METEOROLOGICAL

AND

MISCELLANEOUS TRACTS,

APPLICABLE TO

NAVIGATION, GARDENING, AND FARMING,

WITH

Calendars of Flora.

FOR

GREECE, FRANCE, ENGLAND,

AND SWEDEN.

BY

Colonel James Capper.

Hinc tempestates dubio prædiscere cælo
Possumus: hinc messisque diem tempusque serendi;
Et quando infidum remis impellere marmor
Conveniat; quando armatas deducere classes.

GEORGICS VIRGIL.

CARDIFF:

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National Oceanic and Atmospheric Administration

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January 22, 2008

PREFACE.

THE first of the following tracts originated in answers to various correspondents, who were anxious for information respecting the climate of such places in the south of Europe, as were neither immediately under the command of, nor accessible to the enemy; and where consequently they might safely retire to avoid the inclemency of a severe winter in England.

The second is an attempt to account for the immediate cause, or efficient agent, of what has hitherto been deemed the effect of lunar influence on the weather.

The third was written to answer many enquiries concerning the causes of a kitchen garden in South Wales, having never failed for sixteen years successively to produce abundant crops of fruit and vegetables, which is imputed principally to shelter. The means of obtaining such shelter, without much difficulty or expence are explained; and which has been found by experience likewise to secure the garden from excessive heat in summer, and extraordinary cold in winter, so as to render it equally pleasant and productive at all seasons.

The fourth tends to shew the moral and political effects of late hours, lately introduced into this country. It may probably be thought that some apology should be offered for thus presumptuously dissenting from public opinion on this subject. But the best and almost the only excuse that can be offered for it will be in the words of the philanthropic CHREMES to his neighbour; who misunderstood the real motive of his friends interference in his private concerns.

Homo sum: humani nihil a me alienum puto.
Vel me monere hoc, vel percontari puta;
Rectum est, ego ut faciam; non est, te ut deterream.

The major-part of the materials of which the meteorological tracts or essays is composed, are deduced from well ascertained and regularly recorded facts, collected by the author himself by means of the most approved mathematical instruments. The observations have been constantly entered twice a day in a journal, at eight in the morning, and two in the afternoon; together with such extraordinary circumstances as accidently occurred during the intermediate time, between the hours of six in the morning, and ten at night. But in scientific researches of this nature, in order to coroborate a fact, or to illustrate a speculative opinion, reference must often be made to other writers of established reputation. On all such occasions for atmospherical electricity, and indeed for every other branch of that science, FRANKLIN, and BECCARIA have been principally consulted. FOURCROY has furnished an ample and correct supply of chemical facts. Dr. DARWIN likewise in his phytologia, and zoonomia, as well as in his notes to the botanic garden, has afforded much useful information; nor must the names of TOALDO, and Pere COTTE, be omitted, who have published many valuable memoirs on every branch of meteorology. Both these last-mentioned writers are zealous advocates for the effects of lunar influence on the

weather, in which the author, as will hereafter appear, in some degree concurs with them; but they seem to suppose that lunar influence is direct or immediate; whereas some reasons will hereafter be suggested for thinking that the moon operates rather as a remote, than as the immediate cause of these effects.

The various consequences of a particular temperature, or certain local situations as relative to farming, gardening, or health, are also minutely investigated; and, some reasons founded, chiefly on experience, are suggested for thinking that the long prevailing custom of seeking a retreat in a foreign country for the benefit of mild air, is by no means in all cases necessary; but on the contrary, is very often productive of more harm than good. Providence who tempers the wind to the shorn lamb, also tempers the lamb to the air of his native country.—Animals of that species, literally speaking, which live in extraordinary hot countries, are covered with hair. In cooler climates they are also protected by a fleece of wool; and in the polar regions we find many apparently delicate animals secured against the effects of excessive cold, by a natural impermeable covering of ermine or fur. So likewise the strength of all human beings is perfectly adapted to their native climates; at least until

some by casual indisposition, and others by perseverance in bad habits, have weakened their constitutions; otherwise we should not hear such frequent complaints against the vernal east winds in Britain, which do not materially affect the more hardy farmer, or peasant. Neither do animals in the southern parts of this country essentially suffer from them; whilst the vegetable world evidently benefits from their dessicative quality; which probably gave rise to the old adage, that a bushel of March dust is worth a kings ransom. Besides the easterly winds are far from blowing incessantly during the whole spring quarter; and when they are past, the general temperature of the south of England is probably better adapted to most constitutions, particularly to those of the natives, than that of any country on the continent of Europe. Our summers are comparatively mild; and the earth during the hottest season is often cooled in July by refreshing solsticial showers. The autumn is warm with usually settled weather, and little variation of temperature, until toward the end of it; and even the winter itself is very seldom so severe as seriously to affect those who reside in warm vallies. Whereas in the northern countries of Europe men are subject to suffer from the extremes of heat in summer, and cold in

winter; and in southern countries, the spring, the summer, and the autumn, are all excessively hot; and the cold of the winter, although much shorter than ours in England; is more severely felt, from the contrast with the warmth of the preceding and subsequent hot seasons. Besides a native of Britain is distressed in winter on the southern provinces of the continent, from the want of fire places; which are scarcely known in the best rooms of even the most magnificent houses, either in the south of France, Italy, Spain, or Portugal.

It is well known that few fruit-trees are the natural production of these islands; but they have been long since introduced, and may now be considered as indigenous. The same remark applies equally to many of our most beautiful and useful plants; whence it may be inferred, that with proper attention to soil and aspect, but particularly to shelter from violent winds, abundant crops of fruit may be annually obtained without the expence either of a hot-house, or a conservatory. In the following essays some proofs will be adduced of this fact, from what has been experienced for upwards of sixteen years, in a garden in South Wales; which is thought not to possess any advantage but shelter, over other adjacent gardens much less productive.

As in treating of meteorological subjects doubts frequently arise, even amongst philosopers, respecting the precise time of the commencement and duration of the four seasons of the year. In order to avoid much useless circumlocution, as well as more accurately to define their limits, reference is made in these essays to the unerring revolution of the heavenly bodies. Should this infallible criterion be hereafter adopted, no difference of opinion respecting this matter can possibly exist.—But men are generally too apt to judge of the degree of heat and cold from their own individual feelings, or from a sudden, and temporary change of the state of the atmosphere. With such persons, particularly in the beginning of the spring, and at the end of the autumn, it may appear to be winter one day, and summer the next.

The circulation of the electrical fluid being considered as the principal cause of the variable weather; and particularly of the humidity so often complained of in these islands. Some account of the original discovery of its existence in the atmosphere is added, together with many different modifications of it. At the same time is inserted a valuable memoir of the late Dr. FRANKLIN, addressed to the Academy of Sciences at Paris. This memoir car-

ries within itself internal evidence of its being intended by him as a summary or abridgement of his sentiments on meteorological subjects in general. Those who are not in possession of the works of this excellent philosopher, will probably be happy to obtain so much concentrated practical information, from such an experienced meteorologist; who was not only particularly conversant himself in this branch of natural history; but to which he likewise added many very valuable discoveries. A few cursory remarks are subjoined to this memoir by way of annotations, in order to elucidate one or two passages in it, which to those who have not studied atmospherical electricity, and the cause of the aurora borealis, might otherwise be deemed rather obscure.

In the appendix will also be found a table of the annual and monthly temperature of Cardiff, in South Wales, for eight successive years; and also the quantity of rain that has fallen during that period; to these is added another table of the regular lunar cycles for 228 years. Health and leisure permitting a comparison will hereafter be published of the weather for the space of two complete cycles, which will greatly tend towards confirming or disproving the truth of this hypothesis.

But a knowledge of the course of the seasons, or even of the daily changes of the weather, can afford little interest to those, to whom all distinctions of seasons, and even of day and night, seem perfectly indifferent. It may probably be supposed that late hours which both in a political, and moral point of view, are considered as highly objectionable, are now confined to a few opulent individuals only, who frequent the various circles of pleasure in London. But from thence they have long since been introduced amongst every class of people in the country, who have almost universally adopted them; so that it is now almost as difficult to get any business transacted there before noon, as in the midst of the capital itself. An apology has already been offered for the introduction of these remarks amongst meteorological subjects; but in truth, it is scarcely possible to commence an enquiry into the means by which the prosperity and physical strength of a country may be affected, without adverting, at the same time, to what is proved by daily experience gradually to undermine the health and prosperity of a nation, hitherto distinguished for its courage, good sense, and virtue.

The morning hours, our ancestors fancifully observed, bring gold and health in their hands; but, those of midnight may be said to be accompanied by dissipation,

and consequently disease. We probably have not far to look for the origin of this unhappy fashion, which seems to have been insensibly introduced in the metropolis by our legislators themselves, who are certainly in every respect the greatest sufferers by it. In former times both houses of parliament met and transacted business in the morning; and then, each member returned home early in the evening to the enjoyment of domestic comforts. Whilst these natural habits of life almost universally prevailed, and first to follow nature was the rule; parental tenderness was then daily augmented; the children instructed by virtuous precepts, and at the same time animated by such admirable examples, became dutiful to their parents, and habitually affectionate towards each other; whilst the servants, kept out of mischief by constant and regular employment, were of course obedient, diligent, and faithful. But it would require a volume of no inconsiderable magnitude, to detail with accuracy all the advantages arising from the one system, and all the evils resulting from the other; the cursory mention however of a few instances of the latter will suffice for our present purpose.

It cannot be expected that the most experienced members of either house, will long be able to resist the bad effects of being deprived of their regular meals, and the total want of natural rest. To them therefore, such late atten-

dance must at first be extremely irksome; and in a very short time, become absolutely impracticable. The younger senators may for few years be able to endure such intolerable fatigue; but not without irreparable injury both to their minds, and bodies; and besides, in those who may be much attached to their wives and children, a struggle will always exist between a just sense of their public duty; and a natural wish to return to the enjoyment of a social intercourse with their family, and friends. Admitting as must often happen in these important, and eventful times, that national business should frequently detain the members of either house to a late hour from home; what effects are likely to result from such a constant absence of the master of the family? The ladies thus abandoned by their husbands, will continue to fly from their houses to nocturnal assemblies in search of amusement; and to take with them their charming daughters; many of whom must be just arrived at a period of life, when nature is evidently beginning to develope herself; when wholesome morning air, gentle exercise, and a due proportion of undisturbed sleep, are unquestionably necessary for them. But engaged in scenes of dissipation all night, they must necessarily pass the subsequent day in sleep; and consequently they can no longer pay due attention to those means by which the fair sex formerly acquired domestic information, with

those refined and delicate sentiments, which would of course render them virtuous wives, tender parents, and valuable members of society in general.

The juvenile male branches of the family, from similar causes, must in the same manner be neglected; and therefore the youth from college, and the boy from school, deserted by both parents during the vacation; associate with footmen, grooms, and stable-boys, from whom many of them no doubt have acquired the present prevailing taste for mounting the coach-box in the day; and at night being destitute of pleasant society at home, they too often resort to the tavern, the gaming-table, or the stews, where their education, and ruin, are speedily compleated. With morals, manners, and health, thus greatly depraved, or rather totally destroyed, all parental and filial affection must necessarily perish; for by what means can they be any longer preserved, when both parties are gradually become strangers to each other?

Neither must the baneful effects of late hours on servants, both male and female, be passed over in silence. Whilst the master and mistress keep their servants and horses in the streets, "coughing their own knell," the poor pampered quadrupeds are perishing with cold; but the servants seek shelter and company in the adjoining

public houses, where they necessarily drink, sometimes gamble, and too often form acquaintance with the idle and profligate, who frequent such places expressly to entrap them. The maids at home at the same time, invite their gallants to wile away the tedious hours, till their master and mistress return. It cannot be difficult to guess what passes on these occasions; suffice it to say, that it frequently ends in the house being robbed, and the maids ruined. Complaints are almost universal in the metropolis of the carelessness and depravity of the servants; but it seems probable for the reasons above mentioned, that the real causes of these evils do not always originate in the kitchen.

It is no easy matter to destroy, nor even to weaken the gallant spirit which pervades both our navy and army; but when an officer in either service, brought up in a confirmed habit of late hours, is called forth to the service of his country, let his mind and body be as vigorous and active as such an unnatural course of life will admit, still he must feel rather distressed from such an extraordinary change, either when the one goes on board a ship, or the other takes the field; and those in which the rising generation in general are now educated, must in some degree enfeeble the body, although they may not materially injure the mind. The

early hours of our ancestors are said still to be observed by our formidable rivals the French; who have long since facetiously remarked that the English minister's watch always goes too slow. Ludicrous as this observation may appear to be, it is but too well founded; and cannot, whilst the fashion of late hours continue, be easily remedied. During the *ancienne regime* in France, the bad effects of this evil were not so sensibly felt by us; for then dissipation prevailed more with them, and less with us than at present. But the ruler of France, who now in person commands their armies, rises at four in the morning; takes a temperate repast of half an hour about noon; and generally retires to rest before ten at night. His ministers and generals are of course obliged to conform to the habits of their sovereign, and consequently a general spirit of activity pervades the whole country, which has enabled them in the course of a few years, to over run the whole continent of Europe. It is perfectly well known that with any thing like equal numbers, our troops never have, nor ever will yield to any opponents the palm of victory. But British valour and military skill, great as they are, cannot avail, unless they are brought into action in due time, by correspondent activity in the cabinet. Happily for this nation, ever jealous of the blessings of liberty, it has been judged expedient to establish effectual checks on all those who

are entrusted with the administration of public affairs.—But these prudent restraints on the ambition or extravagance of a minister, which are certainly most desirable in time of peace, must necessarily serve in some degree to retard our operations in time of war. No person however will envy our rivals the glory they may acquire at the expence of their freedom; but every honest Briton will lament that by a ridiculous fashion of turning day into night, or at least of losing eight hours of day-light when both the mind and the body are disposed to be most alert; we unfortunately increase those evils which it is incumbent on us as much as we can to correct. These are times when every patriotic virtue must be called forth into action. The storm and battle universally rage, the pilot therefore must not descend to feast in his cabin, nor yet Palinurus, like slumber at the helm; for this is realy the awful moment, when every British subject must be expected to do his duty; and no doubt can exist of our ultimately prevailing over the force and machinations of our enemies, provided we can only previously learn to conquer and reform ourselves.

OBSERVATIONS

ON THE

Causes and Consequences

OF THE TEMPERATURE

OF AIR

IN DIFFERENT LATITUDES.

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Observations

ON THE CAUSES AND CONSEQUENCES OF THE TEMPERATURE OF AIR IN DIFFERENT LATITUDES.

Pour regler nos travaux pour marquer les saisons
L'art divisa du ciel les vastes regions.
Soleil, ame du monde! Ocean de lumiere!
Douze astres differents partagent ta carriere.

DE LILLE.

THE invention of the thermometer and barometer, with the addition of some other pneumatical instruments in the seventeenth century; considerably extended the bounds of meteorological knowledge. But the most valuable acquisitions to the science, were the discovery of atmospherical electricity made by Dr. FRANKLIN; and the composition and decomposition of water; which we owe to the ingenuity and perseverance of modern chemists.

