and silence. We were here shown, with patriotic pride, the furniture which General Elliot caused to be made out of the fragments of the floating batteries of the besiegers, which were destroyed by his red-hot balls. From this point to the northern end of the rock, towards the neutral ground, which separates Gibraltar from the Spanish line, there is no means of going round the rock but by sea. The bold gigantic form of the naked rock warms the fancy of the painter with scenery peculiar in its kind. The sea breaks with a violent surf against the steep shores, which are here and there hollowed out into deep caverns, which serve as a retreat for wild pigeons. Thousands of little sea-crabs, sea-stars, sea-hedgehogs, sea-nettles, and edible muscle, animate these barren cliffs, which afford asylum to no other living creature. The only place where a landing is practicable, and which is frequently visited by the inhabitants of Gibraltar for their recreation, is occupied by a village of fishermen, called La Galetta. A narrow path leads from thence round the other part of the rock to the northern gate of the town. The wanderer going along this path is almost terrified by the nearly perpendicular ascent of the rock just at the place where it is the highest. From this dangerous path on the precipice, you come at length, by a paved artificial causeway over an arm of the sea, to the town gate.

General Donn, the governor, gave us leave to

visit every part of the rock, even the fortifications, and endeavoured besides to procure the embassy all the amusements which the insulated sea-port could afford. At a ball we saw the light fandango and bolero of the Andalusians, alternate with the dances of the north; and in the brilliantly illuminated avenues round the palace, were heard sometimes the tender strains of Spanish madrigals, sometimes the plaintive song of a northern bard. This contrast between the south and north, here strikes the traveller at every step. In the mixture of Spanish and English inhabitants, there are many Genoese and Calabrese, who, for the most part, follow the occupation of fishermen and mariners. The number of Jews, most of whom speak Spanish, is considerable. The possession of this place by the English has not yet been able to banish the Spanish manners and language; but the abode of numerous strangers, and the great trade, give a general and comprehensive character to this staple place for the commerce of the Mediterranean. But what completes the diversified picture which the inhabitants of Gibraltar present, is the presence of Asiatics and North Africans. Of the latter, there are many Moors, particularly from Morocco, who sell fruit and fine leather manufactures in the streets. The fair North European, and the tawny native of the south, are distinguished by striking differences in the features of the face, and in their whole figure, from these strangers of oriental

origin. The physiognomy of the Moors, and other Africans who are met with here, is expressive of firmness and prudence, yet without that look of cunning of which the people of the Semitic race are accused, but rather united with an agreeable frankness, content, and tranquillity of mind. A lofty forehead, oval countenance, large, expressive black eyes, shaded by arched, bushy eyebrows, a well-formed, long, but not too pointed nose, rather broad lips meeting in an acute angle, thick, smooth black hair on the head and beard, brownish yellow complexions, muscular neck, firmly knit, and robust make, with a stature above the middle size, characterise the inhabitants of North Africa as they are frequently seen in the streets of Gibraltar. Among the most dangerous diseases that occur in this bay of the Mediterranean, which, from its situation, is very hot, and especially exposed to the south wind, is the yellow fever. Only a short time previously to our arrival, many persons fell a sacrifice to this disorder. As in Cuba in the Gulf of Mexico, this destructive disease appears here also, in Cadiz, Barcelona, and other maritime towns which do not enjoy a free circulation of air, where it is still more favoured by the heat and the corrupt and enervating exhalations of the salt water.

The rock of Gibraltar consists of compact limestone, generally of a light yellow, ash grey, and smoke colour, and is often traversed with veins of

calcareous spar of a greyish white or yellowish brown colour. In single drused cavities, the spar is remarkably foliated, and sometimes crystallised in pretty large tables. This limestone rock is, especially towards the N. W. side, more stratified on the surface than deeper down, and contains several smaller and larger caves, so that there can be no doubt that the prevailing formation belongs to that of the Jura, or cavern limestone. In the mass of the limestone itself we discovered no shells, except a single species of sea-snail resembling the *Buccinum undatum*. The largest of the caves, *Gruta de S. Miguel* of the Spaniards, or Saint George's cavern of the English, situated almost in the middle of the rock, and 1100 feet above the level of the sea, contains a beautiful grotto, sixty feet high, and two hundred deep, adorned with various sparry petrifications, and supported by colossal stalactical pillars. The limestone in this cavern is traversed by vast fragments of a very fine brown stalactite, of which there are large mantlepieces in the house of the governor. The Pocoroca is a similar cavern, but not so deep. The tendency to the stalactic formation appears, however, not only in the vast pillars of the caverns, but also in the outside covering of many pieces of rock exposed to the air, which have a coat of yellow striped stalactite. On the south side of the town we observed, in the red clay of a ditch, several considerable pieces of a smoky grey

hornstone, such as frequently occurs also in the Jura limestone.

