



XXII. Report made to the class of the physical and mathematical sciences, of a Memoir of C. Daubuisson on the Basaltes of Saxony

C. Ramond

To cite this article: C. Ramond (1804) XXII. Report made to the class of the physical and mathematical sciences, of a Memoir of C. Daubuisson on the Basaltes of Saxony , Philosophical Magazine Series 1, 19:74, 122-133, DOI: [10.1080/14786440408676537](https://doi.org/10.1080/14786440408676537)

To link to this article: <http://dx.doi.org/10.1080/14786440408676537>



Published online: 18 May 2009.



Submit your article to this journal [↗](#)



Article views: 2



View related articles [↗](#)

guests, and of the robe which contains them. He comes out of the inclosure deprived of all his former beauty, in a state of decrepitude, exhausted, and threatened with approaching death. He shortly passes to the state of a chrysalis; and, after giving life to thousands of eggs, suddenly loses his own, leaving to the cultivator an advantage which may be so improved, as to more than compensate the ravages which he occasions. In about eight days, the little worms contained in the cocoons are metamorphosed into flies, having four wings. Their antennæ are long and vibrating; some have a tail, others do not show it; they feed upon small insects of the family of *acarus*, and evidently belong to the ichneumon tribe.

"The cotton-shell or wrapper is of a dazzling white, and as soon as the flies have quitted the cocoon it may be used without any preparatory precaution; it is made up of the purest and finest cotton; there is no refuse, no inferior quality in it; every part is as fine and beautiful as can be imagined."

M. D. Lozieres, the author of this memoir, urges the Americans to preserve and endeavour to increase the fly-carrier, in the same manner and for similar purposes that the breed of the silkworm is encouraged. He declares that he has frequently seen so abundant a harvest of the animal cotton, that in the space of two hours he could collect the quantity of one hundred pints, French measure. Moreover, animal cotton is attended with none of the difficulties which occur in the preparation of vegetable cotton, and it requires less time and less trouble to procure it; and there seems to him no doubt that it will stand the competition with silk and with vegetable cotton: these, when applied to wounds, serve only to inflame and envenom; but the animal cotton may be used as lint, without the smallest inconvenience.

XXII. *Report made to the Class of the Physical and Mathematical Sciences, by C. RAMOND, of a Memoir of C. DAUBUISSON on the Basaltes of Saxony.*

[Concluded from p. 66.]

THE author, supported by this series of observations, proceeds to the considerations which they suggest, and which appear to him proper for establishing the aqueous origin of basaltes. Such is the object of the third chapter. The following chapter is destined to strengthen this first conclusion

elusion with every thing that can tend to prove that this kind of rock cannot have a volcanic origin. The author's proofs may be reduced to the following three principal classes: 1st, Position; 2d, Connection; 3d, Structure and Composition of the Basaltes.

If it be considered then in regard to position, we shall observe, with the author, that it is never found but on summits; that it covers all the mineral substances of which these mountains are composed, and that it is never covered by them; that always similar to itself, whether it rests on granite, gneiss, micaceous schist or porphyry, or whether it extends over gres, gravel, sand, and argil, it never participates in the nature of the soil which supports it. These data conduct to very simple results: the basaltes of Saxony has been the product of a special labour altogether distinct from that which produced the subjacent strata. This labour has been posterior to the formation of primitive rocks; it is even very recent, since transported earth is among the number of the substances by which basaltes is supported.

But what is the agent to which we are indebted for this new production? If fire be admitted, it will be necessary to indicate also the focus where the matters were fused; the mouths by which they were thrown up; the route they pursued to arrive at these summits, which command the country to a great distance around. In this hypothesis the whole will be reduced to either the one or the other of the following suppositions:—Each basaltic crown must be considered as the production of a local eruption, or all these masses must be the fragments of an immense stream which formerly covered the whole region.