Previous to that period therefore we may consider that the best informed philosopbers knew little more on this subject, than what they derived from some practical traditional prognostics, which had been recorded by the ancients. It is supposed that many of these originated with the Chaldeans, and came from them to the Egyptians, by whom they were communicated to the Grecians; and thus following the regular course of all the arts and sciences, they were at length transmitted from the Romans to us. But these traditions must not be considered as the vain dreams and idle fancies of illiterate peasants; on the contrary, they are the result of judicious observations first made almost three thousand years ago, by men of acknowledged wisdom and virtue; who were not liable to be misled themselves, nor capable wilfully of deceiving others. The sentiments therefore of such men on the operations and appearances of nature merit our attention and respect. The rays of science annually, and almost daily dissipate the mists of error and superstition; and at the same time elucidate facts founded on the solid basis of truth.

It cannot have escaped the notice of those who are conversant either in maritime or rural affairs; that experienced seamen and well informed husbandmen are seldom mistaken in the diurnal predictions of the weather.

Their knowledge on this subject is evidently derived from respectable authority; and in truth it must be allowed that what these people know, they generally know well; because their comfort, and even their daily subsistance very frequently depend on the little information they possess. Besides being frequently exposed to the inclemency of the weather at all seasons of the year, and at all times of the day and night; they attentively observe the varying appearances and sudden changes in the clouds; from the influence of which their superiors are much less likely to suffer.

But in attempting to trace the origin of those ancient rustic proverbs which are now so commonly repeated; we have limitted ourselves to the observations recorded in the Georgics of VIRGIL. For this admirable poet, philosopher and farmer, is well known to have been perfectly acquainted with the works of all the Greek and Roman writers on these subjects; and consequently his beautiful poem may be considered as a summary of all the practical and theoretical meteorology known in his time. The prudent English farmer, gardener, and planter, however will do well in all his operations to advert to the geographical and consequently physical difference of climate in the two countries which vary considerably even in the different parts of Italy itself.

This distinction however has not been sufficiently adverted to even by VIRGIL himself, notwithstanding he was born and lived near Mantua until upwards of thirty, and afterwards resided many years at both Naples and Rome. A few words will suffice to shew the cause and the consequences of the diversity of temperature in the north and south of Italy; and at the same time to explain the difference of climate between Italy in general and England.

To the north of Italy we find the frozen Alpine regions, to the south a narrow channel divides it from the burning sands of Africa, to the east is the gulf of Venice, and to the west is the Mediterranean, with many small Islands interspersed in it. In England on the contrary, we of course are surrounded by the sea. An immense expanse of ocean lies to the westward, but on the opposite side we approach very near to the continent of Europe; which is always much colder in winter and proportionably hotter in summer, than those places in the same parellel of latitude in these Islands. It will therefore be necessary for Agriculturists, when consulting the Georgics to consider what effects are likely to be produced from this difference of climate in all the operations of husbandry.

The northern parts of Italy, including both Piedmont and Lombardy, must early in the spring be occasionally exposed to very severe cold; whilst the southern extremity will always suffer in summer from an uncommon degree of heat. But Rome situated nearly in the centre of Italy, being half way between the two extremities, will best serve to mark the precise division of the year into four regular seasons. The latitude of St. Peter's, according to the most correct observations, is 41, 53, 54, north. If therefore, we comprehend all the former territories of the church, this will be nearly the center point between the torrid and the frigid zones, as well as equally distant from Africa and the Alps. At the summer solstice the sun's greater altitude there is 71, 35, 6, and at the winter solstice his least altitude is nearly 24, 37, 6, the mean 48, 6, 6. As far therefore as a more constant and almost equal diffusion of the light and heat of the sun contribute to the warmth and uniform temperature of a country; the centre of Italy may be supposed to have the most regular and best defined seasons. On the contrary in London the sun's greatest altitude in summer is only 62, 0, 0, and in winter his least 15, the mean 38, 30. This inferior degree of regular solar heat and light, together with the consequent obliquity of the sun's rays at the beginning of the spring and the end of autumn will of course

as before observed, produce a considerable difference in the temperature of the two countries; and likewise render the periodical changes of season, less apparent in England than in the centre of Italy.

But these circumstances will hereafter be more particularly investigated, in the mean time it is necessary to render the language used in such discussions rather more definite than it is at present. Individuals seem generally to speak of the commencement and duration of the seasons rather from their own particular feelings, from the external appearance of the country, or from the accidental height of the thermometer, than from the real time of the year. A judgment founded on such variable and precarious data must often be erroneous: nor are Philosophers themselves in this respect wholly exempt from error, for even the learned and truly admirable Dr. HALES does not seem to have paid his wonted attention to this subject. He considers the heat of spring and autumn as precisely the same; that is 18, 25, 0, which according to his thermometer amounts to 50, 25, 0, of FARENHEIT; and in proof of this fact he adduces the temperature of the 30th of April and the 30th of September: whereas the former date according to the regular course of the seasons is the last day of spring, and the latter near the autumnal equinox, or the middle

of that season. But it is no easy matter to make a correct comparison between the temperature of the spring and autumn. An inversion of them would come nearest to the truth, and even made in this manner, the comparison would be very defective, and lead to many false conclusions. The spring, as will be more particularly explained in another place, strictly speaking, commences in February; but at that time the earth is frequently covered with a deep snow, hardened by a severe frost, which gives a country all the appearance of a severe winter; when however these chilling appearances have been removed by a thaw, it is immediately discovered that what induced the opinion of winter still prevailing was erroneous. The internal warmth of the earth which continues all the year at 50 degrees of FARENHEIT, is thus prevented from entering into the atmosphere by a covering of ice and snow; the retention therefore of this terrestial heat must necessarily occasion a considerable degree of cold; yet the operations of nature have all the time been imperceptibly but incessantly carried on under this humid veil, and when it is withdrawn vegetation appears from beneath it in a very advanced state; and is in fact invariably found to be in a more flourishing condition, than if it had been constantly exposed to the influence of the atmosphere. The moisture of the winter in England, the obliquity of the rays of the sun early in

the spring, the melting of the ice and snow on the adjacent continent to the E. and N. E. which is the immediate cause of the periodical return of the winds from those quarters throughout the spring months; and the subsequent evaporation of the winter moisture, must at all times subject England to severe cold weather from the beginning of February to the end of April. To fix therefore, with some degree of precision, the periodical distinction between winter and spring, we must have recourse to the language of our forefathers; who have wisely called the solstice midsummer. If this be the middle of the summer, as the term itself implies, and as it certainly ought to be considered, being the time when the sun has reached his greatest altitude. The whole year being divided into four seasons, and each season into three months; we must refer back six weeks to the commencement of the month of May for the beginning of summer, and which ends six weeks after the solstice, that is at the end of July. The next three months, August, September and October, will be the autumn, with the autumnal equinox as a central point; and of course winter follows with the brumal solstice as the middle of that season. Whatever appearances the month of February may accidently assume, the spring may then be said to open upon us. But that we may not seem wholly led away by a groundless regard to ancient

customs, or what may be considered by some people as obsolete terms; let us examine how far these opinions are founded on what is constantly passing before our eyes.

Every person the least conversant in the calendar of Flora knows that at the beginning of February, unless the winter has been uncommonly severe, the honeysuckle, the elder, and both the male and female buds of the hazel, as well as the leaves of the gooseberry bush, and even those of some other fruit and forest trees, begin to swell and even burst; whilst crocusses and snowdrops at the same time put forth their flowers. Birds also begin to couple, and poultry to lay. The poor peasant anxiously watching for the smallest increase of his scanty pittance, with pleasure repeats, "that on candlemas-day every good goose begins to lay." In short, without seeming to wander very far into the wide field of etymology, it may be presumed that spring derives its name from the renewed activity which universally prevails both in the animal and the vegetable worlds at this season of the year.

Solar heat and light are obviously the primary causes of this well known effect. In the first instance, they occasion the warmth of the summer whilst the gradual

diminution of them afterwards produces the cold of the winter. These therefore may be considered as general causes operating universally on plains, with more or less force in all climates from the equator to the pole.— But the temperature of all countries is influenced by various other contingencies; such as the height of the place from the level of the sea, the steepness of ascent of the hills and mountains, the aspect, and the degree of evaporation which takes place in consequence of these contingencies.

In all plains situated in the torrid zone, the weather is of course at all times excessively hot; but the temperature varies according to the latitude of the place and the situation of the sun. In the temperate zone of the northern hemisphere, the same causes of course produce the same effects, so that in the latitude of 35 degrees it seldom freezes, and almost never snows. The winter does not begin there before December, and ends in January; the rest of the year may be considered as a regular succession of ten summer months. In the frigid zone nature apparently performs all the works of spring, summer, and autumn, in the course of about sixty days only; and winter continues all the rest of the year. But the fruits and flowers of every description are kept alive there all this long winter by a

deep covering of snow, which retains the internal heat in the body of the earth, thus preserving and cherishing vegetation near the surface, and at the same time securing the herbage from the severity of external cold; and when the sun returns, being two months incessantly above the horizon, vegetables and fruits of all kinds are in that short space of time brought to perfection. The effects of solar heat and light on plains being by these means sufficiently proved, we shall in the next place proceed to consider the consequence of these same causes on places situated on hills and mountains.

Solar heat (says Mr. KIRWAN) is propagated through the atmosphere by contact and communication with the earth, hence it is evident that lofty mountains, particularly if their horizontal surface be not very extensive, cannot be warmed by them to any considerable degree. Mountains and high hills of this description receive the sun's meridian rays more obliquely, and communicating less with the common mass of the earth, are less heated than plains, and consequently they must always be cold in proportion to their height. But continents and even islands whose acclivity is almost imperceptible, although not so subject to cold as lofty and detached mountains, nevertheless become colder than vallies, precisely in proportion to their height from the level of the sea.

The decrease of temperature therefore in different countries may always be estimated according to the degree of their gradual ascent, and ultimate height.—This fact is sufficiently manifest from the hills of Thibet which are seen constantly covered with snow at the distance only of 150 miles from the plains of Bahar. The southern range of these mountains is between the latitude of 32 and 35 degrees, two hundred miles further south than the Plains of Calabria, where snow is seldom seen on the plains, even in the depth of the severest winter. But this meteorological fact may be as correctly ascertained in almost every county of Great Britain, where there is a range of hills extending nearly east and west. The inhabitants of Glamorganshire, in South Wales, in particular may easily try the experiment; for in most parts of the county they have the sea to the south, and many ranges of mountains to the north of them. Merthyr for instance lies to the north of Cardiff, at the distance of 25 miles, and at the height of 568 feet from the level of the Bristol Channel. The annual difference in the temperature of these two places is about 11 degrees of FARENHEIT, but the temporary difference is often much greater. In the valley near Cardiff, the snow seldom lies above 48 hours, and not often so long; but the rain which falls in Cardiff, in the months of December and January is generally in

winter and always late in spring converted into snow at Merthyr. So late as the 21st of April of this year (1809) the hills near Merthyr were covered with snow for ten days, whilst the plains near Cardiff were perfectly green; and as usual the snow at the former became at the same time rain at the latter. So uniform and correct are the operations of nature in this respect, that in winter the distance from the level of the sea, and the degree of ascent from its commencement, may be ascertained by the depth of the snow. In a common fall of snow it would immediately dissolve within two miles of the shore; at five miles distance near the entrance of the hills the ground would be completely covered; and thus it would gradually increase, so as at Merthyr to lie at the depth of two or three feet.

The sudden conversion of vapour into snow by the effect of violent cold is very well known in Russia and Siberia; where of course the rooms in winter are kept very close to exclude the external air; and when by any means the cold air is suddenly admitted into a room thus heated by stoves in either of those countries, the moisture floating in the atmosphere of the chamber is instantaneously converted into a white fleecy appearance of snow.

From these well known facts it must very evidently appear that the temperature of most places is infinitely more local than is generally supposed. For a person suffering in winter from intense cold at Merthyr, might in the course of a few hours be conveyed to a temperate climate in the valley of Cardiff; or if oppressed by too much heat in the valley in the height of summer, he might with the same facility in the course of three or four hours be conveyed to the hills near Merthyr or Brecon, where he would benefit by cool refreshing breezes.

Were sufficient attention invariably paid to these circumstances, invalids residing in countries situated on an eminence need not fly so precipitately from England, and spend much money and time in searching after a milder climate in a foreign country; when in fact a carriage would easily convey them in a few hours at home, from a cold hill to a warm valley; where they would be nearly as free from sharp weather in their native country, as if at a great expence of both money and time, they had quitted their family and friends, and hastily fled to Lisbon.

We do not however presume wholly to condemn this kind of emigration in search of mild air, but it has

often fallen to our lot to meet with valetudinarians in Portugal, in the south of France, and in Italy, who had been advised to adopt this plan; but in many instances they avowedly, when too late, repented of it. The privation of a variety of comforts long enjoyed at home, the loss of the society of their dearest friends, added to the pain of parting from them under such inauspicious circumstances; the fatigue of the voyage and subsequent journey, and the want of such skilful medical assistance as England almost exclusively in a superior degree affords; have in many cases known to us, been productive of infinitely more detriment, than could by any means be compensated to the unhappy patient, by a trifling alteration in the temperature of the air.—Besides it must be recollected that in those mild climates which valetudinarians sometimes so anxiously seek, the weather in summer and autumn is often too hot for invalids, so as to retard convalescence, especially in the south of Italy, during the summer months; when the oppressive and relaxing sirocco wind prevails. In the winter and early in the spring at most of the places of this description on the continent, particularly near the Alps; there are also certain local sudden sharp gusts of wind, which are often more prejudicial to persons in a delicate state of health, than even the more frequent, but less violent changes of temperature

in this Island. We believe it is universally admitted that valetudinarians suffer infinitely more at the commencement of the spring, and at the end of autumn, than either in the hottest summers, or the severest winters; for so easily does nature accommodate herself particularly to intense cold, when gradually inured to it; that persons of delicate constitutions feel it more severely even in November, than afterwards in January, although there is almost in every part of Britain a difference of eight or ten degrees in the temperature of these months. This circumstance may be easily understood by those who judge with propriety of the causes of the progressive increase of the cold in winter; or it may be positively ascertained by a reference to meteorological journals.

But we will conclude these discussions for the present with observing that places situated on the coast with the sea to the eastward, and not much above the level of it; will always be warmer in winter, and cooler in summer, than those which are situated in the interior of the country. For the sea in these latitudes never freezes; and consequently the current of air from the east passing over a warm medium in winter, can never be so cold as that which comes over the land covered with ice and snow; but on the contrary, in summer

there is generally a sort of land and sea breeze on the sea coast; such as is experienced from the same causes in tropical countries. But at all seasons vallies are warmer than hills; and the local temperature of places is always in proportion to their aspect, to their relative height from the sea, to the rapidity of the ascent from that level, and in some measure to the latitude of the place. All these data for judging of local temperature we trust have been sufficiently proved; and our purpose will be fully answered in offering them to public consideration, should they prove beneficial to those who suffer from pulmonary complaints; particularly at this time, when we seem entirely excluded from the continent. Thus situated, by way of consolation to those who would go were it practicable to Naples, Nice, or Lisbon; we take upon us very confidently to assert from a practical knowledge of the different climates; that in all the southern countries of Europe, such persons as require a mild temperature, whether weakly constituted, or accidentally attacked by a severe malady, can never reasonably expect to breathe constantly a milder, or a more wholesome air, than what they may easily meet with in some of the fertile and beautiful vallies of their own country. But in support of this opinion we will beg leave to advert to a well known fact,

One of the first journies recommended to those who travel in search of mild air is Bristol. If the waters should be the first object to the patient, the air is unquestionably nearly of equal importance. This city is placed nearly in the same parallel of latitude as London, and like most others was built by our judicious predecessors in a valley. The Hotwells are situated on the south-west side of it. But had this valley been sufficiently extensive to admit of there being a greater space left between the city and the wells, open to the south, and yet sheltered as they now are by St. Vincent's rocks, and Clifton hill from the northward; the air of few places in Europe would be equally salutary for those natives of Britain who may feel some incipient symptoms of this alarming disorder. But patients who have lately been sent thither by their Physicians, have sometimes been captivated by the beautiful, and seducing views of Clifton; and therefore have unadvisedly too often fixed upon that pleasant village as their permanent place of residence at all seasons of the year.