At Europa Point, and on the east side of the rock between the extreme fortifications of Cave Guard, and the fishing bay of La Galetta, there lies over this cavern limestone, the well known and remarkable osseous breccia (a limestone breccia), which, towards the sea, forms a mantle-shaped cavern, and seems here to dip in an angle of about 30°. In some places, it fills up the rents, clefts, and corroded hollows in the limestone rock itself. The general cement of this breccia, which is chiefly composed of fragments of the same limestone, is a stalactic mass of considerable hardness, a reddish brown colour, and full of vesicular cavities, which occur, without order, from the size of a poppy seed to an extent of several lines. Sometimes it is itself consolidated into reniform pieces of nearly concentric structure: mixed up with it are pieces, partly rounded, and partly angular, of a smoky grey, and of a light grey limestone, of which the greater part of the M. Calpe consists, and it contains kidneys or nodules of a soft very ferruginous, yellowish brown, fine-grained calcareous marl, and rounded grains of quartz of the size of a millet seed. Here and there, are wavy stripes and streaks of calcareous spar, and in the vesicular cavities, druses of a white stalactic limestone. The mixture is very hard, and the ingredients, which have often a thicker stalactic crust close to them,

are thereby cemented in the strongest manner, and very difficult to break asunder. Petrified bones are very seldom found in this stony mass, but they are so much the more frequent in the more recent bed of the conglomerate, or breccia, immediately over it, which contains the same rounded little grains of quartz, and the other ingredients, though of smaller grain, that is, the rolled pieces, from the size of a hen's egg to that of a bean, as well as a considerable quantity of the light grey limestone, and shows more frequent vesicular cavities. Besides the fossil bones, we found chiefly shells of recent land-snails. They are of the size of half a line to half an inch, partly whole, partly broken. We observed most frequently and clearly the *Helix algira;* several small white fragments seem, however, to belong to other kinds, perhaps even to sea-shells. The bones and teeth of the various animals themselves, lie pretty much calcined in the breccia, mingled together, not lying in regular strata, without any trace of having been rolled in the water, very seldom entire, more often sharp-splintery, without any connection or orderly disposition of the parts, which naturally belong together. Cuvier *, to whom we are indebted for a very accurate examination of these petrifactions, has declared these bones to be those of ruminating animals and *glires*, and, as he con-

* Rapport sur les Breches Osseuses, Annales du Mus. d'Hist. Nat. tom. 13. 1809.

jectures, antelopes or stags, Siberian hares and rats. According to some imperfectly authenticated accounts *, parts of a human skeleton are said to have been found among the remains of those animals: we were not so fortunate as to see such bones anywhere in Gibraltar, or to find them in the stone itself. William and John Hunter corrected the earlier statements of others, according to specimens sent to themselves, and declared the supposed human bones to belong to ruminating animals.

Over the stalactic stratum which we have described, there is a more recent limestone breccia, which lies on the surface of the ground, here and there rent into separate blocks of rock. It consists of a greyish white, or grey limestone, the *detritus* of calcined shells, very few fragments of bones, and a rather reddish, grainy, mortar-like cement; the pieces of limestone are here smaller, from half a line to six lines in diameter, and instead of the abovementioned grains of quartz, which are entirely wanting, there are whitish, pearl-like globules of stalactic limestone, resembling the Carlsbad peastones. The calcined shells are far more numerous here, and form in a manner, thin strata in the stone; no entire shells indeed are to be found among them; they seem, however, from their thickness

* Drinkwater's History of the Siege of Gibraltar, London, 1786. Imrie, Transactions of the Royal Society of Edinburgh, vol. iv. 1798.

and breadth, to belong to the common oyster; others, from their ribbed edge and convexity, perhaps, to a cockle (*Cardium*), that is to say, to marine conchylia. The water and air exercise great influence on this soft, and probably still forming mass, as deep cavities are found in it near the sea. The whole of this breccia formation may rise, perhaps, only a few hundred feet next the limestone mountain, and measure in its greatest thickness about fifty fathoms. The appearance of the petrified bones in it is very limited, as far as the country is at present known. They are found chiefly in the rock near Rosia Bay, and southward of the governor's country-house, on the sea-shore where the waves break violently against the cliffs, which in this place are from 30 to 40 feet high.

