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resinous strong-smelling substance in horizontal strata, which could be easily divided into laminæ of from one to two inches in thickness; but, in other respects, the lava of this volcano exhibits nothing but what has been seen in the other extinguished volcanoes in the neighbourhood. The Val di Noto is the only part of Sicily where traces of ancient volcanoes are found. Travellers, who imagined that they found some of the like kind in other provinces, were either mistaken, or suffered themselves to be deceived by false marks.

XVII. *Observations on the Nature of the Fog of 1783.* By
M. DE LAMANON, *Correspondent of the Academy of Sciences at Paris* *.

WHEN this fog, which may be called an electric fog, began to appear, I was at Sallon de Crau, in Provence. In order to free my neighbours and countrymen from uneasiness as much as possible, I wrote a letter to M. Artaud, editor of the *Courier d'Avignon*, in which, after speaking of the nature of the fog, I said it would be destroyed by the storms that would not fail to ensue. The event fully justified this kind of prediction. Having learned from the public papers that this phenomenon was not local, but almost general throughout Europe, I made new observations, and traversed the highest Alps of Provence, Dauphiny, and Piedmont; and, during the course of my travels, collected information respecting the fog, and the effects of the thunder. But before I offer that explanation of the phenomenon, which appears to me most probable, let me endeavour to give an accurate description of it.

I. *Nature and Effects of the Electric Fog.*

1. In almost all countries the fog was preceded by a storm.
2. It began the same day at places very remote from each other; as Paris, Sallon, Turin, Padua, &c. where it appeared, for the first time, on the 18th of June. M. Senebier

* From the *Journal de Physique*.

wrote to the Count de Saluces, perpetual president of the Academy of Turin, that the fog was observed at Geneva on the 17th. I read in the *Affiches* of Dauphiny, that it began at Grenoble on the 21st.

3. A north wind prevailed in several places when the fog began; and in other places, where it began the same day, a south wind prevailed. The fog, after having ceased, re-appeared in some places by the north wind; in others, by an east, west, or south wind.

4. The atmosphere was not every where equally dry. At Sallon I observed that it did not make salts enter into deliquescence; did not raise the hygrometer; did not prevent evaporation from being abundant; and did not even tarnish glass, which I exposed to it. The salt-pits at Hyeres, in Provence, crystallised a fortnight sooner than usual by the effect of the fog. Messrs. Toaldo and Senebier observed, the one at Padua and the other at Geneva, that the hygrometer did not reach the point which denotes humidity. In the Champsauc of Dauphiny, and at Turin, the fog was sometimes humid.

5. The sun, which was never seen but through the fog, appeared very pale in the day-time; of a blood-red colour at rising, and still more so at setting.

6. At Sallon the fog sometimes diffused a very disagreeable smell, difficult to be determined, and which some believed to be sulphureous. This bad smell was perceived in other places.

7. It was hurtful to the eyes. At Sallon, persons whose lungs were weak, found disagreeable effects from it. The inhabitants of the Champsauc informed me that several people in that neighbourhood had violent pains in the head; and that, in general, they partly lost their appetite. The inhabitants of this valley are the greatest eaters in France: strangers, who reside among them, and drink their waters, eat almost as much as they, and are not so nice as usual in regard to the quality of their food. This I experienced in 1783.

8. In Lower Provence, Languedoc, and other places, the fog ripened the corn, and was favourable to the harvest. The

peasants beheld, with the greatest satisfaction, the effect of the fog on their crops; and yet were afraid of it. In Upper Dauphiny, and at Turin, it blighted several fields of wheat, and rendered copper buttons green. In other places it dried the plants.

9. At Padua, Turin, Paris, Sallon, Grenoble, the barometer remained almost always stationary at the point which denotes its mean state.

10. There were some days remarkably warm; but, in general, the months of June and July were almost everywhere less warm than usual. That year there was no summer on the high mountains of Provence and Dauphiny, where the shepherds of the plains of Crau and Camargue tend annually numerous flocks.

11. There were everywhere storms of rain; and after these storms the fog sometimes increased, but most frequently was diminished.

12. During the whole time of the fog, an electric machine I had at Sallon emitted few or no sparks. A philosophic friend at Sorgues, near Avignon, wrote to me, that his electrometer always indicated a great deal of electricity in the atmosphere.