In the summer, and also in the early part of the autumn, this probably would be a prudent choice; but during the winter, and early in the spring, Clifton is too high; and being exposed to the chilling blasts of

the north and east; the air there during the winter and early in the spring, must of course be occasionally much too keen for delicate constitutions.

For this reason it may be the long established reputation of these wells has lately rather declined; but with due attention to a necessary change of habitation according to the different seasons, we are of opinion that with all the disadvantages of being situated too near this populous city; persons of every description who require a mild air in winter and spring, and cool breezes in summer and autumn, without subjecting themselves to the pain, the trouble, and the fatigue of frequently undertaking tedious and expensive journies, would find they might easily enjoy all these comforts at Bristol wells and Clifton. These places are seperated by a hill only, not difficult of ascent; and the proximity of them, the charming scenery with which they are surrounded; together with the moving picture immediately under the windows of the houses, of ships continually sailing up and down the river, afford a constant succession of interesting objects to those who by indisposition are much confined at home. England in short affords various pleasant and salutary retreats for its inhabitants, without obliging them in sickness to retire to any part of the continent in search of

health. Bath for example in winter may serve for a hot-house to the aged and the infirm, where the efficacy of the waters, and the variety of amusements easily obtained at early hours, may be very beneficial to them. Bristol wells present an agreable green-house for young plants, which cannot with safety endure the severe attacks of the north and east winds of the spring; and where the waters, with a proper regimen, may restore them to health. Whilst numberless bathing places on our coasts may with truth be called conservatories for those who wish to enjoy the warmth of summer, tempered by the refreshing breezes from the sea; and where early bathing in salt water may strengthen the fibres of those who have been too much relaxed by hot rooms, and late hours in London, during the winter.

Happy are those who possess a sufficient share of the gifts of fortune to enable them, when necessary, to benefit by any of these retreats; still more happy are those who can possess such advantages without being indispensibly obliged to have recourse to them from indisposition; but infinitely the most happy of all are those whose situation in life has enabled them to adopt such salutary habits and pursuits at home, as render such excursions unnecessary. By rural occupations of every kind they may obtain the blessings of health

themselves. By both precept and example they may cultivate, with due care, the minds of their children; and whilst they enjoy all the advantages of a pleasant society among their more wealthy friends; they may likewise at the same time, by judicious and well timed assistance, improve the morals, and gain the affections of their less opulent neighbours.

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THE EFFECTS

OF

Lunar Influence

ON THE

WEATHER.

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THE EFFECTS OF LUNAR INFLUENCE ON THE WEATHER.

Luna revertentes cum primum collegit ignes,
Si nigrum obscuro comprenderit aera cornu,
Maximus agricolis pelagoque parabitur imber.

GEORGICS, LIB. I.

IT has long been generally believed both by mariners and husbandmen, that alterations usually take place in the weather at the full and change and quadratures of the moon; and many philosophers both ancient and modern, have concurred in this opinion. Those of Greece and Rome seem to have entertained little doubt on the subject; whilst others of the present day, have taken opposite sides of the question. TOALDO and PERE COTTE, two eminent meteorologists very strenuously support this hypothesis; but the late Bishop HORSLEY on the contrary in a summary manner very positively contradicts it. In his opinion immediate lunar influence

on the weather is highly improbable, unsupported by any physical theory, and entirely destitute of all plausible analogy.

We readily allow that the moon being an opake body, and possessing only reflected heat, and light; is not likely by the immediate influence of either, to produce any sudden operations in the density or temperature of the atmosphere; and were changes of the weather to be imputed to its gravitation, or attraction, or to any other invariable periodical cause; the weather under such influence must necessarily become as regular, as the revolutions of the moon itself.

Thus far then we seem implicitly to agree with Bishop HORSLEY; but still having reason to think from long experience, that changes do actually take place in the weather at these times; we shall consider if they may not be ascribed to some other cause dependant on lunar influence. Heat and cold says the great Lord BACON, are the hands with which nature performeth all her works; it might be added particularly in the atmosphere. On these principles therefore we shall attempt to explain the origin of this difference of opinion between such eminent meteorologists; and endeavour at the same time to establish another hypothesis, upon the more solid foundation of facts.

The tides are almost universally allowed to be subject to the influence of the moon. And as they are likewise supposed to bring from the ocean at the flood a considerable increase of the electric fluid, we feel ourselves authorized to suggest, that the changes of the weather hitherto ascribed to the direct influence of the moon, may be imputed to the circulation of that fluid; and which is in a great degree immediately occasioned by the flux and reflux of the tides.

Whilst it must be acknowledged that the theory of every branch of meteorology can be understood only by such philosophers as have made themselves acquainted with the different sciences on which it depends; it will also be allowed that the practical knowledge of it on the contrary must be best understood by those whose daily occupations, and consequent habits of life, require them to rise early; to live much in the open air; and whose health and comfort, and even personal safety, necessarily oblige them to watch both day, and night, the variable appearances of the clouds. It will not be disputed but that persons of this description are most likely to ascertain the truth of the traditionary prognostics of the weather at all seasons of the year. Few meteorologists are unacquainted with the valuable practical hints suggested on this subject by the honest shepherd of Banbury.

We trust however that philosophers will believe we are not unmindful of the superior advantage they derive from possessing meteorological instruments, and from understanding the use of them. But again on the other side it must be observed that they reside principally in cities, and necessarily adopt those hours, and habits of life, which confine them very much within doors.—It cannot then be supposed that they are able to watch with due attention the sudden changes which frequently take place in the atmosphere, especially whilst shut up in close rooms to avoid intrusion, they are almost wholly occupied in study. To mariners, farmers, gardeners, and shepherds therefore, we must principally trust for practical data to solve this interesting problem. It is our wish to unite as well as we can, the advantages resulting from practical information, with those to be derived from well founded theories.

During fifteen years residence in the country, and in the practical management of a large farm; a meteorological journal has been regularly kept, in which the apparent effects of the tides on the atmosphere have been carefully noted. We shall now submit the result of these united observations to the consideration of the public.

It may seem at first sight very easy to obtain all the information necessary on the subject by comparing a meteorological journal with the phases of the moon, taken from the nautical ephemeris or any other almanack. But it will hereafter be seen that a general knowledge of the state of the tides at different periods is indispensably necessary; and to which must be added the opinions of philosophers respecting the atmospheric electricity. Finally we shall attempt as briefly as possible, to show from the most approved authorities we know, the coincidence of the changes of the weather, with the increase and decrease of the tides.

In the space of about fifteen days the tides perform a complete revolution, and those are known by the two general names of the springs and the neaps. They likewise daily flow twice into such rivers as disembogue themselves into the ocean, and of course as often return to it again. The former is called the flood, and the latter the ebb tide. The springs begin to increase about sixty hours, or two days and a half before the new moon; and their greatest height is the fifth flood, about sixty hours after that period. The neaps then begin, and the tides decrease until about sixty hours after the first quarter of the moon; when mariners say the fresh water shoots, or the springs again begin to

lift; or in common language, they again begin to increase towards the full moon; and from that time they continue the same rotation to the end of the last quarter. The instant of the conjunction and opposition, or what are commonly called new and full moon, therefore, may be considered as the middle of the spring tides; and the quadratures, as the middle of the neaps. The precise mean synodical month consists of twenty nine days, twelve hours, forty four minutes, three seconds, and two thirds.

It must also be observed that the tides as affected by the moon are subject to great changes; when for instance, she is in her perigee or least distance from the earth, the tides increase more than in the same circumstances at other times. The morning tides generally differ from those of the evening. The new and full moon spring tides rise to different heights. In winter the morning tides are highest, in summer the evening; so that after a period of six months, the order of the tides is inverted; and the morning and the evening tides change places. The winter morning high tides, becoming the summer evening high tides. It is also well known to pilots and other mariners, that the tides are increased and diminished at different places by the strength and course of the wind, according to

the shape and bearings of the adjacent coasts. These general hints it is to be hoped will answer the purpose of marking the course of the tides at the different phases of the moon; nevertheless we recommend to the reader to keep in mind the five following postulates, recapitulated principally from what is above mentioned.

First.—The highest spring tides do not happen precisely either at the new or at the full; nor the lowest neaps exactly at the quadratures of the moon; but they begin about sixty hours before each period, and end sixty hours after them.

Secondly.—Two high spring tides never immediately follow each other; for if the moon be at that time in her perigee at the new or change; she must be at her apogee, or greatest distance at the full; having during the intermediate time finished half a revolution: for the same reason, if a great spring tide happens at the full moon, the tide will be lower at the ensuing change.

Thirdly.—The equinoctial spring tides of March and September are highest; and the lowest are at the solstices in June and December. The neap tides are the reverse; the lowest being at the equinoxes, and the highest at the solstices.

Fourthly.—The sun being nearer the earth in winter than in summer; the highest evening spring tides are after the autumnal, and before the vernal equinox.

Fifthly.—The evening tides in summer exceed those of the morning; on the contrary, the morning tides in the winter exceed those of the evening. The difference in some places will amount to twelve or eighteen inches. It must also be remembered that while the moon has north declination, the highest tides are while she is above the horizon; and the reverse when her declination is south.

From this coincidence of the revolutions of the moon and tides it appears that there are twelve periods in each complete revolution which we consider as critical, with respect to changes of weather. First, sixty hours preceding the new moon; secondly, the syzygee or conjunction; thirdly, the height of the spring at the fifth tide after the coujunction; fourthly, the beginning of the neaps; fifthly, the precise time of the quarter; and sixthly, the end of the neaps. The same routine follows from the full, to the new moon; and both together make the twelve periods; at which times we suppose the character of the weather to be generally settled for some days; that is from one period to the

next in succession. But the more clearly to elucidate what is mentioned of the effects of the tides ; we will suppose for example that the weather towards the new moon just as the spring tides commence, has been rainy. The tides commonly for the first day or two do not increase much, and if we suppose that the quantity of electric fluid brought in from the sea, bears any degree of proportion to the height of the tide; the electric matter for the first day or two which has come in with the new tide, may not be sufficient to raise and support the clouds, so as to produce and establish fair weather; but the clouds will frequently at that period begin to condense and rise, so as to occasion a visible effect on the barometer. It is often justly remarked that when the barometer begins, and continues to rise during wet weather; that a series of fair weather will ensue. The cause of it probably is the effect produced by this gradual daily increase of the electric fluid, which comes in with the tide. However at the time of the actual conjunction and opposition of the sun and moon, that is the middle of the springs; the quantity of the electric fluid will often be sufficiently increased to produce those effects. At the new and full moon therefore the changes of the weather have hitherto been supposed to take place; and should the land and sea clouds possess nearly equal quantities

of electric matter, fine weather may reasonably be expected to begin, and continue for some days. The changes of the weather according to this hypothesis are produced by the clouds receiving and parting with the electric matter; which makes them retain, or precipitate the water they contain; and consequently this may happen at the beginning either of the spring, or neap tides; according to the state of the atmosphere, or the strength of the tides. The heavy showers and hard gales of wind which frequently happen about the equinoxes, generally begin before the vernal, and after the autumnal equinox, when the tides are at the highest; and it is observed likewise that they always begin very near the conjunction or opposition of the sun and moon; and cease at latest about sixty hours after those periods. It is also well worthy of remark as tending very strongly to corroborate this theory; that when the spring tides of a new moon begin with rain, the showers which then fall very often commence about three-quarters of an hour later each succeeding day until the weather settles; which is well known to correspond nearly with the diurnal motion of the moon, and the course of the tides.

But before we expatiate further on the nature of the tides, or consider the effects of atmospheric electricity

it is necessary to lay before the reader the sentiments of Dr. HALLEY and Dr. FRANKLIN, on the formation of the clouds. According to these enlightened philosophers who apparently agree on this subject in all essential points; the clouds are formed from atmospheric air, combined with the vapours and exhalations of the earth and sea, and all terrestial bodies; and the latter while in a state of vapour or gas, being specifically lighter than atmospheric air near the earth, they ascend until they arrive at a region of the atmosphere of nearly the same specific gravity as themselves. In those regions they are condensed by the cold, and being there formed into masses, they become visible to us in the various forms of clouds. According to Dr. FRANKLIN, in that state they are kept united, and suspended, by means of an adequate quantity of electric or common fire; but probably the former. It is observed in fair weather that the clouds rise to a great height in the atmosphere, where they appear clear and serene; on the contrary preceding a change of weather, the water in them being no longer in a state of solution, they become lowering and dark; especially before a fall of hail, rain, or snow, according to the different seasons. It must also be observed that electricity sometimes passes from the earth and sea to the atmosphere; and *vice versa* at other times from the atmosphere to the

earth and sea; and that the different clouds are sometimes in a positive, and at others in a negative state of electricity. As they approach each other the one attracts what is in excess in the other, until a perfect equilibrium is restored; and consequently when the clouds are thus united, and kept suspended by means of the electric fire in them, the weather as before observed will then be fair; but when this interchange of electric fire takes place, the clouds being decomposed the water will of course be precipitated. The matter of which clouds are composed will not admit of much doubt; but the effects alluded to of the electric fluid may probably require further illustration. It is not FRANKLIN alone that has suggested this hypothesis, BECCARIA and many others have adduced various proofs of it, derived from actual experiments; Dr. DARWIN among the rest observes, that an accumulation of electric matter evidently contributes to support the atmospheric vapour when condensed into the form of clouds; for it is invariably observed to descend rapidly after the flashes of lightening have diminished its quantity in the atmosphere. We may have occasion frequently to advert to this well known circumstance; but in the mean time we shall proceed to shew the effects of that portion of electricity on the weather which we suppose to be brought in by the tide.

