all made of sticks and reeds; he had also dug a ditch round his house as a defence in case of being attacked. This would, however, have been of little avail, if the Indians had come; but his chief comfort seemed to rest in the thought of selling his life dearly. A short time before, a body of Indians had travelled past in the night; if they had been aware of the posta, our black friend and his four soldiers would assuredly have been slaughtered. I did not anywhere meet a more civil and obliging man than this negro; it was therefore the more painful to see that he would not sit down and eat with us.

In the morning we sent for the horses very early, and started for another exhilarating gallop. We passed the Cabeza del Buey, an old name given to the head of a large marsh, which extends from Bahia Blanca. Here we changed horses, and passed through some leagues of swamps and saline marshes. Changing horses for the last time, we again began wading through the mud. My animal fell and I was well soused in black mire—a very disagreeable accident when one does not possess a change of clothes. Some miles from the fort we met a man, who told us that a great gun had been fired, which is a signal that Indians are near. We immediately left the road, and followed the edge of a marsh, which when chased offers the best mode of escape. We were glad to arrive within the walls, when we found all the alarm was about nothing, for the Indians turned out to be friendly ones, who wished to join General Rosas.

Bahia Blanca scarcely deserves the name of a village. A few houses and the barracks for the troops are enclosed by a deep ditch and fortified wall. The settlement is only of recent standing (since 1828); and its growth has been one of trouble. The government of Buenos Ayres unjustly occupied it by force, instead of following the wise example of the Spanish Viceroys, who purchased the land near the older settlement of the Rio Negro, from the Indians. Hence the need of the fortifications; hence the few houses and little cultivated land without the limits of the walls; even the

cattle are not safe from the attacks of the Indians beyond the boundaries of the plain, on which the fortress stands.

The part of the harbour where the Beagle intended to anchor being distant twenty-five miles, I obtained from the Commandant a guide and horses, to take me to see whether she had arrived. Leaving the plain of green turf, which extended along the course of a little brook, we soon entered on a wide level waste consisting either of sand, saline marshes, or bare mud. Some parts were clothed by low thickets, and others with those succulent plants, which luxuriate only where salt abounds. Bad as the country was, ostriches, deer, agoutis, and armadilloes, were abundant. My guide told me, that two months before he had a most narrow escape of his life: he was out hunting with two other men, at no great distance from this part of the country, when they were suddenly met by a party of Indians, who giving chase, soon overtook and killed his two friends. His own horse's legs were also caught by the bolas, but he jumped off, and with his knife cut them free: while doing this he was obliged to dodge round his horse, and received two severe wounds from their chuzos. Springing on the saddle, he managed, by a most wonderful exertion, just to keep ahead of the long spears of his pursuers, who followed him to within sight of the fort. From that time there was an order that no one should stray far from the settlement. I did not know of this when I started, and was surprised to observe how earnestly my guide watched a deer, which appeared to have been frightened from a distant quarter.

We found the Beagle had not arrived, and consequently set out on our return, but the horses soon tiring, we were obliged to bivouac on the plain. In the morning we had caught an armadillo, which although a most excellent dish when roasted in its shell, did not make a very substantial breakfast and dinner for two hungry men. The ground at the place where we stopped for the night, was incrusted with a layer of sulphate of soda, and hence, of course, was without water. Yet many of the smaller rodents managed to exist even here, and the tucutuco was making its odd little grunt beneath my head, during half the night. Our horses were very poor ones, and in the morning they were soon exhausted from not having had anything to drink, so that we were obliged to walk. About noon the dogs killed a kid, which we roasted. I ate some of it, but it made me intolerably thirsty. This was the more distressing as the road, from some recent rain, was full of little puddles of clear water, yet not a drop was drinkable. I had scarcely been twenty hours without water, and only part of the time under a hot sun, yet the thirst rendered me very weak. How people survive two or three days under such circumstances, I cannot imagine: at the same time, I must confess that my guide did not suffer at all, and was astonished that one day's deprivation should be so troublesome to me.

I have several times alluded to the surface of the ground being incrusted with salt. This phenomenon is quite different from that of the salinas, and more extraordinary. In many parts of South America, wherever the climate is moderately dry, these incrustations occur; but I have nowhere seen them so abundant as near Bahia Blanca. The salt here, and in other parts of Patagonia, consists chiefly of sulphate of soda with some common salt. As long as the ground remains moist in the salitrales (as the Spaniards improperly call them, mistaking this substance for saltpeter), nothing is to be seen but an extensive plain composed of a black, muddy soil, supporting scattered tufts of succulent plants. On returning through one of these tracts, after a week's hot weather, one is surprised to see square miles of the plain white, as if from a slight fall of snow, here and there heaped up by the wind into little drifts. This latter appearance is chiefly caused by the salts being drawn up, during the slow evaporation of the moisture, round blades of dead grass, stumps of wood, and pieces of broken earth, instead of being crystallized at the bottoms of the puddles of water. The salitrales occur either on level tracts elevated only a few feet above the level of the sea, or on alluvial land bordering rivers. M. Parchappe [47] found that the saline incrustation on the plain, at the distance of some miles from the sea, consisted chiefly of sulphate of soda, with only seven per cent. of common salt; whilst nearer to the coast, the common salt increased to 37 parts in a hundred. This circumstance would tempt one to believe that the sulphate of soda is generated in the soil, from the muriate, left on the surface during the slow and recent elevation of this dry country. The whole phenomenon is well worthy the attention of naturalists. Have the succulent, salt-loving plants, which are well known to contain much soda, the power of decomposing the muriate? Does the black fetid mud, abounding with organic matter, yield the sulphur and ultimately the sulphuric acid?

