Examination of some Atmospheric Dust from Shanghae, forwarded to the Asiatic Society of Bengal by D. J. Macgowan, *Esq. M. D. Ningpo Hospital, by* Henry Piddington, *Curator Museum of Economic Geology of India.*

Shower of ashes or dust.

To H. Torrens, *Esq. Vice-President and Secretary of the Asiatic Society. Ningpo, June 5th,* 1846.

Sir,—I beg to enclose for the Meteorological annals of the Asiatic Society, the subjoined communication from Mr. Bellott, the scientific surgeon of H. M. Ship *Wolf*. I have been unable to obtain any information from men, or books, in relation to showers of ashes (such things readily escaping the notice of Chinese observers) though from the proximity of this part of the coast of China, to the volcanic chain which girts the eastern and southern shores of Asia, and the force of the N. E. Monsoon, phenomena of this description might be occasionally expected. I have however learnt from Dr. Robertson of H. C. Steamer *Nemesis* (stationed at this port) that on the day in question (viz. 15th March,) he and some other officers noticed similar appearances to those described by Dr. Bellott, vegetation being covered with sand, and parts of the vessel, and the atmosphere misty. Wind was N. E. At the time I was absent at Chusan, where I am not aware that any sand or dust was perceptible. If I may presume on an opinion I should refer the phenomenon to volcanic action, and probably emanating from Mount Fusi, on the island of Niphon, the chief of the Japan archipelago. The altitude of Mount Fusi is about 14,000 feet, and it is regarded by the Japanese with awe, and wonder. Kæmpfer says, that "Poets cannot find words, nor painters skill and colours sufficient to represent it as they think it deserves." It is subject to frequent eruptions, accompanied with earthquakes, which have destroyed vast numbers of villages. In the eruption of 1707, cinders were carried ten leagues, and ashes fell several inches thick at Dezima. The phenomenon referred to, although occurring in the remotest field of the Society's domain, is not, I think, without some degree of interest. I forward the small packet of sand transmitted to me by Mr. Bellott.

Yours very truly,
D. J. Macgowan.

Copy of a letter from Thomas Bellott, Esq. Surgeon R. N., Fellow of the Royal College of Surgeons, to Dr. Macgowan.

H. M. Ship Wolf, *Shanghae, March 16th,* 1846.

My dear Sir,—I transmit an account of a descent of fine sand that occurred at this place yesterday. On the 15th, the wind was N. N. E. in

force, No. 1; N. E. No. 2; E. N. E. No. 3; N. E. and calm at daybreak; what was considered an ordinary mist was observed; but those officers who walked on shore at that time, noticed their shoes and trowsers dusty. This also I experienced in the afternoon. After 8 A. M. dust was perceptible on the guns, on the upper works, and other polished surfaces on deck. I collected as much as possible; on gathering the dust on the finger, and holding it in the rays of the sun, which consequently shone with half its brilliancy, the particles glittered, and the sand although impalpable between finger and thumb, was gritty between the teeth. The sand passed the ship in light clouds, when the light airs freshened; it was something like smoke, but not of a blue colour. At 2 P. M. I walked three miles into the country, the whole atmosphere appeared to consist of a light brown dusty colored mist; this was the uniform appearance the whole day. The plants were covered. The sun set, apparently more diminished in his diameter than on a frosty evening, and of a pale white, sickly hue. At 10 P. M. I spread two large newspapers to catch the sand; they were kept spread until half past one *mediâ nocte;* yet although the sand descended and lay on the guns, none fell on the paper; whether from electric attraction or not I do not know. The stars, although the sky was cloudless, Ursa Major in the zenith, were dimly visible. The moon three days past her full was partially obscured, and cast a very faint shadow on my hand; at *one mediâ nocte* the moon and stars resumed their usual appearance, and at half-past one the Quarter Master observed "it was all over." The Barometer 29. 88, from 30 inches.* If you breathed it through the mouth the sand gritted between the teeth. The entire surface of this district is alluvial clay, without pebble, or sand; the nearest sand (coarse and shelly) is 12 miles distant. It was said that the merchantman *Denia* fell in with this descent of sand 308 miles from any land, in the direction of Loo-choo, and also pumice stone was floating. As I did not see her log, I do not certify this fact.

Yours sincerely,
J. Bellott.