It is a fact perfectly well understood by philosophers that both the water of the ocean, and the atmosphere over it, abound with electric matter. The ocean is a compound of water and salt; the one a conductor, the other a non-conductor. When friction takes place between these two bodies on the surface of the sea; the electric fire is probably collected from the parts below. In the night it is particularly visible. It appears in the wake of every fast sailing vessel; at every dash of an oar, and in the surf and spray near the shore. During heavy gales of wind at night the whole ocean appears almost a sheet of fire; nor is it perhaps any exaggeration to say, that every drop of moisture which ascends into the atmosphere from the ocean by means of evaporation carries with it a certain portion of that electric fluid; which probably in the body of the ocean serves to keep the water in a liquid state, and even the salt in a state of solution in it. But water being a conductor of electricity it will in this case naturally follow, that every flood of the tide must bring clouds from the sea charged with electricity. If then the land clouds at that time happen to be in a negative state; as those from the ocean which accompany the tide, and which are generally saturated with moisture approach the land clouds, and come within striking distance of them; the sea clouds in a positive

state will of course part with their superfluity of electricity until the equilibrium between them is restored, by which means the clouds will of course be decomposed, and rain will consequently ensue. In support of this hypothesis a reference may be made to the opinion of mariners and fishermen who live near the coast; and frequently on these occasions observe, that the sudden and temporary falls of rain are the consequence of mere passing clouds, which often bring showers on the top of the tide. But this fact admitted; it may be asked whence comes it that this does not happen at every flood? especially at every spring tide? The atmosphere being a vast body of air is transient, and from many obvious causes can never be stationary, nor very long continue in the same state. The clouds are constantly changing both their form and place.—The current of air moves at a different rate, from five to twenty-five miles an hour, without including either calms or hurricanes; it may therefore very often happen that the land and sea clouds may be nearly in the same state, when consequently no material change of weather will take place. For the same reasons it will obviously appear that changes are at least as likely to happen at the neap, as at the spring tides. At the lowest neaps which happen about sixty hours after the quadratures of the moon; the clouds often are in a negative state;

whilst the land clouds charged with electricity from the body of the earth may be at the same time in a positive state. When the same causes inverted will continue to produce the same effects; or the difference as before observed, may be sometimes so inconsiderable as not to produce any change whatever. These changes it may probably be thought will be merely local near the sea coast; but such is the activity of the electric fluid, that in some cases it will almost instantaneously extend to the middle of the broadest continent from the middle of the widest ocean; besides it must be here again recollected that supposing the clouds to move at the rate of ten miles an hour, which implies no extraordinary degree of velocity, they pass over a space in a right line of 240 miles in the course of twenty-four hours.

It often happens in vallies situated near the sea which are bounded by a ridge of mountains to the north, as for instance in the valley of Cardiff, in South Wales; that the sea clouds are driven by a southerly wind towards them. As soon as the clouds approach within striking distance of them, their motion is visibly accelerated by attraction; and the upper part of the mountains being cold, and in a negative state of electricity, the electric matter suddenly quits the clouds, and flies

to the mountains; and from the causes already repeatedly mentioned produce rain. By these means we frequently acquire ocular demonstration of the effect of electricity in the atmosphere. It is known very often to rain on the hills, when it is fair in the vallies; and when it rains in both places, it always begins near the highest hills; where the clouds as before observed, first parts with the electric fire; by which it has been combined and supported. But even in a plain country where no mountains exist to intercept the electrified clouds; yet means are not wanting to make them deposite the water they contain. For should an electrified cloud coming from the sea, meet in the atmosphere a cloud raised from the land, which therefore may not be much electrified; yet the former will instantly flash its fire into the latter; and thereby both clouds will be made suddenly to deposit water.

Thus then we perceive that in the first instance water is evaporated from the earth, the sea, and all terrestial bodies, by which means the clouds are formed. These are afterwards impelled forward by currents of air towards the hills and mountains, where they are decomposed, and made to precipitate the water they contain. From these ascents the water afterwards descends into the lowest parts of the adjacent country,

where it collects in the beds of rivulets and brooks, until at length united in one great river the collected streams arrive at the grand level of all waters, the ocean. Thus, as is observed in the scripture, "All the rivers run into the sea, yet the sea is not full; into the place from whence the rivers come, thither they must return again." The incessant but almost imperceptible operation of evaporation is apparently sufficient to prevent the increase of the waters of the sea; and the earth is continually replenished with a considerable supply of fresh water from the immense ocean of it which is constantly floating above us in the atmosphere. From that source a due proportion of it is likewise deposited on the summits of the most lofty mountains whence springs are in general derived. But it has lately been discovered that the same bounteous hand which by various means most amply provides for all his creatures, has created inexhaustible sources of supply of this grand principle both of animal and vegetable life, which were entirely unknown to our ancestors.

Water was considered by them as one of the four elements; but it is now perfectly understood to be a compound body, formed of hydrogen and oxygen gases combined by electric fire. This curious and invaluable

discovery, although not absolutely made, was unquestionably first confirmed and universally announced to the world in the works of the ever to be lamented LAVOISIER. But as unhappily, he was cut off in the midst of his brilliant career, we shall in this place refer to the work of Mr. FOURCROY, who has made many valuable additions to the discovery of his contemporary and friend, which have been published in the form of a chemical or rather a philosophical pandect; correctly, and elegantly translated into English by Mr. NICHOLSON.

According to this author when a great number of electric sparks are conveyed through a small tube filled with water by means of a conductor with a metallic knob; the water is decomposed and seperated into hydrogen and oxygen gas; and when this composition is so far advanced, that the two extremities become immersed in the mixture of the two gases, so that the sparks explode in them, these gases again take fire and instantaneously become water. Hence the action of electricity may be said to decompose water into its two elements; which it seperates in the form of gas; and also to recombine those gases in such a manner as again to compose the dense fluid.

From this theory we may readily trace the probable source of thunder showers. These gases may exist in the atmosphere (particularly in the summer season, whilst vegetation is in its greatest vigour) in a state of mixture, but not of combination; and the electric spark or flash of lightning by combining them may produce water. According to Dr. DARWIN, inflamable air is constantly uniting with vital air, and producing moisture; which descends in dews and showers, whilst the growth of vegetables by the assistance of light, and probably of electricity, is perpetually again decomposing the water they imbibe from the earth; and while they retain the inflamable air for the formation of oil, wax, honey, rosin, &c.; they give out vital air to replenish the atmosphere. Thus then it appears, that by another obvious and admirable arrangement in the œconomy of nature; springs may probably be formed by the combination of air in the bowels of the earth, as well as in the atmosphere; vegetables by the same means are apparently rendered flourishing, and made to contribute to the reproduction of other substances; and the atmosphere may in a great degree be supplied with moisture, which afterwards descends to us in the various forms of dew, hail, rain, and snow.

These short extracts from the new system of chymistry seem to throw strong and very beautiful lights on the

subject of meteorology; and will no doubt hereafter be employed to explain many circumstances which have hitherto been considered as mysterious in the nature, and principles of vegetation. With respect to the application of them in the present instance, it may be thought to invalidate in some measure what has been previously said on the subject respecting the influence of the tides; but so far from militating against the opinions of HALLEY and FRANKLIN, or against the tides causing very material changes in the weather; we hope to prove that the two systems seem rather to confirm and illustrate each other. The formation of the clouds may be supposed to depend principally on the evaporation of moisture both from the earth and sea; and the subsequent suspension of them may likewise be derived from their being duly electrified. Nevertheless we may at the same time suppose that the quantity of water in them is occasionally increased, or diminished, by means of a greater or less proportion of oxygen and hydrogen combined by the electric spark; particularly at times of extraordinary high or very low tides, when the quantity of electric fluid according to this system, must be considerably increased or diminished. No new agent is supposed to act in either system to the exclusion of the other; and philosophers must hereafter determine by experiments, which of these in general predominates.

The origin, nature, and properties of electric matter are hitherto but imperfectly understood. Some philosophers have supposed that it originates in the sun, and passes through the atmosphere; and from thence together with caloric, and light, or by certain modifications of them, afterwards descends to the earth. Others again have considered the earth itself as a vast electric globe, which making a rotation on its axis in the course of twenty-four hours of more than 25,000 miles, produces that immense quantity of electric matter, which is well known to pervade all terrestial bodies. And that the regular internal heat of the earth which is known to exist at all depths from twenty to two thousand feet, may probably also be imputed to this cause. But without dwelling in this place on such speculative opinions, it will be sufficient for our own purpose, that electricity be allowed to contribute to the formation and suspension of the clouds in the atmosphere; and likewise that by combining oxygen with hydrogen gas in due proportions, that it will occasionally form water either in the atmosphere, or in the earth. These facts being considered as being admitted; we shall not digress further, but return to the principle object of this enquiry, the consideration of the effect of the tides on the changes of the weather.

The variable weather and the singular humidity of the atmosphere of the British Islands, are facts universally believed. The principle cause hitherto assigned for this supposed objection to our climate, is the geographical position of these islands; which being situated near the great atlantic ocean, the westerly winds that prevail from that quarter nearly three-fourths of the year, are supposed to bring to us clouds from thence saturated with moisture, and to occasion those frequent showers of rain, which prevail at all seasons of the year in Great Britain. It is not meant entirely to deny the probability of such a plausiable hypothesis; which is far from incompatible with our own; but at the same time this argument does not appear conclusive; for it would equally well apply to all that range of coast on the west side of Europe, from the entrance of the Baltic, to the straits of Gibraltar. Whereas the atmosphere of the countries situated on the western coasts of France and Spain, is not open to the same objections. It seems necessary therefore to have recourse to some other cause peculiarly applicable to these islands.

The tide which surrounds them comes from the northward and sets to the southward, along the coast of Ireland. On its passage a branch of it falls into the British channel between the Lizard, on the north-west

coast of Cornwall and Ushant (properly Ouessant) as being situated on the western coast of France. Its progress southwards is proved by its being high water on the days of the full and change at Cape Clear, in in Ireland, after four; at Ushant, near six; at the Lizard, about seven: between these two points commonly called the chops of the channel, the flood sets to the northward, and eastward, along the coasts of England and France; until it reaches the Godwin sands, or the Galloper shoals, situate in the Downs, near the mouth of the Thames. Here it meets with the tide coming from the N. E. which sets to the southward along the coast of England, to the Thames; and these two tides meeting at particular times, send a large body of water up that river to London. Sometimes when the natural course of the tide is obstructed by a sudden shift of wind between the two tides meeting near these sands in opposite directions; they have even occasionally been known to produce high water twice in two or three hours in the Thames; which formerly to those unacquainted with the cause according to VARENIUS been considered as a prodigy. But in this as in every other instance.

"*Nature well known, no prodigies remain;*
"*Comets are regular, and tides are plain.*"

The origin of the opinion respecting the periodical and immediate influence of the moon on the weather may be traced, as we have previously observed to the remotest periods of ancient history. But without entering further into a dissertation on this subject, which is well known to be fully explained in the works of many Grecian philosophers; we shall content ourselves with examining how far what has been said on this subject in the Georgics of VIRGIL, corresponds with modern discoveries, and agrees with our hypothesis.

The Roman poet, philosopher, and farmer, we have already remarked, was perfectly acquainted with the literature of the Greeks as well as with the arts and sciences known in his time. It may therefore be very fairly presumed, that he possessed a general knowledge of all their popular traditional prognostics of the weather; and we may venture to assert that this author must have felt himself fully justified in seeming to yield implicit belief to those progoestics, so frequently and so strongly inculcated in every part of the Georgics. Besides, these were professedly intended as agricultural precepts for the use of his countrymen; nor should it be overlooked that the poem was dedicated to his learned patron; who would of course expect what he himself considered as truth on such a subject; although it might be presented to him in a poetical dress.

In every part of the Georgics, VIRGIL has occasionally adverted to the influence of the moon on the weather; but as the work itself is in the hands of many people; and either in the original, or by means of translation within the reach of all; we shall therefore merely select such passages from it as may enable us to shew that the changes of the weather hitherto ascribed to the direct influence of the moon; may with still greater shew of reason be imputed to the immediate effects of the flux and reflux of the tides.

In the Georgics it is poetically said that Jupiter has given us the moon as a monitor to inform us of good and bad weather. *In fair weather (says* VIRGIL) the stars do not appear dim, nor does the moon rise as if she were indebted to her brother's beams; nor are fleeces carried through the air. In this manner are negatively described the signs of fair weather; and consequently when the moon and stars are dim, and the clouds fleckered, and fleecy; rough weather may be expected. These presages are still in the mouth of every intelligent mariner, farmer, and shepherd of the present day. A mackarel sky, and mares' tails, (say the seamen) make tall ships carry low sails. Those fleckered and fleecy clouds, which are fringed and light towards the edges; and dark in the middle:

even when surrounded by an azure sky; generally portend sudden and violent showers either of hail, rain, or snow, according to the season. And when the mares' tails above alluded to appear, they denote that the clouds are thus broken and dispersed by different currents of air in the upper regions of the atmosphere; apparently occasioned by the circulation of the electric fluid. A great body of air thus rarified will produce at the same instant currents of air from opposite directions; which sometimes puzzle, and always alarm the cautious mariner.

Such sudden changes in the course and state of the clouds may for the reasons we have mentioned often escape the notice of theoretical meteorologists; whilst at the same time they will afford very useful information to the practical observer, either by land or sea. In some cases however very superior advantages may be derived from consulting the marine barometer, as when at sea we ourselves have repeatedly experienced. We shall select from amongst many others a very unfortunate instance of the fatal consequences arising from the incredulity of those who were not acquainted with the valuable information to be derived from this instrument.

Monsieur BLONDEAU relates that on the third of October, 1765, the captain of a merchantman upon the point of sailing from Bayonne, having observed a sudden and very extraordinary fall in the barometer, such as generally precedes a violent gale of wind; he predicted to his owners the approach of a tremendous hurricane; but they ridiculed his opinion, and even imputed it to fear. It is true added he I am not entirely free from apprehension in acting contrary to the information which I posses; but I dread still more the imputation of pusillanimity, to which you ascribe the advice I have offered to you. He accordingly sailed and the next day his prediction was verified; for the ship, the crew, and the cargo were all lost.

The authenticity of this fact is not to be disputed; it should therefore serve as an admonition to the commanders of all ships never to go to sea without a marine barometer. Supposing even that the information it usually affords, may in some instances be dubious, which (if the nature of this admirable instrument be well understood) we cannot allow; still the only inconvenience that can arise from having recourse to such precautions as are generally taken against an approaching gale of wind, would be nothing more than a trifling degree of trouble, or a temporary delay; but on the contrary, the neglect

of them, as in the instance abovementioned, may be the loss of many lives, and much property; on which the welfare and happiness of many industrious families may depend.

But nature herself without the aid of any instrument frequently offers many useful hints to the observant and intelligent mariner; who will vouchsafe to peruse those pages of her works which she frequently presents to his view. It is however surprising how often these obvious prognostics are seen, and are either too carelessly observed, or totally overlooked. But what is still more to be lamented, after they have become known and have been actually recorded, in the course of a few years they are again buried in oblivion.

The following letter from Mr. WINN to Dr. FRANKLIN, fully justifies this remark.

"SPITHEAD, *August* 12, 1772.

"SIR,

"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 indica-

tions of impending tempests precede them a considerable time, did we but carefully note them. The phænomenon which I am going to mention, is one of those indications which not only portend an approaching tempest, but serves to 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 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 first 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 the 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; insomuch, that we could not have seen the land 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 pay particular attention to future Auroræ, and the weather that should succeed them; and as I have above observed, 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 splendour and vivacity of the Aurora, and the distance of time between them. I suspect that the more bril-

liant and active the first is, the sooner will the latter 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 judgment 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 extend 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, which might have otherwise 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 unaprized of this circumstance, have not only been driven back, but with difficulty escaped shipwreck.

