

The foregoing paper was, upon the motion of His Excellency the Earl of Dalhousie, ordered to be communicated to the Society of arts, manufactures and commerce of London, with specimens of the raw and of the prepared materials, and that society was pleased to award to the writer the gold Isis medal which was received and presented to him by His Excellency at a meeting of the society.

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ART. III.—*An account of some meteorological phenomena observed in Canada by Capt. Bonnycastle, R. E. in the years 1826–7.*

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At Kingston, in Upper-Canada, for many days previous to Tuesday, August 28th, 1827, the heavens had exhibited the Aurora very brilliantly, and more frequently than had been hitherto observed. On that night the scene was very grand, and I inclose a description of it from the Kingston Herald. I did not witness this splendid scene, neither did I observe that of Saturday night, the 8th of September, which was nearly equal in magnificence. I saw it, however, now and then on other nights, and on Sunday night, the 9th inst. I observed a most uncommon and interesting spectacle which did not appear to me to belong to the usual signs of the Aurora. That night, at about dark or eight o'clock, I saw an arch forming in the sky which, as the obscurity of the night increased, became very luminous. It extended at first from about under Arcturus or the Lion to the Pleiades, with but a small convexity or elevation.

Gradually and exceedingly slow it rose or became more convex, and at nine it attained, on its north-western limb, the altitude of the highest part of the body of Ursa Major, while it had increased in thickness very much, and being complete, formed a broad and highly magnificent arch of pale white light, which spanned a third part of the horizon.

It was now like a heavenly bow of luminous white vapour, through which the larger stars of the constellations were very visible ; nor did its grandeur or its light diminish when the moon, slowly emerging from the extremity of its south-eastern limb at a  $\frac{1}{4}$  before nine, shewed a deep yellow disk through its splendid veil. At half-past eight the true Aurora became suddenly apparent : first, in the zenith a cloud of bright white light, with a singular curved pear shaped form, arose, and elongating its lesser extremity, slowly bent to the horizon, and as slowly vanished. Then on the south-east arose from the lower boundary of the sky, a rod of the same white light which, enlarging its dimensions very slowly, pointed to and at length reached the milky way at the northern cross, and after shooting through the galaxy with a stately and somewhat stealing pace, slowly vanished.

Even in these appearances there was little or no signs of the Aurora Borealis as it is usually observed in high latitudes. I have seen it in the northern hemisphere sufficiently high to observe the sun at midnight, but I never remember any thing like these slow and stately movements, nor any thing that could be compared with the stationary arch I have described, which, as the moon rose above it, did not disappear even as late as  $\frac{1}{2}$  past ten, although the brilliancy of her light had certainly rendered that of the bow very faint.

The thermometer at noon in the shade, for the preceding week, varied from 70 to 84 of Fahrenheit. There had been very little or no rain for a long period, but the night dews had been very heavy, and there was a sudden and very transient thunder storm, which destroyed a barn near this place on the Thursday afternoon.

The greatest extent of the circle I observed was 160 degrees or more than 1-3d of the visible horizon. You may conceive the singularity of the scene when you reflect that the vast expanse of tranquil water of Lake Ontario, the deep gloom of the forest, the town of Kingston, and the immense ships

ships in the dock yard were all component parts of it. Abstracted by such a scene from all the petty feelings of our nature, which habit and circumstances cause to be generally uppermost, the mind of the contemplative man soars away into the realms of boundless space, forgets for a while the clog that holds it here, and with a full certainty of its own comparative insignificance amid the works of creation, returns humbly to a consciousness of its present state, having added one more to the endless reasons which cause it to adore the inscrutable wisdom of the Almighty Architect of the Universe.

On the 7th September, last year, (1826,) whilst coming up from the gulf, the weather had been cold without much wind, the little there was being from the south west. At two o'clock A. M. in the night, the mate, whose watch it was on deck, suddenly aroused the captain in great alarm, from an unusual appearance on the lee bow. The night was starlight, but suddenly the sky became overcast over the high land of Cornwallis county, and a rapid instantaneous and immensely brilliant light, resembling the Aurora Borealis, shot out of the hitherto gloomy and dark sea on the lee bow, and was so vivid that it lighted every thing distinctly even to the mast head. The mate having alarmed the master, put the helm down, took in sail and called all hands up.

