FOREIGN CORRESPONDENCE.

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Geological Odours—Organic Smells and Mineral Odours—Odour given out by Black Limestone—Ozone produced by Quartz—Hydrochloric Acid in Nature—Chlorine in ancient Volcanic Products—Sulphurous Acid and Sulphuretted Hydrogen—Gases Devoid of Smell—Naptha present in Active Volcanos—Perpetual Burning Springs—The famous Asiatic Chimœra—A Fire that has Burnt for Several Thousand Years—Gaseous Emanations of Tuscany—Boracic Acid—Fumarolle and Lagoni—The Peat-bogs of Suder-Brarup—Errata.

Our readers probably will not have forgotten the account we laid before them in May last, concerning the odour of the antediluvian seas. Geological odours, or odours emitted naturally from rocks or minerals, are interesting on this account—that they are not common. We are speaking, of course, of characteristic odours. Indeed, hardly a rock or stone exists but which, having condensed in its pores certain gases, emits them with their peculiar olfactive properties, when breathed upon or when wet. Thus, many persons have doubtless, like ourselves, had frequent occasions to remark the peculiar odour which arises suddenly from the earth in the country roads, as well as in the streets of our cities, the moment a heavy summer-shower of rain begins to fall.

In organic nature odoriferous substances are very abundant, and many of them have actually been produced artificially by modern chemists. This is true, for instance, of the sweet essence of bitter almonds, the flavour of the apple (valerianate of amyl), of the pear (acetate of amyl), of pine-apple (butyrate of amyl), the strong-smelling oil of garlic (sulphate of allyl), &c. But, in the mineral kingdom, only a very few natural species may be distinguished from others by the aid of the olfactory nerve. Certain natural bituminous substances (and here we fall again into the organic world), such as naphtha, petroleum, &c., may be recognized by their peculiar smell; and among the strictly inorganic mineral species, sulphurous acid, hydrosulphuric acid, chlorine, and hydrochloric acid are the most powerful odorous substances known.

When mineral substances are acted upon chemically, the presence of many may be ascertained with certainty by the odours they then give rise to. For instance, arseniferous minerals, and compounds of selenium, which, when heated on charcoal before the blow-pipe, give out an unmistakeable smell of garlic and rotten cabbage; or, again, certain sulphides, when acted upon by a strong acid, evolve sulphuretted hydrogen; certain chlorides which, in the same circumstances, evolve hydrochloric acid, &c.

We have heard many persons speak of the smell of sulphur. Pure sulphur has little or no smell at all; but, when burnt in the air, it develops sulpurous acid, the pungent odour of which brings tears into the eyes. Certain black and dark-coloured limestones, particularly those of the coal and anthraciferous strata, develope, when broken or scratched, a

peculiar odour, which has sometimes been attributed to sulphuretted hydrogen, or arsenuretted hydrogen; but, if I mistake not, Dr. Percy has satisfactorily proved that in many black limestones no sulphuretted hydrogen is contained; and it appears more probable that this odour is of organic nature, and due to bituminous substances contained in the limestones we speak of.

Every schoolboy is aware that when two pieces of quartz are rubbed smartly together in the dark, they produce a sort of electric light, or phosphorescence, which is, to a certain extent, a reproduction *en petit* of the grand phenomenon of sheet-lightning. A strong odour is emitted at the same time, and this, although I have made no actual experiment to prove it, I believe to be due to *ozone*—a peculiar condition or state of oxygen gas, which, though quite devoid of smell in its natural state, becomes, under the influence of the electric spark, and in various other circumstances, remarkably odoriferous, whilst, at the same time, its chemical properties are completely changed. The electricity produced by rubbing together the two pieces of quartz acts, it would seem, upon the oxygen of the air which surrounds them, and produces an odour of ozone.