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

"I am, &c. &c. &c.

"*(Signed)* "J. S. WINN."

As it appears that on all such occasions the current of air comes in a direction diametrically opposite to that where the meteor appears, it seems probable that the Aurora Borealis is caused by the ascent of a considerable quantity of electric fluid in the superior regions of the atmosphere to the north, and north-east, where consequently it causes a body of air near the earth to ascend, when another current of air will rush from the opposite point to fill up the vacuum; and thus may produce the southerly gales which succeed to the Aurora Borealis; and what seems to corroborate

this opinion is that the violence and duration of the southerly wind is apparently in proportion to the splendour and activity of the northern lights. But whether this be the true solution or not of this phænomenon is of little consequence, the fact as mentioned by Mr. Winn, and confirmed by much repeated experience, ought to be made known to every officer and pilot; and should be registered at every seaport, and in every log book, particularly of those who navigate the British channels. It is likewise the more valuable as these northern lights are most prevalent about the vernal equinox, when the days are rapidly decreasing in length; and when of course the navigation of these seas becomes more dangerous during the long nights.—It is hoped that this digression will not be deemed useless or inapplicable to the subject of meteorology. We will now return to a further comparison of ancient and modern prognostics of Lunar Influence.

Virgil observes that when the moon first collects the returning rays, if her horns are obscured by dark clouds, a storm both by land and sea may be expected; but should she spread a virgin blush over her face, there will be wind. If again at her fourth rising she appears clear and not with blunted horns; let this be considered as an infallible sign of settled weather;

not only for twenty-four hours, but for the whole lunation.

If in this place the word tide be substituted for that of the moon, this prognostic will be found to correspond nearly with our system. The middle but not the greatest height of the spring tide being as we have stated nearly about the time of the moon passing the sun; the fifth flood after the conjunction which falls on the third day, is the highest spring. If therefore at the fifth or highest tide after the syzygee; a sufficient quantity of electric fluid has been brought from the sea to elevate and consolidate the clouds; the horns of the moon on the fourth day will probably be clear and distinct; and then a series of fair weather may with reason be expected.

But on the contrary should an extraordinary quantity of electric fluid have been brought in by the springs as is often the case, particularly at the equinoxes; and the land clouds at the same time be in a negative state; wind and rain will probably ensue, and the horns of the moon will at least appear obtuse, if not be wholly obscured; and the weather consequently may in that case continue unsettled several days. In these two instances which we have selected from the Georgics

of the opinion of the most enlightened and scientific philosopher of the Augustan age, respecting the presages of the changes in the weather; and comparing them with the supposed operations of electricity in the atmosphere at the present time; it will we trust appear that the one is by no means incompatible with the other; we shall therefore for the present conclude this part of our enquiry with some additional observations on the origin, progress, and effects of atmospherical electricity.

It is not in this place necessary to investigate the claims of different nations to the merit of the first discovery of it; no record we believe exists to prove that it was known previous to the report made of it in the year 1752, by Dr. FRANKLIN, in America.—The particulars of this important event, and likewise the subsequent experiments of other persons who nearly at the same time followed his example in Europe, will be mentioned in the appendix.

To whomsoever the world is indebted for this discovery of the existence of electricity in the atmosphere, it may with propriety be considered as the commencement of a new æra in meteorology. Dr. FRANKLIN, BECCARIA, and others have laid the solid foundation of

a system which has since their time received considerable additions from the modern discoveries in chemistry. For if we admit that the two gases of which water is formed, exist in the atmosphere, where they may be easily combined by means of the electric spark, and that although water so combined may be kept suspended in the form of clouds as the clouds themselves are afterwards composed and decomposed by the circulation of the electric fluid, it may fairly be concluded from these premises, that the quantity of rain which falls in every country, will in a great measure depend upon the quantity of hydrogen, oxygen, and electric fluid existing in the atmosphere. As a strong presumptive proof of the truth of this fact; we shall mention a circumstance of great notoriety, extracted from Mr. EDWARDS' history of Jamaica.

When our settlements were first established in the West-Indies, not only Jamaica, but Barbadoes, and some other islands were almost covered with wood. But in order to render the land fit for the cultivation of sugar, which was the primary object of the planters; as well as to make pens and farms to feed the negroes and to support the live stock necessary for carrying on the works; they rather precipitately cut down the trees.— But the bad effects of this hasty measure were very soon

felt, for those islands where formerly they had enjoyed abundance of dew and rain, immediately became subject to severe droughts, and from which they have never since been wholy exempted. For this change of climate two causes may probably be assigned: first, that the trees served formerly as conductors to the electric fluid; and secondly, that they occasionally absorbed, increased, and again gave out those two airs by which water is formed in the atmosphere. Whether or not the moisture with which those islands is now but scantily supplied, varies according to the flux and reflux of the tides, remains yet to be ascertained.

But it must be remembered that similar effects have likewise been experienced in those parts of America, where forests of immense extent have likewise been felled. Nor is it by any means impossible but that from the same cause both the islands, and the continent, have been rendered less healthy than they formerly were. It may with propriety be deemed a question worthy the consideration of physiologists, what quantity of wood is requisite to keep the air of all countries both within and without the tropics; upon islands as well as on continents, in a salutary state. But the necessity of preserving a proper number of trees to keep up a certain supply of moisture in the atmosphere, for the

purposes of vegetation in all countries, will we believe in opposition to self-evident facts, be no longer disputed.

From the earliest ages the sun, the moon, the planets, and even the fixed stars, have been supposed to influence, or rather to have governed the destinies of men. Nearly cœval with this idle superstition, another somewhat less exceptionable prevailed, that particular operations of husbandry ought to take place at the heliacal rising of certain stars. The first of these errors is evidently a vain and idle chimera originating in fear, the offspring of ignorance; and which so slow is the progress of truth, has not yet entirely died away.—But the latter had at one time at least some shew of reason. This mode of judging however, of the proper time of sowing and planting must be considered as local and temporary; for besides the variety of seasons which must be expected in the same country in different years; and the variation in the rising of the stars, according to the elevation of the pole. By the precession of the equinoxes, the same stars will rise in the course of 1000 years even in the same latitudes at very different periods. It is time therefore now to abandon all such fallacious monitors, and to seek for others derived from subsequent discoveries made both in the arts and sciences.

Dr. MEAD and Dr. DARWIN, amongst many other medical men, have ascribed the crisis of lunacy, hemicrania, and even final dissolution to solar and lunar influence. But the combined powers of the sun and moon, according to Sir Isaac NEWTON, are estimated at only one 7,868,850th part of the power of gravitation; a circumstance, as Dr. DARWIN observes, apparently too small to produce very considerable effects on the weight of sublunary bodies; yet we may cease to be surprised, adds the Doctor, that a diminution so minute of the gravity of the particles of the blood should so far affect the chemical changes, or their stimulating quality, as joined with other causes sometimes to produce the beginning of diseases. But as in the zoonomia the Doctor expatiates very fully, and ingeniously on this subject, we must beg leave to refer the reader to that learned work. In the mean time we shall submit to his perusal some general reasons for not implicitly adopting the Doctor's opinion of such effects being produced by the gravitation or attraction of the sun and moon.

It seems generally understood that caloric light and electricity all emanate from the sun, but what modifications they undergo; or by what means they are afterwards circulated in all sublunary bodies, remains

yet to be ascertained. The suggestions of the above-mentioned respectable physician are ingenious, and may possibly be very well founded; but when the nature and properties of electricity, as well as the means by which it is circulated are better understood, as it is universally allowed to pervade all terrestial bodies, it may probably be found to have very extensive effects upon all critical diseases incidental to human nature.—LUCILIUS and HORACE tell us it was currently believed at Rome in their time, that fish taken, and fruit gathered about the full of the moon, were in the most perfect state. It has also been already mentioned that medical men consider those periods as critical in many disorders; and shepherds and husbandmen, know that sheep and cattle are sensibly affected, previous to gestation, every fifteen days, according to the phases of the moon. Collecting therefore all these circumstances together we may venture to infer from them, that at particular times of the moon, most animal and vegetable bodies are subject to some secret influence. And as the lunar revolutions evidently govern the tides of the ocean; and there is great reason to believe that the tides occasion a circulation of the electric fluid; it remains to be considered whether these critical effects are most probably produced by the gravitation of the atmosphere, or by the effects of electricity. The

former is obviously a very remote cause; the effects of which are not yet rendered very comprehensible to us. The latter is a more proximate, periodical, and evident cause; which is well known to be constantly, but imperceptibly circulating from the atmosphere to the earth; and again returning from the earth, to the atmosphere. In the course of such incessant circulation it must more or less affect all sublunary bodies, according to their positive or negative state; for it is an indisputable fact, that no body whatever, either animal, vegetable, mineral, or fossil, can for a moment exist without possessing its due proportion of electricity.

REMARKS

ON

The Situation and Form

OF A

FRUIT AND KITCHEN

Garden.

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REMARKS ON THE SITUATION AND FORM OF A FRUIT AND KITCHEN GARDEN.

Quotque in Flore novo pomis se fertilis arbos,
Induerat, totidem autumno matura tenebat.
GEORGICS, LIB. 4.

IT is by no means intended to attempt a dissertation on horticulture in general; but merely to state a few facts confirmed by long experience, on which the comfort and profit of an useful unornamented garden are supposed in a great measure to depend. The first objects of a fruit or kitchen garden seem to be aspect and soil; and both these may in some degree be considered as natural advantages; in many situations however they may be in part created; and in all be considerably improved. The spot of ground hereafter to be described was about twenty-three years since a barren waste, where the neighbours occasionally dug gravel; and whence it derived the name of the gravel pits.—

A space of about an acre and a half of this ground was inclosed on the north side with a wall of about 140 yards in length, extending from east to west; on the opposite side, an holly hedge was planted; and parallel to it a row of Scotch firs, so as to leave a walk between them. The intermediate space between the north wall and the fir trees towards the holly hedge, was the kitchen garden; containing, deducting the walks, about three-quarters of an acre. From the west end of the north wall to the south or opposite side of the holly hedge, a double plantation of different evergreens, with a walk between them, formed a screen to the kitchen garden against the westerly winds from the S. by W. to N. by W. In short the figure of the kitchen garden is triangular, the base of which is the screen of evergreens, shrubs, and trees; the sides are the wall, and the holly hedge; and the vertex is cut off by a summer house, with high elm trees on the outside of it. This form was accidental, owing solely to the interposition of roads, otherwise a garden of a semicircular shape with the diameter forming the south wall, and trees with an holly, or a strong quick hedge making the semicircle, would for many reasons have been preferred. When the south wall was finished, peach, nectarine, and other fruit trees were planted in a border of about six feet in the natural soil, very little improved

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by a small quantity of old compost, but since that time it has never been manured. A few load of maiden earth only have been annually put upon it after the winter pruning. This plan was adopted by the advice of an experienced gardener, who remarked that constantly manuring the trees with compost, would either cause the trees to run excessively to wood; or by forcing them beyond their natural state, make them exhaust themselves by one vigorous exertion, and thus after having borne only one superabundant crop of fruit, they would afterwards become barren. Nevertheless it may be worthy the consideration of gardeners if this remark does not more immediately apply to young vigorous trees; for as they advance in age, they seem to require occasionally the stimulus of dung, especially when it becomes necessary to head them down. In the month of November, when the circulation of the sap is apparently stopt, and of course the leaves fall, the first pruning is made; and after this operation, the border is trenched for the winter; and therefore no perennial flowers are ever sown upon it. The principal object of this description of the fruit garden is to demonstrate the advantages resulting from shelter. The peach and nectarine trees are open to the southern sun; but at the same time, by means of an evergreen screen and the house, are secured against

the violence of every kind of westerly wind; and as the trees thus situated, have for many years invariably produced abundant crops of fruit; the soil and aspect being nearly the same as those of many other adjacent gardens, which are much less productive; it is presumed that the uncommon fruitfulness of this, may be justly ascribed principally to shelter. Many circumstances tend to corroborate this opinion, of which the following seems the most obvious. At the eastern extremity of this south wall, a cressan pear is planted, which for ten years successively has never failed to bear fruit; whilst at the western extremity of the same wall, where there is a small opening to the S. W. another cressan was planted, that was brought and transplanted the same day, from the same nursery, in the same kind of soil, and precisely open to the same aspect; in short with no apparent difference, excepting that of being exposed to sudden gusts of south-west wind; and this last tree has never produced any fruit whatever. It may likewise be worthy of remark that the bark of it, after the 5th year, was attacked by the Aphides, which were washed off with soap-suds and a brush that cleaned the bark; but at length it became necessary to cut down the tree, as being perfectly barren.

The peach and nectarine trees on this wall generally push forth their blossoms about the beginning, and always before the middle of March; the standard and espallier apples, pears, and plumbs, in the middle of the garden, blow at least a month later; and it is at this season of the year also, that the well known equinoctial gales of wind prevail. The blossoms therefore of such fruit trees as stand exposed to them, were they not sheltered, would be blown off before the fruit is set; whilst those which are properly sheltered by the screen, are rather benefited than injured by those strong currents of air; which being moderated by passing through the evergreens, serve only gently to ventilate the whole garden. These circumstances may perhaps be deemed worthy the attention of those who have either orchards or hop gardens. It may be supposed that high walls of either brick or stone, properly placed, would equally well answer the purpose; and that this kind of shelter might be more easily, or at least more readily obtained. High walls would undoubtedly in a great measure shelter such trees, and plants, as are situated immediately under them, in proportion to their height; but when a current of air has surmounted the wall, it derives additional force from having been obstructed; and consequently at the angle of incidence in the garden, does more mischief

than if it had not been stopt in its natural course.—It now remains to be considered, whether the same shelter may not be procured for a garden, both as cheaply, and as expeditiously, as by the erection of a wall either of brick or stone.

As it is a great object to a gardener to obtain this kind of shelter without loss of time, he must endeavour to effect it by transplanting of evergreen trees, and shrubs. The various species of firs and pines may be effectually used for this purpose, together with laurels, bays, arbutus', phillyreas, laurestinus', and many other beautiful shrubs. But deciduous trees and plants would not answer the purpose, for they would not be early enough in leaf, to answer the purpose of a screen Evergreens however, if skilfully managed, may at the same time be rendered both useful and ornamental.—The trees and shrubs may be safely removed with almost a certainty of success, either in October or even in March. But as some difference, as to the proper season, will arise from local circumstances, a person not conversant in this business, will do well to consult proper books on this subject, adverting always to the latitude of the place, and particularly to its height from the level of the sea. The good old fashioned English oracle, Mr. MILLER, who in many respects

well merited the reputation he so long enjoyed, if too implicitly followed, in this instance, would mislead an unexperienced person, in what is considered as a very important point; particularly in removing large evergreen trees and shrubs.

A late edition of Mr. EVELYN'S Silva, edited by Dr. HUNTER, contains much learned and useful information on the subject of planting both fruit and forest trees. But neither the Author nor the Editor seem to have expatiated sufficiently on that passage in the Georgics of VIRGIL, which by him is copied from THEOPHRATUS, and which certainly merits great attention. Mr. MILLER does not seem to have given it due consideration.

