

the former is fertile, covered with mamees, sapotas (*achra*), banana trees and other plants cultivated by the Indians in their *charas*.<sup>27</sup> The town boasts no buildings of particular interest, and the frequency of earthquakes prevents such plans.

The outlying area of Cumaná is as densely populated as the old town. This includes Los Cerritos, where we met with attractive tamarind trees, San Francisco to the south-east, and the place where the Guaiquerí live. The name of this tribe was quite unknown before the conquest. The Indians who use this name used to belong to the Warao who still inhabit the marshy area of the Orinoco delta. Some old men assured me that the language of their ancestors was a Warao dialect, but in Cumaná and Margarita not one Indian has spoken anything but Castilian for over a century.

The word 'Guaiquerí', like the words 'Peru' and 'Peruvian', owes its origin to a simple mistake. When Christopher Columbus's companions reached Margarita Island, on whose northern tip these Indians still live, they found several Indians fishing with harpoons, throwing these sharp-pointed sticks tied with string at the fish. Columbus's men asked the Indians in the Haitian language what their name was, but the Indians thought the foreigners referred to their harpoons made of the hard and heavy wood of the macana palm and answered: 'Guaiké, guaiké', meaning 'pointed stick'. These Guaiquerí are an intelligent and civilized tribe of fishermen, notably different from the wild Guarano from the Orinoco who build their houses up in the mauritia palm trees.

The beach near the mouth of the small Santa Catalina river is lined with mangrove trees (*Rhizophora mangle*); but these mangroves (*manglares*) are not extensive enough to affect the salubrity of Cumaná's air. Otherwise the plain is partly bare and partly covered with tufts of plants including the *Avicennia tomentosa*, the *Scoparia dulcis*, a shrub-like mimosa with very sensitive leaves,<sup>28</sup> and especially cassias, so many of which can be found in South America that on our travels we gathered more than thirty new species.

On leaving the Indian suburbs and climbing the river towards the south we reached a little wood of cacti, and then a marvellous place shaded by tamarind trees, braziletos, bombax and other trees remarkable for their leaves and flowers. Here the soil is rich enough for

pasturing, and among the trees there are dairies built of reeds. The milk is kept fresh not in the calabashes, which are made of thick ligneous fibres, but in porous earthenware pots from Maniquarez. A prejudice current in northern countries led me to believe that cows in the torrid zone did not give buttery milk. However, during my stay in Cumaná, and especially while on a trip through the vast plains of Calabozo, covered in grasses and sensitive plants, I learned that European cows adapt perfectly to extreme heat provided they are given water and good fodder.

As the inhabitants of Cumaná prefer the freshness of the sea breeze to forests their favourite walk is along the open shore. The Castilians, accused of not being fond of trees or birdsong, have transported these tastes and prejudices into their colonies. In Terra Firma, Mexico and Peru it is rare to see a native plant a tree just to get some shade, and, excepting the great capitals, tree alleys are almost unknown. The arid plain of Cumaná provides an extraordinary phenomenon after violent rainstorms. After being drenched with rain the earth is heated by the sun and gives off that musky smell common to many different tropical animals like the jaguar, the small tiger-cat, the capybara (*Cavia capybara*), the gallinazo vulture (*Vultur aura*), the crocodile, viper and rattlesnake. These gases seem to emanate from mould containing innumerable reptiles, worms and insect remains. I have seen Indian children from the Chaima tribe pick out 18-inch millipedes from the earth and eat them.

The waters of the Manzanares river are very clear and do not resemble at all the Manzanares river in Madrid, made to seem even more narrow by its sumptuous bridge. It springs, like all the rivers of New Andalusia, from the llanos (plains) known as the plateaux of Jonoro, Amana and Guanipa. The construction of a dyke to irrigate the land has been several times proposed to the government, but without success for, despite the apparent sterility, the land is extremely productive wherever heat and humidity meet.

The banks of the Manzanares are very attractive, shaded by mimosas, erythrinas, ceibas and other gigantic trees. A river whose temperature descends during the floods to as low as 22 °C when the air is 30 °C to 35 °C is a blessing in a country where the heat is excessive all year round and one wants to bathe several times a day. Children

spend a good part of their lives in this water; everybody, including the richest women, knows how to swim. In a country where people live so close to nature the most important question people ask each other on first meeting is whether the river water is fresher than it was the day before. There are several ways of bathing. Each evening we visited a group of respectable people in the Guaiquerí suburb. In the moonlight they would install chairs by the water; men and women were lightly dressed as if at European spas, and would spend hours smoking cigars and chatting with their families and strangers, according to the habits of the place, about the dryness, the heavy rains and the excessive luxury of Caracas and Havana ladies. Nobody worried about the small but rare crocodiles that approach humans without attacking, although dolphins swim upstream and scare bathers by spouting water.

Cumaná harbour has an anchorage in which all the fleets of Europe would fit. The whole of the Gulf of Cariaco, which is about 35 miles long and 6 to 8 miles wide, offers excellent anchoring. The hurricanes of the West Indies are never felt in this region, and you can sail about in an open boat. I have spent some time describing the location of Cumaná because it seemed important to make the place that has seen so many tremendous earthquakes known.

