There are besides these, a mass of marly limestone above Viznar to the south east of the city, whence issue the beautiful springs which supply the city, and a copious deposition of carbonate of lime proceeding from them. A similar deposit, but of much greater beauty, is formed at Lanjaron, on the opposite side of the mountain. See the account of marble. There is a formation at Monte Frio, which I have been informed contains shells. It is very probably similar to that of Escuzar, but I had not time to visit it. It is on the opposite side of the Vega, three leagues from Loxa. The limestone seen on the right of the road to Guadix, which appears to be a part of the same formation as that of Viznar, require examination, and amongst other desiderata of the geology of Granada, it would be adviseable to carry a section from the point mentioned of the junction of the primary to the Sierra de Elvira, and through the secondary strata to the marles which cover it, on the side of the Guadalquivir.

It will be remembered that the Vega of Granada is a mass of transported materials and ruin of former rocks. It extends some distance on the road to Guadix, and at its termination the mica slate may be seen in a spot, the only one I saw on that side of the mountain, where the primary is shown under the recent strata.

After this is a gorge or barranco in the limestone, no doubt of the secondary formation, which terminates in a long promontory, running out into a vast sea of sand and transported materials, extending, with a flat surface worn into innumerable hillocks and ravines, to the foot of the Sierra de Filabres, which is the eastern continuation of the Sierra Nevada. The city of Guadix stands on this formation, which is hollowed into numerous habi-

tations in the vicinity. The Sierra de Baza, which seems to be a continuation of the Sierra de Segura, rises through this recent formation, and separates it from the basin of Baza, which contains a lacustrine formation, observed and described by Colonel Silvertop. The formation at the eastward of the basin of Baza, after crossing the Guadiana, which is the eastern feeder of the Guadalquivir, is of gypsiferous loose sand stone and appears to rest on the Sierra de Segura. The formation of sand and detritus which has been followed from beyond Granada, to Guadix and Baza, probably supports the lacustrine formation of the latter place, and it is continued towards Murcia and the vale of Lorca, on the south east. To the south, from corresponding observations made in different places, though I cannot aver it to be the case, not having actually traversed it, I have no doubt whatever that it extends uninterruptedly to the delta of the Almanzora, where there is a wide tract, exactly of the same description, resting on one side, upon the range which divides the vale of that river from that of the Lorca in Murcia. On the other side of this vale of the Almanzora it reposes on the primary range of the Sierra de Macael, where are the marble quarries, which is part of the Sierra de Filabres. On its northern side, to the right of the Almanzora, it is tolerably level, but towards Murcia, it is heaped up, and has been worn into innumerable hillocks, or hummocks, as termed at sea. In this part it contains lignite* and gypsum, but is essentially composed of reddish sand, giving the peculiar African character to this interesting region. Near

* I am indebted for the information of this liguite, which is near Cuevas de Baza, and which I did not see, to Mr. Lambert, F. G. S., who visited it officially, but it was found unfit for any economical purpose.

a village called Cantoria, close to Purchena, the primary rocks are nearly uncovered on both sides of the stream, but only for a short distance, leaving the water course open between them, and with the very small intervals mentioned in this sketch, I have traced this formation, which may be termed the Granada detritus, and which is mainly composed of sand, from the sea at the mouth of the Almanzora, by Purchena, Baza, Guadix, Granada, Padul, and Tablarte, almost to the sea again at Motril, thus forming a nearly uninterrupted stream around the Sierra Nevada. An extensive deposition, of exactly the same nature, is also seen in ascending the great river of Almeria, to Tabernas. In this last line, it forms perpendicular walls, of several hundred feet in height, worn by the torrents. There is some reason to believe that the Sierra de Filabres is entirely detached from the principal chain, and that it is covered by more recent formations, in the line between Guadix and Almeria, but I cannot assert that it is so, not having crossed it in that direction. Amongst the rocks which compose it, are mica slate, and granular limestone, the latter rock resting on the mica slate. It may be observed, that the name of nummulite limestone, given in the accounts of the neighbourhood of Granada at the geological society, is not used here. The term, I have understood, was given provisorily, and certainly there is no formation in that neighbourhood to which it applies. It is, in fact, the secondary limestone of the general chain that has received this appellation. The nummulite rock which gave the name, is, I understood from Colonel Silvertop, at Velez Rubio in Murcia, which place I did not visit. It may be a member of the secondary series, but is much more probably of the tertiary, or more re-

