

ten inches deep, will be moistned by it when melted; rivers, and springs recruited, as much as if a quantity of rain had fallen that covered the surface of the earth to the depth of one inch.

I am, my Lord,

with the greatest respect,

your Lordship's most obedient

and most devoted humble servant,

Alex. Brice.

Received June 5, 1766.

XXVII. *Some Observations on the Country and Mines of Spain and Germany, with an Account of the Formation of the Emery Stone; from William Bowles, Esq; Director General of the Mines of Spain; communicated by P. Collinson, F. R. S.*

Read June 19,
1766.

AT the extremity of Old Castile, in Spain, is situated a territory called Montana, which is divided into two parts; the Low Montana is that chain of mountains, which bounds the

the Cantabrian Sea. The city Santander is its chief port, from whence you ascend southerly, twelve long leagues, a succession of high craggy mountains, to the town of Reynosa in the upper Montana, which extent stretches three leagues more, and then you continually descend about fourteen leagues to the city of Burgos, the capital of Old Castile.

Reynosa is in the center of an open plain, surrounded by a ridge of high mountains, at whose feet are low hills of pasture-land.

To the west of Reynosa, in an hour's walk, is the source of the great river Ebro, which receives all the waters on that side, and conveys them into the Mediterranean, seven leagues below the city Tortosa.

All the spring, rain and snow waters, of the mountains to the north of Reynosa, run into the Bay of Biscay.

The waters, from the south chain of the mountains, are collected in the river Pisuerga, which runs into the river Duero, and from thence are carried to the Atlantic ocean at Oporto.

Hence we see, that the adjacent parts of Reynosa divide the waters of the three seas, which lye north, east, and west.

Eight leagues square of this upper Montana is the highest land in Spain; the mountains rise to the atmosphere to the line of congelation; I see snow from my window this 4th of August, as writing this letter. Some years ago there used to fall so much snow, that the people were forced to dig lanes through it, to go to church, in the winter; but there has fallen little snow since the earthquake at Lisbon, and some years none at all. I am persuaded, it changed the climates

of many parts of Spain ; for no man living saw, nor heard his father say he saw, snow fall in or about the city of Sevil, until the year 1756.

I found many plants in these mountains, which I remember to have seen in Switzerland ; they abound with oak, beech, birch, holly, and hazel.

The hills and plains are fine pasture ; I never saw a meadow in any other part of Spain, neither did I see horses and cows feed on hay any where else.

These mountains are formed of sand-stone, limestone, plaster-stone (or gypsum) and emery-stone.

The sand-stone, is at the summit of the mountains, and some hills, and the lime-stone forms the body ; but the contrary is seen in others, the sand-stone abounds, and the plaster is always lowest.

As for example, the high mountain of Arandilla, which is a small league off the town, is all sand-stone at the summit ; its body is a mass of ash-coloured lime-stone, in which is found imprisoned petrified cornu ammonis, and scollop shells ; and there are beds of plaster-stone at its foot, towards the plain ; these join to a stratum of black marble veined white and yellow, which is no more than a purer kind of lime-stone, as all other marbles are.

On the hill to the east of Reynosa, and in the plain, are found great blocks of emery-stone, of which I will say a word, because I think its nature is not truly known ; at least that of Spanish emery, which the looking-glass grinders of the king's fabric at St. Ildefonso say is the most biting emery, they ever used ; and I never saw any other in its native matrix.

That

That iron has been, and is now, in a fluid state, percolating through the earth, and that it subsides, chrysalises, or is precipitated, to form different bodies, is demonstrated by the black and red bloodstone, by some beautiful stalactites, which are almost pure iron, by the eagle-stone, by figured pyrites, by native vitriol, and by native crocus.

When this fluid iron penetrates a rock of sandstone, and only stains the surface of each grain, of a brownish, reddish, or yellow colour, it becomes only sand and crocus; but, when it is joined with the chrysaline matter in a fluid state, in the very act of chrysalisation of each grain of sand it incorporates with it, its weight and hardness is increased, and then it becomes emery.

The earth of the mountains and hills is of the same nature as that of the rock below. If it is limestone, the soil cast into any acid liquor will boil up with a violent effervescence, and the acid will dissolve it.

If the rock below be sandstone, or plaster-stone, or emery, the earth of that hill or mountain will remain quiet in the acid, and there is no effervescence nor dissolution.

I have often observed, that, when the rocks below are mixed, calcary and noncalcary, the soil of the surface is also of a mixt nature; and I always found the action of the acid to be weak or strong upon these earths, in proportion to the sort of stone with which they abound.

Thirty one leagues south east of Madrid, and five leagues south of the source of the river Tagus, is situated the town of Molina Aragon, capital of a lordship

lordship of the crown, almost in the center of Spain ; the high hills of this little territory are covered with pine trees ; here I learned some truths, which prove, that the following opinions ought to be ranked amongst vulgar errors.

First, that salt-springs are not found in the high primitive mountains, but in the low hills and plains only.