We have judged it proper to be more circumstantial in our description of the osseous breccia of Gibraltar, because the similar formation in many countries on the Adriatic and the Mediterranean, gives it very great interest in a geognostical view. For besides Gibraltar, some parts of Corsica, Cette, Antibes, Nice* in the south of France, Fustapidama in Corfu, Nona near Zara, and Ragosnitza in Dalmatia, the islands in the Golfo di Quarnero, Osero, Cherso, Sansego, &c., offer a perfectly similar breccia, which was formed from the fragments of the limestone mountains which run in a chain along the coasts of the Mediterranean. The late

* Faujas de St. Fond. Annal. du Mus. tom 10.

origin of this formation will, perhaps, be more certainly shown, if by continued accurate investigation it shall be proved to contain human bones, as many persons have supposed*, which is not impossible, since the existence of objects of art, such, for instance, as Germar mentions†, has been certified. But the larger masses of osseous breccia, which Spallanzani‡ describes as heaped up in the isle of Cerigo, so as to form a considerable mountain, and the fossils of Vicentin, Verona, and of Concud in Arragon, which are, perhaps, not dissimilar, merit, on that account, to be more accurately investigated by naturalists. It is particularly important in this extensive maritime formation that those remains of bones belong to species of animals of the herbivorous kind, which are still extant, for the most part domesticated, or at least frequently used; whereas the cavern limestone in the interior of the European continent contains only those of bears and carnivorous animals enclosed in a similar manner.

The peculiarity of the mountain of Gibraltar

* James's History of the Herculean Strait. London. 1773. Donati, Storia del Mar Adriatico. Forlis, Saggio d'osservazioni sopra le Isole di Cherso ed Osero. Venez. 1771. iv. p. 99.

† Journey to Dalmatia and Ragusa. Lips. 1817. Where he represents the whole formation of this osseous breccia under the name of an alluvial mountain. Among the substances found in the mass he mentions a piece of glass; iron nails have also been found in it.

‡ Observations on the isle of Cerigo.

appears in a still more striking manner, when we consider the country immediately adjacent. About half a mile* to the north-west of it, rises another mountain called by the English, "The Queen of Spain's Chair," which extends for many leagues almost directly from north to south. On both its sides, which are very gently sloped, it has in some places verdant pastures, in others, a scanty vegetation of heaths and cistus roses, and on the ridge chiefly bare blocks of rock. This mountain consists of a coarse-grained, red, and yellowish red sandstone. In general it seems not to be regularly stratified; the rare strata run from north-east to south-west, and incline in many different angles to the south-east. Towards the sea, the mountain gradually sinks to the flat sandy tract on the sea-shore. Most of the mountains which run westward of the Queen's Chair appear to have the same direction. Behind the latter mountain, a hilly country extends, which is adorned with all the charms of luxuriant vegetation and industrious cultivation. The little town of St. Roque, stands on an eminence opposite the western foot of the mountain; avenues of noble American aloes, and flowering bushes of oleander ornament this pleasant hill, the summits of which are crowned by the fortifications of the place, which were once considerable. A low sandy beach not only occupies

* It is not stated whether we are to understand a German mile, which is about four and half English miles. *Trans.*

the neutral ground between the fortress and the Spanish lines, which are protected by the two forts of St. Barbara and St. Philip, but extends all round the bay to the Spanish town of Algesiras, situated on the west side of it. The quicksand consists of rolled pieces of quartz, flinty slate, a yellowish jasper-like stone, and limestone.*

We crossed this little sandy desert in going from Gibraltar to visit the Spanish lines and Algesiras. At the frontier posts were a few Spanish troops of the line garrisoned in small houses; and, being unprotected from the beams of the sun, have a very disagreeable abode during the summer months: we obtained permission to visit the Spanish territory in our scientific excursion. Besides a few small gardens round the dwellings, we saw nothing on this strand except some single strand plants, which but sparingly cover the poverty of this tract, which the wind has raised into sandhills. Lizards, several species of *Pimelia*, *Copris*, and *Scarites*, are the chief inhabitants (of the animal kingdom) of this sandy soil. Proceeding this way along the coast we passed two inconsiderable streams. Nearer to Algesiras we entered a little grove of pines. The town itself, a well-built pleasant place, enjoys a delightful situation. To the west of it, are gently rising hills, adorned with lovely verdure, scattered pines and cork trees; and from their summits a charming

* Germar mentions, after Chrysogono, in particular, the existence of horns.

prospect opens into the valley. A lofty aqueduct brings water from the mountains, across the plains, to the town. The bay of Gibraltar, covered with innumerable vessels, extends here before the eye of the traveller, and the lofty Calpe, with its steep cliffs, bounds the prospect in the horizon. The hills round Algesiras are composed of the same red sandstone as that of which the Queen's Chair consists. They are sparingly shaded by the Spanish oak and the cork tree (*Quercus esculus* and *suber*), and diversified by the finest flowering shrubs, among which is the *Rhododendron ponticum*, probably a remnant of Moorish horticulture; but they are inhabited by the European scorpion and the American scolopendra.*

Near Algesiras, between the town and the Cabrita to the south of it, some antiquarians fix the place where Karteia, afterwards called Heraclea by the Romans, stood, a flourishing trading colony of the Phœnicians. Carter † says that he saw the ruins of this city on the banks of the little river Guadaranque.