Two days afterwards I again rode to the harbour: when not far from our destination, my companion, the same man as before, spied three people hunting on horseback. He immediately

dismounted, and watching them intently, said, "They don't ride like Christians, and nobody can leave the fort." The three hunters joined company, and likewise dismounted from their horses. At last one mounted again and rode over the hill out of sight. My companion said, "We must now get on our horses: load your pistol;" and he looked to his own sword. I asked, "Are they Indians?"—"Quien sabe? (who knows?) if there are no more than three, it does not signify." It then struck me, that the one man had gone over the hill to fetch the rest of his tribe. I suggested this; but all the answer I could extort was, "Quien sabe?" His head and eye never for a minute ceased scanning slowly the distant horizon. I thought his uncommon coolness too good a joke, and asked him why he did not return home. I was startled when he answered, "We are returning, but in a line so as to pass near a swamp, into which we can gallop the horses as far as they can go, and then trust to our own legs; so that there is no danger." I did not feel quite so confident of this, and wanted to increase our pace. He said, "No, not until they do." When any little inequality concealed us, we galloped; but when in sight, continued walking. At last we reached a valley, and turning to the left, galloped quickly to the foot of a hill; he gave me his horse to hold, made the dogs lie down, and then crawled on his hands and knees to reconnoitre. He remained in this position for some time, and at last, bursting out in laughter, exclaimed, "Mugeres!" (women!). He knew them to be the wife and sister-in-law of the major's son, hunting for ostrich's eggs. I have described this man's conduct, because he acted under the full impression that they were Indians. As soon, however, as the absurd mistake was found out, he gave me a hundred reasons why they could not have been Indians; but all these were forgotten at the time. We then rode on in peace and quietness to a low point called Punta Alta, whence we could see nearly the whole of the great harbour of Bahia Blanca.

The wide expanse of water is choked up by numerous great mud-banks, which the inhabitants call Cangrejales, or *crabberies*, from the number of small crabs. The mud is so soft that it is impossible to walk over them, even for the shortest distance. Many of the banks have their surfaces covered with long rushes, the tops of which alone are visible at high water. On one occasion, when in a boat, we were so entangled by these shallows that we could hardly find our way. Nothing was visible but the flat beds of mud; the day was not very clear, and there was much refraction, or as the sailors expressed it, "things loomed high." The only object within our view which was not level was the horizon; rushes looked like bushes unsupported in the air, and water like mud-banks, and mud-banks like water.

We passed the night in Punta Alta, and I employed myself in searching for fossil bones; this point being a perfect catacomb for monsters of extinct races. The evening was perfectly calm and clear; the extreme monotony of the view gave it an interest even in the midst of mud-banks and gulls sand-hillocks and solitary vultures. In riding back in the morning we came across a very fresh track of a Puma, but did not succeed in finding it. We saw also a couple of Zorillos, or skunks,—odious animals, which are far from uncommon. In general appearance, the Zorillo resembles a polecat, but it is rather larger, and much thicker in proportion. Conscious of its power, it roams by day about the open plain, and fears neither dog nor man. If a dog is urged to the attack, its courage is instantly checked by a few drops of the fetid oil, which brings on violent sickness and running at the nose. Whatever is once polluted by it, is for ever useless. Azara says the smell can be perceived at a league distant; more than once, when entering the harbour of Monte Video, the wind being off shore, we have perceived the odour on board the Beagle. Certain it is, that every animal most willingly makes room for the Zorillo.

CHAPTER V — BAHIA BLANCA

Bahia Blanca—Geology—Numerous gigantic Quadrupeds—Recent Extinction—Longevity of species—Large Animals do not require a luxuriant vegetation—Southern Africa—Siberian Fossils—

Two Species of Ostrich—Habits of Oven-bird—Armadilloes—Venomous Snake, Toad, Lizard—Hybernation of Animal—Habits of Sea-Pen—Indian Wars and Massacres—Arrow-head, antiquarian Relic.

THE Beagle arrived here on the 24th of August, and a week afterwards sailed for the Plata. With Captain Fitz Roy's consent I was left behind, to travel by land to Buenos Ayres. I will here add some observations, which were made during this visit and on a previous occasion, when the Beagle was employed in surveying the harbour.

The plain, at the distance of a few miles from the coast, belongs to the great Pampean formation, which consists in part of a reddish clay, and in part of a highly calcareous marly rock. Nearer the coast there are some plains formed from the wreck of the upper plain, and from mud, gravel, and sand thrown up by the sea during the slow elevation of the land, of which elevation we have evidence in upraised beds of recent shells, and in rounded pebbles of pumice scattered over the country. At Punta Alta we have a section of one of these later-formed little plains, which is highly interesting from the number and extraordinary character of the remains of gigantic land-animals embedded in it. These have been fully described by Professor Owen, in the Zoology of the voyage of the Beagle, and are deposited in the College of Surgeons. I will here give only a brief outline of their nature.

First, parts of three heads and other bones of the Megatherium, the huge dimensions of which are expressed by its name. Secondly, the Megalonyx, a great allied animal. Thirdly, the Scelidotherium, also an allied animal, of which I obtained a nearly perfect skeleton. It must have been as large as a rhinoceros: in the structure of its head it comes according to Mr. Owen, nearest to the Cape Anteater, but in some other respects it approaches to the armadilloes. Fourthly, the Mylodon Darwinii, a closely related genus of little inferior size. Fifthly, another gigantic edental quadruped. Sixthly, a large animal, with an osseous coat in compartments, very like that of an armadillo. Seventhly, an extinct kind of horse, to which I shall have again to refer. Eighthly, a tooth of a Pachydermatous animal, probably the same with the Macrauchenia, a huge beast with a long neck like a camel, which I shall also refer to again. Lastly, the Toxodon, perhaps one of the strangest animals ever discovered: in size it equalled an elephant or megatherium, but the structure of its teeth, as Mr. Owen states, proves indisputably that it was intimately related to the Gnawers, the order which, at the present day, includes most of the smallest quadrupeds: in many details it is allied to the Pachydermata: judging from the position of its eyes, ears, and nostrils, it was probably aquatic, like the Dugong and Manatee, to which it is also allied. How wonderfully are the different Orders, at the present time so well separated, blended together in different points of the structure of the Toxodon!

The remains of these nine great quadrupeds, and many detached bones, were found embedded on the beach, within the space of about 200 yards square. It is a remarkable circumstance that so many different species should be found together; and it proves how numerous in kind the ancient inhabitants of this country must have been. At the distance of about thirty miles from Punta Alta, in a cliff of red earth, I found several fragments of bones, some of large size. Among them were the teeth of a gnawer, equalling in size and closely resembling those of the Capybara, whose habits have been described; and therefore, probably, an aquatic animal. There was also part of the head of a Ctenomys; the species being different from the Tucutuco, but with a close general resemblance. The red earth, like that of the Pampas, in which these remains were embedded, contains, according to Professor Ehrenberg, eight fresh-water and one salt-water infusorial animalcule; therefore, probably, it was an estuary deposit.