According to the first system, every basaltic mountain must have been a volcano; but who does not know that a volcanic mountain is a confused accumulation of blocks, fragments, rapilli, pumice stones and scorizæ, intermixed with torrents of lava? Here nothing of this disorder is seen: rocks solidly deposited, and regularly placed one upon the other, have retained the situation given them by the water which formed them. Before an eruption, prepared in the interior of mountains, could charge their summits with the basaltes added to them, it would be necessary that it should form a passage in the axis of the mountain; that is to say, in the line of the greatest resistance: and where are the traces and aperture of this chimney, which, according to the simplest laws of mechanics, must be classed among the number of gratuitous suppositions? For six hundred years these mountains have been pierced, and their interior parts have

been examined: every where the mountain is sound, its rocks are entire, and geologists are obliged to look for those pretended volcanic abysses, which interrupt as little the gallery of the miner as the vein for which he searches, in a few small superficial cavities which may have been formed by the hand of man, or by the least accident.

The second system will not be more fortunate. It will be readily admitted that the valleys by which the chain is traversed are posterior to its formation; that the strata now divided by these hollows were formerly continued; that the basaltes now accumulated on these summits formed an uninterrupted covering along the ridge, of which these strata are the remains. But in that case, whence did this enormous stream of fused matters proceed? At what distance are we to search for the volcanic region whence it issued? How can we conceive that the paste-like fluidity of the lava should yield to the length of the passage, and to so many surfaces of a different level, and that a deluge of fire should have overwhelmed such an extent of ground without calcining the calcareous matters, without baking the argillaceous, consuming the coals, filling up the places where it originated, and interspersing those where it passed with scoræ, pumice stones, and ashes?

On this point the author derives great advantage from the thick stratum of coal on which the masses of the mount Meissner, in Hesse, are deposited. He observed this fact after the celebrated Werner. Like him, he asserts that it is impossible to distinguish the least traces of alteration in this accumulation of combustibles, which in general is separated from the basaltes only by a thin stratum of argil, and which very often is absolutely contiguous to it. But this is not all: in other places the basaltes is found alternately with the coals. This phenomenon has been observed in Bohemia, the Feroe isles, the isle of Mull, at Borrowstownness, in the mountains of Bathgate. Will it be said that the basaltes thus inserted between strata of combustible matters has been currents of fused stones? By what fire were these stones liquefied, if it spared in the centre of its crystals more fusible than itself; if it sported in the midst of bitumen without dissipating it in flames and in smoke: in a word, if it respected every thing except these stones themselves?

On the other hand, if we restore to the water that part of its domain which has been taken from it, all these difficulties will vanish. The basaltes of Saxony consists of strata regularly placed above each other, and formed by
water,

water. The basaltes of Bohemia, Scotland, &c. are strata regularly inserted between strata which have no other origin. Why should we separate operations which are inseparable, and seek for forced explanations to facts which may be explained in so natural a manner? If it be admitted that the basaltes of Saxony is the work of water, nothing is more simple than what took place on that occasion. The mass of this chain was formed when the aqueous solution which inundated the country covered the old sediment with a stratum of basaltes. This stratum was at first continued like the banks and masses, which served it as a support; but being exposed to the erosion of currents and the destructive action of the weather, it yielded to the first of all the causes of degradation: it is at its expense that the first valleys have been dug out, and what remains on the summits is nothing but the last fragments.

Such is the first point of view under which the present question may be considered; and it must be allowed that, adopting the common laws of nature, the partisans of the latter opinion will not throw the whole *onus probandi* on those who propose exceptions. But this first advantage would become illusory, if it should be contradicted by a more minute examination of those masses which hitherto we have considered only under their more general aspect, and if we should discover some circumstances respecting the existence of basaltes easier to be explained by igneous than by aqueous fluidity.

The second object of consideration which occurs to us in the order we have adopted, is that of the connection of the basaltes. Though this substance seems to have been produced by the special and distinct labour of nature, it is not the only result. If we examine its position, it will be seen placed alternately with coals, and it is well known that it has been seen also alternately with shell stones. These successions are accidental in the formation. Coals and shell stones belong in part to its epoch without belonging to itself, and their presence indicates only the intermission of the cause which produced, in turn, these intercalated strata. But there exist two kinds of stones which are almost always associated with basaltes, which have the greatest analogy to it, which seem to be products of the same cause, and whose existence is so intimately connected with it, that no decision can be formed in regard to its origin till an opinion has been formed in regard to the rest: these rocks are *wacke* and *grunstein*.