cent epoch. I never met with it in any part near Granada. The relations of this nummulite rock are not yet established, and it would only lead to error, to consider it identified with the vast mass of secondary limestone which plays so important a part in Spanish geology, and to which it is almost certainly superposed.

ENVIRONS OF MALAGA.

The territory of Malaga is principally of red sandstone, crossed by bands of grey limestone. The sandstone, appears, on the whole, to occupy the lower place, although, after much examination, I cannot affirm that it does so. Traces of coal have been discovered at a place about three leagues to the west, where a small seam is associated with grits of various kinds, similar to the beds usually found with regular coal.

The understructure of the district is compact blue slate, which may be seen in the sea close to the town, and in a barranco to the east. This slate is extremely like that which underlies Monserrat in Catalonia. In pursuing the royal road to Antequera, a variety of primary rocks shew themselves, which are covered by the sandstone, its grits, and limestone. At the base of the lofty Puerto, which is passed to arrive at Antequera, is red sandstone. The Puerto itself is a magnificent ridge, which is formed by mural precipices, exactly similar to those of the Breche de Roland, in the Pyrennees, and of a limestone very like it, appears to rest on this sandstone, but it was too much covered to enable me to see the junction. On the Antequera side is a wide plain of saliferous marle or clay, which rests on this secondary chain, and extends, with little interruption, to the Gua-

dalquivir. The chain of Estepa, which is mentioned before, and which I believe to be formed of primary limestone, is an abutment or continuation of a chain commencing at Antequera which runs in a rectangular direction to the secondary limestone, but the state of the country, latterly, made it impossible to carry on observations in that vicinity. A tertiary, or recent deposit, is observed near Malaga, but it will be subsequently mentioned, in the general coast outline, in which it will be more clearly brought under view.

To the west of Malaga, after crossing the Vega and the great river, a bold Sierra presents itself, which is of blue limestone, and running in a semicircular direction, forms part of the Serrania de Ronda, closing in the Vega at its western end, where serpentine or greenstone comes through it. On the coast side it leaves a narrow pass where the substructure is seen, composed of primary granular limestone and mica slate. In the sea, near Frangirola, are appearances of members of the sandstone formation similar to those of the interior. They are now isolated and crumbling with the ceaseless efforts of the ocean, which will no doubt cause them, at no distant period, to disappear. At Marbella, the primary formation rises to a considerable height, when it breaks off, and is succeeded at once by red sandstone which, with bands of grey limestone crossing it, is continued, without interruption, round the western end of Andalusia, and to the great plain, which we shall designate as lower Andalusia.

The tract enclosed between this plain and the Mediterranean, is that termed the Serrania de Ronda. From observation, and some scanty information I have obtained, I believe this mass to be composed almost en-

tirely of sandstone and secondary limestone, with indurated marles, resting on serpentine and other rocks, which are seen on the southern side of it. A line followed from Marbella to Ronda, which I had not time to make, would probably throw light on this district. About the centre is a magnificent range, the highest peak of which is named St.-Cristobal in the country, but by seamen is known as the Moor's head, which is a landmark in the Atlantic, and might be one in the Mediterranean. I am ignorant what the upper part of this range is composed of, but it appears to be limestone, and it has been said to be primary.