13. On the 4th of July, at five in the morning, M. Nicolas, physician at Grenoble, and M. Plana, apothecary, took four measures of fog and mixed them with two measures of nitrous air: the absorption was 1-4th, and nothing remained but a gas, in which a candle became extinguished several times. Atmospheric air generally contains nearly 1-3d of pure air (oxygen gas), and 2-3ds of mephitic air (azotic gas). Fontana's eudiometer gave the same result on the 7th of July: of three hundred parts of atmospheric air, thirty-two were absorbed. The air of the fog, mixed with inflammable (hydrogen) gas, did not prevent it from exploding when a lighted taper was presented to the neck of the bottle in which it was contained.

14. Almost all those who have spoken of this fog, say that it was low. When I was on the top of Mount Ventoux, however, nearly 1040 toises above the level of the sea, I saw it far above me. M. Senebier says, in his letter to Count

de Saluces, that it was seen in the Alps at an elevation greater than that of Mount Salève, which rises 601 toises above the sea. On the 22d of September (1783) I ascended the highest Alps of Dauphiny, to the height of 1660 toises above the sea. (No one has yet been higher in Europe.) The shepherds, who served me as guides, all assured me that this fog had however passed over these mountains.

15. The lowest part of the fog was the thickest and driest. I assured myself of this by proceeding from the borders of the sea to the summits of the highest mountains.

16. It is probable, according to every account, that this fog overspread almost all Europe, the islands of the Mediterranean, and a part of Africa. It covered the whole Adriatic Sea, but extended only to the distance of 100 leagues on the ocean. It was properly a continental fog.

17. The thunder this year (1783) occasioned great devastation. In Provence and Dauphiny alone it killed nearly sixty persons, and a great number of animals. I have found no instance of its falling and doing mischief in places higher than 450 toises above the level of the sea. It would be too tedious to insert here the name of every place, which I noted down in my journal, where I learned that the thunder fell. It will be sufficient to relate the most singular effects it produced, and such as may add to our knowledge respecting the nature of these terrible meteors.

According to Pliny, Plutarch, Seneca, &c. the olive, fig-tree, and laurel, are never struck by lightning. Porta adopted this opinion, which was that of all the ancients. Toaldo says also, it is only those trees which contain resin that can perhaps escape the danger of thunder; such as the olive-tree, laurel, fir, and some others of the like kind. This, in all probability, is the foundation of the practice, common among the populace, of keeping in their houses, and placing on the summits of steeples and at the corners of fields, branches of olive that have been blessed, and of burning them in their houses during storms. It is possible, and even probable, that trees of this kind may be less frequently struck by lightning than those which contain a great deal of aqueous juices; but I can assert, that these preservatives of the ancients are not

equal to our conductors. On the 21st of June the lightning burnt the leaves of a fig-tree, and all the bark of an olive-tree, in the territory of Sallon; and I learned that the same thing had happened formerly, and that there even had been fig-trees and olive-trees split and tore to pieces by thunder.

There is some kind of thunder, says Seneca, accompanied with a loud report, by which men fall dead, and some become stunned and lose their senses. In 1783 I saw several instances which confirm the truth of this observation. At Pellissanne in particular, which is scarcely a league from Sallon, the thunder, attracted by an iron cross, killed two persons, and deprived several others, as it were, of their senses. The same thing happened at Freissinouse, in Dauphiny.

Thunder sometimes, says Seneca, renders wine frozen and congealed. Of the two persons killed by the thunder at Pellissanne, one lost immediately all his natural heat, and the body was found extremely cold. Thunder must sometimes produce these effects by occasioning a strong and speedy evaporation.

Bodies struck by thunder, says Plutarch, do not corrupt; dogs and birds do not eat them. This may sometimes be the case, but I know several examples of the contrary*. On the day of the fair of Villefranche (July 22d) the thunder killed a mule, which corrupted so soon that it was found necessary to remove it. About eight or nine years ago, several sheep were killed by lightning on the mountain of Sederon in Provence; and the shepherds abstained, for a long time, from approaching the place, on account of the bad smell which they emitted. On the 1st of July, about four in the afternoon, the lightning fell at Carpentras on the Lazaret, (a place where those who died of the plague were formerly buried,) and set fire to the wood-work. The fire being communicated to several quintals of gunpowder, an explosion took place, by which five persons were killed and fifteen wounded. The same flash of lightning traversed the convent of the Carmelites, and melted part of the scissars of the prior: it killed also a cow, which was eaten without any bad consequence.