The remains at Punta Alta were embedded in stratified gravel and reddish mud, just such as the sea might now wash up on a shallow bank. They were associated with twenty-three species of shells, of which thirteen are recent and four others very closely related to recent forms. [51] From the bones of the Scelidotherium, including even the knee-cap, being intombed in their proper relative positions, and from the osseous armour of the great armadillo-like animal being so well preserved, together with the bones of one of its legs, we may feel assured that these remains were fresh and united by their ligaments, when deposited in the gravel together with the shells. [52] Hence we have good evidence that the above enumerated gigantic quadrupeds, more different from those of the present day than the oldest of the tertiary quadrupeds of Europe, lived whilst the sea was peopled

with most of its present inhabitants; and we have confirmed that remarkable law so often insisted on by Mr. Lyell, namely, that the "longevity of the species in the mammalia is upon the whole inferior to that of the testacea." 53

The great size of the bones of the Megatheroid animals, including the Megatherium, Megalonyx, Scelidotherium, and Mylodon, is truly wonderful. The habits of life of these animals were a complete puzzle to naturalists, until Professor Owen 54 solved the problem with remarkable ingenuity. The teeth indicate, by their simple structure, that these Megatheroid animals lived on vegetable food, and probably on the leaves and small twigs of trees; their ponderous forms and great strong curved claws seem so little adapted for locomotion, that some eminent naturalists have actually believed, that, like the sloths, to which they are intimately related, they subsisted by climbing back downwards on trees, and feeding on the leaves. It was a bold, not to say preposterous, idea to conceive even antediluvian trees, with branches strong enough to bear animals as large as elephants. Professor Owen, with far more probability, believes that, instead of climbing on the trees, they pulled the branches down to them, and tore up the smaller ones by the roots, and so fed on the leaves. The colossal breadth and weight of their hinder quarters, which can hardly be imagined without having been seen, become on this view, of obvious service, instead of being an incumbrance: their apparent clumsiness disappears. With their great tails and their huge heels firmly fixed like a tripod on the ground, they could freely exert the full force of their most powerful arms and great claws. Strongly rooted, indeed, must that tree have been, which could have resisted such force! The Mylodon, moreover, was furnished with a long extensile tongue like that of the giraffe, which, by one of those beautiful provisions of nature, thus reaches with the aid of its long neck its leafy food. I may remark, that in Abyssinia the elephant, according to Bruce, when it cannot reach with its proboscis the branches, deeply scores with its tusks the trunk of the tree, up and down and all round, till it is sufficiently weakened to be broken down.

The beds including the above fossil remains, stand only from fifteen to twenty feet above the level of high-water; and hence the elevation of the land has been small (without there has been an intercalated period of subsidence, of which we have no evidence) since the great quadrupeds wandered over the surrounding plains; and the external features of the country must then have been very nearly the same as now. What, it may naturally be asked, was the character of the vegetation at that period; was the country as wretchedly sterile as it now is? As so many of the co-embedded shells are the same with those now living in the bay, I was at first inclined to think that the former vegetation was probably similar to the existing one; but this would have been an erroneous inference for some of these same shells live on the luxuriant coast of Brazil; and generally, the character of the inhabitants of the sea are useless as guides to judge of those on the land. Nevertheless, from the following considerations, I do not believe that the simple fact of many gigantic quadrupeds having lived on the plains round Bahia Blanca, is any sure guide that they formerly were clothed with a luxuriant vegetation: I have no doubt that the sterile country a little southward, near the Rio Negro, with its scattered thorny trees, would support many and large quadrupeds.

That large animals require a luxuriant vegetation, has been a general assumption which has passed from one work to another; but I do not hesitate to say that it is completely false, and that it has vitiated the reasoning of geologists on some points of great interest in the ancient history of the world. The prejudice has probably been derived from India, and the Indian islands, where troops of elephants, noble forests, and impenetrable jungles, are associated together in every one's mind. If, however, we refer to any work of travels through the southern parts of Africa, we shall find allusions in almost every page either to the desert character of the country, or to the numbers of large animals inhabiting it. The same thing is rendered evident by the many engravings which have been published of various parts of the interior. When the Beagle was at Cape Town, I made an excursion of some days' length into the country, which at least was sufficient to render that which I had read more fully intelligible.

Dr. Andrew Smith, who, at the head of his adventurous party, has lately succeeded in passing the Tropic of Capricorn, informs me that, taking into consideration the whole of the southern part of Africa, there can be no doubt of its being a sterile country. On the southern and south-eastern coasts there are some fine forests, but with these exceptions, the traveller may pass for days together through open plains, covered by a poor and scanty vegetation. It is difficult to convey any accurate idea of degrees of comparative fertility; but it may be safely said that the amount of vegetation

supported at any one time [55] by Great Britain, exceeds, perhaps even tenfold, the quantity on an equal area, in the interior parts of Southern Africa. The fact that bullock-waggons can travel in any direction, excepting near the coast, without more than occasionally half an hour's delay in cutting down bushes, gives, perhaps, a more definite notion of the scantiness of the vegetation. Now, if we look to the animals inhabiting these wide plains, we shall find their numbers extraordinarily great, and their bulk immense. We must enumerate the elephant, three species of rhinoceros, and probably, according to Dr. Smith, two others, the hippopotamus, the giraffe, the bos caffer—as large as a full-grown bull, and the elan—but little less, two zebras, and the quaccha, two gnus, and several antelopes even larger than these latter animals. It may be supposed that although the species are numerous, the individuals of each kind are few. By the kindness of Dr. Smith, I am enabled to show that the case is very different. He informs me, that in lat. 24 degs., in one day's march with the bullock-waggons, he saw, without wandering to any great distance on either side, between one hundred and one hundred and fifty rhinoceroses, which belonged to three species: the same day he saw several herds of giraffes, amounting together to nearly a hundred; and that although no elephant was observed, yet they are found in this district. At the distance of a little more than one hour's march from their place of encampment on the previous night, his party actually killed at one spot eight hippopotamuses, and saw many more. In this same river there were likewise crocodiles. Of course it was a case quite extraordinary, to see so many great animals crowded together, but it evidently proves that they must exist in great numbers. Dr. Smith describes the country passed through that day, as "being thinly covered with grass, and bushes about four feet high, and still more thinly with mimosa-trees." The waggons were not prevented travelling in a nearly straight line.

