VII. Agenda, or a collection of observations and researches the results of which may serve as the foundation for a theory of the earth

M. De Saussure

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fail to be of essential service to him. This fact I can attest from experience.

If absolute precision be wanted, it may be obtained by employing three or more pyrometers, distributed at regular distances round the furnace, instead of using only one. The mean of the whole will be the true degree of heat in the furnace.

VII. *Agenda, or a Collection of Observations and Researches the Results of which may serve as the Foundation for a Theory of the Earth.* By M. DE SAUSSURE.

[Continued from page 190.]

CHAP. XVIII.

A. *Observations to be made on Volcanoes at the Time of an Eruption.*

1. **T**HE form, dimensions, and elevation of the crater.
2. The colour, elevation, and other sensible qualities of the flames and the smoke.
3. Phenomena which preceded the eruption, subterranean noise, earthquakes, extraordinary movements of the sea.
4. Phenomena which accompany the eruption; as thunder, lightning, positive or negative electricity, subterranean noise, earthquakes: scoræ, ashes, and stones thrown up; to what height and distance.
5. Smell of the smoke. In general it indicates the sulphureous acid; but it may indicate also bitumen and coal.
6. Nature of the gases which escape during the eruption.
7. Velocity of the lava. Its degree of fluidity compared with the inclination of the ground over which it flows.
8. To measure, if possible, the degree of its heat when it issues from the volcano.
9. Whether the lava appears to be in a state of combustion, or only incandescence.

10. Whether it does not cool more slowly, and according to other laws, than that of the bodies heated or melted in our furnaces.

10. A. Can it be supposed that the matter thrown up by volcanoes was not inflamed, or even in a state of incandescence, in the bowels of the earth; and that it is only the contact of the air which gives it these qualities?

11. Whether the sudden cooling of lava in the air or in water divides it into prismatic columns, such as those of basalt.

12. Whether it be true that scoria newly thrown up, and suddenly cooled by its rapid passage through the air, seems covered with a bituminous varnish.

13. And, in general, whether the mountain throws up bituminous matter or any thing that resembles the residuum of the combustion of coal, or whether it rather throws up pyrites or the residuum of their decomposition.

14. To ascertain by observations, and even by experiments, whether it may not be possible that pyrites or other ferruginous matters decomposed by water, undergo a fermentation, which, acting on grand masses, may disengage a sufficient heat to produce the effects of a volcano.

15. Or whether, as M. Romme thinks, the fire of volcanoes is kept up by matters accumulated by rivers and currents of the sea.

16. To search for means of ascertaining the depth of the focus of the volcano.

17. To examine whether, at the moment when an eruption begins to take place, there is any remarkable change in the tides, currents, springs, and the nearest spiracles and volcanoes.

18. Muddy eruptions: their height, bulk, nature of the water they contain; whether it be saline: nature of the earth and stones thrown up; whether it contains sea shells, of what kinds, and in what state. Watery eruptions: the same researches:

searches: whether they hold in solution earths not usually soluble in water*.

B. Observations to be made at all Times on Volcanoes decidedly such.

19. Nature of the countries and mountains between which they are found.

20. History of the volcano: its form, height, and extent in the most ancient times; its successive changes down to the present moment; its lateral mouths, and the epochs of their formation.

21. Chronology and enumeration of its different eruptions; description of them, and their most remarkable characters.

22. To descend, if possible, into the craters of extinguished volcanoes; to measure their depth; describe their form, the nature of their sides, their strata, and the concretions adhering to them, such as fulphur, salt, &c.

22. A. To observe the *fumaroles*, or jets of smoke, often acid, which arise; their temperature, their nature, and their effects on the lava with which they come in contact.

23. To examine the fissures; whether they contain metallic or stoney crystallisations, which may be considered as sublimed, and formed by the crystallisation of substances reduced to the state of smoke or vapour.

24. The nature of the streams of cooled lava; their extent and thickness.

25. Whether it be true that, in general, they are porous both at the upper and lower surfaces of the strata, and compact in the interior part.

26. To study the nature of the different currents placed above each other, in order to ascertain the difference that may have taken place in the focus of the volcano, and even in the source of its lava.

* To observe those excavations from which considerable currents of air issue either periodically or constantly. C.

27. To examine, in general, in the lava, the nature of the earth and stones of which it has been formed.

27. A. To study the origin of the crystals found inclosed in the lava, as the white garnets or leucites in that of Vesuvius, in order to ascertain whether these crystals have been formed in the lava since the time of its fusion, or whether they pre-existed in the stones from which the lava was produced.

28. The nature and progress of the decomposition of the different kinds of lava, either by volcanic acids or meteors.

28. A. Whether there are any which have actually been in fusion, and yet have preserved all the external characters which the stone had before it was subjected to the action of the subterranean fires,

29. The origin of volcanic ashes, pozzolanas, tarras, tufas, &c.

30. The origin of pumice-stones: whether they are granites or feld-spars, asbestos, phrenites, deodalites, or potter's clay more or less ferruginous, or, lastly, the remains of the decomposition of pit-coal.