The rock or Peñon of Gibraltar is a mass of grey limestone, exactly similar to that forming the secondary chain, and which we have traced, almost uninterruptedly, from the frontiers of Aragon, and which varies only in colour in different situations. A few fossils have lately been found in the mass of the limestone, and as the attention of the officers of engineers has now been called to the preservation of them, it is to be hoped there may be collected data, to throw some light on the age of this limestone. Those hitherto found are terebratulæ; a magnificent univalve, probably a terebra; patella; fissarella? At the south end of the rock are indications which I have generally seen to accompany the vicinity of the primary of this formation. They may be seen on the road to Europa point, in ascending from Rosea. There are stalactites, stalagmites, and conglomerates, with osseous breccia, in abundance, the former being common in this formation every where. A cu-

* I was indebted for assistance in obtaining these fossils to Dr. Farrell and Colonel Harding R. E.

rious specimen is in possession of an officer of the naval arsenal, a mass of bones and skeletons of birds, chiefly of the gull species, which are covered with a thin stalagmite, leaving the forms quite perfect. At the east side of the rock is a quantity of drift sand, thrown up from a great distance by the furious swirls of the Levant winds, from the sandy isthmus, and lodged against the limestone, which only requires a cementing liquid to form a compact sandstone. The neighbourhood of St.-Roque is covered by a recent marine deposit, which is mentioned in the coast line. The sandstone and limestone appear to extend beyond the straits, and to be carried, according to information I have received, far into Africa.

LOWER ANDALUSIA.

Vast beds of clay and marle appear to cover the sandstone and limestone of the Serrania de Ronda; and form the territory of Xeres, and the greater part of what may be termed, lower or western Andalusia. At Xeres and the vicinity, it is covered by a marine formation, exactly identical with that of the coast. At Vejer, between Gibraltar and Cadiz, is a similar formation to that traced along the coast, and no doubt contemporaneous with it. Here it is in thin beds, with a dip from the sea. I have some reason to believe that the same formation is found at Medina Sidonia, and Arcos. Near the former are beds which supply the best mill stones in the south of Spain. I have never seen them, but from the description they ought to belong to the sandstone.

At Alcala de Guadaira and Carmona, the marine for-

mation is of great extent, and considerable elevation, especially at Carmona, where it rises above the plain to some hundred feet. At the Molino de los Cartuxos, a mill upon the Guadaira, at a short distance above Alcala, I found the marine deposit resting on a stratum of blue clay, in which were pectens, shewing what I have no doubt is the regular position. I had sought in vain, previously, for a direct junction, or any organic remains, in this vast deposit of clay, in which at Xeres they have pierced to a very great depth, in search for water, without getting through it. The marine deposit extends far inland. At Villa Nueva del Rio, on the opposite side of the Guadalquivir, it covers the sandstone and coal formation, and I have seen something which resembles it in the bed of the Guadalquivir, between Cordova and Andujar, which requires examination. Near Andujar pectens were found in a stratum of clay and were sent to Madrid by a nobleman residing at Andujar, who communicated to me his observations *. I have no doubt whatever, that it is the same formation extending by the course of the Guadalquivir and covered by its alluvions in great part. I saw nothing of this formation further up than Andujar, where I crossed the line of it, but it is of great interest in the geology of Spain. This marine formation of Carmona and Alcala de Guadaira or of los Panaderos, is a rough crag, formed chiefly of marine exuviæ, and is loose and friable. The curious aqueduct of the Moors, which supplies Seville with beautiful water from this same formation, is driven through it, and passes underneath the town of Alcala, where there is a subterraneous mill worked by the stream

* I was indebted for the first information respecting this interesting deposit of Andujar to Professor Gutierrez of Madrid, and General Zareo Valle.