Quin etiam cœli regionem in cortice signant:
Ut, quo quæque modo steterit, qua parte calores,
Austrinos tulerit, quæ terga obverterit axi,
Restituant: adeo in teneris consuescere multum est.
GEORGICS, *lib.* 2.

This seems one of many precious jewels which abound in this valuable casket; but which has not hitherto been properly appreciated by planters of the present day. Mr. EVELYN it is true observes on this subject, that although PLINY neglects it, he knows from dear bought experience, that it is necessary, having

sometimes, he adds, transplanted great trees at mid-summer with success (the earth adhering to the roots) and miscarried in others, where this circumstance of aspect was omitted. In his opinion therefore a proper observance of aspect seems far more important, than even an attention to the season.

If the air be as much the mother and nurse of trees, as water and earth (adds Mr. EVELYN) such blossoming plants as court the motions of the meridian sun, evidently show the advantage they derive from their position. The clearness and comparative brightness of some trees towards the south; and the mossiness of others on the opposite side, sufficiently denote the unkindness of that aspect; which is most evident on the bark of oaks, and many other trees, particularly on the south side of a hill; while those exposed to the north have a hard, dark, rougher, and more mossy integument.

In the note on this subject the learned Editor observes that when it is judged necessary to transplant trees of a large size, Mr. EVELYN's advice seems highly commendable, though Mr. MILLER treats it as chimerical. With smaller trees (the Editor himself thinks) the caution is unnecessary.

Every fruit and forest tree, like animals in general, have each of them a constitution peculiar to itself; which is originally in a great degree derived from the germ or seed, or other adventitious circumstances of exposure, general temperature, and subsequent treatment. Animals possessing locomotive powers, may in some cases guard against violent wind, or the inclemency of the weather; but trees and plants being stationary, must depend on their own innate stamina, to resist the force of the storm. Forest trees of course can never escape from the effects of the weather, and always by an inclination of the head, greater or less according to the violence of the wind, they demonstrate precisely the current of air which prevails where they are planted. The constitution therefore both of fruit and forest trees, is thus gradually formed in the course of five or six years by the effects of heat, cold, and moisture, which affect the different sides of them; and their clean or mossy appearance, as before observed, when properly examined, clearly prove the fact. When a tree is cut down the difference between the north and south side may likewise be discovered by the breadth of the annual rings, the number of which also proves the age of the tree. These rings are much closer on the north, than on the south side. The warmth of the sun must dilate both the wood and the bark on the south and

west sides, for they absorb a much greater degree of moisture from the current of air that comes from those different quarters; while the dry cold air from the opposite sides, condenses and contracts the bark and wood, and consequently render the circles above-mentioned much more compact. Let us suppose for example, that a screen should be required for a garden or an orchard, or that a person for either use or ornament, should wish to transplant some of those trees which often grow in hedge rows, by acorns, mast, or any other seed dropping from the parent tree. When it is intended to transplant large trees for either of these purposes, care must be taken to move as much of the root, and also of the soil, as can easily be effected; but above all to place it in the same aspect as before, otherwise in forming a new constitution, when the different sides of the trees are exposed to the opposite aspect, the tree, for the reasons before-mentioned, will in all probability perish. It must also be observed that the strongest roots are always situated towards the north-west, on the side whence in England the most violent wind usually blows, which is an aditional reason for attending to the aspect or position. When these precautions have been taken, the most luxuriant top branches should likewise be lopped; and the trunk must also be strongly supported, so that there may be

no extraordinary motion to prevent the roots striking for the first year or two, at least during dry weather, the roots also should occasionally be watered. All these measures adopted, we take upon us to say from repeated experience, that fruit and forest trees, and evergreens, even of ten or twelve years growth, may with safety be removed, in due season, to a similar elevation, soil, and aspect, so as almost immediately to produce excellent shelter against the equinoctial gales of the spring. The leaves and roots of them for the first year or two, will no doubt be rather weak, and in fruit trees, the fruit also may be small, but with proper care the second or third year, they will again recover nearly their former vigour. The same precautions are not perhaps indispensibly necessary in transplanting young trees or shrubs, for these are often placed in sheltered situations; and besides, like young animals, their constitutions are not entirely formed; whilst their roots being still vigorous, and in a growing state, they will more readily adapt themselves to the change of soil and situation.

It is almost generally understood that evergreens and shrubs may be removed, in England, with safety in October and March; all young fruit, and most forest trees, in November and early in December; but in

every plantation, and in all seasons, it is strongly recommended not to omit marking the aspect, and to transplant them precisely in the same exposure. This plan it must be remembered is of great antiquity, and is sanctioned also in modern times by the indisputable authority of Mr. Evelyn; may we also presume to add, that with us it has always succeeded both in India, and in England. But the effects of local temperature seem hitherto not to have been sufficiently regarded in any branch either of gardening or farming. Topographical writers content themselves with observing that the corn harvest, or the vintage begin at a certain time in any particular country. But the corn harvest, for example, in the southern provinces of Italy and Spain, often commences before the end of May; but in the northern provinces of both countries, towards the Alps and the Pyrenees, it is at least a month later. And it is rather singular that this circumstance should have entirely escaped the notice of even Virgil himself, although he was born, and lived till the age of thirty near Mantua, employed in rural occupations; and he resided many years afterwards both at Rome and Naples. Neither do our own modern books of gardening or agriculture always sufficiently advert to this circumstance.

But in fact the temperature of all places depends more immediately on their elevation from the level of the ocean, than from what may be called their geographical position; in so much that 500 feet of elevation within the compass of a few miles, will produce a greater difference of temperature, than 3 or even 4 degrees of latitude. For instance, a valley 30 or 40 feet only above the level of the sea near Edinburgh, is not more cold, in summer, or even late in spring than Myrther-Tydvil, in Glamorganshire, which is situated almost 4 degrees further south, but nearly 568 feet above the level of the Bristol channel. If it be wished to advert to objects still nearer the metropolis, for a confirmation of this fact; the fruit and vegetables in the gardens and fields near Chelsea, and Kentish Town, will by a comparison in the spring, be found to be generally fifteen days more forward than those of the same kind either at Hampstead, or Highgate; and likewise on the contrary side of London, the same difference exists from St. George's Fields over Black Heath, to the summit of Shooter's Hill. The first consideration therefore should be the elevation of the garden or field; which however may in some measure vary in temperature according to the aspect and soil. But the elevation, aspect, and soil, may always be altogether correctly known by refering to the immediate

state of the surrounding vegetation, particularly in the forest trees and those wild plants and flowers, which not being the immediate objects of daily attention, and management, may with propriety be considered as nearly in a state of nature. Would the gardeners and farmers at all times consult this calendar of Flora, they would require no other monitor to direct them in any of their operations, either in the garden or field.—But notwithstanding the most eminent philosophers, both ancient and modern, have repeatedly recommended the adoption of this plan, it has hitherto been most unaccountably neglected; and many of the erroneous precepts and practices of our predecessors, are still implicitly followed. In hopes of once more reviving the subject which has too long laid dormant, a meteorological journal, and a calendar of Flora, will be inserted in the appendix. The former will of course require the aid of philosophical instruments; but the latter may be kept by any persons who can read and write, and who have leisure and inclination to attend to the subject, and faithfully record their daily observations.—should such journals and calendars hereafter be kept in every county of Great Britain, the whole taken together would form an immense collection of meteorological facts, which might be regularly published every three months, in the form of a meteorological magazine.

Such a work composed from authentic materials would no doubt in the present age amply defray the expence of it; and if conducted by men of science, would likewise excite universally an active spirit of enquiry, which could not fail, almost immediately, to dispel those mists of error in which this interesting subject has been long so unfortunately involved.

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PHYSICAL, MORAL,

AND

POLITICAL EFFECTS

OF

Late Hours.

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PHYSICAL, MORAL, AND POLITICAL EFFECTS OF LATE HOURS.

"The time of life is short, to spend that shortness basely, 'twere too long."

SHAKSPEARE.

THAT late hours are eventually injurious to the morals of a country cannot well be disputed; but doubts may arise if they are equally pernicious to the health. The advocates for them may say, if only a certain number of hours of sleep be necessary, why should it not be as wholesome, especially for persons in health, to take that number, suppose eight hours, from four in the morning to twelve at noon, as from ten at night to six in the morning? The obvious answer to this question is that it is evidenly a deviation from the laws of nature; which no one can expect to violate with impunity. Some beasts of prey and a few obscene birds only excepted, all other animals, and even many plants pass the whole night in sleep.—

Besides as the greater part of the works of man require both light and air; it seems reasonable to suppose that the day should be spent in active employments, and the night be devoted to rest. Such an answer might perhaps satisfy those who are not led astray by the capricious dictates of fashion; but it may be necessary to enter more minutely into this subject, for the satisfaction of those who for a moment's pleasure will too often bring on an age of pain. A few hints may also be addressed, at the same time, to literary men on this subject, who are too apt to consider the stillness of the night, when they are exempt from intrusion, as particularly well adapted for study. But they should recollect that the strength of the mind depends much on the health, and vigour of the body; and consequently neither poets, nor philosophers, can long persevere in those lucubrations, which deprive them of their natural rest.

Whilst the love of nature in a poetic dress continues to be justly appreciated in England, the poems of Dr. Armstrong on health, and of Dr. Downman on infancy, will be read and admired by all persons of good taste; and from these two works may be deduced every argument that can be suggested in favour of early hours, both for the old and young. But although intelligible

to all classes of people, yet as poems they will not often fall under the observation of the unlearned; who will be apt to consider them as addressed merely to the imagination, and as such deem them beyond their comprehension. It is therefore to be wished that some philantrophic physician would draw up a plain compendious regimen, adapted to persons of all ranks, of all ages, and of both sexes. It should of course be founded on scientific principles, but it may at the same time be rendered perfectly intelligible to every class of readers from the prince to the peasant.

Dr. Buchan's treatise on domestic medicine is a work of great merit, and to some persons extremely useful. That part of it at least that relates to the management of children, if published separately from the rest, would answer very well for that essential branch of physiology; but the remainder of the volume unless in very skilful hands may perhaps sometimes do more harm than good. At all events it is better to teach mankind the certain means of avoiding diseases, than an uncertain means of curing them; especially as none but professional men, when instructed by study, and matured by experience, can be expected to judge properly of the symptoms of different diseases. In physic above all studies a little learning is a dangerous thing,

and therefore professors themselves should either drink deep, or taste not, the pierean spring. No person however can be injured by early hours, temperance, gentle exercise in the open air, and rational amusements; but numbers perish daily by a deviation from these well known medical aphorisms. Some benevolent philosopher perhaps may hereafter explain the limits and proper application of them, to different ages and sexes; in the mean time we trust the following suggestions on this interesting subject, will not be thrown aside as perfectly useless.

Amongst the most advantageous of modern philosophical discoveries respecting the health, is the analysis of atmospheric air; which has been ascertained to consist principally of two gases; oxygen or vital air, and nitrogen or azote, which latter when uncombined is of a mephitic or deleterious quality. The proportion of each gas is nearly 27 of the former, and 73 of the latter. It is well known that our health very much depends on the air we respire; and so requisite is a competent degree of vital air for this purpose, that where the natural quantity of it in the atmosphere of a chamber, is by any means diminished, in all such cases our health and comfort, and in others, even our existence are proportionably endangered. Atmospherical

air is also taken in by the lungs at every inspiration, where it is afterwards decomposed, and then the oxygen is circulated through the whole system, by means of the blood; to which it communicates both warmth and colour. Some part of the azote also is again thrown off, together with a quantity of fixed air or carbonic acid gas, and a considerable quantity of moisture.—Any impediments therefore arising to the free inspiration of the atmospheric air, or which tend to adulterate it, or to the discharge of the fixed air and moisture by respiration; must of course be excessively prejudicial to health. The existence of the moisture and fixed air in the lungs, and of their being thrown off by expiration, is easily demonstrated by breathing on a glass, which will plainly indicate the former; and the breath conveyed through a bent tube, containing a little lime-water, will revive the lime-stone by restoring the fixed air, or carbonic acid that had been lost in calcination, which clearly demonstrates the other. The lime-water first becomes turbid, and the stone itself is afterwards visibly precipitated.

The atmosphere must of course be most pure in the country, where it is not likely to be adulterated with any heterogeneous mixture. But the impure state in which it must be supposed to exist in populous cities,

would not be so hurtful as it is, were not the air which is breathed in them rendered still more pernicious by other concurrent causes.

The charms of society, and the pleasures of the table added to late hours, must not only literally and figuratively shorten the number of our days; but likewise serve to render many of those few which are allotted to us on those terms, very uncomfortable. Fashionable hospitality which when carried to excess, is much more honoured in the breach, than in the observance; now requires that our tables should be covered with an endless variety of luxuries, which by flattering the palate tempt us to overload the stomach with a superfluous quantity of unwholsome food. But here the evil only commences; for the ceremony of dinner over, the gentlemen still remain in the same room, which must be filled with the vapour arising from hot dishes of fish, meat, soup, and vegetables, together with the breath and exhalations of the guests, and attendants. But what perhaps is not quite so well understood, the vital part of the atmospheric air has been at the same time consumed not only by the inspirations of such an assemblage of persons, but also by the number of candles which have been burning in the room. Could any doubt remain of the corrupted state of the air of

such a room, the sufferings of those guests who have weak lungs, and likewise the dimness of the lights, which will not burn clear when the vital air of an apartment is considerably diminished, sufficiently prove the fact. So pernicious and even dangerous, is the respiration of air in this unnatural state, that were not the circulation of fresh atmospheric air imperceptibly supplied by means of the doors, the windows, and the chimney; a number of persons thus immured would perish in the course of a few hours, from the same cause, and in the same manner, as the unhappy sufferers in the black hole at Calcutta.

Independently therefore of the luxuries of the table, which in moderation may be occasionally enjoyed; the late hour of dinner of the present day obliges every body to dine by candle-light, which keeps the company confined to the house the rest of the day; and yet there is no reason why a person might not enjoy a good dinner at three o'clock, or even at an earlier hour, provided he would but begin the day at the right end, that is at the first blush of the morning.

This plan adopted, the breakfast might be on the table at eight o'clock; from that time to dinner would be seven hours; in which time three hours devoted to busi-

ness, and study, with four to exercise, recreation, and the toilet, would prepare the family for enjoying a wholesome dinner, seasoned with chearful and instructive conversation. Were the foreign custom likewise introduced of the gentlemen rising from the table, when the ladies withdraw after the desert; there would then be full time during three-fourths of the year at least, for both parties, either together or separately, to enjoy the fresh air after dinner; those in the country by walking or riding; or those who live in town may occasionally repair to places of public diversion early in the evening, so as to retire to bed, as they formerly did, by eleven o'clock. Besides by this arrangement nobody would be tempted to drink more wine than is necessary after dinner, as is now too often the case from an idle habit, or even merely for pastime. It has been previously mentioned in another place, as the subject of well founded regret, that the present fashionable late hours serve likewise to estrange parents from their children.—The only effectual remedy against this increasing evil, replete with the most lamentable consequences; is the parents again conforming themselves to those hours which their children must early in life necessarily observe; and which by long, and early habit, soon become what is called a second nature to them. But in fact they are such hours as people of all ages should throughout life

universally observe; especially all those who are disposed to live comfortably themselves, and to be blest with the company of their own offspring. But the advantages resulting from this plan will be most clearly illustrated by a brief description of two families; the one adopting late, and the other early hours.