* See *Mr. Aboard's Experiments, in Philosophical Magazine*, Vol. III. p. 1.
Towards

Towards the end of the month of June, the cure of Espinouse, in Provence, standing at the door of the church in order to exorcise the thunder, was killed, as well as his maid-servant and his clerk. At Mane, in Provence, the bell-ringer was killed by it. On the 26th of August the lightning was attracted by the iron cross on the church of Sigoger du Hai, in Dauphiny; and, going round it both on the inside and outside, frightened the ringer so much that he swore he would never return thither again in the time of a storm. At Pernes, in the Comtat, it overturned a cross. This cross, the remains of which I saw, was of white calcareous stone, and fastened by a bar of iron to a column of *coquilliere* stone* of a yellowish colour. The iron had disappeared; a part of the column was shivered, and blocks of it carried to the distance of more than twenty-five paces.

At Aix the thunder dried up a beam, and left in one place only the fibrous part. At Fressinouse, in Dauphiny, it killed two oxen; deprived a labourer of his senses, and carried away one of his toe-nails. I must here remark, that his shoes were shod with iron. At La Motte du Caize, in Provence, it entered at a window, where there was no iron, and went out at the chimney. At Claret it unsaddled an ass without doing him any hurt, and carried the pack-saddle to a considerable distance. In several places, and particularly at Bapon in Provence, the lightning tore off the hair from the heads of several women. At Saint Cristol, in Provence, it carried away the half of a girl's body. At Avignon it carried away the half of a cat. I had this fact from M. Sauvan, who on that day (June 21st) observed the ball on the steeple of the Grands Augustins of Avignon covered with a crown of light, which continued three quarters of an hour, and disappeared at eleven at night.

On the 22d of July there fell a great quantity of hail at Saint Esprit: it was of a very large size. A girl, struck on the head by a grain of it, applied her hand to the place and found her head-dress on fire.

On the 21st of June ascending thunder was seen at Sallon:

* A kind of stone mixed with abundance of shells.

like phenomena were observed the same day in several other places. In several villages through which I passed, I was shewn a great number of trees stripped of their bark by the thunder; and I remarked that the part of the bark, or wood, carried away, was almost always broad at the bottom of the tree, and narrow at the summit. It would seem as if the lightning had met with obstacles, and that it had not the same force when it attacked the higher parts of the tree. In my opinion the thunder which produced these effects was all ascending; and I often observed holes at the roots of the trees which had been deprived of their bark. I observed also that dry land had been less struck with the lightning than moist land, which induces me to believe that the greater part of the thunder that year was ascending.

II. *Thoughts on the Origin of the Electric Fog.*

Several philosophers adopted the opinion of the populace, and considered this fog as a natural effect of the earthquake which laid waste Sicily and a part of Calabria. Toaldo thought that all these exhalations were brought from Calabria and Sicily by the winds which blew from the southward: but this respectable philosopher, at the time when he wrote, did not know that the fog was almost general throughout Europe. Besides, the earthquakes in Calabria and Sicily took place chiefly in February, and the fog did not appear till the middle of June; that is to say, till more than four months after. In my opinion, then, this fog was not occasioned by the earthquakes of Calabria and Sicily; but the fog and these earthquakes, as well as those which we are assured took place in Iceland, had a common cause, which produced different effects according as they were modified by circumstances and the nature of the places. Let us now search for this cause; we shall find it in the annals of meteorology, and nothing is necessary but to distinguish it.

I have said, in another place *, that the constitution of the atmosphere depends chiefly on the nature and form of the ground, and that the revolutions of the air are subject to the

* *Journal de Physique*, Mars 1782, p. 187.

revolutions of the earth, over which they have an influence in their turn. If we consider the different bodies or substances of which that part of the earth known to us is composed, we shall see that, notwithstanding their apparent rest, they all obey, as we may say, an intestinal motion; and that this motion gives continual rise to new compositions and combinations, the connection of which escapes us, but which nevertheless exist. The remains of animals and vegetables still distinguishable, and which occupy so much room in our globe; the acids which attack them; the aëri-form fluids disengaged from them; the metals and pyrites brought to perfection, or decomposed; the fires separated, or collected; the fermentations and effervescences; in a word, the innumerable decompositions and recompositions of all the parts of the earth, furnish abundance of subtle matter, which, by its levity, disengages itself at the surface of the globe, cannot, in certain circumstances, resist the gravity of the air, and rises sometimes to the summit of the atmosphere. On the other hand, the rains which fall, moist fogs, and several other causes, make a part of the water, which detaches itself from the air, to penetrate the earth, and to combine with the substance of these exhalations. It is afterwards, in part, attracted by the external heat, or repelled by the heat of the earth itself; but it never returns to the atmosphere as pure as it was when it issued from it. It carries with it a great part of that subtle matter of which I have spoken; and it is this afterwards which produces thunder, and almost all fiery meteors. There is then a continual communication from the earth to the atmosphere, and from the atmosphere to the earth. The greater part of these exhalations, in general, is specifically heavier than the atmospheric air; and, if they are not impregnated with a certain quantity of water, they cannot quit the earth. They must necessarily be there collected, and accumulate to a greater or less depth in the time of great droughts.