Besides these large animals, every one the least acquainted with the natural history of the Cape, has read of the herds of antelopes, which can be compared only with the flocks of migratory birds. The numbers indeed of the lion, panther, and hyaena, and the multitude of birds of prey, plainly speak of the abundance of the smaller quadrupeds: one evening seven lions were counted at the same time prowling round Dr. Smith's encampment. As this able naturalist remarked to me, the carnage each day in Southern Africa must indeed be terrific! I confess it is truly surprising how such a number of animals can find support in a country producing so little food. The larger quadrupeds no doubt roam over wide tracts in search of it; and their food chiefly consists of underwood, which probably contains much nutriment in a small bulk. Dr. Smith also informs me that the vegetation has a rapid growth; no sooner is a part consumed, than its place is supplied by a fresh stock. There can be no doubt, however, that our ideas respecting the apparent amount of food necessary for the support of large quadrupeds are much exaggerated: it should have been remembered that the camel, an animal of no mean bulk, has always been considered as the emblem of the desert.

The belief that where large quadrupeds exist, the vegetation must necessarily be luxuriant, is the more remarkable, because the converse is far from true. Mr. Burchell observed to me that when entering Brazil, nothing struck him more forcibly than the splendour of the South American vegetation contrasted with that of South Africa, together with the absence of all large quadrupeds. In his Travels, [56] he has suggested that the comparison of the respective weights (if there were sufficient data) of an equal number of the largest herbivorous quadrupeds of each country would be extremely curious. If we take on the one side, the elephant, [57] hippopotamus, giraffe, bos caffer, elan, certainly three, and probably five species of rhinoceros; and on the American side, two tapirs, the guanaco, three deer, the vicuna, peccari, capybara (after which we must choose from the monkeys to complete the number), and then place these two groups alongside each other, it is not easy to conceive ranks more disproportionate in size. After the above facts, we are compelled to conclude, against anterior probability, [58] that among the mammalia there exists no close relation between the bulk of the species, and the *quantity* of the vegetation, in the countries which they inhabit.

With regard to the number of large quadrupeds, there certainly exists no quarter of the globe which will bear comparison with Southern Africa. After the different statements which have been given, the extremely desert character of that region will not be disputed. In the European division of the world, we must look back to the tertiary epochs, to find a condition of things among the mammalia, resembling that now existing at the Cape of Good Hope. Those tertiary epochs, which we are apt to consider as abounding to an astonishing degree with large animals, because we find the remains of many ages accumulated at certain spots, could hardly boast of more large quadrupeds than Southern Africa does at present. If we speculate on the condition of the vegetation during these

epochs we are at least bound so far to consider existing analogies, as not to urge as absolutely necessary a luxuriant vegetation, when we see a state of things so totally different at the Cape of Good Hope.

We know 59 that the extreme regions of North America, many degrees beyond the limit where the ground at the depth of a few feet remains perpetually congealed, are covered by forests of large and tall trees. In a like manner, in Siberia, we have woods of birch, fir, aspen, and larch, growing in a latitude 510 (64 degs.) where the mean temperature of the air falls below the freezing point, and where the earth is so completely frozen, that the carcass of an animal embedded in it is perfectly preserved. With these facts we must grant, as far as *quantity alone* of vegetation is concerned, that the great quadrupeds of the later tertiary epochs might, in most parts of Northern Europe and Asia, have lived on the spots where their remains are now found. I do not here speak of the kind of vegetation necessary for their support; because, as there is evidence of physical changes, and as the animals have become extinct, so may we suppose that the species of plants have likewise been changed.

These remarks, I may be permitted to add, directly bear on the case of the Siberian animals preserved in ice. The firm conviction of the necessity of a vegetation possessing a character of tropical luxuriance, to support such large animals, and the impossibility of reconciling this with the proximity of perpetual congelation, was one chief cause of the several theories of sudden revolutions of climate, and of overwhelming catastrophes, which were invented to account for their entombment. I am far from supposing that the climate has not changed since the period when those animals lived, which now lie buried in the ice. At present I only wish to show, that as far as *quantity* of food *alone* is concerned, the ancient rhinoceroses might have roamed over the *steppes* of central Siberia (the northern parts probably being under water) even in their present condition, as well as the living rhinoceroses and elephants over the *Karros* of Southern Africa.

I will now give an account of the habits of some of the more interesting birds which are common on the wild plains of Northern Patagonia: and first for the largest, or South American ostrich. The ordinary habits of the ostrich are familiar to every one. They live on vegetable matter, such as roots and grass; but at Bahia Blanca I have repeatedly seen three or four come down at low water to the extensive mud-banks which are then dry, for the sake, as the Gauchos say, of feeding on small fish. Although the ostrich in its habits is so shy, wary, and solitary, and although so fleet in its pace, it is caught without much difficulty by the Indian or Gaucho armed with the bolas. When several horsemen appear in a semicircle, it becomes confounded, and does not know which way to escape. They generally prefer running against the wind; yet at the first start they expand their wings, and like a vessel make all sail. On one fine hot day I saw several ostriches enter a bed of tall rushes, where they squatted concealed, till quite closely approached. It is not generally known that ostriches readily take to the water. Mr. King informs me that at the Bay of San Blas, and at Port Valdes in Patagonia, he saw these birds swimming several times from island to island. They ran into the water both when driven down to a point, and likewise of their own accord when not frightened: the distance crossed was about two hundred yards. When swimming, very little of their bodies appear above water; their necks are extended a little forward, and their progress is slow. On two occasions I saw some ostriches swimming across the Santa Cruz river, where its course was about four hundred yards wide, and the stream rapid. Captain Sturt, 511 when descending the Murrumbidgee, in Australia, saw two emus in the act of swimming.