The city, dominated by the fort, lies at the foot of a hill without greenery. Not one bell-tower nor one dome attract the traveller from afar; just a few tamarind trees and coconut and date palms stand out above the flat-roofed houses. The surrounding plains, especially near the sea, appear sad, dusty and arid, while fresh, luxuriant vegetation marks out the winding river that divides the city from its outskirts and the European settlers from the copper-coloured Indians. The isolated, bare and white San Antonio mountain, with its fort, reflects a great mass of light and heat: it is made of breccia, whose strata contain fossil marine life. Far away towards the south you can make out a dark curtain of mountains. They are the high calcareous New Andalusian alps, topped with sandstone and other recent geological formations. Majestic forests cover this inland mountain chain linked along a forested valley with the salty, clayey and bare ground around Cumaná. In the gulf and on its shores you can see flocks of fishing herons and gannets, awkward, heavy birds, which, like swans, sail

along the water with their wings raised. Nearer the inhabited areas, you can count thousands of gallinazo vultures, veritable flying jackals, ceaselessly picking at carcasses. A gulf whose depths contain hot thermal springs divides the secondary from the primary and schistose rocks of the Araya peninsula. The two coasts are bathed by a calm blue sea lightly rippled by a constant breeze. A dry, pure sky, only lightly clouded at sunset, lies above the sea, over a peninsula devoid of trees and above the Cumaná plains, while one sees storms building up and bursting into fertile downpours around the inland mountain peaks.

Another characteristic common to both the New Andalusian coast and Peru is the frequency of earthquakes and the limits nature seems to have prescribed for these phenomena. In Cumaná we ourselves felt violent seismic shocks; they were still rebuilding the ruined houses and so we were able to gather detailed information on the spot about the terrible catastrophe of the 14th of December 1797. These notions will be the more interesting as earthquakes have been considered up to now less from a physical and geographical point of view than from the way they disastrously affect the population and well-being of society.

On the Cumaná coast and on Margarita Island most share the opinion that the Gulf of Cariaco was formed as a consequence of a fracturing of the territory and a flooding from the sea. The memory of this powerful cataclysm had been preserved by the Indians up to the fifteenth century, and it is said that by Christopher Columbus's third voyage the Indians still talked about it as recent. In 1530 the inhabitants of the Paria and Cumaná coasts were terrified by new shocks. The sea flooded the land and a huge crack was created in the Cariaco mountains and in the gulf of the same name. A great body of salt water, mixed with asphaltum, burst out of the micaceous schist. At the end of the sixteenth century earthquakes were very common and, according to tradition, the sea flooded the shore several times, rising some 90 to 100 feet above normal. The inhabitants fled to the San Antonio hills, and to the hill where the San Francisco convent stands today.

Because there are no records kept in Cumaná, and thanks to the persistent destructive activity of the termites, the white ants, no

documents older than 150 years remain in the archives, thus making it hard to know the exact dates for the earlier earthquakes. We know only that 1766 was most fatal for the settlers and most remarkable for the natural history of the country. There had been a drought for over fifteen months when on the 21st of October 1766 the city of Cumaná was completely destroyed. Every year that date is celebrated by a religious service and a solemn procession. All the houses collapsed in a few minutes, and every hour for fourteen months tremors were felt. In several areas in the province the earth opened up and vomited out sulphureous water. During 1766 and 1767 the Cumaná inhabitants camped out in the streets and began rebuilding only when the tremors slowed down to a few a month. While the earth continually rocked it felt as if the air was about to dissolve into water. Formidable rainstorms swelled the river; the year was extraordinarily fertile, and the Indians, whose frail shacks survive the most violent earthquakes, celebrated with dances of joy following an ancient superstition about the destruction of the old world and the birth of a new one.

According to tradition, during the quake of 1766 the earth moved in simple horizontal waves; only on the fatal day of the 14th of December did the earth rise up. More than four fifths of the city was completely destroyed, and the shock, accompanied by a loud subterranean noise, resembled the explosion of a mine placed deep in the ground. Fortunately the main shocks were preceded by light undulations thanks to which most of the inhabitants were able to reach the streets, and only a few who hid in the church died. It is generally believed in Cumaná that the worst earthquakes are preceded by weak oscillations in the ground, and by a humming that does not escape the notice of those used to this phenomenon. In those desperate moments you heard people everywhere shouting 'Misericordia! Tiembla! Tiembla!' ('Mercy! The earth is trembling!') The most faint-hearted attentively observe the dogs, goats and pigs. These last, with their acute sense of smell, and skill in poking around in the earth, give warnings of approaching dangers with frightened screams.

In Cumaná, on San Francisco hill with its convent, an intense stink of sulphur was smelled on the 14th of December 1797 half an hour before the great catastrophe. In this same place the underground noise was loudest. At the same time flames were seen on the Manzanares

river banks near the Capuchin hospital, and in the Gulf of Cariaco near Mariguitar. This phenomenon, so strange in non-volcanic countries, happens frequently in the calcareous mountains near Cumanacoa, in the Bordones river valley, on Margarita Island and on the plains of New Andalusia. On these plains the sparks of fire rose to a considerable height and were seen for hours in the most arid places. Some asserted that when the ground through which the inflammable substances rose was examined not the smallest crack was found. This fire, which recalls the springs of methane or the Salse of Modena and the will-o'-the-wisp of our marshes, does not burn the grass. The people, though less superstitious here than in Spain, call these reddish flames by the odd name of The Soul of the Tyrant Aguirre; imagining that the ghost of Lope de Aguirre,<sup>29</sup> harassed by remorse, wanders over these countries sullied by his crimes.

