



PHILOSOPHICAL
TRANSACTIONS.

I. *A Letter from Sir William Hamilton, K. B. F. R. S. to Sir John Pringle, Bart. P. R. S. giving an Account of certain Traces of Volcanos on the Banks of the Rhine.*

S I R,

From on board a Yacht on the Rhine,
near Mayence, Sept. 29, 1777.

Read Dec. 11,
1777.

AS I do not recollect ever to have heard of, or seen, any account of ancient volcanos on the banks of this river, I have the pleasure of sending you a few imperfect remarks, which I have

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just made during a five-days most delightful passage up the Rhine from Bonn to Mayence. The first certain token of volcanos having existed in this country was evident to me in the court of the palace of the Elector-palatine at Duffeldorff, which is at this moment new paving with a lava exactly like that of Etna and Vesuvius. Upon enquiry I was told, that it came from a quarry belonging to the same Elector at Unkel, between Bonn and Coblenz. When I arrived at the gates of Cologne, I was struck with the sight of numberless basaltic columns inserted in the walls of the town; and I remarked, that columns of the same sort were universally used as posts in the streets, and at every door; they are chiefly pentagonal, but some are hexagonal, and a few have only four sides; they are very like the basaltes of the Giants Causeway, but without their regular articulations. I was informed, that they came likewise from the Unkel quarry; and that the town of Cologne is in possession of an ancient right to as much stone from that quarry as may be wanted for its own use. I perceived likewise, that the walls of most of the ancient buildings in the town of Cologne were of a tuffa exactly resembling that of Naples and its environs. This species of stone, as I was informed, abounded on the banks of the Rhine, between Bonn and Coblenz: these circumstances

made me keep a sharp look-out, and, on my approach to Bonn, was struck with the volcanic forms of the Sevenbergen, or Seven Mountains, about two leagues from the town, on the other side of the Rhine. In the walls and streets of Bonn are many of the above mentioned columns of basalt, and the pavement of the Town is of lava. The stone in general use for building here, is a very compact one, a hard volcanic tuffa like that of Piana near Naples, and of the sort called Piperno in Italy; it is something like free-stone, but, upon near inspection, is mixed with fragments of lava and other volcanic substances.

The day after my arrival at Bonn I visited Wolckenberg, Tackenfelts, and Stromberg, three of the Sevenbergen, and found the two first entirely composed of tuffa, and the last of tuffa and lava: I dare say, by the shape and appearance of the rest of these mountains, I should have found them all equally composed of the same volcanic substances, had my time allowed me to have examined them. The craters on the mountains I visited are discernable, though much altered, and filled up by time and the rubbish thrown from the quarries that are constantly worked on their tops. On each side of the Rhine, most of the way from Bonn to Coblenz, particularly between Prohl and Andernach, I perceived

high rocks of lava or tuffa. Where the volcanos had not operated, the mountains and rocks are of flate. At Erpel, in a mountain clofe to the river, and oppofite the convent fituated on an ifland about three leagues from Bonn, there are fome traces of bafaltic columns, the quarry feeming to have been nearly exhausted. I have often thought (and this exhausted quarry brings it to my mind again) that the reafon why there are fcarcely any remains of lavas that have taken the columnal form on Vefuvius and the volcanos near Naples is, that they have been carried off for the ufe of paving the great Roman roads. The Appian way is mostly compofed of lava of a pentagonal and hexagonal form, and feems evidently made of pieces of fuch bafaltic columns. Thefe lavas being ready cut by nature, would naturally be carried off firft, as the cutting of folid rocks of lava for fuch purpofes is attended with very great expence.

At Unkel, above a league further on towards Coblenz, juft oppofite the town on the other fide of the Rhine, is the great quarry belonging to the Elector Palatine, which affords a moft pleafing and uncommon fight: it is entirely compofed of the moft regular detached bafaltic columns, and though millions of thefe columns have been extracted, as the towns of Cologne and Bonn teftify, yet the quarry is very rich. They lie moftly in an horizon-

tal direction, but some are perpendicular, and others inclining towards the Rhine, which, being very low, shews many of them in the bed of the river itself; they rise from thence into the mountain (where is the present quarry) above 100 feet. They are, as I mentioned before, chiefly pentagonal; the smallest are in general the most distinct and regular, about six inches diameter; the largest of the columns that I measured in this quarry (or indeed that I had remarked any where) was about three feet long, and about one foot and a half diameter. The other lavas in this neighbourhood are of the same substance, and some incline to the same forms, but none so regular. I have not the least doubt but that all basaltes, wheresoever they exist, have originated from subterraneous fire, and are true lavas.

I hope some one, who has more leisure, will examine this curious country particularly. It is wonderful to me, that such visible tokens of great volcanic productions, in a country so well inhabited, should not have attracted the attention of naturalists more than they seem to have done.

I must not forget to mention another curious circumstance: at Andernach, between Bonn and Coblenz, I saw vast heaps of tuffa ready cut, lying on the banks of the Rhine, and some Dutch vessels loading it; upon enquiry

enquiry I found, that a considerable trade of this material is carried on between this town and Holland, where they grind down this sort of stone by wind-mills into a powder, which they use as a puzzolane for all their buildings under water. This also corresponds with an idea mentioned in one of my former letters to the Royal Society, that the tuffas of Naples were composed of a puzzolane, prepared by volcanic fire deep in the bowels of the earth, and, mixing with water at the time of its explosion, formed a sort of natural mortar or cement. The Dutch reduce it again to its pristine state of puzzolane.

I flatter myself you will excuse my sending you such crude and hasty remarks, as my time will not allow me to examine further: I only mean to point out this curious country for further investigation. What I have just seen confirms me in the opinion, that volcanic operations are much greater agents of nature than is generally imagined.

I am, &c.