Let us now consult our registers, and those of different observers, and we shall see that there had prevailed, at least for nine years, an extreme drought, not only in Europe, but also in Africa and America. This was announced year after
year

year by our domestic as well as foreign gazettes; and we may conclude so from the minute observations of the celebrated Van Swinden, and the tables published by Toaldo, Cotte, Beraud, Beguelin de Romily, &c. Sometimes, indeed, rain took place in one country or other; but in general, till the preceding winter, an extraordinary drought prevailed. It began about 1774, and in the month of June 1782 was extremely great in Italy and in our southern provinces. We experienced at that period a suffocating heat; the earth, as we may say, seemed to be on fire, and, in the Plain of Camargue, scorched the feet of the reapers to such a degree that they were obliged at length to walk upon straw: several died of heat with the sickles in their hands, and there were a great many sick. In a word, the drought and heat were so excessive, that, at two leagues from Sallon, the spiders, which in general are not venomous, occasioned by their bite violent diseases, which had a great affinity to those occasioned by the bite of the tarantula.

In consequence of this great drought, the exhalations of the earth, specifically heavier than the air, and deprived of that humidity which serves them as a vehicle, remained in the bosom of the earth, where they must have formed immense accumulations. The winter of 1782—1783 was rainy, particularly in Calabria and Sicily; and the Alps were covered with a great deal of snow. The spring also was in general rainy. The water then being filtered into the bowels of the earth, was at first absorbed by the very dry exhalations there confined. This humidity, added to the warmth of the spring, no doubt occasioned effervescences and fermentations; so that the exhalations, disengaging themselves with violence, in certain places convulsed the earth, as was the case in Calabria and Sicily. In proportion as the water filtered into the earth by its own weight, it found new exhalations, which, by disengaging themselves, occasioned new convulsions, but less considerable on account of the less abundance of these exhalations. In places where they were heated by their mixture, they liquefied stones, and threw up volcanic islands, as in Iceland. In the last place, these subtle exhalations rising into the atmosphere from all parts, with the vapours, which

which served them as a vehicle, did not at first alter its purity, being intimately connected with it; but they nevertheless existed, and produced in its highest regions the multiplied halos, parafelena and parhelia observed that year. The heat increasing, and the earth continuing to furnish exhalations in proportion to the preceding humidity, these were communicated to the atmosphere in a manner almost insensible: but the atmosphere being at length saturated, these exhalations underwent new decompositions; storms were formed, the atmosphere was cooled, and suffered to escape a part of these exhalations, which fell again towards the earth, and in one day Europe was covered with a dry fog *. Local circumstances, in regard to moisture, winds, and clouds, exempted certain places from it for some time. The earth, however, continuing to furnish exhalations, and these being united to those which the atmosphere, as we may say, had deposited, descending and ascending thunder were seen till the exhalations of the earth and the atmosphere were consumed. The atmosphere being gradually purified, and the source of the exhalations exhausted, the earth ceased to be convulsed.

XVIII. *Report on the Conversion of Soft Iron into Cast Steel by means of the Diamond. Read in the French National Institute, Thermidor 26, Year 7. By C. GUYTON †.*

THE Clafs will recollect the account which I gave of the grand experiment of the combustion of the diamond in oxygen gas in the focus of the lens of Tſchirnhausen, and the new facts which I thence deduced respecting the true nature of the diamond; plumbago, which is its oxyd in the first degree; carbon, which is its oxyd in the second degree; and the carbonic acid, which is the produce of its complete oxy-

* The same fog, I presume, took place in America, where there had been great complaint of drought for eight years. It was not seen in the open sea, because it was absorbed by the water: for this reason it did not appear in countries where the sky was overspread with clouds.

† From the *Annales de Chimie*, No. 92.