30. A. Whether, as M. de Fichtel believes, the action of the fire of volcanoes may augment the fusibility of feld-spar, and change it, in the same manner as quartz; into real zeolite.

31. Nature of the obsidians or volcanic glasses: whether they be really glass, and the results of a complete fusion; or whether they are not rather stones of a vitreous appearance, and which have not been exposed to the action of a heat sufficiently strong to fuse them.

32. Whether there exist ancient kinds of lava, which, as related of those of Isehia, are susceptible of being heated by the moisture of rain and fogs, which would support the conjecture of No. 14.

C. Observations to be made on Hills and Mountains which are doubted to have been really Volcanoes.

33. The form, elevation, and other dimensions of the hill

er

or mountain, the volcanic origin of which may appear doubtful.

34. Situation of its strata. To ascend to the summit of those which are inclined; to examine whether they have not a crater, or vestiges of one.

35. To observe, above all, whether, in departing from the most elevated point, there are found strata diverging in all parts, and proceeding from that point as a centre.

36. To study the characters of the stones which have been exposed to the action of the fire, in order to distinguish them from other porous stones, such as glandulous stones or amygdaloides.

37. When these characters are discovered, to examine whether, in the neighbourhood of the doubtful mountain, there are found scattered stones which exhibit the same characters, and which seem to have proceeded from that mountain.

38. To observe whether there are found, in the neighbourhood of the doubtful mountain, any vestige of the remains of heat concealed in the bosom of the earth, as of thermal, or even acidulous waters. It is well known that these signs are equivocal, but their combination with others may throw some weight into the scale.

38. A. Whether there exist certain proofs of alternate deposits of lava or other volcanic productions, and of matters accumulated or deposited by the sea.

39. Among the stones changed by the fire, to discover those which may be considered as having been subjected to the action of one stratum of coal in deflagration, and which the celebrated Werner calls *pseudo-volcanic*, and to distinguish them from those which have been fused in a real volcano.

40. Basaltes: their forms in columns, in beds, round masses; their connections, the relation which the basaltes of these different forms observe with each other.

41. The nature of these basaltes: that of their texture, of the points which they contain, of the pores and empty

or full cells that may be observed in them; of their different accidents and decomposition.

41. A. The phenomena they exhibit in the fire, either exposed to, or sheltered from the action of the air. But before any arguments are drawn from these experiments, it will be necessary to resolve the question, Whether it be true that a stone may have been melted by subterranean fire, and yet none of its characters exhibit those indications of fusion which the fire of our furnaces would have given to the same stone.

42. Their connection, if there be any, with lava, fully ascertained as such: if it be true, for example, as M. Faujas affirms, that currents of lava are seen terminated by columns of basalt.

43. The nature of the bases on which the basalt rests; whether, as M. Werner says, any is found resting on wacke or hornstone, of an earthy and compact fracture, which itself reposes on sand or freestone.

44. Whether at other times basalt is seen to repose on beds of coal (*bouille*) which present no indications of combustion.

45. In a word, to examine whether the soil which bears them, or the sides of the veins in which they are contained, present indications of the action of fire, or at least of having been exposed to the contact of an incandescent mass; or, on the contrary, whether there appear indications of deposits of a substance which had been in a state of aqueous fluidity.

46. Whether there are in the basalt vestiges of organised marine bodies or others; and in what state these vestiges are found.

47. Whether there are observed, as M. Faujas says, basalt which seems to have formed a passage for itself from top to bottom through masses of granite.

48. In doubtful cases of this kind it would be necessary, were it possible to be at the expence, to push a gallery under a rock of basalt, to examine whether the columns descend
below

below the soil which seems to carry them; and if they are found below the soil, to sink a vertical well to ascertain the truth of the systems which suppose them to have been raised from the interior parts of the earth through the upper strata.

[To be continued.]

VIII. *Observations on the different Inducements to the Eating of Human Flesh.* By J. DE LOUREIRO*.

THE first inducement which can lead men to this excess is extreme hunger; but however pardonable it may be under such circumstances, if the flesh used be that of dead bodies, it is highly detestable on account of the consequences. During a dreadful famine in India, which destroyed more than a hundred thousand persons, when the roads and streets were covered with dead bodies, because people had not sufficient strength to inter them, I saw several have the resolution to preserve their lives by this disgusting food; but some of them, though not many, found it so delicious that when the famine was at an end they retained such an irresistible propensity to human flesh that they lay in wait for the living in order to devour them. Besides others, there was a mountaineer who concealed himself in a forest near the highway, where he used to cast a rope, with a noose, over the heads of the passengers, whom he afterwards cut to pieces to gratify his unnatural appetite. He had killed many persons in this manner, but he was at length caught and executed. At the same time, and owing to the same cause, a woman used to go out for the express purpose of carrying away children who had strayed from their homes. She stopped up their nose

* The author of this paper is an eminent Portuguese naturalist. A copy of it was given by the author from his own manuscript, never published, to Dr. G. H. Langsdorf, physician to Prince Christian of Waldeck at Lisbon, on the 5th of January 1798, who translated it into German, and sent it to Professor Voigt of Jena. See his *Magazin für den nützen Zustand der Naturkunde*, Vol. I. part 3.