The strong-smelling substances, sulphurous acid, hydrochloric acid, sulphuretted hydrogen, and perhaps chlorine, are present in active volcanos and solfatara. Hydrochloric acid is very common, for instance, at Vesuvius, where it is condensed by the aqueous vapour into an acid liquid; it is also found in certain mineral waters, and now and then it is evolved from beds or strata of rock-salt. Chlorine is frequently discovered in the pores of certain ancient volcanic products, such as those of the Puy-Sarcourg, in Auvergne. Sulphurous acid is extremely common in volcanic eruptions of all descriptions, and in the gaseous emanations of solfatara, &c., whilst sulphuretted hydrogen (hydrosulphuric acid) is most frequently perceived in dormant volcanos and certain mineral waters.

Pure carbonic acid, which is acknowledged to be the most important of all gaseous emanations, both on account of the abundance with which it is evolved and the number of localities in which it presents itself, is completely devoid of smell. The same may be said of nitrogen gas and proto-carbide of hydrogen, whilst deuto-carbide of hydrogen has a slight but very peculiar odour.

In mud-volcanos and salzes we have a production of sulphurous acid, carbides of hydrogen, naphtha, or other bituminous and odoriferous substances, besides certain gases which are devoid of smell.

A fact which is perhaps little known is, that naphtha is also present in ordinary volcanos; and this was actually perceived by the ancient writer Strabo, who relates that the elevated dome-like hill of Methano opened in fiery eruptions, at the close of which *an agreeable odour* was diffused in the night time. It is very remarkable that the latter was observed during the volcanic eruptions of Santorino in the autumn of 1650, when, according to Ludwig Ross, an "an indescribable pleasant odour" followed the stinking smell of sulphurous vapours. The same *pleasant odour* has been also noticed by Kotzebue, during an eruption of the newly-formed volcano Umnack, in the year 1804; and, during the

great eruption of Vesuvius, on the 12th of August, 1805, Humboldt and Gay-Lussac perceived a bituminous odour prevailing at times in the ignited crater.

There is not much doubt left now that it is naphtha that burns in several of those remarkable productions of nature, the perpetual burning springs—more especially in the famous Asiatic Chimœra (in Lycia, on the coast of Asia Minor). In many springs of this kind it has been supposed that it was carburetted hydrogen gas (carbide of hydrogen) that burns. "We see issue from the ground," says Humboldt, speaking of gaseous emanations in general,* "steam and gaseous carbonic acid—almost free from the admixture of nitrogen—carburetted hydrogen gas, which has been used in the Chinese province of Sse-tschaun for several thousand years, and recently in the village of Fredonia, in the State of New York (U.S.), in cooking and for illumination." But it is difficult to account for so continual a supply of gas, always emanating from nearly the same spot. Indeed, this objection might be raised respecting naphtha, but it loses, perhaps, a little of its force in the latter case.

At the time Captain Beaufort visited the famous Chimœra in Lycia (he published his observations in 1820), it was thought to be a spring of burning carburetted hydrogen gas. Since that time the same spot has been visited by many travellers curious to see a perpetual fire that has been burning now for several thousand years, and which has been spoken of by Pliny,† Seneca,‡ Ctesias,§ Strabo,‖ among the ancients, and a host of more modern writers. Lieut. Spratt and Professor Edward Forbes found this spring as brilliant as ever, just as Beaufort had left it, perhaps even somewhat increased. They speak of *soot* being deposited by its flames;¶ this seems to prove that it is naphtha that burns, and not carburetted hydrogen, for the latter would deposit no soot. But what gives more probability to this assertion is the *agreeable odour* remarked near this spring by a more recent traveller, Albert Berg, a distinguished German artist.

The Chimœra rises from serpentine rocks associated with limestone, somewhat similar to the formation observed by Murchison and Parets in the districts of Tuscany, where the boracic acid *fumarolle* exist, of which we shall speak presently; and, curious to relate, it appears proable, from certain ancient traditions, that some of these boracic acid springs were once luminous (ignited) during the night.

At the bottom of a crater-like cavity, from which the combustible vapours issue in the Chimœra, is a shallow pool of sulphurous and turbid water, which is regarded by the natives of these parts as a sovereign remedy for all kinds of skin-disease.