We will not continue to describe in detail the local changes produced by the different earthquakes of Cumaná. In order to follow our original plan we shall try to generalize our ideas, and include in one section everything that relates to these frightening and difficult-to-explain phenomena. If men of science who visit the Alps of Switzerland or the coasts of Lapland should broaden our knowledge about glaciers and the aurora borealis, then a traveller who has journeyed through Spanish America should mainly fix his attention on volcanoes and earthquakes. Every part of the earth merits particular study. When we cannot hope to guess the causes of natural phenomena, we ought at least to try to discover their laws and, by comparing numerous facts, distinguish what is permanent and constant from what is variable and accidental.

The great earthquakes, which appear between long series of slight shocks, do not happen regularly at Cumaná. We have seen them take place at intervals of eighty, a hundred and sometimes less than thirty years, while on the Peruvian coasts, for example at Lima, a certain regularity has marked the complete ruin of the city. The local belief in this uniformity has luckily aided public tranquillity and encouraged industry. Most admit that a long period of time elapses before the same causes act with the same energy. But such reasoning counts only if the shocks are considered as a local phenomenon, and if one supposes that great catastrophes are caused at one particular place.

When new buildings are raised on the ruins of the old we learn from those who refuse to rebuild that the destruction of Lisbon on the 1st of November 1755 was soon followed by a second and no less fatal quake on the 31st of March 1761.

A very ancient belief, still commonly held at Cumaná, Acapulco and Lima, establishes a perceptible connection between earthquakes and the state of the atmosphere that precedes these phenomena. On the coasts of New Andalusia people are alarmed when, in excessively hot weather and after long droughts, the breeze suddenly drops and the clear, cloudless sky turns reddish near the horizon. However, this way of predicting earthquakes is very uncertain, for when we gather together all the meteorological variations in times of earthquakes we find that violent shocks take place equally in dry and wet weather, whether when a cool wind blows or during a dead and suffocating calm. From the great number of earthquakes that I have witnessed on both sides of the equator, on the continent and at sea, on coasts and 2,500 toises high, it appears to me that the oscillations are quite independent of the previous state of the atmosphere. This opinion is shared by many educated people in the Spanish colonies whose experience of earthquakes, if not as extensive as mine, covers more years. Against this, scientific observers in Europe, where earthquakes are rare compared to America, tend to admit some close connections between the undulations of the ground and certain meteors that appear as if by chance at the same time. In Italy, for example, the sirocco and earthquakes are suspected to have some link; and in London, the frequency of shooting stars and those southern lights that have since often been observed by Dalton were considered as forerunners of those shocks felt from 1748 to 1756.

In the Tropics on those days when the earth is shaken by violent shocks the regularity of the barometer is not disturbed. I have verified this observation at Cumaná, at Lima and at Riobamba. Scientific observers should note this, for on Santo Domingo, in the town of Cape François, it has been asserted that a water barometer sank 2.5 inches just before the earthquake of 1770. It has also been related that a chemist, at the time of Oran's destruction, fled with his family a few minutes before the earthquake because he had noticed that the mercury in his barometer had sunk in an extraordinary manner. I do

not know whether to believe his story. But as it is practically impossible to examine the variations of the weight of the atmosphere during the shocks, we must be satisfied with observing the barometer before and after.

We cannot question that the earth, when split open and shaken by shocks, sometimes emits gaseous substances into the atmosphere in places remote from active volcanoes. At Cumaná, as we have already observed, flames and vapours mixed with sulphureous acid rise from the most arid soil. In other parts of the same province the earth throws up water and petroleum. At Riobamba, a muddy, inflammable mass, called *moya*, issues from crevices that close up again and pile up into hills. Seven leagues from Lisbon, near Colares, during the terrible earthquake of the 1st of November 1755, flames and a column of thick smoke rose up from the rock face of Alvidras and, according to some witnesses, from the depths of the sea. This smoke lasted several days and was thicker when the underground noises accompanied the strongest tremors.

I am inclined to think that nothing escapes from the shaken earth during earthquakes and that when gases and steam are seen they precede as often as they follow or accompany the shocks. This last circumstance probably explains the mysterious influence in equinoctial America of earthquakes on the climate and seasons of rains and droughts. If the earth acts only on the air at the moment of shock we can see why a perceptible meteorological change so rarely predicts one of these great revolutions of nature.

The hypothesis that during the Cumaná earthquakes elastic fluids escape from the earth's surface seems confirmed by the dreadful noise heard during the shocks near the wells in the plain of Charas. Water and sand are sometimes thrown 20 feet high. Similar phenomena did not escape the ancients' notice in areas of Greece and Asia Minor, in caves, crevices and underground rivers. Nature, in its uniform progress, everywhere gives birth to the same ideas concerning the causes of earthquakes, and man, forgetting the measure of its force, tries to diminish the effect of underground explosions. What the great Roman naturalist Pliny said about how wells and caves are the cause is repeated by the most ignorant Indians of Quito when they show travellers the *guaicos*, or crevices, of Pichincha.

The underground noise so frequently heard during earthquakes is not usually related to the strength of the shocks. At Cumaná the noise constantly preceded the shocks, while at Quito, and recently at Caracas and in the West Indies, a noise like the discharge of a battery of guns was heard a long time after the shocks had ended. A third kind of phenomenon, and the most remarkable of all of them, is the rolling of those underground thunders that last several months without being accompanied by the slightest tremors.