The inhabitants of the country readily distinguish, even at a distance, the cock bird from the hen. The former is larger and darker-coloured, 512 and has a bigger head. The ostrich, I believe the cock, emits a singular, deep-toned, hissing note: when first I heard it, standing in the midst of some sand-hillocks, I thought it was made by some wild beast, for it is a sound that one cannot tell whence it comes, or from how far distant. When we were at Bahia Blanca in the months of September and October, the eggs, in extraordinary numbers, were found all over the country. They lie either scattered and single, in which case they are never hatched, and are called by the Spaniards huachos; or they are collected together into a shallow excavation, which forms the nest. Out of the four nests which I saw, three contained twenty-two eggs each, and the fourth twenty-seven. In one day's hunting on horseback sixty-four eggs were found; forty-four of these were in two nests, and the remaining twenty, scattered huachos. The Gauchos unanimously affirm, and there is no reason to doubt their statement, that the male bird alone hatches the eggs, and for some time afterwards

accompanies the young. The cock when on the nest lies very close; I have myself almost ridden over one. It is asserted that at such times they are occasionally fierce, and even dangerous, and that they have been known to attack a man on horseback, trying to kick and leap on him. My informer pointed out to me an old man, whom he had seen much terrified by one chasing him. I observe in Burchell's travels in South Africa, that he remarks, "Having killed a male ostrich, and the feathers being dirty, it was said by the Hottentots to be a nest bird." I understand that the male emu in the Zoological Gardens takes charge of the nest: this habit, therefore, is common to the family.

The Gauchos unanimously affirm that several females lay in one nest. I have been positively told that four or five hen birds have been watched to go in the middle of the day, one after the other, to the same nest. I may add, also, that it is believed in Africa, that two or more females lay in one nest. 513 Although this habit at first appears very strange, I think the cause may be explained in a simple manner. The number of eggs in the nest varies from twenty to forty, and even to fifty; and according to Azara, some times to seventy or eighty. Now, although it is most probable, from the number of eggs found in one district being so extraordinarily great in proportion to the parent birds, and likewise from the state of the ovarium of the hen, that she may in the course of the season lay a large number, yet the time required must be very long. Azara states, 514 that a female in a state of domestication laid seventeen eggs, each at the interval of three days one from another. If the hen was obliged to hatch her own eggs, before the last was laid the first probably would be addled; but if each laid a few eggs at successive periods, in different nests, and several hens, as is stated to be the case, combined together, then the eggs in one collection would be nearly of the same age. If the number of eggs in one of these nests is, as I believe, not greater on an average than the number laid by one female in the season, then there must be as many nests as females, and each cock bird will have its fair share of the labour of incubation; and that during a period when the females probably could not sit, from not having finished laying. 515 I have before mentioned the great numbers of huachos, or deserted eggs; so that in one day's hunting twenty were found in this state. It appears odd that so many should be wasted. Does it not arise from the difficulty of several females associating together, and finding a male ready to undertake the office of incubation? It is evident that there must at first be some degree of association between at least two females; otherwise the eggs would remain scattered over the wide plain, at distances far too great to allow of the male collecting them into one nest: some authors have believed that the scattered eggs were deposited for the young birds to feed on. This can hardly be the case in America, because the huachos, although often found addled and putrid, are generally whole.

When at the Rio Negro in Northern Patagonia, I repeatedly heard the Gauchos talking of a very rare bird which they called Avestruz Petise. They described it as being less than the common ostrich (which is there abundant), but with a very close general resemblance. They said its colour was dark and mottled, and that its legs were shorter, and feathered lower down than those of the common ostrich. It is more easily caught by the bolas than the other species. The few inhabitants who had seen both kinds, affirmed they could distinguish them apart from a long distance. The eggs of the small species appeared, however, more generally known; and it was remarked, with surprise, that they were very little less than those of the Rhea, but of a slightly different form, and with a tinge of pale blue. This species occurs most rarely on the plains bordering the Rio Negro; but about a degree and a half further south they are tolerably abundant. When at Port Desire, in Patagonia (lat. 48 degs.), Mr. Martens shot an ostrich; and I looked at it, forgetting at the moment, in the most unaccountable manner, the whole subject of the Petises, and thought it was a not full-grown bird of the common sort. It was cooked and eaten before my memory returned. Fortunately the head, neck, legs, wings, many of the larger feathers, and a large part of the skin, had been preserved; and from these a very nearly perfect specimen has been put together, and is now exhibited in the museum of the Zoological Society. Mr. Gould, in describing this new species, has done me the honour of calling it after my name.

Among the Patagonian Indians in the Strait of Magellan, we found a half Indian, who had lived some years with the tribe, but had been born in the northern provinces. I asked him if he had ever heard of the Avestruz Petise? He answered by saying, "Why, there are none others in these southern countries." He informed me that the number of eggs in the nest of the petise is considerably less than in that of the other kind, namely, not more than fifteen on an average, but he asserted that more than one female deposited them. At Santa Cruz we saw several of these birds. They were excessively wary: I think they could see a person approaching when too far off to be distinguished themselves.

In ascending the river few were seen; but in our quiet and rapid descent, many, in pairs and by fours or fives, were observed. It was remarked that this bird did not expand its wings, when first starting at full speed, after the manner of the northern kind. In conclusion I may observe, that the Struthio rhea inhabits the country of La Plata as far as a little south of the Rio Negro in lat. 41 degs., and that the Struthio Darwinii takes its place in Southern Patagonia; the part about the Rio Negro being neutral territory. M. A. d'Orbigny, 516 when at the Rio Negro, made great exertions to procure this bird, but never had the good fortune to succeed. Dobrizhoffer 517 long ago was aware of there being two kinds of ostriches, he says, "You must know, moreover, that Emus differ in size and habits in different tracts of land; for those that inhabit the plains of Buenos Ayres and Tucuman are larger, and have black, white and grey feathers; those near to the Strait of Magellan are smaller and more beautiful, for their white feathers are tipped with black at the extremity, and their black ones in like manner terminate in white."

A very singular little bird, Tinochorus rumicivorus, is here common: in its habits and general appearance, it nearly equally partakes of the characters, different as they are, of the quail and snipe. The Tinochorus is found in the whole of southern South America, wherever there are sterile plains, or open dry pasture land. It frequents in pairs or small flocks the most desolate places, where scarcely another living creature can exist. Upon being approached they squat close, and then are very difficult to be distinguished from the ground. When feeding they walk rather slowly, with their legs wide apart. They dust themselves in roads and sandy places, and frequent particular spots, where they may be found day after day: like partridges, they take wing in a flock. In all these respects, in the muscular gizzard adapted for vegetable food, in the arched beak and fleshy nostrils, short legs and form of foot, the Tinochorus has a close affinity with quails. But as soon as the bird is seen flying, its whole appearance changes; the long pointed wings, so different from those in the gallinaceous order, the irregular manner of flight, and plaintive cry uttered at the moment of rising, recall the idea of a snipe. The sportsmen of the Beagle unanimously called it the short-billed snipe. To this genus, or rather to the family of the Waders, its skeleton shows that it is really related.