What the Germans call *wacke* is a sort of stone which holds

holds a mean place between argil and basaltes. Like the latter, it often contains crystals of hornblend, but never olivin or augite; and always black hexagonal mica, which is rarely found in basaltes, and which serve to distinguish these two rocks when they approach so near to each other as to be confounded. Wacke often forms strata below those of basaltes.

Grunstein, on the other hand, generally covers basaltes. It is composed of feldspar and hornblend in distinct grains. It is the *whinstone* of the English, and the *granitella* of the French mineralogists. A comparative analysis of basaltes from Staffa, and whinstone from Salisbury, gave to Dr. Kennedy the same results with a precision worthy of remark; and it is proved, by the experiments of Sir James Hall, that these two rocks liquefy in the same manner, furnish by sudden cooling the same kind of glass, and by slow cooling the same stony substance.

If basaltes covered by grunstein be accurately observed, grains of feldspar appear between grains of amphibolite, and the rock at length assumes the granitoid texture. It was in the Meissner of Hesse that C. Daubuisson observed the most beautiful examples of this transition. He collected, he says, a series of specimens which in regard to the size of the grain present a decreasing progression from the most beautiful grunstein to the best characterized compact basaltes. And that it might not be objected that these specimens did not belong to the same mass, he chose some in which the granulated part was in the middle of the compact part, and in which they were seen, as it were, to blend into each other. We shall here remark, that the observation in question is exactly the same as that made by Desmarests and Dolomieu on certain kinds of basaltes which they have excluded from the number of volcanic productions.

On the other hand, if we consider the wacke on which basaltes rests, it will be seen to degenerate below into argil and then into gravel, while above it gradually assumes the colour, the texture, and solidity of basaltes. C. Daubuisson has seen prisms of basaltes very hard and very compact in its upper extremity, become tender and argillaceous at its lower. Dr. Reuss found in Bohemia basaltes the prismatic division of which was propagated in the wacke and the argil, which served it as a support. And before these observers, so long as fifteen years ago, the celebrated Werner, speaking of the Scheibenberg, said:—"I have seen, by a progressive series of shades, the most perfect transition of argil into wacke, and of the latter into basaltes.

These

These three substances are the product of the same formation ; that is to say, of the precipitation or sediment of the same solution, which becoming more and more tranquil has deposited argil, then wacke, and, in the last place, basaltes."

The partisans of the volcanic nature of the basaltes of Saxony have considered wacke sometimes as the production of muddy eruptions, and sometimes as the result of the decomposition of basaltes itself. If the observations here related were accurately made, these two suppositions are equally inadmissible. Wacke, which passes by insensible gradations to the state of basaltes, cannot be the result of muddy eruptions, if basaltes itself be not so. Nor is this wacke decomposed basaltes, for it contains neither the peridot nor the pyroxene of the latter ; but, on the other hand, contains mica, of which the other is entirely destitute. In this supposition, founded on the gradual passage of basaltes to wacke, it would be necessary to draw the same inductions from the transition of wacke to argil, and from argil to the gravel which supports it. But who will believe that basaltes destitute of mica can be reduced by decomposition to wacke, which is filled with it ; thence into argil, more and more sandy ; and then into quartz gravel, which did not exist in one of these substances more than the other ?

But if we ascend from basaltes to the grunstein by which it is covered, what will become of all the explanations borrowed from the direct or indirect action of fire ? This grunstein so entire, this granitella composed of grains of feldspar and amphibolite, endowed with all their splendour and freshness, which the least exposure to fire tarnishes, which a longer continued heat reduces to glass, and which more careful cooling reduces to a stony state where these elements are confounded never to be again separated,—can it be any thing else than the produce of water formed in the same manner as all other analogous rocks ; and particularly as primitive grunstein, the origin of which is doubted by no one ? Shall we suppose that it proceeds from basaltes itself, first thrown up by a volcano, then dissolved by the water, and again deposited ?