in its passage. On approaching the Guadalquivir it is covered by the diluvions of the river. At Cadiz and in the neighbourhood, there is a crag, apparently much more recent, with oysters, of which the walls of the city are built. On the north side of the Guadalquivir opposite to Seville, are beds of clay, apparently the same as those of the Xeresano, etc., and which most probably rest on the primary rock of the Sierra-Morena, at a short distance from the city. Higher up the river, at about thirty miles from Seville, is the sandstone and coal formation of Villanueva del Rio, which contains grits and the usual accompaniments of coal strata. It is associated with a formation of red sandstone, to which it no doubt belongs, which rests on the primary formation of the Sierra Morena. I saw the junction on the road to Cazalla, after crossing the river at Cantillana. Above the coal formation is a patch of the tertiary marine formation which is burnt for lime. There is every probability that this mass of carboniferous sandstone on the right of the Guadalquivir, which rests on the primary formations of the Sierra Morena, and is covered by a capping of recent marine formation, is a part of the sandstone of the Serrania de Ronda, opposite to it, and from which it is separated by the overlying beds of clay and marine formation of Carmona and Alcala, and the yet more recent diluvions of the Guadalquivir. The section of lower Andalusia will be more intelligible by the help of the accompanying sketch.

The secondary limestone of the Serrania de Ronda is seen at Moron, nine leagues from Seville, where it is of a blood red, and is quarried as an ornamental marble. I have seen a slab which contained nautili of a large size.

SECTION ACROSS LOWER ANDALUSIA.

S. M. Sierra Morena.
a. Primary range.
b. Redsandstone.
c. Coal basin of Villanueva del Rio.
d. Capping of recent marine formation, believed to be identical with *g*.
R. G. River Guadalquivir.

e. Diluvions.
C. A. Carmona and Alcala.
g. Recent marine formation with oysters etc., resting on
h. Blue clay, supposed to be identical with clay of Xeres etc.
S. R. Serrania de Ronda.
I. Secondary limestone etc.

The distance across the plain is diminished for the same reasons as given before.

ON THE COAST OF THE MEDITERRANEAN.

The observations hitherto made, give a general outline of the formations which compose considerable portions of the internal structure of Spain. To make the remaining part more clear it will be better to take the coast line, from Valencia to the western extremity of the Peninsula, which I have followed in nearly all its length. The reason of this arrangement is, that it will condense, and bring under one view many details which seem to bear on the same point, and will obviate much repetition, and that these sections offer some of the more remarkable features of the geology of an almost unknown country.

I had no opportunity of observing in detail, the eastern part of the kingdom of Valencia. From the Ebro to the west is a long and almost uninterrupted flat, between the great secondary chain and the sea, which is highly cultivated. There is reason to suppose it is of the same character as the coast line further west, but I have no correct information on this subject.

The Huerta, or plain, of Valencia, which is composed of alluvions and transported materials, is bounded to the west by the great secondary chain of the Sierra de Cuenca, and Segura, which ends abruptly in the sea at Cape St.-Martin, forming bold and magnificent cliffs. In approaching Alicante are masses of white indureted marle, at the base of which near Xixona is gypsiferous marle, and on the coast a variety of recent marine formations, containing pectens, oysters, Venus, pectuncula and many other recent fossils. These beds are in various forms and positions. The castle hill is formed of

them, and associated with them is marle, and a thin bed of nummulites, to the north of the town. In proceeding to the west along the shore, white marle is seen near the mouth of the Segura, in which are various recent shells. Torre Vieja, the scene of the earth quake, stands on a solid rock of indurated marle, which dips into the sea, and appears of recent formation. The country inland, to the foot of the secondary range at Orihuela, is of marle, but I saw no organic remains. Through this formation was the line of the earth quake, on which almost every building was levelled, but the surface was scarcely disturbed, and has reverted to its original state. The vale, or *huerta*, of Murcia in the course of the Segura, is between a range of the secondary limestone, and another more recent formation. Greenstone is seen on both sides the valley, especially near the curious isolated Monte Agudo, of which the base is that rock, and the apex limestone. This valley has been the scene of earthquakes in modern times, especially in its western side, where there are signs of much disturbance. The chain between the Segura and the sea, to the south, is a masss of sandstone and conglomerates with marle on the outer flank. Between this and Cartagena is a flat plain, covered by alluvions. An excellent section of the range to the right of the Segura, is seen by following a barranco a few miles south of the city of Murcia. It exhibited marles and recent sandstones, the boldest feature being a mass of conglomerate, of blood red, which forms a noble cliff of considerable height. I followed it quite through the range, until I came to beds of marle etc. I think there can be little doubt that this is part of the series of the recent formations, which ought to rest on the secondary limestone of the.