The Tinochorus is closely related to some other South American birds. Two species of the genus Attagis are in almost every respect ptarmigans in their habits; one lives in Tierra del Fuego, above the limits of the forest land; and the other just beneath the snow-line on the Cordillera of Central Chile. A bird of another closely allied genus, Chionis alba, is an inhabitant of the antarctic regions; it feeds on sea-weed and shells on the tidal rocks. Although not web footed, from some unaccountable habit, it is frequently met with far out at sea. This small family of birds is one of those which, from its varied relations to other families, although at present offering only difficulties to the systematic naturalist, ultimately may assist in revealing the grand scheme, common to the present and past ages, on which organized beings have been created.

The genus Furnarius contains several species, all small birds, living on the ground, and inhabiting open dry countries. In structure they cannot be compared to any European form. Ornithologists have generally included them among the creepers, although opposed to that family in every habit. The best known species is the common oven-bird of La Plata, the Casara or housemaker of the Spaniards. The nest, whence it takes its name, is placed in the most exposed situations, as on the top of a post, a bare rock, or on a cactus. It is composed of mud and bits of straw, and has strong thick walls: in shape it precisely resembles an oven, or depressed beehive. The opening is large and arched, and directly in front, within the nest, there is a partition, which reaches nearly to the roof, thus forming a passage or antechamber to the true nest.

Another and smaller species of Furnarius (F. cunicularius), resembles the oven-bird in the general reddish tint of its plumage, in a peculiar shrill reiterated cry, and in an odd manner of running by starts. From its affinity, the Spaniards call it Casarita (or little housebuilder), although its nidification is quite different. The Casarita builds its nest at the bottom of a narrow cylindrical hole, which is said to extend horizontally to nearly six feet under ground. Several of the country people told me, that when boys, they had attempted to dig out the nest, but had scarcely ever succeeded in getting to the end of the passage. The bird chooses any low bank of firm sandy soil by the side of a road or stream. Here (at Bahia Blanca) the walls round the houses are built of hardened mud, and I noticed that one, which enclosed a courtyard where I lodged, was bored through by round holes in a score of places. On asking the owner the cause of this he bitterly complained of the little casarita, several of which I afterwards observed at work. It is rather curious to find how incapable these birds must be

of acquiring any notion of thickness, for although they were constantly flitting over the low wall, they continued vainly to bore through it, thinking it an excellent bank for their nests. I do not doubt that each bird, as often as it came to daylight on the opposite side, was greatly surprised at the marvellous fact.

I have already mentioned nearly all the mammalia common in this country. Of armadilloes three species occur namely, the Dasypus minutus or *pichy*, the D. villosus or *peludo*, and the *apar*. The first extends ten degrees further south than any other kind; a fourth species, the *Mulita*, does not come as far south as Bahia Blanca. The four species have nearly similar habits; the *peludo*, however, is nocturnal, while the others wander by day over the open plains, feeding on beetles, larvae, roots, and even small snakes. The *apar*, commonly called *mataco*, is remarkable by having only three moveable bands; the rest of its tesselated covering being nearly inflexible. It has the power of rolling itself into a perfect sphere, like one kind of English woodlouse. In this state it is safe from the attack of dogs; for the dog not being able to take the whole in its mouth, tries to bite one side, and the ball slips away. The smooth hard covering of the *mataco* offers a better defence than the sharp spines of the hedgehog. The *pichy* prefers a very dry soil; and the sand-dunes near the coast, where for many months it can never taste water, is its favourite resort: it often tries to escape notice, by squatting close to the ground. In the course of a day's ride, near Bahia Blanca, several were generally met with. The instant one was perceived, it was necessary, in order to catch it, almost to tumble off one's horse; for in soft soil the animal burrowed so quickly, that its hinder quarters would almost disappear before one could alight. It seems almost a pity to kill such nice little animals, for as a Gaucho said, while sharpening his knife on the back of one, "Son tan mansos" (they are so quiet).

Of reptiles there are many kinds: one snake (a Trigonocephalus, or Cophias 518), from the size of the poison channel in its fangs, must be very deadly. Cuvier, in opposition to some other naturalists, makes this a sub-genus of the rattlesnake, and intermediate between it and the viper. In confirmation of this opinion, I observed a fact, which appears to me very curious and instructive, as showing how every character, even though it may be in some degree independent of structure, has a tendency to vary by slow degrees. The extremity of the tail of this snake is terminated by a point, which is very slightly enlarged; and as the animal glides along, it constantly vibrates the last inch; and this part striking against the dry grass and brushwood, produces a rattling noise, which can be distinctly heard at the distance of six feet. As often as the animal was irritated or surprised, its tail was shaken; and the vibrations were extremely rapid. Even as long as the body retained its irritability, a tendency to this habitual movement was evident. This Trigonocephalus has, therefore, in some respects the structure of a viper, with the habits of a rattlesnake: the noise, however, being produced by a simpler device. The expression of this snake's face was hideous and fierce; the pupil consisted of a vertical slit in a mottled and coppery iris; the jaws were broad at the base, and the nose terminated in a triangular projection. I do not think I ever saw anything more ugly, excepting, perhaps, some of the vampire bats. I imagine this repulsive aspect originates from the features being placed in positions, with respect to each other, somewhat proportional to those of the human face; and thus we obtain a scale of hideousness.