In every country subject to earthquakes the spot where the effects are most clearly felt, probably due to a particular disposition of the stony strata, is selected as the cause and focus of the shocks. Thus, at Cumaná, the hill of the San Antonio castle, especially where the San Francisco convent stands, is thought to contain an enormous amount of sulphur and other inflammable matter. We forget that the speed with which the undulations are propagated across great distances, even across the ocean, proves that the centre of action is very remote from the earth's surface. For this same reason earthquakes are not confined to certain types of rock, as some naturalists claim, for tremors pass through all kinds of rock. If I remain faithful to my own experiences I can here cite the granites of Lima and Acapulco, the gneiss of Caracas, the mica-slate of the Araya peninsula, the primitive schist of Tepecoacuilco in Mexico, the secondary limestones of the Apennines, Spain and New Andalusia, and finally the trappean porphyries of the provinces of Quito and Popayan. In these different places the ground is frequently shaken by the most violent shocks, but sometimes, in the same rock, the upper strata form invincible barriers to the propagation of the waves. In Saxony mines we have seen miners rush up frightened by oscillations that were not felt on the earth's surface.

If, in regions remote from each other, primitive, secondary and volcanic rocks conduct in equal ways the earth's convulsive movements, we have also to admit that within very limited areas certain classes of rock do not propagate shocks. At Cumaná, for example, before the great catastrophe of 1797, earthquakes were felt only along the southern calcareous coast of the Gulf of Cariaco as far as the town of the same name, while in the Araya peninsula and at the village of Maniquarez the ground did not move at all. The inhabitants of this

northern coast composed of mica-slate built their huts on solid earth, and a gulf some 3,000 to 4,000 toises wide separated them from a plain covered with ruins and overturned by earthquakes. This security, based on the experience of several centuries, no longer exists, because since the 14th of December 1797 new underground communications have opened up. At the present moment the Araya peninsula is not only subject to the same shaking as at Cumaná, but the mica-slate promontory has become a particular centre of tremors.

In New Andalusia, as well as in Chile and Peru, shocks follow the shore line and hardly extend inland. This circumstance indicates, as we shall soon show, an intimate connection between the causes that produce earthquakes and volcanoes. If the earth were most shaken on coasts because they are the lowest part of the land, why do we not feel equally strong oscillations on those vast savannahs or plains scarcely 8 to 10 toises above sea-level?

The earthquakes at Cumaná are connected with those of the West Indies, and it has even been suspected that they are somehow connected with the volcanic activity of the Andean cordilleras. On the 4th of February 1797 the ground of the province of Quito suffered such a destructive upheaval that nearly 40,000 natives died buried in the ruins of their houses, sucked into crevices or drowned in suddenly formed lakes. At the same time, the inhabitants of the eastern Antilles were alarmed by shocks that lasted for eight months when the volcano of Guadeloupe threw out pumice-stone, ashes and gusts of sulphureous gases. This eruption of the 27th of September, during which constant underground roaring was heard, was followed on the 14th of December by the great Cumaná earthquake. Another volcano in the West Indies, at Saint Vincent, has recently given a fresh example of these extraordinary connections. This volcano has not been active since 1718, and it burst out again in 1812. The complete ruin of Caracas preceded this explosion by thirty-four days, and violent waves were felt both on the islands and on the coasts of Terra Firma.

It has long been noted that the effects of great earthquakes extend much further than phenomena arising from active volcanoes. In studying the physical revolutions of Italy and carefully examining the series of eruptions of Vesuvius and Etna, we can see scarcely any sign

of simultaneous action, despite their proximity. But it is a fact that at the last two destructions of Lisbon (1755 and 1761) the sea was violently stirred as far away as Barbados in the New World, more than 1,200 leagues from Portugal.

Several facts seem to prove that the causes that produce earthquakes are connected with those that cause volcanic eruptions. The linking of these causes, already known by the ancients, struck Europeans again when America was discovered. This discovery not only brought new objects to satisfy man's curiosity, but also new ideas about physical geography, about the varieties of human species, and about the migrations of tribes. It is impossible to read the narratives of the first Spanish travellers, especially the Jesuit Acosta's,<sup>30</sup> without realizing the happy influence that the appearance of this great continent, the study of its marvellous nature, and the contact with men of different races has exerted on the progress of knowledge in Europe. The germ of a great number of physical truths can be found in these sixteenth-century works, and this germ would have given fruit had it not been crushed by fanaticism and superstition.

We learned at Pasto that the column of thick black smoke that, in 1797, issued from the volcano near the shore for several months, disappeared at the very moment when, 60 leagues south, the towns of Riobamba, Hambato and Tacunga were destroyed by an enormous shock. Thus, sitting in the interior of a burning crater near those hillocks formed by scoriae and ashes, we feel the ground move several seconds before each eruption takes place. We observed this phenomenon at Vesuvius in 1805 while the mountain threw out scoriae at white heat; we witnessed the same thing in 1802 on the brink of the immense crater of Pichincha, but this time only gases came out.