It must therefore be allowed that simplicity is on the side of those who admit here only the effect of water. According to these, grunstein, basaltes, and wacke, with the argil and gravel on which they rest, are only sediments belonging to the same epoch, and constituting the different parts of the same system of coordinate rocks. The sea then contained all the elements, some of them suspended and others dissolved.

dissolved. It first deposited the coarsest under the form of argil and wacke, and, chemical precipitations succeeding to mechanical processes, in proportion as the waters became purified they then furnished basaltes and grunstein according as the crystallization, more or less turbid or tranquil, confounded or separated the hornblend and feldspar of which they were constituted.

But when we confess that this explanation is in many respects more natural, we must admit also that under other points of view there are difficulties: that this new labour of the seas, altogether distinct and detached from the preceding operations, supposes either the return of the waters which covered the globe, or strange changes in the properties of those by which it was still covered; that it is very singular to see these waters suddenly resume the dissolving power, which they had long lost, to cover the primitive and secondary mountains, and even the strata of alluvion, with new deposits, which represent in an inverse order those which they had before formed; to abandon first the coarsest matters, to finish by crystalline sediments, and the least soluble to crystallize the last; that one can hardly conceive how this solution, which covered very high mountains, and which consequently inundated a great part of the globe, should not leave more monuments of its existence; and how so great causes, acting so generally and at periods so modern, should produce only some thin deposits separated by intervals so vast.

It is, however, from the analogy which exists between the basaltes scattered throughout countries very remote from each other, that C. Daubuisson derives one of his most specious arguments in favour of its aqueous origin; and it is here that we shall enter into an exposition of this order of proofs, on which he founds the composition and structure of this kind of stone.

If we compare, says he, the basaltes from Sweden, Hesse, and Saxony; of Bohemia and Hungary; of Italy, d'Auvergne, and the island of Reunion; the same prismatic division, the same colour, fracture, and weight, will be found in them all. The foreign substances they contain are always amphibolite, peridot, pyroxene, &c.: when analysed they yield the same constituent principles. The different analyses of the same mineral seldom agree so much as those which Bergman, Klaproth, and Kennedy, have given us of the basaltes of Sweden, Bohemia, and Staffa. This conformity appears striking to the author of the memoir, and he finds in it one of the distinctive attributes of
rocks

rocks produced in the humid way. The calcareous and schistous rocks, &c. are every where similar; while the lava of Solfaterra, Lipari, and Vesuvius, are sensibly different, notwithstanding their proximity to each other. Nay, more, the lava thrown up by the same volcano is far from being identic: and how can the case be otherwise, since the foci of these volcanoes, placed in the middle of different rocks, must impress on the substances thrown up characters as various as the matters which are subjected to their action?

These considerations would be of little weight in the hypothesis of Dolomieu. The lava of the author of this memoir would belong to the strata which compose the crust of the globe: the basaltes would have issued from the greatest depths, from that common reservoir where this great observer of volcanoes sought for the origin of the greater part of his lithoid lavas. But could basaltes ever be fused? This C. Daubuisson denies, and it is from the crystals contained in it that he thinks he can deduce his most decisive proofs.

The crystals and grains found in basaltes are generally amphibolite, olivin, pyroxene, and feldspar, &c. These either must have pre-existed in the basaltes, and they must have been enveloped by the matter in fusion, or must have been formed in the bosom of that matter by the aggregation of the molecu^l_æ of the same nature found disseminated in it. In the first case, how could those which are more fusible resist the heat which reduced them to the fluid state; and how could those which are more refractory preserve their colour, their transparency, and their splendour? In the second case, would not the paste-like fluidity of this lava have yielded to the movements of these molecu^l_æ, and would not the heat have imprinted its character on their aggregation? But these crystals and grains which are generally found in basaltes are not the only bodies inclosed in them. The author found also gres. Others speak of several other substances, and particularly calcareous fragments. According to Werner, the basaltes of Carlsbad, in Bohemia, contains so large a quantity of it that it is employed for making lime; and Saussure relates in his Travels, that he saw basaltes which contained angular fragments of compact gray calcareous stone, which was in no manner altered at the point of contact. Nay, fossils themselves are not entirely foreign to this rock, and to that of the same epoch. M. de Buch found turbinites in a rock of trap. The author quotes Dr. Blagden and Mr. Chenevix as having seen the impression of shells in the hardest and most compact