The elevated town of Molina, and the rocky country about it, is formed of red and grey sand-stone, lime-stone, white and grey granite. These rocks contain either salt, or salt-petre ; the houses built of this stone are covered with the saline efflorescences, which are drawn out by the sun after rain. The whole territory of Molina is full of salt springs ; but there is a copious salt-spring, rising out of a land yet higher than the source of the Tagus, and not far from it, which is one of the highest territories in all the inland parts of Spain, for it divides the waters of the ocean and Mediterranean. This spring furnishes salt to the jurisdiction and bishoprick of Albarrazen. There is besides another salt spring, in another elevated ground, which supplies the eighty two towns and villages of Molina-Aragon with salt : besides which, there is a salt spring, issuing out of a spot in the Montana, which is higher than the fountain of the Ebro, and about a quarter of a mile distant from it.

Secondly, that metallic vapours destroy vegetation ; the following instances evince the contrary.

There are many iron, copper, lead, and pure pyritous ores, in these mountains ; and yet the same plants, and the same sweet grass grow there as in other parts, of which I will give a more particular account.

About two hours walk northwest of Molina, there is a little hill called Platilla; it extends about half a league over, from valley to valley; its body is a solid, rocky, white granite, through which run, in different directions, and without any order, an infinite number of blue, green, and yellow veins of rich copper ore, which holds a little silver, mineralized by a great quantity of arsenick and sulphur: the very surface of the rock is in many places stained blue, and green, and the veins of ore are not above a foot deep. In the fissures, and in the solid rock, is contained lead ore, which is sometimes found even on the surface; and yet the following plants grow out of the soil, which covers these arsenical sulphurous veins, and is not more than a foot deep; true oak, flax, white thorn, juniper, cystus, wild-rose, uva ursi, phlomis, verbasum, stœchas, sage, thyme, serpillum, rosemary, and many others, which it would take up too much time to mention. The earth of this same hill is covered with the same sweet small grass as the rest of the country.

I have also made the same observations, out of Spain, at the three greatest mines in Europe, viz. St. Mary of the mines in Alsatia; Clausthal, in the Hartz-mountains of Hanover; and Frayberg, in Saxony.

The mines of St. Mary are at the head of a valley. Its hills are some of them covered with oak, pines, and others with apple, pear, plum and cherry, and others, with fine grass downs. The tops of others are fields of wheat, which, in the year 1759, as I found by my notes, gave a produce of eight for one. All these vegetables grow in a soil, a foot or two deep,
which

which covers a rock, full of the most arsenical, sulphureous, silver, copper, lead, and cobalt ores, in Europe, and most of the veins are near the surface.

The mines of Frayberg are in low hills near the city. I saw them all covered with barley in July. A stranger would not imagine that men were reaping corn over hundreds of miners heads, who were blowing up veins of ore, arsenick, and brimstone.

The mines of Clausthal are in a plain, which, in truth, is the summit of a mountain; the Dorothy and Caroline veins of silver, lead, and copper ore, stretch away eight miles to the Wild-Man mountain; the finest meadows and sweetest grass are upon these veins, and all their branches near the city: they feed nine hundred cows, and two hundred horses; they are mowed in June, and a second crop springs up, which is mowed in August: a multitude of plants grow in these high meadows, over the mines.

It is true, I saw mines in the barren naked mountains and hills: but it is certain that their barrenness is not the effect of mineral vapours; but the air, moisture, heat, and cold, have more power over the surfaces of some rocks, than of others, to moulder the stone into earth. Such is the high mountain of Ramelsberg, above Goslar, whose inhabitants have lived by the mines found therein. I crept up this steep rock to its summit; I found it split and cracked into millions of fissures, from one foot to an inch wide; in other places, it was shivered into small rotten stones, which became a receptacle for a few plants, grass, moss, &c. and, as this decayed stone moulders into earth, it will be more abundant in vegetable productions; this may, perhaps, have been the original

nal state of those mountains, which are now covered with verdure.

Communicated by

Madrid,
Jan. 1765.

P. Collinson.

XXVIII. *Commentarius de indole Electricæ Turmalini, auctore Torberno Bergman, Mathematicum & Philosophiæ Naturalis ad Reg. Academiam Upsl. adjuncto, Academiæ Imper. N.C. Academiæ Reg. Scientiarum Stockholmenfis & Societatis Regiæ Londinensis membro.*

Read Nov. 20, I. 1766. **C**UM circa finem anni præteriti quinque selecti turmalini, ab Academia Regia Scientiarum Stockholmenfi nuper acquisiti, in meas inciderent manus, venia illustribus hujus Societatis varia hisce institui tentamina, ut singularium horum lapillorum naturam, si fieri posset, penitus expiscarer. Fateri vero convenit, me parum successus sperasse, postquam celeberrimi nostri ævi physici, Æpinum loquor & Wilsonum, turmalinum adtentione, viris hujus ordinis propria, scrutati fuerant. Et sane, si res esset dijudicanda ex numero scriptorum admodum parvo,