Everything in earthquakes seems to indicate the action of elastic fluids seeking an outlet to spread into the atmosphere. Often on the Pacific coast the action is almost immediately communicated from Chile to the Gulf of Guayaquil, some 600 leagues distant. Remarkably the shocks seem to be stronger the further the country is from the active volcano. The granitic mountains of Calabria, covered with very recent breccias, the calcareous chain of the Apennines, the country of Pignerol, the coasts of Portugal and Greece, those of Peru and Terra Firma, all show striking proof of this claim. The earth, we

might say, is shaken with greater force in proportion to the smaller number of funnels communicating the surface to caverns deep inside. At Naples and at Messina, at the foot of Cotopaxi and of Tungurahua, earthquakes are dreaded only if gases and flames do not burst out of the crater. The great catastrophes of Riobamba and Quito have led several well-informed people to think that this unfortunate country would be less often disturbed if the underground fires could break the porphyritic dome of Chimborazo and turn this gigantic mountain into an active volcano. Throughout the ages, similar facts have led to identical hypotheses. Like us, the Greeks attributed the ground's undulations to the tensions of elastic fluids, and quoted in support of their argument the fact that tremors on Elba ceased when a crevasse opened on the Levantine plain.

We have tried to collect at the end of this chapter the general phenomena of earthquakes in different climates. We have shown that subterranean gases are subjected to the same laws as those in the atmosphere. We have avoided discussing the nature of the chemical agents that cause the great earthquakes and volcanoes. It is sufficient to note that these causes are hidden at immense depths, and that we must seek them in what we call primitive rocks, perhaps below the earthy, and oxidized, crust, in the abysses that hold the metalloidal bases of silex, lime, soda and potash.

The phenomena of volcanoes and earthquakes have recently been seen as the effects of voltaic electricity, developed by a particular disposition of heterogeneous strata. It cannot be denied that when violent shocks often follow each other the electricity in the air increases the moment the ground is most shaken. But in order to explain this phenomenon it is not necessary to state a hypothesis which directly contradicts everything that has already been observed concerning the structure of our planet and the disposition of its strata.

## CHAPTER 5

### *The Araya peninsula – Salt marshes – Ruins of the Santiago fort*

We spent the first weeks of our stay in Cumaná testing our instruments, botanizing in the nearby countryside, and investigating the traces of the earthquake of the 14th of December 1797. Dazzled by the sheer amount of different objects we found it awkward to stick to a systematic way of studying and observing. If everything that we saw around us excited us, our instruments in their turn awoke the curiosity of the local inhabitants. The numerous visitors disturbed us; in order not to disappoint all those who seemed so pleased to see the spots of the moon through Dollond's telescope,<sup>31</sup> the absorption of two gases in a eudiometrical tube, or the effects of galvanism on the motions of a frog, we had to answer many obscure questions and repeat the same experiments for hours.

This same situation repeated itself over the five years of our journey whenever we settled down in a place where people knew we had microscopes, telescopes and electrical apparatus. This was all the more tiresome as those who visited us held confused notions of astronomy or physics, two sciences that in the Spanish colonies are called by the bizarre name of new philosophy, *nueva filosofía*. The half-scientific looked at us scornfully when they heard we had not brought with us books like Abbé Pluche's *Spectacle de la nature* or Sigaud la Fond's *Cours de physique* or Valmont de Bomare's Dictionary. These, along with Baron Bielfeld's *Traité d'économie politique*, are the foreign works most admired in Spanish America. No one is deemed learned who cannot quote from them in translation. Only in the great capitals are the names of Haller, Cavendish and Lavoisier replacing those who have been famous for over fifty years.

Our house in Cumaná was magnificently situated for observing the sky and meteorological phenomena; on the other hand, during the day, we witnessed scenes that disgusted us. A part of the great plaza is

### *Araya peninsula – Salt marshes – Santiago fort*

surrounded with arcades above which runs a long wooden gallery, common to all hot countries. This is where the slaves brought from Africa were once sold. Of all European countries Denmark was the first and for ages the only government to abolish the slave-trade; yet the first slaves we saw here were transported by a Danish slave-ship. What silences the speculations of vile interest in its struggle with the duties of humanity, national honour and the laws of the fatherland?

The slaves put up for sale were young people from fifteen to twenty years old. Every morning they were given coconut oil to rub into their bodies to make their skin black and shiny. All the time buyers would approach and, examining their teeth, would calculate their age and health; they forced open their mouths just as if dealing with horses at market. This debasing custom dates back to Africa as is faithfully shown in a play by Cervantes who, after a long captivity with the Moors, outlined the sale of Christian slaves in Algiers.<sup>32</sup> It is distressing to think that still today in the Spanish West Indies slaves are branded with hot irons to identify them in case they escape. This is how one treats those 'who save other men from the labour of sowing, working in the fields and harvesting'.<sup>33</sup>

The deep impression caused by our first sight of a slave sale in Cumaná was alleviated somewhat by the relief of finding ourselves with a people and on a continent where this spectacle is very rare, and the number of slaves, in general, insignificant. In 1800 there were not more than 600 slaves in the two provinces of Cumaná and New Barcelona, while the total population reached around 110,000. The trade in African slaves, never favoured by the Spanish Crown, has dwindled to almost nothing on these coasts where, in the sixteenth century, it reached a terrifying figure.