compact basaltes detached from prisms of the Giant's Causeway. In that of Vicentin, camites have been found. M. de Besolding has described an ammonite found in a basaltes of Forez: it still had a pearly splendour. The same naturalist speaks of other ammonites and gryphites contained in basaltes in the neighbourhood of Constance. In the last place, there exists in the neighbourhood of Bohemia a large mass of wacke which contains whole trees half petrified, and still retaining their bark, and even their leaves.

This wacke, which envelops whole trees, could not certainly be the production of a volcanic eruption. Basaltes in which shells are found with their pearly splendour does not appear to have been fused. But can these observations, made on some kinds of basaltes, be every where generalized? If it should result from the state of several of them that they have not an igneous origin, can we thence conclude that all, without exception, are of an aqueous origin? And does not the existence of certain kinds of basaltes, in places where its position gives reason for classing it among the lava, prove that the crystals in them may, in certain cases, have been subjected to the action of subterranean fire without being altered?

Here the long discussion which took place on the degree of the heat of volcanoes is renewed. Deluc, Dolomieu, and those who adopt their opinion, will affirm that they saw, as we may say, with their own eyes, torrents of lava the heat of which respected substances much more fusible than hornblend and feldspar.

The author of this memoir did not see any of this lava, but he answers this objection by experiments which establish the relative degrees of fusibility of basaltes and of the crystals found inclosed in it.

The former will set out from their observations to establish the hypothesis of a certain mode of fusion which does not alter the stones subjected to it.

Their adversaries will insist on experiments and analogies which tend to prove that fused mineral substances exhibit the same phenomena in nature as in our laboratories, and will mention instances of these kinds of lava having burnt, calcined, and destroyed, every thing they met with in their passage.

The one, then, will doubt what the others establish as a principle, and will reciprocally inclose each other in a kind of circle, from which it will be difficult for them to escape.

The question was in this state long before the time when the author of this memoir took it up; and we shall not enlarge

large further on this part of the discussion, where the strength of both parties seems to be balanced, and which scarcely contains any thing which has not been repeated a hundred times. But more numerous observations and more careful analyses have furnished new arms to the partisans of the aqueous origin of basaltes. It therefore remains to show how far they make the balance preponderate in their favour.

All the kinds of basaltes hitherto analysed contain a certain quantity of water, and from fifteen to twenty per cent. of iron. The case is the same with the wacke and the grunstein: they are in no manner different from basaltes, as appears by the analyses of Dr. Kennedý, which the author quotes.

If it be believed that the water contained in basaltes belongs to crystallization, it is evident that it has been in a state of aqueous solution itself, and the question is decided. This is the opinion of C. Daubuisson; and he refers also to the analysis of lava properly so called, which has all the principles of basaltes, except that water is not found in it. This argument, however convincing it may appear, is not unanswerable. The presence of this small quantity of water may be a consequence of the texture of basaltes rather than an indication of its origin. Since it is proved that fused stones resume, under certain circumstances, the lithoid form, it is probable also that it recovers the property of admitting water, which the most vitreous lava rejects; and this property is even proved in basaltes by the existence of geodes, which the infiltration of the water may have lined with crystals.

The quantity of iron which basaltes contains is of more importance to the fate of this dispute. All volcanic products properly so called, conduct, by observation and analysis, to known kinds of rock from which they originated. But whence does basaltes proceed, and what stone furnishes from fifteen to twenty per cent. of iron, if we exclude from the number of rocks basaltes and similar substances?

Shall we search for this iron in the depths of the common reservoir, which Dolomieu has supposed? C. Daubuisson will demand whether there exist other indications of this basaltes, and whether it is possible to admit an hypothesis which is of no other use than to explain this supposition.