D. J. Macgowan, Esq. M. D. Ningpo.

P. S.—I forward a little of the sand.

I should premise that the entire weight of the minute specimen of this dust forwarded to us did not exceed $1\frac{1}{2}$ grains, so that all the experiments are performed with less than pin-head specimens, but chemists well know the accuracy with which these microscopic experiments can demonstrate the presence or absence of certain elements, and from

* So in MSS. I presume that what is meant is, that the Barometer *fell* to 29.88 from 30.00 ?—H. P.

the details can judge at a glance if they have been correctly and carefully performed. This is necessarily mentioned because I could only sacrifice such exceedingly minute assays, and have thus been obliged to refrain from further researches, as for example its specific gravity, the proportion of animal to mineral matter, and the hygrometric qualities of the dust, all of which, with many other points, it would be very satisfactory to know. I am in hopes however that I shall receive a report, with specimens, under the Admiralty order to H. M. Ships on the Eastern Station to report on Storms, in which other Meteorological phenomena are I presume included.

The dust is an olive grey powder, cohering much together, like the scrapings from a paper filter, and when viewed with the magnifier is evidently mixed with something like hairs of two kinds, black and rather thick white ones. Under the microscope it is evidently a congeries of very short transparent white, black and brown hairs or fibres, with some reddish, strait spines, and grains of pellucid quartz-like sand adhering amongst them. There was one small grain like a seed, but hard, which when viewed carefully appeared to be an earthy concretion. I unfortunately lost it and could not thus try it at the blowpipe.

It just '*grits*' under the nail on glass, and rubbed between two glass surfaces scratches them but very faintly, felting into a smooth mass from the quantity of fibre. I *think* the taste is slightly saline, but in the very minute quantity taken cannot be sure. Moistened on turmeric paper it distinctly reddens it and is thus alkaline, and contains probably the sub-carbonate of soda, the commonest of the alkaline salts.

Blowpipe Examination.

On platinum foil: held over the lamp it flames up, the fibres are burnt with a strong ammoniacal odour, and a grey coherent powder, like pumice, remains.

2. *On platinum foil alone: before the blowpipe;* this powder fused in the reducing flame but at one point only* and not at the detached portions. The fused part is a bottle-green glass, and when detached is found to have made a little circular hole in the platinum, undoubtedly from an alkali contained in the assay.

* Probably at one of the minute concretions noted above, and which are not remarked by the naked eye.

3. *The fibres,* which one would assume to be capillary obsidian, if we supposed the dust volcanic, are not so, but apparently animal! burning up with the common ammoniacal smell and smoke of burnt hair or feathers.

4. *On charcoal* the assay burns up as before, leaving a coherent, olive-grey, granular mass like pumice, which is infusible.

5. *With Soda on charcoal* this fuses to a reddish, dark grey, opaque and pearly bead with violent spitting and throwing up of little globules.

6. *When to this bead is added an equal quantity of Borax,* it fuses on Platinum wire to a transparent bright and colourless, but crackly glass, which is slightly green while cooling.

As far then, as physical and chemical characters are concerned, we may call our dust a congeries of light downy fibre or hairs with silex adhering to them and an admixture of an alkaline salt! It appears from Dr. Macgowan's and Dr. Bellott's letters that the mist and dust certainly extended on the same day from Ningpo in about 30° N. Lat.; to Shanghae in 31½° N. (I use round numbers here) which gives 90 miles of difference of latitude, and that it was noticed with light winds from N. N. E. to E. N. E. from 8 A. M. to 1 A. M. or for 17 hours. Now if we take it to have moved only at the rate of 2½ miles per hour, as "the sand passed the ships in light clouds," says Dr. Bellott (and this is the slowest rate we can assign to moving clouds,) this would give $17 \times 2\frac{1}{2}$ or 42 miles in length for it, and without noticing the difference of longitude between Ningpo and Shanghae, which are nearly N. W. and S. E. of each other, we may say that the difference of latitude, 90 miles, was the breadth. We have thus $90 \times 42\frac{1}{2}$ or 3825 square miles for its extent!

Where could a cloud of 3800 square miles of fibres, alkali, and sand (for this it was by the specimens before us) come from?

We have seen that it is not in the least volcanic, its animal nature putting this wholly out of the question, and all the volcanic dusts upon record are for the most part fusible and pulverulent (like pumice or obsidian) while the residuum of ours is perfectly infusible—for the little globules are, as I have stated, properly the only fusible parts, being the alkaline concretions. I shall now proceed to show that though the wind was *from* the N. E. and the phenomena occurred while the N. E. monsoon was yet blowing, that in all meteorological probability the dust did *not* come from the N. E. but from the N. W. or W. N. W.