Our first excursion was to the Araya peninsula and those regions formerly so infamous for slave-trading and pearl fishing. On the 19th of August, at about two in the morning, we embarked on the Manzanares river, near the Indian settlement. Our main objectives on this short trip were to visit the ruins of the ancient Araya fort, the salt works and the mountains that form the narrow Maniquarez peninsula where we hoped to carry out some geological research. The night was deliciously cool, swarms of luminous insects (*Elater noctilucus*) shone in the air, on the ground covered with sesuvium, and in the

mimosa (*Lampyrus italica*) thickets bordering the river. We know how common glow-worms are in Italy and all southern Europe, yet the picturesque effect they produce cannot compare with these innumerable scattered and moving lights, which embellish the tropical nights all over the plains, repeating the spectacle of the stars in the sky on the ground.

Descending the river we passed the plantations or *charas* where negroes had lit bonfires for their fiestas. A light billowing smoke rose above the palm-tree tops, giving a reddish colour to the moon's disk. It was a Sunday night and the slaves danced to the monotonous and noisy music of guitars. A fundamental feature of the black African races is their inexhaustible store of vitality and joy. After working painfully hard all week, they prefer to dance and sing on their fiesta days rather than sleep for a long time. We should be wary of criticizing this mixture of thoughtlessness and frivolity for it sweetens the evils of a life of deprivations and suffering!

The boat in which we crossed the Gulf of Cariaco was very spacious. They had spread large jaguar skins out so that we could rest at night. We had been scarcely two months in the torrid zone, and already our organs were so sensitive to the slightest temperature changes that cold stopped us sleeping. To our surprise we saw that the thermometer marked 21.8 °C. This fact is familiar to those who have lived long in the Indies. During our stay at Guayaquil in January 1803, we watched the Indians cover themselves and complain of the cold when the temperature sank to 23.8 °C, while they suffocated with heat at 30.5 °C. A difference of 6 °C or 7 °C was sufficient to cause the opposite sensations of cold and heat. At Cumaná, during heavy showers, people in the streets are heard to complain 'Qué hielo! Estoy emparamado,'<sup>34</sup> though the thermometer exposed to the rain sinks only to 21.5 °C.

At about eight in the morning we landed at Araya point, near the new salt works. A solitary house (La Ranchería de la Salina Nueva) stood in the middle of an arid plain, next to a battery of three cannons, sole defence on this coast since the destruction of the Santiago fort. The salt-works' inspector spends his life in a hammock from where he passes on his orders to his workers, and a 'king's launch' (*la lancha del rey*) brings him his supplies from Cumaná every

week. It is astonishing that a salt works which once made the English, Dutch and other powerful maritime countries jealous did not lead to the founding of a village or even a farm. Only a few miserable Indian fishermen's huts exist at the tip of Araya point.

The abundance of salt contained in the Araya peninsula was known to Alonso Niño when, following the tracks of Columbus, Ojeda and Amerigo Vespucci, he visited these countries in 1499. Though the Indians of South America consume the least salt of any people on the globe because they eat mainly vegetables, it appears that the Guaiquerí dug into the clayey and muriatic soil of Punta Arena for salt. The Spaniards, established first at Cubagua, then on the Cumaná coasts, worked the salt marshes from the beginning of the sixteenth century. As the peninsula had no settled population the Dutch availed themselves of the natural riches of a soil that to them seemed common property. In our days, each colony has its own salt works. Navigation has so improved that merchants in Cádiz can send salt, at little expense, from Spain to cure meat in Montevideo or Buenos Aires, some 1,900 leagues away. These advantages were unknown at the time of the conquest. Colonial industry has made so little progress that Araya salt was carried to Cartagena and Portobello.<sup>35</sup> In 1605 the Madrid Court sent armed ships to expel the Dutch by force. The Dutch continued furtively to gather salt until a fort was built in 1622 near the salt works, which became known as Santiago fort, or the Real Fuerza de Araya. These great salt mines are laid down on the oldest Spanish maps. In 1726 a violent hurricane destroyed the Araya salt works and made the expensively built fort useless. This sudden hurricane was very rare in a region where the sea is generally as calm as the water of our large rivers; the high waves penetrated far inland and transformed the salty lake into a gulf several miles long. Since then there have been artificial deposits or vases to the north of the chain of hills that separate the fort from the northern coast of the peninsula.<sup>36</sup>

Having examined the salt works and finished our geodesical observations, we left at dusk with the intention of spending the night in an Indian hut near the ruins of the Araya fort. We sent our instruments and provisions on ahead as the extreme heat and irradiation from the ground so exhausted us that we only felt like eating in the cool of

night and early morning. Going southward, we crossed first the bare plain covered in salty clay, and then two chains of hills formed with sandstone between which there was a lagoon. Night surprised us while following a narrow path bordered on one side by the sea, and on the other by a wall of perpendicular rock. The tide was rising fast, and at each step narrowed the path. When we reached the foot of the old Araya fort we saw before us a natural picture that was melancholic and romantic. Yet neither the freshness of the dark jungle nor the grandeur of the plants could enhance the beauty of the ruins. These ruins stand on a bare, arid hill, with nothing but agave, columnar cacti and thorny mimosa, and seemed less like the work of men than masses of rock torn apart during the early revolutions of the earth.