opposite side of the valley of the Segura. I saw no traces of fossils in any of the various beds, but they would certainly pay the examination of any one who might have leisure for the purpose.

The town of Cartagena is situated at the termination of a bay or indenture of the limestone, which forms bold cliffs to the east and west. To the east ward they soon end in the low land of Cape Palos, which appears to be the continuation of that of Torre Vieja and the Alicante coast. Outside the town of Cartagena, associated with thin beds of sandstone, are beds of trachyte, which run in a direction to the Volcanic district of Almazarron, on the flanks of the mass of limestone which lies to the west of Cartagena. Along the inland flanks of this range, associated with the trachyte, further to the west, is a recent marine formation, which extends to near Almazarron, which is seven leagues distant from Cartagena. Almazarron bears the strongest marks of having been the scene of volcanic action. There are masses of trachyte, and volcanic conglomerate, of which there is a bold *cerro* of considerable height, and the curious alumiferous rock of St.-Cristobal, which has been wrought for many ages. These are associated with a porphyritic rock of blood red, with primary slates, and a recent marine formation inland of it. To the west is a vast mass of trachyte, followed by more recent beds, and the line is suddenly interrupted by a bold and lofty and most remarkable primary chain, called the Lomo de Vaca, cow's back, from its precipitous ridge. It is in this ridge or its branches that it appears probable were the celebrated mines of the Carthaginians, of which all trace has been lost. This range has on either flank, beds of marles and other recent formations,

of small extent, and ends precipitously in the sea between Almazarron and Aguilas, a small town on the coast. The castle of the latter place occupies a promontory of secondary limestone, to the east of which are two others quite detached from each other, and on the coast line, upon the flank of the Lomo de Vaca, forming an interesting feature in this part of the country. The slate is close to the town of Aguilas, on which this limestone no doubt rests. Aguilas stands on a small semicircular plain round which the primary continuation of the Lomo de Vaca would appear to sweep, closing in the western end, where it forms a vast mass of black slates, much contorted, running to the east and west, over which, as I ascertained from the fallen masses, there is a capping of recent marine exuviæ, forming a compact mass, and rising to a considerable height. This range is termed Sierra de Almagro. The plain of Aguilas is primary, as shown in places, and is covered by transported materials and other recent formations, and in one place is a curious conglomerate of unrolled primary fragments. There is also marle with oysters, and pectens; the whole at a moderate elevation above the sea. After passing the Sierra de Almagro, which closes in the westenr end of the plain, the vast delta of the Almanzora is met with, which exactly corresponds with the Vega of Granada, and the plain of Guadix. As it has already been described, it requires no further mention. My route now left the coast, which I revisited at Almeria, after crossing the primary Sierra de Filabres, and descending from Tabernas, by a tract exactly similar to that of the mouth of the Almanzora, also mentioned above.