Amongst the Batrachian reptiles, I found only one little toad (Phryniscus nigricans), which was most singular from its colour. If we imagine, first, that it had been steeped in the blackest ink, and then, when dry, allowed to crawl over a board, freshly painted with the brightest vermilion, so as to colour the soles of its feet and parts of its stomach, a good idea of its appearance will be gained. If it had been an unnamed species, surely it ought to have been called *Diabolicus*, for it is a fit toad to preach in the ear of Eve. Instead of being nocturnal in its habits, as other toads are, and living in damp obscure recesses, it crawls during the heat of the day about the dry sand-hillocks and arid plains, where not a single drop of water can be found. It must necessarily depend on the dew for its moisture; and this probably is absorbed by the skin, for it is known, that these reptiles possess great powers of cutaneous absorption. At Maldonado, I found one in a situation nearly as dry as at Bahia Blanca, and thinking to give it a great treat, carried it to a pool of water; not only was the little animal unable to swim, but I think without help it would soon have been drowned. Of lizards there were many kinds, but only one (Proctotretus multimaculatus) remarkable from its habits. It lives on the bare sand near the sea coast, and from its mottled colour, the brownish scales being speckled with white, yellowish red, and dirty blue, can hardly be distinguished from the surrounding surface. When frightened, it attempts to avoid discovery by feigning death, with outstretched legs, depressed

body, and closed eyes: if further molested, it buries itself with great quickness in the loose sand. This lizard, from its flattened body and short legs, cannot run quickly.

I will here add a few remarks on the hybernation of animals in this part of South America. When we first arrived at Bahia Blanca, September 7th, 1832, we thought nature had granted scarcely a living creature to this sandy and dry country. By digging, however, in the ground, several insects, large spiders, and lizards were found in a half-torpid state. On the 15th, a few animals began to appear, and by the 18th (three days from the equinox), everything announced the commencement of spring. The plains were ornamented by the flowers of a pink wood-sorrel, wild peas, cenotherae, and geraniums; and the birds began to lay their eggs. Numerous Lamellicorn and Heteromerous insects, the latter remarkable for their deeply sculptured bodies, were slowly crawling about; while the lizard tribe, the constant inhabitants of a sandy soil, darted about in every direction. During the first eleven days, whilst nature was dormant, the mean temperature taken from observations made every two hours on board the Beagle, was 51 degs.; and in the middle of the day the thermometer seldom ranged above 55 degs. On the eleven succeeding days, in which all living things became so animated, the mean was 58 degs., and the range in the middle of the day between 60 and 70 degs. Here, then, an increase of seven degrees in mean temperature, but a greater one of extreme heat, was sufficient to awake the functions of life. At Monte Video, from which we had just before sailed, in the twenty-three days included between the 26th of July and the 19th of August, the mean temperature from 276 observations was 58.4 degs.; the mean hottest day being 65.5 degs., and the coldest 46 degs. The lowest point to which the thermometer fell was 41.5 degs., and occasionally in the middle of the day it rose to 69 or 70 degs. Yet with this high temperature, almost every beetle, several genera of spiders, snails, and land-shells, toads and lizards were all lying torpid beneath stones. But we have seen that at Bahia Blanca, which is four degrees southward and therefore with a climate only a very little colder, this same temperature with a rather less extreme heat, was sufficient to awake all orders of animated beings. This shows how nicely the stimulus required to arouse hybernating animals is governed by the usual climate of the district, and not by the absolute heat. It is well known that within the tropics, the hybernation, or more properly aestivation, of animals is determined not by the temperature, but by the times of drought. Near Rio de Janeiro, I was at first surprised to observe, that, a few days after some little depressions had been filled with water, they were peopled by numerous full-grown shells and beetles, which must have been lying dormant. Humboldt has related the strange accident of a hovel having been erected over a spot where a young crocodile lay buried in the hardened mud. He adds, "The Indians often find enormous boas, which they call Uji or water serpents, in the same lethargic state. To reanimate them, they must be irritated or wetted with water."

I will only mention one other animal, a zoophyte (I believe Virgularia Patagonica), a kind of sea-pen. It consists of a thin, straight, fleshy stem, with alternate rows of polypi on each side, and surrounding an elastic stony axis, varying in length from eight inches to two feet. The stem at one extremity is truncate, but at the other is terminated by a vermiform fleshy appendage. The stony axis which gives strength to the stem may be traced at this extremity into a mere vessel filled with granular matter. At low water hundreds of these zoophytes might be seen, projecting like stubble, with the truncate end upwards, a few inches above the surface of the muddy sand. When touched or pulled they suddenly drew themselves in with force, so as nearly or quite to disappear. By this action, the highly elastic axis must be bent at the lower extremity, where it is naturally slightly curved; and I imagine it is by this elasticity alone that the zoophyte is enabled to rise again through the mud. Each polypus, though closely united to its brethren, has a distinct mouth, body, and tentacula. Of these polypi, in a large specimen, there must be many thousands; yet we see that they act by one movement: they have also one central axis connected with a system of obscure circulation, and the ova are produced in an organ distinct from the separate individuals. [519] Well may one be allowed to ask, what is an individual? It is always interesting to discover the foundation of the strange tales of the old voyagers; and I have no doubt but that the habits of this Virgularia explain one such case. Captain Lancaster, in his voyage [520] in 1601, narrates that on the sea-sands of the Island of Sombrero, in the East Indies, he "found a small twig growing up like a young tree, and on offering to pluck it up it shrinks down to the ground, and sinks, unless held very hard. On being plucked up, a great worm is found to be its root, and as the tree groweth in greatness, so doth the worm diminish, and as soon as the worm is entirely turned into a tree it rooteth in the earth, and so becomes great. This transformation is one of the strangest wonders that I saw in all my travels: for if

this tree is plucked up, while young, and the leaves and bark stripped off, it becomes a hard stone when dry, much like white coral: thus is this worm twice transformed into different natures. Of these we gathered and brought home many."

During my stay at Bahia Blanca, while waiting for the Beagle, the place was in a constant state of excitement, from rumours of wars and victories, between the troops of Rosas and the wild Indians. One day an account came that a small party forming one of the postas on the line to Buenos Ayres, had been found all murdered. The next day three hundred men arrived from the Colorado, under the command of Commandant Miranda. A large portion of these men were Indians (mansos, or tame), belonging to the tribe of the Cacique Bernantio. They passed the night here; and it was impossible to conceive anything more wild and savage than the scene of their bivouac. Some drank till they were intoxicated; others swallowed the steaming blood of the cattle slaughtered for their suppers, and then, being sick from drunkenness, they cast it up again, and were besmeared with filth and gore.

Nam simul expletus dapibus, vinoque sepultus Cervicem inflexam posuit, jacuitque per antrum Immensus, saniem eructans, ac frusta cruenta Per somnum commixta mero.