Albert Berg has described the famous Asiatic Chimœra** as follows: "Near the ruins of the ancient temple of Vulcan rise the remains of a

* *Cosmos*, Vol. I. † ii. 106. ‡ *Epist.* 79. § *Fragm.* cap. 10. ‖ Lib. 14.

¶ The Turks use this soot as a remedy for sore eyelids, and value it as a dye for the eyebrows.

** It is situated near the town of Deliktasch, in Lycia (Asia Minor), on the west coast of the Gulf of Adalia.

Christian church in the later Byzantine style. . . . . In a forecourt situated to the east, the flame breaks out of a fireplace-like opening, about two feet broad and one foot deep, in the serpentine rock. It rises to a height of three or four feet, *and diffuses a pleasant odour*, which is perceptible to a distance of forty paces. . . . . At a distance of three paces from the flame of the Chimœra the heat it gives out is scarcely endurable. A piece or dry wood ignites when it is held in the opening and brought near the flame without touching it." And this magnificent phenomenon has been going on for several thousand years!

This bring us naturally to the subject of gaseous emanations, and we have at this moment before us a paper quite fresh upon the subject.

MM. Ch. Deville and Leblanc have been studying for some time past the nature of the gaseous emanations which accompany, as a rule, the deposit of boracic acid in the *lagoni* of Tuscany. Whilst making a delightful stay in that country about this time last year, the authors wrote to M. Élie de Beaumont from Pomarana, a letter dated Nov. 2, 1857, in which they stated, as the result of their united experiments, that the gases which are evolved with the boracic acid appear to consist, independently of a great quantity of aqueous vapour, of sulphuretted hydrogen and carbonic acid, which predominate; oxygen gas was only found in very minute quantities, and appeared to be altogether absent when the gases were collected with great care. These facts had, however, already been made known by M. Payen and Professor Schmidt. But MM. Ch. Deville and Leblanc added, in their letter of the 9th Nov. 1857, that in all the places they had visited they had found small quantities of carburetted hydrogen gas mixed with nitrogen (besides the gases already named), but which they had not then analysed.

We have now, since the date given above, some new details on this subject by the same authors. It would be useless here to enter into particulars concerning the manner in which the different gases were collected, measured, and analysed, and the different apparatus employed for this purpose; it will be sufficient, I think, to state that the aeriform fluids were collected with the greatest possible care, and their analysis conducted in such a manner as to ensure the greatest possible accuracy. An interesting paper presented by the authors to the *Academy of Sciences* at Paris, on the 23rd of August last, and subsequently published, furnishes us with the following facts* :—

1. The temperature of the gases, whether collected from the *soffioni* or from certain artesian wells, is, at the surface of the earth, as much as 100° (centigrade), but never exceeds this point, although the rapidity with which the gases are evolved seems, in many cases, to indicate an internal pressure.

2. All these gaseous emanations, from whatever point they proceed, contain the same gases, and pretty nearly always in the same proportions. Carbonic acid predominates in quantity, as M. Payen had previously made known. The quantity of sulphuretted hydrogen is to

* Sur les émanations gazeuses qui accompaynent l'acide borique dans les Lagoni de la Toscane, par MM. Ch. Ste. Claire Deville et Leblanc.

that of the carbonic acid gas (if we consider the maximum) as 6·4 : 93·6 —oxygen appears to be completely absent. Nitrogen, on the contrary, is always present, in the proportion of from 2 to 3 per cent.

3, and finally, comes a fact which MM. Ch. Deville and Leblanc have been the first to observe: In every case these gaseous mixtures contain a certain quantity of free hydrogen gas and protocarbide of hydrogen (C^2 H) which both measured together attain, on an average, the same per-centage as the nitrogen. In some places, for instance, in a crack or fissure that joins Laderello and Castelnuovo, the proportion between these two combustible gases is nearly as 1 : 1.

The presence of hydrogen in these gaseous emanations of Tuscany affords a new feature of resemblance between them and the famous Geysers and Solfatara of Iceland, but up to the present time we are not aware that any of the acute observers who have studied the Iceland emanations have ever remarked in them the presence of carburetted hydrogen.