Southwest of Algesiras lies Tarifa, the most southerly point of Andalusia, and of the whole European continent. The way to it, through meadows and over scantily wooded sandstone hills, is very diversified. This little town is, for the most part, of ancient construction, and still possesses fortifications erected in the times of the Moors, which,

* See Note, page 77.

† Journey from Gibraltar to Malaga.

however, are of far less importance at present than when the Saracens made this place the chief medium of their intercourse with Africa. This connection of Tarifa with the Moors, seems to have left some traces even in the physiognomy of the inhabitants. Their complexion and features are said to resemble the Arabian more than those of the other inhabitants of Andalusia. The beauty of the women of Tarifa is particularly celebrated, the charms of which they contrive to heighten, by improving their form with the black silk garment, and increasing the lustre of their ardent eyes by letting one of them peep through the veil which envelops their face. The Romans were already acquainted with the importance of this place, and peopled the town, which they called Julia Joza or Traducta, with colonists of Punic origin from Tingis (Tangier). At present the place being thinly peopled and without trade, has no general interest, except from its situation on the strait, from which it lies about a quarter of a league distant, with sandhills and sandbanks intervening.

From the towers of the town may be seen the opposite coast of Africa. Alcazar el Ceguer, a seaport of some importance under the Moors, but now deserted, is only three miles distant from Tarifa; to the east and west the strait becomes broader. The southern pillar of Hercules, Mons Abyla (Kynegetica, in some passages of the ancients), or the Mountain of Monkeys, at the foot

of which Ceuta is situated, rises nearly opposite to Gibraltar; towards the west appears the chain of mountains which extends behind Tangier, and terminates in Cape Espartel. The current may be easily perceived in the strait, which constantly brings water from the ocean into the Mediterranean, and gave rise to Halley's well-known theory, of the more rapid evaporation of the water in that sea. This current runs about four or five leagues in the hour, and is so strong, that even large ships cannot sail from the strait to the west without a good east wind, for which reason they are frequently obliged to remain a long time in the harbour of Gibraltar, whereas vessels from the Atlantic can enter, even with a contrary wind. In the Mediterranean, the current is perceptible as far as the coast of Malaga, twenty leagues, or according to others, Cabo de Gata, seventy leagues from Gibraltar. Rennel's observation * is, that the whole surface of the ocean, from the 45th to the 30th degree of latitude, to the distance of a hundred and thirty miles westward of the shores of Europe and Africa, is in motion towards the Pillars of Hercules, and runs between Cape St. Vincent and Cape Cantin, as it were into a funnel, of which the strait of Gibraltar is the mouth. This current is connected with that which goes southward along the western coast of Spain and Portugal, is felt beyond Madeira, and causes vessels, bound to Madeira or

* Edinburgh Philosophical Journal, 1821, vol. iv. p. 241.

the Canary Islands, to deviate from their course, to the south-east. Besides the current in the strait, from the ocean towards the east, a contrary motion of the Mediterranean from east to west, is observable below the surface. The existence of this lower current is further strengthened by the well known reappearance of a ship, sunk in the strait, to the west of it.* The greater specific gravity of the sea water in the Mediterranean, may be perhaps looked upon as the chief cause of this countercurrent. The accounts of travellers agree in this difference in the specific gravity, and our own observations confirm it, as we found that of the Mediterranean to be 1.03384, and that of the Atlantic ocean, near the strait, 1.02944.† The

* Drinkwater's History of the late Siege of Gibraltar; Waiz, in Schwed. Abhandl. 1757; Marcet, in Phil. Trans. 1819; Patton, in Edinb. Phil. Journ. 1821, vol. iv. p. 243. It is also confirmed by two opposite currents in other straits, as in the Dardanelles, in the Sound, &c. Mr. Von Hoff (History of the natural Changes of the Surface of the Earth, Gotha, 1822. 8.) has very lately suggested doubts, not indeed of the existence of a sub-marine countercurrent, but of water being conveyed by it from the Mediterranean to the ocean, for he supposes that the motion towards the west, begins in the middle of the strait itself, and therefore proceeds only from the lower parts of the water of the ocean, which are hindered, by a supposed dam at the bottom of the strait, from entering the more shallow Mediterranean, so that they strike against it, and must return to the west.

† The observation made by Lalande (Voyage en Italie) that the water on the coast of France is lighter than that in the middle of the sea, as it contains only $\frac{1}{34}$ to $\frac{1}{30}$, and not $\frac{1}{27}$ to $\frac{1}{22}$, of its weight of salt, does not contradict our supposition,