In the morning they started for the scene of the murder, with orders to follow the "rastro," or track, even if it led them to Chile. We subsequently heard that the wild Indians had escaped into the great Pampas, and from some cause the track had been missed. One glance at the rastro tells these people a whole history. Supposing they examine the track of a thousand horses, they will soon guess the number of mounted ones by seeing how many have cantered; by the depth of the other impressions, whether any horses were loaded with cargoes; by the irregularity of the footsteps, how far tired; by the manner in which the food has been cooked, whether the pursued travelled in haste; by the general appearance, how long it has been since they passed. They consider a rastro of ten days or a fortnight, quite recent enough to be hunted out. We also heard that Miranda struck from the west end of the Sierra Ventana, in a direct line to the island of Cholechel, situated seventy leagues up the Rio Negro. This is a distance of between two and three hundred miles, through a country completely unknown. What other troops in the world are so independent? With the sun for their guide, mare's flesh for food, their saddle-cloths for beds,—as long as there is a little water, these men would penetrate to the end of the world.

A few days afterwards I saw another troop of these banditti-like soldiers start on an expedition against a tribe of Indians at the small Salinas, who had been betrayed by a prisoner cacique. The Spaniard who brought the orders for this expedition was a very intelligent man. He gave me an account of the last engagement at which he was present. Some Indians, who had been taken prisoners, gave information of a tribe living north of the Colorado. Two hundred soldiers were sent; and they first discovered the Indians by a cloud of dust from their horses' feet, as they chanced to be travelling. The country was mountainous and wild, and it must have been far in the interior, for the Cordillera were in sight. The Indians, men, women, and children, were about one hundred and ten in number, and they were nearly all taken or killed, for the soldiers sabre every man. The Indians are now so terrified that they offer no resistance in a body, but each flies, neglecting even his wife and children; but when overtaken, like wild animals, they fight against any number to the last moment. One dying Indian seized with his teeth the thumb of his adversary, and allowed his own eye to be forced out sooner than relinquish his hold. Another, who was wounded, feigned death, keeping a knife ready to strike one more fatal blow. My informer said, when he was pursuing an Indian, the man cried out for mercy, at the same time that he was covertly loosing the bolas from his waist, meaning to whirl it round his head and so strike his pursuer. "I however struck him with my sabre to the ground, and then got off my horse, and cut his throat with my knife." This is a dark picture; but how much more shocking is the unquestionable fact, that all the women who appear above twenty years old are massacred in cold blood! When I exclaimed that this appeared rather inhuman, he answered, "Why, what can be done? they breed so!"

Every one here is fully convinced that this is the most just war, because it is against barbarians. Who would believe in this age that such atrocities could be committed in a Christian civilized country? The children of the Indians are saved, to be sold or given away as servants, or rather slaves for as long a time as the owners can make them believe themselves slaves; but I believe in their treatment there is little to complain of.

In the battle four men ran away together. They were pursued, one was killed, and the other three were taken alive. They turned out to be messengers or ambassadors from a large body of Indians, united in the common cause of defence, near the Cordillera. The tribe to which they had been sent was on the point of holding a grand council, the feast of mare's flesh was ready, and the dance prepared: in the morning the ambassadors were to have returned to the Cordillera. They were remarkably fine men, very fair, above six feet high, and all under thirty years of age. The three survivors of course possessed very valuable information and to extort this they were placed in a line. The two first being questioned, answered, "No se" (I do not know), and were one after the other shot. The third also said "No se;" adding, "Fire, I am a man, and can die!" Not one syllable would they breathe to injure the united cause of their country! The conduct of the above-mentioned cacique was very different; he saved his life by betraying the intended plan of warfare, and the point of union in the Andes. It was believed that there were already six or seven hundred Indians together, and that in summer their numbers would be doubled. Ambassadors were to have been sent to the Indians at the small Salinas, near Bahia Blanca, whom I have mentioned that this same cacique had betrayed. The communication, therefore, between the Indians, extends from the Cordillera to the coast of the Atlantic.

General Rosas's plan is to kill all stragglers, and having driven the remainder to a common point, to attack them in a body, in the summer, with the assistance of the Chilenos. This operation is to be repeated for three successive years. I imagine the summer is chosen as the time for the main attack, because the plains are then without water, and the Indians can only travel in particular directions. The escape of the Indians to the south of the Rio Negro, where in such a vast unknown country they would be safe, is prevented by a treaty with the Tehuelches to this effect;—that Rosas pays them so much to slaughter every Indian who passes to the south of the river, but if they fail in so doing, they themselves are to be exterminated. The war is waged chiefly against the Indians near the Cordillera; for many of the tribes on this eastern side are fighting with Rosas. The general, however, like Lord Chesterfield, thinking that his friends may in a future day become his enemies, always places them in the front ranks, so that their numbers may be thinned. Since leaving South America we have heard that this war of extermination completely failed.

Among the captive girls taken in the same engagement, there were two very pretty Spanish ones, who had been carried away by the Indians when young, and could now only speak the Indian tongue. From their account they must have come from Salta, a distance in a straight line of nearly one thousand miles. This gives one a grand idea of the immense territory over which the Indians roam: yet, great as it is, I think there will not, in another half-century, be a wild Indian northward of the Rio Negro. The warfare is too bloody to last; the Christians killing every Indian, and the Indians doing the same by the Christians. It is melancholy to trace how the Indians have given way before the Spanish invaders. Schirdel [521] says that in 1535, when Buenos Ayres was founded, there were villages containing two and three thousand inhabitants. Even in Falconer's time (1750) the Indians made inroads as far as Luxan, Areco, and Arrecife, but now they are driven beyond the Salado. Not only have whole tribes been exterminated, but the remaining Indians have become more barbarous: instead of living in large villages, and being employed in the arts of fishing, as well as of the chase, they now wander about the open plains, without home or fixed occupation.

I heard also some account of an engagement which took place, a few weeks previously to the one mentioned, at Cholechel. This is a very important station on account of being a pass for horses; and it was, in consequence, for some time the head-quarters of a division of the army. When the troops first arrived there they found a tribe of Indians, of whom they killed twenty or thirty. The cacique escaped in a manner which astonished every one. The chief Indians always have one or two picked horses, which they keep ready for any urgent occasion. On one of these, an old white horse, the cacique sprung, taking with him his little son. The horse had neither saddle nor bridle. To avoid th