For example sake we may suppose the family settled in London, and to consist of two girls and two boys. The eldest son a youth of eighteen, just matriculated at one of the universities; the two young ladies between fifteen and eighteen; and the youngest boy about thirteen, in the fourth form of a public school. The father may be a gentleman of independent fortune, or at the bar, where by means of a respectable character and eminent abilities, he finds himself very fully employed. A family thus constituted, the parents would of course be fully occupied in the morning, excepting during the vacations; the father either in attending the courts of law, or in other avocations at his chambers, where his presence is frequently necessary in the afternoon. The mother in attending to the domestic concerns of the family, and particularly in superintending the education of her daughters. The sons, the vacations excepted, would be at the university, and the public school. But the father ought to

rise early in the morning, particularly in term time, to prepare for his attendance at Westminster, where the courts are open, and the business commences, before ten o'clock. He however will very reluctantly rise so early after having taken a late dinner at six or seven o'clock the preceding evening, and of course remained at table until near ten. Some persons take tea, and others a light supper about midnight. But the constitution of this gentleman must be uncommonly strong if after the fatigues of the preceding night, and not going to bed before one or two, he can rise sufficiently refreshed by sleep to prosecute his studies at an early hour the following morning. Routs and public places may for a moment be blotted out of this part of the account of the mother and daughters; it shall be supposed only that they have followed the regular family routine either in giving, or receiving dinners; but it is impossible to suppose that they can by any means retire to bed before one or two in the morning. It is well known they do not, and indeed that they cannot get up again and finish their toilet before twelve. Breakfast will engage them another hour, so that not until long after mid-day in winter, are they able to take any exercise or pursue any study whatsoever.—But the mother must necessarily devote an hour or two to the cares of the family, and therefore from the

beginning of November, to the end of January, neither the mother nor the daughters, even with a wish to act otherwise, can enjoy the light of the sun, or the benefit of the wholesome air, much above one little hour of the whole twenty-four. The physical consequences of these pernicious habits of life have been already sufficiently detailed. The moral effects need not be repeated; and the fatal consequences produced from uninformed, dissipated minds speak for themselves.

During the vacations of the college and school, the sons come home. The eldest readily accommodates himself, we may believe, to the habits of his family, that is oppressed with the late dinners, and midnight suppers, to which he ought not to be accustomed; he rises and takes his breakfast with his mother and sisters; and then sallies forth in pursuit of his comrades of the same age as himself, with whom he sometimes passes the remainder of the day, it may be hoped in harmless amusements. But when he dines at home with the family, and the mother and sisters go either to routs or parties, in what manner is he then to amuse himself? He cannot enjoy the company of his father, mother, and sisters; of course then with all his youthful passions in a ferment, he flies to scenes of dissipation, which he frequents to the irreparable injury of his health

and morals, and at the expence of money which no moderate fortune can conveniently bear. When the vacation is over, with a mind and body very ill at ease, he returns to college incapable of paying attention to his studies, and revolting against the discipline of the university; so entirely different from those habits in which he has recently indulged himself at home. The youngest son when at school has been compelled to rise at six in the morning; to breakfast between eight and nine; to dine at one; and to go to bed at nine, or at latest at ten o'clock; but after having taken a deep draught of what he considered pleasure at home; after having turned day into night, and changed all his former wholesome, and natural habits, for others injurious both to his health and morals; without having once been invited to take a book into his hands, he returns to school where he must be scourged into new habits of application, which he had abandoned when at home; and during the holidays, having had no society with his parents, or brother, or sisters who have been otherwise engaged, he naturally seeks for companions in the stable or kitchen. Amongst the servants he immediately selects a model worthy in his opinion of imitation, most probably one of the grooms, or the coachman; who has inspired him with the miserable ambition of being the first whip, or the most skillful jockey in the county.

With respect to the female part of the family, the late hours of the night oblige them to remain in bed until near noon of the following day; so that in the spring, in summer, and in autumn, the air being considerably heated by the presence of the sun for six or eight hours before they rise, the unhappy persons so situated must be relaxed, and enervated, instead of being refreshed with sleep. For as the air grows gradually cooler from sun set to sun rise, and during the night particularly in spring, the thermometer frequently falls below the freezing point. Chilled as the ladies must be by thin cloathing, fatigue, and cold air on their way home, they cover themselves in bed with a superfluous quantity of cloathing in order to bring on a gentle perspiration. They of course in the first instance succeed; but from sun rise they must afterwards lie immersed in a hot unwholesome air bath, which brings on fevers, pulmonary complaints, and many other disorders which cut off too many of them in the bloom of youth. These baneful effects are experienced three fourths of the year; and for the remainder in winter, the fashionable part of the world enjoy no more of the light, or heat of the sun, than the wretched inhabitants of those gloomy regions of Siberia and Lapland.

It is admitted that some young people may fortunately have parents who will endeavour to shield them as well

as they can, from such severe attacks on their future happiness; but until late hours are abolished, parents must either renounce society altogether, or abandon their children to the care of servants; a melancholy dilemma to those who would wish at the same time to associate with their family and friends; especially as they must be sensible that such an association forms the real solid basis, both of general society; and domestic comfort. But no such desirable reform can possibly take place unless such hours of study, recreation, and rest, are universally adopted, as shall tend to promote a more frequent, friendly, and confidential intercourse between the children and their parents.

The advantages resulting from a total change of these odious habits may be comprised in a few words. The whole family would assemble at an early hour at breakfast, where the plan of operations for the day are in general very pleasantly discussed; and then the father, after having enjoyed the pleasure of seeing himself surrounded by his family in health and spirits, and animated by their presence, would cheerfully resume his daily occupations, whatever they may be.

The mother after having settled her domestic arrangements, would of course employ herself most usefully and agreably in cultivating and improving her daughters'

minds; whilst probably encouraged by such laudable examples the sons, and especially the youngest of them, would acquire a taste, or rather an appetite for study; which in well regulated minds, invariably increases by what it feeds on. After an hour or two thus profitably employed, the rest of the day to dinner time should be engaged, when the weather permits, in exercise and various amusements until three o'clock; the whole gay family thus assembled would then meet again for dinner, and whilst they all enjoyed the wholesome repast, with the most luxurious of all sauces, a good appetite; the parents by judicious unreserved conversation, expressed in appropriate, but not studied language; would even at table instruct the children; whilst the young folks again delighted with the society of their beloved parents, and partaking with them of all the wholesome luxuries of their table, would by imitation, and almost insensibly to themselves acquire an easy unaffected stile of behaviour, and rub off any little rust they may have contracted in the less polished societies at school, or even at college. A play, an opera, and a ball at an early hour, would occasionally destroy the monotony of a constant domestic circle; and furnish the father and mother with pleasant topics of conversation, which being judiciously turned might also be made to inspire the young folks with a love of reading,

and all kinds of literary pursuits. But to convey an adequate idea of a pleasant domestic circle, a further view may likewise be taken of the close of the evening, and the effects of the nights repose. In winter, when not otherwise engaged, the male branches of the family may occasionally read, whilst the mother and daughters work. The young ladies may frequently be able to entertain their brothers with music, and sometimes a neighbouring family or two meeting without ceremony may amuse themselves for a couple of hours with a cheerful dance. In spring, summer, and autumn, the gardens and fields afford a variety of salutary amusements, and those who are obliged to reside in town will find many beautiful walks, either for the morning or the evening, in every part of the environs of London. Those who have risen at six or seven in the morning, and in the course of the day have taken a sufficient quantity of mental and bodily exercise, will feel no reluctance at going to bed soon after ten; where they will be refreshed by wholesome sleep, and willingly rise at the same early hour the following day, to pursue the same wholesome routine. Modern fashionable people will revolt at first at such an extraordinary change, but they would soon find that it is only the first step that is a little troublesome; and for this apparent sacrifice they would obtain health and happiness both for themselves and their children.

To men of literature and science little more will be necessary than just to observe to them, that composed as we are both of mind and body, whilst studiously endeavouring to improve the one, we must not at the same time wholly neglect the other. In vain will a man however strongly constituted he may be, attempt to derange the regular order of nature. By some irresistable means she will soon or late vindicate her claims; and either compel every one to obey her reasonable dictates, or inflict such an adequate, and well merited punishment on the offenders, as their pertinacity deserves. But who can doubt the truth of this observation when he peruses an account of the sufferings of the late virtuous, amiable, and elegant author of "the Task," who seems never once to have suspected the real cause of his indisposition; so pathetically described in the collection of letters published by his learned, and worthy friend Mr. HAYLEY. But all those who rationally suppose that every physical effect, must arise from some adequate cause; after having perused these letters, will readily understand that by intense application to study, he gradually undermined, and ultimately destroyed, the powerful faculties of his delightful mind. He lived in the country it is true, and generally rose early; too early alas! for his health, and happiness; but then it must be recollected that instead of taking gentle exercise in the open air,

and an early breakfast; he applied four, and sometimes five hours successively to his literary labours; particularly in his translation of Homer, without taking the smallest nourishment or recreation. This plan was almost as exceptionable as sitting up late at night, and produced nearly the same effects. Besides when the number of his works, and the highly polished beauty of his poems are considered, it may reasonably be presumed, even from his own account of himself, that he worked both late and early. Be this however as it may, his mind by these means was kept so constantly on the stretch, that at length he brought on a morbid sensibility of nerves, which unhappily first clouded his reason, and ultimately put an end to his existence. The same melancholy effects are to be apprehended by all men of genius, who prefer midnight lucubrations to the more cheerful and rational light of the day. In one case having strongly agitated their nervous system to a late hour, they certainly deprive themselves of their natural rest at the time when otherwise they might wish to invite sleep. In the other, when heated and almost distracted by study in the early part of the day; by walking or riding exercise before they are too much fatigued, they may restore their nerves to their proper tone, and renovate their strength, so as to resume their occupations on the following day, without any material injury to their health or comfort.

The mind and body somewhat like husband and wife in a well *regulated family*, are evidently united by indissoluble bonds in one common interest; and whilst they occasionally continue to make proper concessions to each other for their mutual accomodation, they will form a comfortable and permanent *menage;* but the instant that either party becomes selfish, or unreasonable, the domestic harmony ceases; and after having passed a few years unhappily together, they are at length by some extraordinary tumult, seperated for ever.

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APPENDIX.

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THE FOLLOWING MEMOIR

Written by Dr. FRANKLIN, *was read by Monsieur* LE ROY, *the* 14*th of April*, 1779, *in the Royal Academy, at Paris; and afterwards was recorded by extract in the* Journal de Physique. *This being a clear, concise, and methodical summary of the various philosophical principles of a man of an enlightened and vigorous mind, will no doubt be highly appreciated; especially as during a long and very active life, he lost no opportunity of examining by experiments judiciously made, the truth of his opinions on all these different subjects.*

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Memoir and Remarks.

1. AIR heated by any means, becomes rarified, and specifically lighter than other air, in the same situation, not heated.

2. Air being made thus lighter rises, and the neighbouring cooler heavier air takes its place.

3. If in the middle of a room you heat the air by a stove, or pot of burning coals near the floor; the heated air will rise to the ceiling, spread over the cooler air till it comes to the cold walls; there being condensed and made heavier, it descends to supply the place of cool air, which had moved towards the stove or fire, in order to supply the place of the heated air which had ascended from the space around the stove or fire.

4. Thus there will be a continual circulation of air *in the room;* which may be rendered visible by making a *little smoke, for that smoke will rise and circulate* with the air.

5. A similar operation is performed by nature on the air of this globe. Our atmosphere is at a certain height, perhaps at a medium two miles: above that height it is so rare as to be almost vacuum. The air *heated between* the tropics is continually rising; its place *is supplied* by *northerly, and southerly winds,* which come from the cooler regions.

6. The light heated air, floating above the cooler and denser, must spread northward and southward; and descend near the two poles, to supply the place of the cool air, which had moved towards the equator.

7. Thus a circulation of air is kept up in our atmosphere, as in the room above-mentioned.

8. *That heavier* and lighter air *may move in* currents of different and even opposite *directions, appears* sometimes by the clouds that happen to be in *those* currents, as plainly as by the smoke in the experiment above-mentioned. Also in opening a door between two chambers, one of which has been warmed, by holding

a candle near the top, near the bottom, and near the middle; you will find a strong current of warm air passing out of the warm room above, and another of cool air entering below; while in the middle there is little or no motion.

9. The great quantity of vapour rising between the tropics, forms clouds, which contain much electricity. Some of them fall in rain, before they come to the polar regions.

10. If the rain be received in an isolated vessel, the vessel will be electrified; for every drop brings down some electricity with it.

11. The same is done by snow or hail.

12. The electricity so descending, in temperate climates, is received and imbibed by the earth.

13. If the clouds are not sufficiently discharged by this gradual operation, they sometimes discharge themselves by striking into the earth, where the earth is fit to receive their electricity.

14. The earth in temperate and warm climates, is generally fit to receive it, being a good conductor.

15. A certain quantity of heat will make some bodies good conductors, that will not otherwise conduct.

16. Thus wax rendered fluid, and glass softened by heat, will both of them conduct.

17. And water, though naturally a good conductor, will not conduct well, when frozen into ice, by a common degree of cold; not at all, where the cold is extreme.

18. Snow falling upon frozen ground has been found to retain its electricity; and to communicate it to an isolated body, when after falling, it has been driven about by the wind.

19. The humidity, contained in all the equatorial clouds that reach the polar regions, must there be condensed and fall in snow.

20. The great cake of ice that eternally covers those regions, may be too hard frozen to permit the electricity descending with that snow, to enter the earth.

21. It may therefore be accumulated upon that ice.

22. The atmosphere being heavier in the polar regions than in the equatorial, will there be lower; as

well from that cause, as from the smaller effect of the centrifugal force: consequently the distance of the vacuum above the atmosphere will be less at the poles, than elsewhere; and probably much less than the distance (upon the surface of the globe) extending from the pole to those latitudes in which the earth is so thawed as to receive and imbibe electricity (the frost continuing) to lat. 80, which is ten degrees, or six hundred miles from the pole; while the height of the atmosphere there of such density as to obstruct the motion of the electric fluid, can scarcely be esteemed above half a mile.

23. The vacuum above is a good conductor.

24. May not then the great quantity of electricity, brought into the polar regions by the clouds, which are condensed there and fall in snow, which electricity would enter the earth, but cannot penetrate the ice; may it not I say, (as a bottle overcharged) break through that low atmosphere, and run along in the vacuum over the air towards the equator; diverging as the degrees of longitude enlarge; strongly visible where most dense, and becoming less visible as it diverges; till it finds a passage to the earth in more temperate climates, or is mingled with their upper air.

25. If such an operation of nature were really performed, would it not give all the appearances of an Aurora Borealis ?

26. And would not the Auroræ become more frequent after the approach of winter; not only because more visible in longer nights; but also because in summer the long presence of the sun may soften the surface of the great ice cake, and render it a conductor, by which the accumulation of electricity in the polar regions will be prevented.

