

The Moon and the Weather.

By CHARLES H. BARTON.

For at least a thousand years, perhaps much longer, the influence of our attendant satellite on the weather has been a tenet firmly held by the nations of north-western Europe. The foggy and uncertain climates of the British Islands, with Norway, Jutland, and the coasts of the German Ocean and the Baltic, are the cradle of the belief that change of weather has a necessary if not always prefigurative dependence on the moon's phases. To this day the great majority of Englishmen, Scandinavians, Germans, and other branches of the old Teuton stock, place more or less faith in "the arbitress of floods," and half-unconsciously consult their lunar oracle with a degree of confidence which, considering how often it is deceived, must be ingrained in their very nature. Among the Latin and Slavonic nations who inhabit regions much less troubled with atmospheric vicissitudes, this belief is not equally prevalent, or, at all events, does not enter so habitually into the calculations of daily existence. Where sun and cloud, drought and rain, storms and calms are wont to recur periodically at accustomed seasons, there is little room left for speculative combination of conjecture. Frenchmen, Italians, Russians, &c., generally trouble themselves very little with weather predictions of any sort, least of all with such as are professedly based on a coming full or new moon. Not that they are devoid of fancies about lunar influence, but such fancies are of a more special, and, so to speak, subjective complexion, dealing with the supposed effects of moonlight on the human body and on the wide range of natural objects pressed into man's services for the uses of daily life. If, as seems probable, the moon really does affect the weather, the latter class of ideas, based, as they must be, on actual though inexact, and, perhaps, mistaken observation of sundry phenomena, would be more likely to lead up to the discovery of some positive law than the traditional or conventional aspects and critical states of the atmosphere. It is easy to conceive how such a theory may gradually have crystallised out of the crude guesses of a seafaring people, ever anxious to gather some warning of the sudden changes habitually occurring in their boisterous and fickle climate.

In the zone embraced between north latitudes, 50, 60, and upwards, the moon is far from being constantly under observation. In the latitude of Greenwich, for instance, it happens that out of about 345 hours per lunar month during which she is above the horizon, there are, at or near the winter solstice (when the moonlight is longest) not more than 235 in which her rays are not drowned by the glow of the sun. At the summer solstice the possible hours of exclusive moonlight per lunar month are, in the same latitude, only 54 or 55. Hence the mean between these extremes, or 144 hours, represents the average moonlight per month over the whole year. But at least half this time is, by the bulk of the population, spent in sleep, while of the remaining 72 hours, representing the actual time during which the moon would (in a clear sky) be visible to the community at large, a considerable proportion must be deducted for foggy or cloudy weather. Fifty hours of moonlight per lunar month, under such circumstances, be accounted a very liberal allowance to the average observer in those latitudes. To him, therefore, the lunar orb or crescent is, compared with other heavenly bodies, a relatively infrequent, not to say unfamiliar, object. But in proportion to the infrequency of the phenomenon will attention be concentrated more strongly on those startling changes of aspect which unfold themselves more gradually to the observer in a more favorable climate, and exert a less powerful effect on his imagination.

The existence of a generic connexion between the four principal lunar phases and accompanying atmospheric changes was, no doubt, suggested originally by the tides. The high or spring tides at full and new moon, with the neap or lack tides at the times of her quadrature, would naturally lead to the inference that causes adequate to produce such effects in the oceanic region must be equally potent in the domain of the atmosphere. Such a theory could, however, assume definite shape only where the tidal phenomena are strongly marked, as on the deeply indented coasts of North-Western Europe,

where the rise and fall exceed, in places, 49 ft. to 50 ft. On the almost tideless shores of the Mediterranean, as on the Atlantic seaboard of Southern France and the Iberian Peninsula, where the change of level in unobstructed ocean is comparatively slight, the tidal oscillations would attract little attention and their periodical increase and decline probably still less. The Teutonic persuasion of definite weather change corresponding with definite lunar change, had its origin no less in the tide-vest no less in the cloud draped and storm-swept northern skies.

A real or assumed connexion between the two classes of phenomena once established, an accommodating empiricism would soon work out of the theory in all desired minuteness of detail. The interval between any two of those lunar phases of which it takes account never exceeds seven days. Hence it results that any notable change of weather must either precede or follow one of said phases at an interval not greater than three and a half days. The chances, moreover, are much against any weather change being so exactly intermediate that it cannot be plausibly and decisively referred either to the preceding or succeeding phase. If it be full moon on one Sunday and the last quarter on the Sunday following, and a decided change of weather take place during the week, a believer in the phase theory will naturally connect such change with the phase to which it comes nearest in point of time. Should the change, however, by a rare accident occur precisely in the middle of the week, he will put no great strain on his convictions by attributing it to the preceding or full-moon phase as the more striking and, consequently, the more potent one, and thus press into the service of his weather-creed the very argument which, to an unbiased mind, would be conclusive as to its fallacy. The weather-tables propounded some years ago by a Captain Saxby, who professed to have reduced the phase-theory to exact rule, were as remarkable for the elasticity of interpretation they admitted as for the immediate and powerful hold they took on the public mind.