Almeria is situated in a nook, at the foot of the secon-

dary chain which covers the south east flank of the Sierra Nevada. The immediate rocks are however more recent. There is a ferruginous sand, containing pectens and balani, associated with white marle; a compact mass of marine exuviæ, which is quarried, and exhibits a solid mass of sixty or seventy feet thick. From it has been built the citadel of the Christians, which crowns the summit of the Moorish fortress directly opposite, and was built soon after the conquest. This rock also forms a revêtement, or facing, to the older limestone, in the precipitous cliff along which the road is carried, proceeding to the westward. In a ravine behind the citadel are indications of red and purple sandstone, underneath the limestone. On the summit of the ridge, above this sandstone, is a bed of pectens in white marle. To the east of Almeria is a flat beach, with a formation of white indurated marle and conglomerate. This terminates abruptly in the volcanic rocks of Cape de Gatt, which rise like a wall at the extremity of it, and forms a sort of circular mass, surrounded in great part by the sea. The state of the country prevented my examining this district in detail, but I have heard that at Nijar are traces of a crater*. To the west of Almeria, after passing the defile above mentioned, the plain called the campo de Dalias opens. This is of bare white indurated marle, forming a table, a little elevated above the sea, and gradually closing in at the western end, where is a sandy beach and lagoon. Near this lagoon is a bed of oysters a little above the sea. At Adra is found slate, which seems to be of the primary series. A part of these

* These volcanic formations of Cape de Gatt and Almazarron, with that of Olot, which I was prevented visiting in 1830, are the only volcanic traces I am acquainted with, in the wide range covered by these observations.

slates is covered by a mass of sand and fragments of rolled quartz, to which balani are adhering. This formation is somewhat different from any I saw elsewhere, although probably of the same age with some of them. It is about half a league from the town on the road to Berja, and rises to an elevation of probably four hundred feet above the sea. From Adra I again formed the coast line at Motril, about ten leagues to the west. In this part, the coast line is formed alternately of primary slates, covered by secondary limestone, of which the rock of Salobreña forms the largest mass. Near Nerja, where there is a small elevated plain, I found recent shells in marle. A sandy beach extends from Velez Malaga, and to the west of the river is a bold mass of recent marine formation, in which clypeaster has been found. It rises to the height of an hundred and fifty feet above the sea. To Malaga is seen sandstone, and limestone, and in places patches of the same recent marine formation above mentioned, the last of which is near the town, to the east. To the west, on the skirts of the Vega of Malaga, this recent marine formation is again seen, where it attains a height of some hundred feet but, after a diligent search, I coud find no fossils. It is entirely of marine exuviæ. I have been informed that oysters have been found near Alhaurin, at a corresponding height on the western side of the Vega, which almost certainly belongs to it.

The coast line between Malaga and Gibraltar is of primary slates, and limestone, and sandstone with its limestone, covered in places, by recent white marle rock. The country at the gates of Gibraltar is covered by a recent marine deposit, previously mentioned in the geology of Andalusia, and which appears to be identical

with that stated to have been traced by me at Vejer, Xeres, Alcala de Guadaira, Carmona, Villanueva del Rio, near Seville, and up the Guadalquivir to Andujar. This detail of the coast line is given, in order to make it more clear at one view, that, in the long line from Valencia, round the coast of Gibraltar, and across western Andalusia, along the course of the Guadalquivir, for a distance of nearly two hundred miles inland from the present coast line, there has been a regular lift of the coast, at a period comparatively recent. The formations which suggest this observation rest sometimes on primary, but more frequently on secondary strata, and rise to the height of some hundred feet, the highest point being that where it covers the slates of the Sierra de Almagro; between Aguilas and the delta of the Almanzora. If however the marine formation of Granada be hereafter assigned to this epoch, as I have little doubt it will, it gives a much more wide extent to it. In general this formation is a crag, or, as at Almeria, a compact mass of marine particles, strongly cemented together. To the eye this description of rock appears to be friable, but it is excessively tough to the hammer. I saw the facility of its cohesion at Alicante, where the convicts employed in quarrying it for the mole, were making a small road for the convenience of working, by breaking the fragments extremely small, and throwing salt water upon them, when with the assistance of a burning sun, they quickly formed a hard cement. The fossils in this formation are not numerous, having no doubt been destroyed in the compression, and they are found both above and below the beds. At Almeria beautiful pectens in great numbers are in a bed, at a considerable, height, and in a corresponding situation, further to the

west, there were appearances of them. The clypeaster is sometimes found in the mass of rock. The oysters in some instances are low down in the beds, but at Alcala de Guadaira, there are pectens still lower, passing into the blue clay as before noticed.