We wanted to linger and admire the superb spectacle, and to observe the setting of Venus, whose disc appeared now and then between the broken fragments of the fort; but our mulatto guide was parched with thirst and insistently begged us to return. For a long time he had thought that we were lost, and, trying to scare us, he talked of the dangers of tigers and rattlesnakes. It is true that venomous reptiles are very common near the fort, and that a few days before two jaguars had been killed near the entrance to the village of Maniquarez. Judging by the skins we saw they could not be much smaller than tigers from India. We vainly tried to calm our man by telling him that those animals do not attack humans on a coast where goats offer copious prey; but we had to give in and retrace our steps. When we had been walking for three quarters of an hour along a beach covered by high tide we met the negro who was carrying our food; on seeing that we had not returned he had got worried and set out to find us. He led us through a wood of nopal cacti to the hut of an Indian family. We were received with that frank hospitality common in these lands to people from all social classes. From the outside the hut where we slung our hammocks looked very clean. Inside we found fish, bananas and other edibles, and, something that in this arid zone is far more appreciated than delicious food, excellent fresh water.

At dawn the next day we realized that the hut where we had spent the night formed part of a group of huts situated on the banks of a salt lake. They are the few remains left of a considerable village

formed long ago around the fort. The ruins of the church were half buried in sand and covered with brushwood. When in 1762 the Araya fort was completely dismantled, to save the expense of maintaining a garrison, the Indians and other coloured residents who lived around about emigrated one by one to Maniquarez, Cariaco and the Guaiquerí suburb at Cumaná. Only a few remained in the wild and desolate village, deeply attached to their native land. These poor people live from fishing on the coast and in neighbouring shoals rich in fish. They seemed content with their fate and found it strange that I asked them why they had no gardens to cultivate nutritious plants. 'Our gardens,' they replied, 'lie on the other side of the strait; we bring fish to Cumaná and they give us cassava, bananas and coconuts in return.' This economic system, which flatters laziness, is followed at Maniquarez and throughout the Araya peninsula. The principal wealth of these inhabitants consists of large, beautiful goats. They move freely about like the goats on the Tenerife peak; they are completely wild, and are branded like the mules because it would be difficult to recognize them from their colour or spots. These fawn goats do not vary in colour like domestic ones. When a settler out hunting shoots a goat that is not his, he brings it to whichever neighbour it belongs to.

Among the mulattos whose huts surround the salt lake we found a shoemaker of Castilian descent. He received us with that gravity and self-sufficiency characteristic in those countries where the people feel they possess some special talent. He was stretching the string of a bow, and sharpening arrows to shoot birds. His trade of shoemaking could not be very lucrative in a country where the majority go barefoot; and he complained that the expense of European gunpowder reduced him to using the same weapons as the Indians. He was the sage of this place; he understood the formation of salt through the influence of the sun and full moon, the symptoms of earthquakes, the marks by which gold and silver mines are found, and the structure of medicinal plants, which he divided, like everybody in South America, into hot and cold. Having collected local traditions he gave us some curious accounts of the pearls of Cubagua, objects of luxury, which he treated with contempt. To show how familiar he was with the Bible he liked quoting Job, who preferred wisdom to all the pearls of

the Indies. His philosophy was limited to the narrow circle of his vital needs. All he wanted was a strong ass to carry a load of bananas to the loading-wharf.

After a long speech on the vanity of human greatness he pulled a few small opaque pearls from out of his leather pouch and forced us to accept them, making us note down on our writing tablets that a poor shoemaker of Araya, white and of noble Castilian race, had given us something that, across the ocean,<sup>37</sup> was thought of as very precious.

The pearl-oyster (*Aviculidae*, *Meleagrina margaritifera*, Cuvier) abounds on the shoals that extend from Cape Paria to Cape La Vela. The islands of Margarita, Cubagua, Coche, Punta Araya and the mouth of the Hacha river were as famous in the sixteenth century as the Persian Gulf and the island of Taprobana were to the ancients.

Benzoni<sup>38</sup> relates the adventure of one Louis Lampagnano, to whom Charles V granted the privilege of proceeding with five caravels to the Cumaná coasts to fish for pearls. The settlers sent him back with the bold message that the Emperor, too liberal with what was not his own, had no right to dispose of the oysters living at the bottom of the sea.

The pearl fisheries diminished rapidly towards the end of the sixteenth century, and had long ceased by 1683. The industrious Venetians who imitated fine pearls perfectly, and the growing popularity of cut diamonds, made the Cubagua fisheries less lucrative. At the same time the oysters became scarcer, not because, according to popular legend, they were frightened by the sound of oars and moved away, but because the rash gathering of thousands at a time stopped them propagating themselves. To form an idea of the destruction of the shells caused by the divers, we must remember that a boat collects in two to three weeks more than 35,000 oysters. The animal lives but nine to ten years, and only in its fourth year do pearls begin to show. In 10,000 shells there is often not a single pearl of value.

On the morning of the 20th the son of our host, a young, robust Indian, led us to the village of Maniquarez, passing through Barigon and Caney. It was a four-hour walk. Because of the reverberation of the sun's rays on the sand the thermometer remained at 31.3 °C. The cylindrical cacti along the path made the landscape green, but without

freshness or shade. We had walked barely a league when our guide decided, at every opportunity, to sit down and rest. When we got near to Casas de la Vela he even tried to lie down in the shade of a beautiful tamarind tree, to await nightfall. We observed this characteristic trait whenever we travelled with Indians; it has given rise to the most mistaken ideas about the physical constitutions of different races. The copper-coloured Indian, who is more used to the burning heat of these regions than a European, complains more because nothing stimulates his interest. Money is no bait, and if he is tempted by gain he repents of his decision as soon as he starts walking. This same Indian, who would complain when we loaded him with a box filled with plants while herborizing, would row his canoe against the strongest current for fourteen or fifteen hours in order to be back home.