Science, doubly armed with scepticism where a traditional belief is in question, has long since exploded, by exact observation, the alleged relation of weather phenomena to the nearest lunar phase. It does not, therefore, follow, however, that the moon is wholly inactive, and that her position and aspect ought to be left out of the account in any attempt to establish a basis for meteorological inquiry. That she does not exert influence of a certain kind was more than half accepted by Humboldt, who alludes to, without controverting, the belief that the full moon at the zenith has a mysterious faculty of dispelling cloud. Melloni's experiments on the calorific power of the moon's rays, and the more decisive data since obtained by Professor Smyth on the Peak of Teneriffe, are certainly not consistent with the alleged inertness of the illuminated surface of the satellite. And the yet more recent discovery of magnetic tides, closely following the moon's passage over the meridian, warrants the conclusion that at least one of the more potent factors of meteoric change is directly under her control.

It is to be regretted that scientific observers, concerning themselves exclusively with testing the grounds of the phasemagical superstition, have almost entirely neglected the study of weather phenomena occurring contemporaneously with the course of the moon above the horizon. If the moon does—as there is strong reason to suspect—indeed influence the weather, though not after the fashion popularly imagined, it is probable that such influence is similar in kind to that which causes the tides, but that, having for its medium the more yielding aerial ocean, it would vary greatly in its sensible effect. The influence would, for instance, be exerted over only one-half of the globe at a time, viz., that hemisphere to which the moon had (either visibly or invisibly) risen. The effect would, moreover, be less subject to retardation, would come into play more speedily, and sooner pass off again. Want of precision and detail in all the earlier meteorological records deprives us for the present of data on which a precise theory of the moon's meteoric influence could be built. Even now, at the majority of observatories, no account is taken of the hours or duration of rainfall, but merely of the quantity registered during the day and night together; and similarly with regard to the amount of cloud, direc-

tion, and pressure of wind, &c. The writer has long held the view that a systematic registration of weather phenomena from hour to hour, were it only for a few months, would conclusively demonstrate the existence of a direct action of the moon, while above the horizon, on the upper atmospheric strata, and especially during the interval between her meridian passage and her setting. From attentive though not regular observation, I have arrived at the conclusion that the bulk of the annual rainfall in any locality takes place in the interval between the moon's setting and her next meridian passage, and that the hours which in critical states of the atmosphere are most likely to prove rainy are those immediately preceding moonrise. This thesis, if borne out by observation, would by no means exclude a large amount of variation in the effect exercised by the satellite, which effect might be expected to differ according as the meridian passage takes place by day or by night, in conjunction or in quadrature, or under different electric states of the atmosphere. Although the commonest effect of a high moon is to dissolve the venereal vapours as they drift past, her ascent towards the zenith is not unfrequently attended with gathering clouds, which are not dispersed until some time after the meridian passage has been accomplished. If the perceptible effects are due to attraction, either acting alone or in conjunction with small but appreciable quantities of doubly-reflected heat, it is *primæ facie* to be expected that those agencies might, under one set of conditions, increase the capacity of the atmosphere for holding moisture in solution, while under another set of conditions they might remain inert, or even favour the contrary result of condensation. The strongest effect either way is, probably at night, but the clearing or dissolving influence is also very perceptible on the bright afternoon of cloudy mornings, and especially about sunset, when the latter precedes by a few hours the setting of the moon.

Should these views be thought of such importance as to warrant a course of systematic registration over a sufficient period with the object of testing their correctness, and should their validity be demonstrated as fully as the writer anticipates, an important point will thereby be gained for the infant science of meteorology. The fact, once established, that the oceanic tide that accompanies the satellite in her circuit round the earth has its analogue not only in the magnetic medium but in the gaseous envelope of our planet, must greatly simplify the study of atmospheric phenomena, and afford valuable aid in the attempt to harmonise and explain their apparent contradictions. To be able to predict, with tolerable confidence, the wet and the dry for the coming 24 hours, and to be able, under ordinary conditions, to repeat the prognostication at will, would be an achievement hardly second in practical usefulness to the lately acquired power of tracing the origin and marking out the probable course of a cyclone.—*English Paper.*

The Thermometer.

Hero, of Alexandria, who lived about 130 years B.C., is said to have been the inventor of an instrument for measuring the heat of the atmosphere, which continued in use until the close of the sixteenth century. It was then reduced to a more convenient form by Santonino, an Italian; and was afterward considerably improved upon, especially by Fahrenheit, who, in 1720, affixed the graduated scale, and added other details, which chiefly tended to render the thermometer the instrument of practical utility which it now is.

—The reason why the thermometer does not always accord with the comparative discomfort of hot weather is owing to variation of moisture in the air. While the human body is all the time giving off perspiration, either sensible or insensible, this evaporation will go on more rapidly when the air contains but little moisture than when it contains a great deal. Evaporation is cooling when it has no obstruction; but when it is obstructed by moist air, the reverse effect is produced, and a temperature of 80 degrees is quite as oppressive as that of 90 when the air is dry.