Closing the memoir quoted above, we will add here a few remarks upon boracic acid, as it is a very interesting natural production. Before it was discovered dissolved in the waters of the Tuscan *lagoni*, all the *borax* used in metallurgical operations, in medicine, and by the mineralogist in his essays with the blow-pipe, came from Asia—principally from India. Now, the boric acid of Tuscany is converted into borax (bi-borate of soda), for the arts and manufactures. The natural acid only contains 56 per cent. of pure acid, the remainder being water.

Boric acid (or boracic acid, as it is often called), though not volatile when pure, even at a high temperature, possesses the peculiar property of being volatile in watery vapour; so that, if a dissolution of it be distilled in a retort, a certain quantity of the acid will be found to have passed over with the steam, and will slowly deposit itself in the recipient, where it will crystallize in beautiful little white crystals. This is pretty nearly what takes place in nature. Besides the invisible vapour with which the air is constantly more or less charged, and which is every now and then condensed in the shape of clouds or fog, there is a constant supply of watery vapour, that makes its way (together with the gases of which we have been speaking above), through the fissures of certain rocks, either volcanos, solfatara, or calcareous and serpentine formations. These vapours are evolved from the earth near, at, or above boiling point (100° centigrade), with a hissing noise, and sometimes from high white columns of steam, that are visible from afar. This is the phenomenon to which the Italians have given the name of *fumarolla*, and which is nowhere more strikingly grand than in Tuscany, in the calcareous hills (often associated with serpentine) of Monte-Cerboli, Castelnuovo, and Monte-Rotondo.

This projected vapour carries with it boric acid and the gases noticed above. The vapours rise either directly from clefts in the rocks or from stagnant pools, in which they throw up small cones of mud; in places where the boric acid vapours permeate the fissures of the rocks, they deposit sulphur. The boric acid is dissolved by the water, which constantly condenses from the *fumarolle*, and forms the *lagoni*, from

which it is extracted daily by a process of concentration. The gaseous emanations which arise with the steam were only very incompletely known until the recent investigations of MM. Deville and Leblanc.*

We read in a late number of the *Flensburger Zeitung*, that the peat-bogs of Suder-Brarup, in Schleswig, are become latterly a rich mine for antiquarians. It appears extremely probable that a small army was swallowed up in these peat-beds about 2,000 years ago. The soldiers had, it is supposed, endeavoured to cross the country in the winter, whilst the bogs were frozen, when they sank in and perished. Their remains are found in considerable quantities. "Never before," says the journal just quoted, "have organic substances, such as cloth, wool, leather, &c., been found in so perfect a state of preservation. Bows and arrows, spears, shields, and the like, buried in the peat some two thousand years ago, are almost in as good a state as if they had been manufactured only last year. Some of the objects are now exposed to public gaze at the *Hotel de Ville* of the town of Flensburg.

News has lately come from America to France (and is now travelling away over the Continent) of a man having been petrified alive after drinking some water contained in a geode he had broken open, the interior of which was beautifully crystallized. The *route* this marvellous history—which beats Chamisso's "Peter Schlemyl"—has travelled, is pretty nearly this:—From an article in the *Alta California* of the 20th of July last, it got into the *Athenæum*, of London, from thence into our Parisian contemporary, *Le Cosmos*, from which it has been copied into other journals. The French look upon this account as the last American *canard*.†

Errata in our Last.—P. 487, line 9, *for* make, *read* macle; p. 488, line 22, *for* titanite, *read* titanate; p. 490, lines 4, 8, and 14, *for* Muladetta, *read* Maladetta; p. 490, lines 9 and 17, *for* Nethon, *read* Nethou.

* For further information on this subject, consult Payen in the "*Annales de Chimie et de Physique*," 1841; Larderel, "*Etablissements Industriels de l'acide borique en Tuscane*;" Sir. R. I. Murchison, "On the Vents of Hot Vapour in Tuscany," Quart. Journ. Geol. Soc., vol. vi., p. 367.

† I have not much doubt myself, from the extensive account given in the papers mentioned above, that the man died of a fit of apoplexy.—T. L. P.