For it is now a well recognised fact that the higher currents of the atmosphere are north, say at the polar circles, and become north-westerly and gradually westerly as they approach the equator, although the trades are easterly and the monsoons alternating in their direction, and we know also that volcanic ashes and other light matters are often carried from the west *to* the eastward by this great upper stream of westerly wind. The fall of the ashes of the volcano of Cosseguina at Jamaica in 1835, 800 miles to the North-East of it and consequently directly *against* the trade-wind, is a decisive instance of this* and I do not mention others for brevity's sake.

We are assured moreover that our dust must have come from the land by its semi-animal constituents, and that it must have come therefore originally from some quarter to the westward of the meridian of Ningpo, for to the eastward is the ocean, and as it was brought down by a north-easterly current below, that it must have come from the northward. In the north-west then seems the most probable direction to suppose it was originally carried into the atmosphere, as I shall presently show, that it is improbable it could have come from Corea or Japan. We may also note here, that Dr. Macgowan himself certifies that no dust fell at Chusan, where he was; Chusan lying north-east of Ningpo. Hence it was either too high to fall there or it came at least from the north-west. The report of the ship I do not notice here, her position being uncertain, and no time given, and Loo Choo bears about South-East from Shanghae, which would make the dust come from the N. W.

The volcanic ashes and dust are, it is always supposed, and this is most probable, projected far enough into the atmosphere, or carried up by the whirlwinds which volcanic eruptions undoubtedly create, high enough to enter the upper currents of the winds, but volcanic action is out of the question here, and we must look for other causes.

Frogs, fish, seeds, pollen, &c. are well known to have been carried up by whirlwinds and horizontally to great distances by currents of air before their fall, and on a larger scale we have the fine dust of the Sahara, which is often carried up and falls far out at sea about the

* Ashes from the same volcano fell also on board H. M. S. *Conway*, in the Pacific, 1200 miles to the westward of it. Jorullo, Tuxtla and St. Vincent, are cases too well known to be detailed, of ashes carried to the N. E.

Cape de Verd Islands. There is nothing extraordinary then in supposing that this dust was originally raised by some such cause as a great storm or whirlwind, and that it might be carried by the superior current to a very great distance before it fell. It was probably also raised in a very dry state, and one cause aiding its fall might be the absorption of the humidity of the air as it approached the ocean, hair being highly hygrometric, and hence the difficulty of supposing it to have crossed any great extent of sea, as it must have done to come from Corea or Japan. It is evidently, by Dr. Bellott's description, so light that (which appeared to him very unaccountable), it obeyed strictly, like a part of the atmosphere, the laws which regulate the deposition of dew; for it was deposited on the guns and other quickly radiating bodies but "would not settle" on his newspaper! He forgot that the paper, being a non-conductor of the highest order, prevented the radiation from the deck in that part, and thus keeping it at a little higher temperature prevented the depositing of the dew, which in this case was carrying the dust with it.

It is a startling thing to say, and I do it with all caution, but it is quite within the limits of possibility, if not of probability, that this dust came originally from the steppes of Tartary! and the presence of an alkaline salt in it is no small addition to the probabilities. The nearest part of Mongolia without the Great Wall is only about 675 miles from Shanghae, a distance to which a light mass, half dust and half fibre, might easily be carried, especially if raised as it would be there, in a perfectly dry state; the dry winds of Tartary, and the Pak-fung or dry north wind of China which splits and cracks up in an hour the most seasoned wood work, are well known.

P. S.—Since this paper was written, the dust has, through the kind assistance of Dr. Cantor and Mr. J. W. Grant, C. S. been examined by much more powerful microscopes than I possess, and these gentlemen, together with Major Munro, pronounce the fibres to be Confervæ, and not hair. Some of these bodies may afford the ammonia in combustion of which the smell is so strong and distinct as to lead us to suppose, without this correction, that the fibres are hair.

Assuming then these to be Confervæ, we have to the North-Eastward as before, Japan and Correa; and to the Westward and North-Westward the Poyang, Tai-you, Hong-tze and other great inland lakes

of China, some or most of which are shallow (*jheels ?*) and might furnish vast quantities of remains of confervæ on their inundated banks and flats.

In a paper by Mr. Darwin in the Journal of the Geological Society for 1845, on the fall of the Fine Dust in the Atlantic, which had escaped my notice and which Mr. Laidlay has been good enough to point out to me, mention is made not only of small but of coloured particles of stone $\frac{1}{1000}^{\text{th}}$ of an inch square, with some few a little larger, and much fine matter; but all the dusts examined by Mr. Darwin fuse under the blowpipe. Professor Ehrenburg finds that this dust contained no less than sixty-seven forms of Infusoria, that is of their siliceous tissues, but none of the soft parts remain. We may observe too that the whole of the dust falling on the Eastern side of the Atlantic comes from the neighbouring shores of Africa.