I am not acquainted geologically with Lisbon or the coast of Portugal, but I have strong reason for believing that the heights of Almada, on the left of the Tagus, are of a similar nature with the recent marine formation of the coasts of Andalusia. The patches examined in the neighbourhood of Nantes and mentioned by M. Lyell in his second volume, are exactly of a similar description to a great part of this widely spread mass, and the marine beds I have subsequently examined at Rome, which underlie the volcanic formations and appear to rest on blue clay, bear the strongest external analogy to some parts of them.

DESIDERATA.

The outline of the formations which cover a great part of this region being given, we will conclude by stating what appear to be some of the principal desiderata, in order to have a fuller knowledge of the geology of Spain.

In old Castile the beds of the formation between Valladolid and Burgos require examination, in order to ascertain whether they be entirely marine, and what fossils are to be obtained from them. One only, of which I have lost the name, was found by me in some rock used in the public works at Valladolid. A section across the country from Burgos, in a direction by Soria, until the primary or older formation of Alhama de Aragon or of

the Sierra de Moncayo be met with, and from Soria or that neighbourhood to the presumed lacustrine formation of the district of Guadalaxara in New Castile. To ascertain whether any recent formations, besides the diluvions of the lower part of old Castile, are dependant on the Sierra de Gata, which is the prolongation of the chain of the Somosierra and Guadarrama.

NORTHERN PROVINCES.

To ascertain whether the section of Vittoria really commences near the Ebro, or whether the sandstone in the neighbourhood of Miranda del Ebro belong to it, or be part of another series, and the relations of the limestone of Pancorbo with the latter rocks. A section to be carried across the chain from Burgos to Santander, and the ammonitic remains mentioned by Bowles as existing near Reynosa, to be examined. The important and difficult question to be solved, whether the axis be changed along the north coast, and whether, as I believe, the formation in which the great coal basin of Asturias is situated, be older than the carboniferous series of Vittoria. The solution of this must be sought either near the parallel of the bay of Santander, where the strata are broken off, or between that place and Riva de Cella. In must be sought in the interior, by following the rivers, as I fear the coast will be of no assistance, being a longitudinal line.

A section across the Puerto de Pajares, between Oviedo and Leon, and an examination and drawings of the gigantic vegetables, which cannot be removed, near Campomanes, and appear to belong to the coal field of Asturias. A careful examination of the beds on the southern flank

of the Puerto de Pajares, in descending to Leon. The chain which separates old Castile from Galicia, and the chain to the western end of Asturias, between that province and the primary formations of Coruña to be examined.

NEW CASTILE.

The relations of the gypsiferous marles of Madrid with those of the red sandstone, which form the soil of the Alcarria, and of the district of Sacedon and Guadalaxara, and the important fact of the extent of the presumed fresh water formation, by carrying a section from Colmenar, by Arganda, or Villarejo, across the Alcarria to Priego, on some point of the Sierra de Cuenca, and to observe the situation of the rock gypsum above Tarancon, relatively to the supposed fresh water limestone, and the marles on which it rests. A line carried across the Sierra de Cuenca to Valencia, by Mignanilla, in order to ascertain if the limestone of the upper formation above the city of Cuenca lie entirely above the sandstone, as I suspect it to do, or whether it alternates, as an opinion is held in the country, also to determine where the central axis of that chain is, and of what it is composed.

A line by the plateau where the Tagus, Guadalaviar and Xucar rise, into Aragon, by Teruel, and from the Alcarria, across by Molina de Aragon until the slates of Alhama de Aragon are met with, and to ascertain what the quartzose formation is, in which are the copper mines, and the shells in close contact with it, at Molina, mentioned by Bowles, and to what formation these last are to be referred, and whether the quartzose rock be, as I suspect, a continuation of the axis of Alhama de Aragon.