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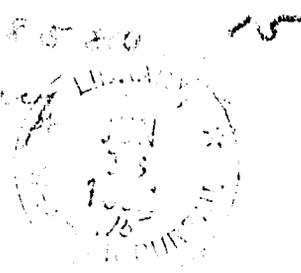
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continuation of that, which lies on the slope of the neighbouring hills, it is probable, that many centuries have not been requisite to its production; and, consequently, that these mineral waters are not of very antient date.

And, if we may rely upon an observation, which I had from a plain, inquisitive, and intelligent man, on the spot, the source, whence these waters derive their impregnation, is in some degree exhausted. This person assured me, from his own experience, that pieces of moss, and other substances, put in the course of the waters, and in the same circumstances as formerly, require more than double the time, for their petrification, that they did thirty years ago.

The *Stratum*, therefore, from which the Matlock waters are impregnated, must either be considerably exhausted; or the waters have deviated from their former course, and are now only partially distributed over this *Stratum*.

Liverpool, Oct. 15, 1773.

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XVII. *Remarks on the Aurora Borealis.*
 By Mr. Winn. In a Letter to Dr.
 Franklin.

Spithead, August 12, 1772.

SIR,

Redde, Jan. 20, 1774. I Have often wished, that somebody would carefully collate a sufficient number of meteorological journals, with intent to observe and class the several appearances in the atmosphere, before great changes in the weather, particularly before great storms. I am persuaded, from my own observation, that, in general, sufficient indications, of impending tempests precede them a considerable time, did we but carefully note them. The phenomenon, which I am going to mention, is one of those indications which not only portend an approaching tempest, but ascertain from what quarter it will come; a circumstance, that may render it of essential service to seamen. I believe the observation is new, that the *Aurora Borealis* is constantly succeeded by hard southerly, or south-west winds, attended with hazy weather, and small rain. I think, I am warranted from experience, to say constantly; for in twenty-three instances, that have occurred, since I first made the obser-

observation, it has invariably obtained. However, I beg leave to request, you will recommend it to the notice of the Royal Society, as a matter, which, when confirmed by further observations, and generally known, may be of more consequence than at first appears. To shew that it may, give me leave to recite the circumstance, which first occasioned my taking notice of it. Sailing down the English channel in 1769, a few days before the autumnal equinox, we had a remarkably bright and vivid *Aurora* the whole night. In shore, the wind was fluctuating, between N. N. W. and N. W. and farther out, W. N. W. Desirous of benefiting by the land wind, and also of taking advantage of an earlier ebb-tide, I dispensed with the good old marine adage, *never to approach too near a weather-shore, lest it should prove a lee-shore*, and, by short tacks, clung close along the English coast. Next day, the wind veered to the S. W. and soon after to S. S. W. and sometimes S. We were then in that dangerous bay between Portland and the Start Point, and carried a pressing sail, with hopes of reaching Torbay before dark; but night fell upon us, with thick haze, and small rain, in so much, that we could not have seen the land at the distance of a ship's length. The gale was now increased to a storm; in this dilemma, nothing remained but to endeavour to keep off the shore, till the wind should change. Luckily our ship was a stout one, and well rigged.

Reflecting some time after, on the circumstances of this storm, and the phænomena that preceded it, I determined to have particular attention to

future *Auroræ*, and the weather, that should succeed them; and, as I have observed above, in twenty-three instances, have found them uniform, except in degree: the gale generally commencing between twenty-four and thirty hours after the first appearance of the *Aurora*. More time and observation will probably discover, whether the strength, of the succeeding gale, is proportionate to the splendor and vivacity of the *Aurora*, and the distance of time between them. I only suspect, that the more brilliant and active the first is, the sooner will the later occur, be more violent, but of shorter duration, than when the light is languid and dull. Perhaps too, the colour of the *Aurora* may be some guide, in forming a judgement of the coming gale. That which preceded the storm I have mentioned, was exceedingly splendid. The tempest succeeded it in less than twenty-four hours, was violent, but of short (about eight hours) continuance. In June last, a little without soundings, we had for two nights following, faint inactive *Auroræ*; the consequent gale was not hard, but lasted near three days: the first day attended with haze, and small rain; the second with haze only, and the last day clear.

The benefit which this observation, on the *Aurora Borealis*, when further confirmed and known, may be of to seamen, is obvious, in navigating near coasts, which tend east and west, particularly in the British channel. They may, when warned by the *Aurora Borealis*, get into port, and evade the impending storm; or, by stretching over to the southward, facilitate their passage, by that very storm,

storm, which might have destroyed them; for no winds are so dangerous, in the channel, as southerly and south-west. In a word, since I have made this observation, I have got out of the channel, when other men, as alert, and in faster sailing ships, but unapprized of this circumstance, have not only been driven back, but with difficulty have escaped shipwreck.

Perhaps, the observation, that southerly gales constantly succeed these phenomena, may help to account for the nature of the *Aurora Borealis*; my own thoughts on that subject, I shall some time beg leave to lay before you.

I am, with great respect,

S I R,

Your obliged,

humble servant,

J. S. WINN.

A further Note from the same Gentleman.

In August last, Mr. WINN sent Dr. FRANKLIN some observations on the *Aurora Borealis*, to which he would add, that, on Saturday evening, the 16th instant, as Mr. Winn came to town, the *Aurora* was so bright, that he found a croud of people in the Minories, gazing at it, which they took to be the effect of a great fire about Bishopsgate-street; the next day we had a hard gale at S. S. W. with rain.

Friday Morn. 22 Jan.

Conjecture on the foregoing.

The *Aurora Boreales*, though visible almost every night of clear weather, in the more northern regions, and very high in the atmosphere, can scarce be visible in England, but when the atmosphere is pretty clear of clouds, for the whole space between us and those regions, and therefore are seldom visible here. This extensive clearness may have been produced by a long continuance of northerly winds. When the winds have long continued in one quarter, the return is often violent. Allowing the fact so repeatedly observed by Mr. Winn, perhaps this may account for the violence of the southerly winds, that soon follow the appearance of the *Aurora* on our coasts.

B. F.
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