Shall we retort the argument by asking him whence proceeds that lava so well characterized, that lava of Mount *Ætna*, which gives by analysis the same principles as basaltes, including the fifteen or twenty per cent. of iron? His

answer will be very simple,—It proceeds from basaltes itself, which constitutes a large portion of the soil of Italy and Sicily : and this answer is the decisive word of the memoir, and the fundamental opinion of its author.

We shall add, that this is the opinion also of the best English and German mineralogists, and particularly of the celebrated Klaproth, who announced it almost in the same terms in his analysis of basaltes, translated and inserted in the *Journal des Mines* by C. Daubuisson *.

Hence real prismatic basaltes, which is found in volcanic soil, will belong to the mass of mountains, and not to their lava. Lava having the aspect of basaltes, and being composed of its constituent principles, will be basaltic lava, and not basaltes. The greatest difficulties, therefore, of this great question would rest, in some measure, on ambiguities, and would be removed by a simple distinction.

Let us now stop, and terminate here the analysis of the memoir, the examination of which has been confided to us.

C. Daubuisson first examined the basaltes of Saxony. He then gradually rises to more extensive considerations on basaltes in general, and deduces from them conclusions which form the subject of the fifth and last article of this memoir.

In regard to the first object, we are of opinion that he has discharged well the task imposed on him, and that his observations give a new degree of probability to the opinion received in Germany on the origin of the basaltes of that part of Europe.

In regard to the general considerations, by which he raises the basaltes known to him to that which he has not had an opportunity of observing, we are of opinion that he must naturally have been conducted to this extension of his first conclusions, either in the course of reasoning or by the authority of observers whose testimony he invokes.

A subject, however, where hazarded analogies seem already to have occasioned more than one mistake, requires, more than any other, great reserve in the employment of them ; and on ground which two parties dispute inch by inch, each step ought to be justified by an observation and marked by a fact.

C. Daubuisson never saw those of volcanoes still burning, nor those of extinguished volcanoes, the existence of which he has not disputed. Being placed hitherto in the midst of the works of water, we wish he would proceed to

* Brumaire, year 11.

those places where the empire of fire has prevailed. We are desirous, above all, that he should examine the basaltic of Auvergne, which M. Leopold Buch, another pupil of Werner, has visited, and among which he observed some the volcanic origin of which he could not venture to dispute. C. Daubuisson knows how to observe; we have a proof of it in the works he has already published, were it not furnished by the memoir in question: and the attention which his observations seem to us to deserve, cannot be testified to him in a manner more useful to science than by encouraging him to continue them.

(Signed) HAUY and RAMOND.

The class approves the report, and adopts the conclusions.

(Signed) CUVIER, perpetual secretary.

XXIII. *A short Account of Mr. ARTHUR WOOLF's Improvement in the Construction of Steam-Engines.*

MR. WOOLF founds his improvements on a very important discovery which he has made respecting the expansibility of steam when increased in temperature beyond the boiling point, or 212° of Fahrenheit's thermometer. It has been known for some time, and for this discovery the world is indebted to Mr. Watt, who has been the principal improver of the steam-engine, that steam acting with the expansive force of four pounds the square inch against a safety-valve exposed to the atmosphere, is capable of expanding itself to four times the volume it then occupies, and still to be equal to the pressure of the atmosphere. Mr. Woolf has discovered that, in like manner, steam of the force of five pounds the square inch can expand itself to five times its volume; that masses or quantities of steam of the like expansive force of six, seven, eight, nine, or ten pounds the square inch, can expand to six, seven, eight, nine, or ten times their volume, and still be respectively equal to the atmosphere, or capable of producing a sufficient action against the piston of a steam-engine to cause the same to rise in the old engine (with a counterpoise) of Newcomen, or to be carried into the vacuum part of the cylinder in the improved engines first brought into effect by Messrs. Boulton and Watt; that this ratio is progressive, and nearly if not entirely uniform, so that steam of the expansive force of 20, 30, 40, or 50 pounds the square inch of a common safety-valve will expand itself to 20, 30, 40, or 50 times its

Vol. 19. No. 74. July 1804. L volume;