The captain then called me up, but the light which had been only from one quarter, now as suddenly spread over the whole of the sea between the two shores, and the waves before tranquil now became much agitated. I shall never forget the scene which presented itself when I came on deck. The whole sea as far it could be distinguished, was one blazing sheet of awful and most brilliant light such as I never before saw, although I have frequently observed the luminous appearance which the ocean occasionally presents. A long and vivid line of light, superior in brightness to the parts of the sea not immediately near the vessel, shewed us the base of the high frowning and dark land abreast of us ;

the sky became lowering and intensely obscure, and perhaps such a scene will seldom fall to the lot of many to observe. The oldest sailors on board had never seen any thing of the kind to compare with it, except the captain who had, he said, observed something of the kind in the Trades.

The fish appeared terribly alarmed, long tortuous lines of darting light in a contrary direction to the sea, shewed immense numbers of very large fish flying about as if lost.

The wind increased a little, but not much, and had a peculiar hollow sound. Day broke very slowly, and the sun rose of a fiery and threatening aspect. Rain followed next.

To sail on a sea of fire is the only similitude I can fancy to this really grand and awful scene.

The sprit sail yard and mizen boom were lighted by the reflection as though they had gas lights burning immediately under them, and until just before day break at 4 o'clock, I could distinctly see, by the light of the sea, on any part of the deck, the most minute objects on my watch.

This light first came from the N. W., and there had been a slight Aurora observed about eleven.

I caused a bucket of this fiery water to be drawn up, it was one mass of light when stirred by the hand, and not in sparkles, as usual, but in actual corruscations.

I kept some in an open jug and sealed up some in a bottle. The first night after there was no light on shaking the bottle, but plenty in the jug. The second night the same; the water in the jug sparkled as much as ever. The third night the same: the scintillations were this night visible somewhat strongly on the sea, as even on spitting into the water they appeared, and the usual trick of throwing a rope over and towing it along, caused a very beautiful line of light. On this evening the sun had set very singularly so as to exhibit a double sun, and when a few degrees above the horizon, it showed as if the globe of that luminary had been suddenly changed into a long cylinder which reached the horizon. I made a drawing of it. This night the sea was again very luminous and  
smooth,

smooth, in fact it was very nearly as much so as before ; the water in the jug still the same. On the fourth night the water in the jug was still very brilliant, although oil had been accidentally spilt into it. The fifth night the sea scarcely exhibited any traces of luminosity ; the water in the jug this night as brilliant as ever. Sixth and seventh nights, water in the jug the same. I am sorry to say I left the sealed bottle on board in my hurry, and that the water in the jug was spilt before we landed at Quebec.

Sea water being a compound of muriate of soda and sulphate of magnesia, with oxygen and hydrogen, it strikes me that by some combination, a greater or a lesser quantity of a phosphate is formed, or phosphoric acid, in certain cases, which readily melting from its solid state, spreads and diffuses itself over a vast surface, and thus by its greater or lesser volume creates more or less of the phenomena alluded to.

My *data* for this argument, amongst other things, are the two following.

By the strictest investigation, I could discover no appearance whatever, on the occasion above detailed, for supposing that animalculæ had any thing to do with the appearance, and I think the putrescent matter from shoals of dead fish is equally unlikely in sea water.

Secondly, if four drachms of the substance of fresh herring be mixed with two drachms of sulphate of magnesia in two ounces of water, and the whole put in a phial, and allowed to stand 24 hours, on the next night a very beautiful luminous appearance will be seen on shaking the bottle, and this will continue four or five nights.

May not therefore the phosphate be formed either from the exuvia of fish, or from some secretion of the finny tribes mingling with the ocean waters. But this is a subject far beyond my research. I wish it may receive the attention of an able hand.