We examined the remarkably solid ruins of Santiago. The 5-foot-thick walls of freestone have been toppled over by mines; but we still found huge sections with scarcely a crack in them. Our guide showed us a cistern (*el aljibe*), 30 feet deep, which though damaged furnishes water to the inhabitants of the Araya peninsula. This cistern was finished in 1681. As the basin is covered with an arched vault the excellent water remains very cool. Crossing the arid hills of Cape Cirial we detected a strong smell of petroleum. The wind blew from the place where the springs of petroleum, mentioned by the first chroniclers,<sup>39</sup> are to be found.

The Maniquarez potteries, famous from time immemorial, are a specialized industry completely run by Indian women. They work with the same method that was used before the conquest. This reveals both the infancy of this craft and that immobility of manners so characteristic of American Indians. Three hundred years have not sufficed to introduce the potter's wheel to a coast not more than forty days' sailing from Spain. The Indians have a vague idea that something of the sort exists, and surely would adopt one should it be shown to them. The quarries where they extract their clay lie half a league to the east of Maniquarez. This clay is produced by the decomposition of a mica-slate stained red by iron oxide. The Indian women prefer the part most loaded with mica; and very skilfully shape vessels of 2 to 3 feet in diameter with regular curves. As they do not know how

to use kilns they place scrub from *desmanthus*, cassia and arborescent *capparis* around the pots and bake them in the open air.

At Maniquarez we met some creoles who had been hunting at Cubagua. Deer of a small variety abound in this uninhabited island, and one person may kill three or four a day. I do not know how these animals got to the island as chroniclers mention only the great amount of rabbits. The *venado* of Cubagua belong to one of those numerous species of small American deer long confused under the vague name of *Cervus mexicanus*. In the plains of Cari we were shown something very rare in these hot climates, a completely white deer. Albino varieties are found in the New Continent even among tigers. Azara<sup>40</sup> saw a completely white-skinned jaguar.

The most extraordinary, even most marvellous, object on the Araya coast is what the people call the 'eye stone' (*piedra de los ojos*). This calcareous substance is the subject of many conversations as it is, according to Indian science, both stone and animal. It is found in the sand, where it is motionless: but if it is picked up and placed on a polished surface, for example a pewter or pottery plate, it begins to move if you drip some lemon juice on it. If it is then placed in the eye this supposed animal will expel any other foreign substance that may accidentally get in there. At the new salt works, and in the village of Maniquarez, hundreds of eye stones were offered to us, and the Indians pressed us to test them with lemon juice. They wanted to put sand in our eyes to convince us of the virtues of this remedy. Very quickly we saw that these 'stones' are the thin and porous valves of diminutive univalve shells. They have a diameter of some 1 to 4 lines, with one surface plane, the other convex. These calcareous coverings effervesce with lemon juice and start moving as the carbonic acid is formed. When placed in eyes, these eye stones act as tiny round pearls and seeds, used by the Indians of America to stimulate the flow of tears. These explanations did not satisfy the inhabitants of Araya. For man nature seems more grand the more it is mysterious, and the physics of the people rejects any simple explanation.

Along the southern coast, east of Maniquarez, three strips of land run out to sea. In these parts the seabed is made of mica-slate, and from these orogenic rock formations, some 26 metres from the coast, issues a spring of petroleum whose smell reaches far inland. We had

to wade into the water up to our waists to observe this interesting phenomenon. The waters are covered with *zostera*, and in the centre of a large bank of these plants you see a clear round patch, about 3 feet in diameter, across which float masses of *Ulva lactuca*. It is here that the springs are found. The bed of the bay is covered with sand, and the transparent and yellow petroleum resembles naphtha itself, bursting out in jets, accompanied by air bubbles. When we trod down the bottom with our feet we saw how these little springs changed place. The naphtha covers the sea for more than 1,000 feet from the shore line.

After exploring the outskirts of Maniquarez, we embarked in a fishing-boat for Cumaná. Nothing confirms how calm the sea is here as much as the tiny, badly kept boats with their one tall sail. Though we had picked the least damaged boat it leaked so much that the pilot's son had to continually bale out the water with a *tutumo*, or shell of the fruit of the *Crescentia cujete* (or calabash). In the Gulf of Cariaco, especially north of the Araya peninsula, canoes laden with coconuts often capsize because they sail too near the wind and against the waves. These accidents inspire fear only in those travellers who do not swim well; for when a pirogue is manned by an Indian fisherman and his son, the father turns the pirogue round and bales out the water while the son swims around, gathering all the coconuts. In less than a quarter of an hour the pirogue is sailing again without the Indian, with his boundless impassivity, having once complained.

The inhabitants of Araya, whom we visited a second time when returning from the Orinoco, have not forgotten that their peninsula is one of the places most anciently populated by the Castilians. They like talking about the pearl fisheries, the ruins of the Santiago fort, which they hope will be rebuilt one day, and all that they call the ancient splendour of these countries. In China and Japan inventions are called recent if they are more than 2,000 years old: in the European colonies an event seems extremely ancient if it is three centuries old, dating back to the discovery.

This absence of memories, which characterizes these new people in the United States of America and in the Spanish and Portuguese possessions, is worthy of attention. It is not only distressing to the traveller, who becomes deprived of the pleasures of the imagination,