27. The atmosphere of the polar regions being made more dense by the extreme cold, and all the moisture in that air being frozen; may not any great light arising therein, and passing through it, render its density in some degree visible, during the night time, to those who live in the rarer air of more southern latitudes ? and would it not, in that case, although in itself a full and complete circle, extending perhaps ten degrees from the pole, appear to spectators so placed (who could see only a part of it) in the form of a segment; its chord resting on the horizon, and its arch elevated more or less distant, of a darkish colour, but yet sufficiently transparent to permit some stars to be seen through it ?

28. The rays of electric matter issuing out of a body diverge by mutually repelling each other, unless there be some conducting body near, to receive them: and if that conducting body be at a greater distance, they will first diverge, and then converge in order to enter it. May not this account for some of the varieties of figure seen at times in the motions of the luminous matter of the Auroras; since it is possible, that in passing over the atmosphere, from the north in all directions or meridians, towards the equator, the rays of that matter may find, in many places, portions of cloudy region, or moist atmosphere under them, which (being in the natural or negative state) may be fit to receive them, and towards which they may therefore converge: and when one of these receiving bodies is more than saturated, they may again diverge from it, towards other surrounding masses of such humid atmosphere, and thus form crowns, as they are called, and other figures mentioned in the histories of this meteor.

29. If it be true that the clouds which go to the polar regions, and carry thither the vapours of the equatorial and temperate regions, have their vapours condensed by the extreme cold of the polar regions, and fall in snow or hail; the winds which come from

those regions ought to be generally dry, unless they gain some humidity by sweeping the ocean in their way. And if I mistake not, the winds between the north-east, and the north-west, are for the most part dry, when they have continued for some time.

Remarks.

FROM these positions of Dr. FRANKLIN, in which he is supported by many of the best informed modern philosophers, the cause and consequences of the Aurora Borealis cannot very well be disputed. It is evidently an electric light in the etherial regions above the lower term of congelation in the atmosphere, and is rendered visible in dark nights, in the act of flashing from one part of those regions to another in a highly verified medium. Such strong presumptive proofs, must have due weight with every person who has carefully observed them. But those who are in possession of an

electrical and pneumatical apparatus, may easily satisfy themselves on this subject by having recourse to Mr. CANTON's beautiful experiment exhibiting electric light. Make a Torricellian vacuum in a glass cylinder of about three feet in length, hermetically sealed, whereby it will be always ready for use. Let one end of this tube be held in the hand, and the other be applied to the conductor, and immediately the whole of it will be entirely illuminated, and when taken from the conductor will continue luminous without interruption, very often, for the space of a quarter of an hour. If after some time it be drawn through the hand, either way, the light again becomes uncommonly intense, extending as before, the whole length of the tube. After this operation, which in some measure seems to discharge its flashes, they will however again recur at intervals, though it be held quite still and only at one extremity. But if the tube be grasped by the other hand at the same time, in different places, strong flashes will again occasionally dart from one end to the other; and this will continue for twenty-four hours without further excitation.

For the reasons assigned in the twenty-fourth and twenty-sixth paragraphs of this memoir, it may seem extraordinary that this electric fluid should find resistance

on frozen earth so early as the autumn; for at that time in England the earth still retains a considerable degree of warmth; vegetation is merely beginning to fade; and in fact, with us it is the cheerful season of the harvest, and of the vintage in the south of Europe. But on the contrary, in Siberia and Lapland the revolution of the seasons is different. The snow does not begin to melt there before the summer solstice. About the first of July, it entirely disappears; on the ninth, the fields are covered with verdure; on the seventeenth, plants are at their full growth; on the twenty-fifth they are in full blossom, on the second of August the fruits are ripe, on the tenth they shed their seed, and towards the eighteenth or twentieth of that month snow again begins to fall; and the earth continues to be covered with a veil of snow in those countries for the ten succeeding months. Hence the appearance of the northern lights in autumn is obviously explained, according to the system of Dr. FRANKLIN, for the electric fluid not penetrating the earth after the beginning of the polar winter re-ascends into the atmosphere, and may begin to be visible to us before the autumnal equinox; and likewise occasionally appear to the end of June.

The circulation of the electric fluid within the torrid zone, after its return from the adjacent poles, produces

those different phœnomena which are so common in all tropical countries; in some cases they produce water spouts, in others heavy squalls of wind, and at particular times whirlwinds, or hurricanes, and sometimes even earthquakes.

At a certain height in the atmosphere, which varies in almost every latitude, it continually freezes in every season, through in warm climates it in some degree thaws the next day. This height is called by Mr. Bouguer the lower term of congelation between the tropics, he places it at the height of 15,577 feet.

At still greater heights it never freezes; not because the cold decreases, but because vapours do not ascend so high. This height is called the upper term of congelation and under the equator it is fixed at the height of 28,000 feet at most. But adds Mr. Kirwan as there is a mean annual temperature peculiar to each latitude; so there is a mean height for each of those terms peculiar to each latitude; and which by his table of the height of the two terms of congelation varies considerably in different latitudes. In England the lower term is about 6,300 feet, and that of the upper term 11,253 and that of the arctic circle, the lower nearly 2,400, and the upper nearly 4,500 feet. When Dr.

FRANKLIN wrote the above memoir, he did not advert to this difference in the height of the atmosphere in different paralels of latitude; the above remarks therefore extracted from Mr. KIRWAN's tables may be an useful addition to the memoir.

OBSERVATIONS

ON

WHIRLWINDS

AND

Water-Spouts.

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Observations

ON WHIRLWINDS AND WATER-SPOUTS.

BESIDES those awful convulsions of nature which have been already mentioned in the preceding remarks, and whose direful effects seem in a great measure confined to the torrid zone, and the places adjacent.—It is with great shew of reason supposed, that water-spouts which are so commonly observed during the hottest weather in those regions, are produced by the same causes, and differ only from them in their dimensions. A water-spout being only a whirlwind on a small scale, and a hurricane a whirlwind of an immense extent. Some doubts have been suggested whether the water-spouts ascend or descend; but it seems probable, for reasons which will be hereafter mentioned, that they

universally descend. They appear in the greatest number and of the greatest force during the hottest weather in the torrid zone. For example, on the coast of Guinea, in the straits of Malacca, and in all other places of the same description; especially when the sun is nearly vertical. They are often seen likewise about the summer solstice in what are called the calm latitudes at sea, on the verge of the tropics. They sometimes appear in the Mediterranean, and even in England when the summer is unusually hot; but they are almost entirely unknown in high latitudes, nor are they ever seen I believe in the southern latitudes of this hemisphere during the winter. Hence it is evident that they are most prevalent in those places where the atmosphere near the earth is in a highly rarified state; and of course during the most violent heat. At the same time and place likewise sudden squalls of wind and violent rains generally occur.

Notwithstanding the superior body of air at these seasons is more dense and heavy near the point of congelation in the atmosphere, yet the rarified air below will still continue to support it whilst it remains undisturbed; but the equilibrium once destroyed, either by ascending or descending electrical fluid, the body of cold air instantly forces its way through the rarified

medium and produces either a hurricane, a whirlwind, a hard squall of wind and rain, or a water-spout. The force and duration of the wind, or the number of water-spouts may in some measure depend on the quantity of cold air that descends; and the rarified state of the air at that time in the atmosphere. The body of cold air in descending, as it penetrates the warmer regions filled with aqueous particles, condenses and renders the air visible in various forms. In some cases the cold air forms heavy dark clouds of considerable extent; but however from their height and distance they very frequently appear small to mariners like the ox eye on the coast of Guinea; but these of course increase in bulk as they approach, both from the accumulation of other clouds in their passage, and from approximation. The form they assume, as water-spouts, is produced from the same cause as sinking any heavy body in water. The air in a whirling motion receding every way from the centre as an axis of the water-spout, leaves there a vacuum which cannot be filled through the sides; the whirling motion of the condensed air acting as an arch prevents it; and thus the shape it assumes is that of the proboscis of an elephant.—This singular resemblance is the more striking from its motion, which is sometimes serpentine; but where a great quantity of water is collected in these spouts,

either by the separation of the aqueous particles, from the internal air; or possibly from the composition of water in it, by the combination of hydrogen and oxygen; the water-spout, from its gravity when filled, forms a straight line, and the water falls into the sea with a loud splashing noise not unlike that of a great cataract. The appearances cannot have escaped the observation of those who must have seen water-spouts when becalmed near the coast of Guinea; or in passing the streights of Malacca, in the month of July; or even in crossing the line near the equinox either on the outward, or homeward bound passage, to or from India.

The number and continuance of them will be as the cause that produces them. They may be somewhat varied according to incidental circumstances; but the well known splashing noise from the fall of water will be in proportion to the quantity of water they contain, as well as to their height and magnitude. It is found that in some instances they have been destroyed by firing a gun at them; but the shot might as well be spared, for probably it is the explosion of the powder that rarifies and agitates the air, and consequently destroys the cohesion of the cold and dense body of it, in which they are enveloped.

On the principle of gravity, it would not be as easy to account for water-spouts being formed by the ascent of water from the sea, as by its descent from the atmosphere. Besides it often happens that they come from the sea and burst upon the land, when the water they contain has been found invariably to be perfectly sweet, and free from all saline particles. Besides such as burst upon land, if they absorbed or sucked up any thing, they would be filled with earth and its productions, and not with water.

In a work not long since published, an attempt has been made to describe the appearences of the weather, previous to those gales of wind which prevail under various names, in different parts of the globe; and likewise to ascertain the cause of them. In all countries situated within the northern tropics, they occur nearly about the same season of the year; it is also observed that they never continue to blow long from the same point; that the changes are quick and violent; that they are preceded by a sudden considerable fall of the barometer; and that the violence of them is considered as past, when thunder and lightning commence, accompanied with violent rain. It is likewise well ascertained that the violence of them seldom extends above 50 or 60 miles, although the wind at that time blows from

every point of the compass. From these data which are *facts well founded*, as may be seen by referring to the work already asserted; these hurricanes are evidently whirlwinds only on a great scale; and ships attacked by them may judge of their situation by the violence and rapidity with which the wind changes. If sudden and frequent, they probably are situated near the centre or vortex of them; but when they blow in strong gusts, and continue long near the same point, it may be inferred that they are near the extremity of them.

THE DISCOVERY

OF

Atmospherical Electricity,

AND

ITS EFFECTS ON

ANIMAL AND VEGETABLE BODIES.

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THE DISCOVERY OF ATMOSPHERICAL ELECTRICITY, AND ITS EFFECTS ON ANIMAL AND VEGETABLE BODIES.

EARLY in the last century many eminent philosophers were engaged in electrical pursuits, but in the summer of 1752, Dr. FRANKLIN, in America, first discovered the existence of it in the atmosphere. It was originally his intention to have pursued his inquiry by the means of an iron rod fixed on some eminence, and insulated by being placed in a cake of rosin. But as that plan might have been attended with many inconveniences, and would have subjected him to some expence and delay; it suddenly occurred to him to attempt it by means of a kite. He attached a silk handkerchief which would not like paper, be injured by

moisture, to two cross sticks; and affixed an iron point to the upright stick, which boys call the straighter. The string or twine with which it was to be flown, was as usual made of hemp, but terminating in silk; and between the hemp and silk a key was fixed. Thus prepared, on the appearance of a thunder storm, and accompanied only by his son, he went into the fields and raised his kite. The first cloud passed over, and no signs of electricity appeared; but at the moment he began to despair of success, he suddenly observed the loose fibres of the twine assume an erect position; which encouraged him to present his knuckle to the key, from whence he instantly received a strong spark, that seemed to confirm him in his new theory.

It is to be regretted that the day and hour are not precisely known, for it was certainly the instant which gave birth to a new system of meteorology. This discovery gave rise, much about the same time, to many experiments in France, particularly by Messieurs D'Alibard and Delor, whom the Abbe Nollet mentions as the partizans of Franklin. The former prepared an apparatus at Marley la Ville, six leagues from Paris; the latter, another near his own house, on some of the highest ground near the metropolis. An accurate description of either apparatus would be use-

less, but to know their success will probably be interesting.

The philosopher himself being very often from home, he called COIFFIER, a joiner, to his aid; who had served fourteen years in the dragoons, on whose courage, attention, and perseverance he could safely rely. This valuable assistant was properly instructed respecting the object of the inquiry, and was at the same time taught to use the necessary precautions to ensure his own safety; but, that the authentic evidence of the facts might not be wanted, he was also directed to summons the clergyman of the parish to attend whenever a thunder cloud should appear in the absence of Monsieur D'ALIBARD.

On Wednesday the 10th of May, 1752, between the hours of two and three in the afternoon, the honest corporal, in the absence of his commander, heard a loud clap of thunder; and seizing a phial furnished with a brass wire, he presented one end of it to the iron rod, when immediately a small spark issued from it, with a snapping noise. After having taken a second much stronger than the former, and attended with a much louder report; he applied to a neighbour to call Monsieur LE CURE. True to the summons the worthy

clergyman flew on the wings of curiosity to the place, and arrived in time to make an experiment with his own hand, and to satisfy himself and others of the existence of electricity in the atmosphere.

The cloud was not more than a quarter of an hour in the zenith of the machine; and no more than one clap of thunder was heard. All the parties concerned of course were as active as possible to prevent the cloud passing before their business was effected; and the hurry and anxiety shewn by the parties at the time of the experiment, gave rise to an opinion in the village, that the attentive centinel COIFFIER himself had fallen a victim to the lightning; and that the priest had been suddenly called upon to assist him in his last moments. This mistake however was soon rectified, and the alarm of his friendly neighbours immediately turned into joy and admiration at his discoveries. The respectable ecclesiastic sent off COIFFIER with a report to Monsieur D'ALIBARD of what had passed; and the terms in which he expressed himself marked his pious character, for he says he repeated the experiment six times in a *pater* and an *ave*; or in plain English, in the space of about four minutes. It is proper to observe that Monsieur DELOR about eight days after experienced the same success, although it was from a cloud which ostensibly afforded no thunder or lightning.

Monsieur Romas assessor to the presideal of Nerac appears, the next on the list of those engaged at that time in making the same experiments; his first efforts were crowned with success, and nearly resembled those of his contemporaries; but still persevering he at length produced a much greater quantity of electricity from the clouds than any of his predecessors. The kite he made was seven feet and a half high, and three feet wide; which offered him a surface of eighteen feet, and a wire was interwoven in the hempen twine with which it was to be flown. By means of this kite on the 17th of June 1753, about one in the afternoon, with 780 feet of string, he raised it to the height of 550 feet from the ground, describing an angle of about 45 degrees with the horizon. At this height he drew sparks from his conductor three inches long, and a quarter of an inch thick; the snapping noise of which was heard at the distance of 200 paces. Whilst taking these sparks although he was above 3 feet from the string, he felt a sensation, very familiar to electricians, as if a cobweb covered his face. Not thinking it safe to remain so near, he called aloud to the numerous company, to retire as he did himself to the distance of three or four feet; and thus situated he attentively observed what was passing in the atmosphere near the kite. No lightning was perceptible, but an indistinct sound of thunder was

heard. The wind was westerly with a fresh breeze, which raised the kite nearly 100 feet higher. Near the tin tube to which the string was fastened about three feet from the ground, he saw three straws, one near a foot long, the other two nearly half that length, all standing erect, and performing a circular dance like puppets under the tin tube, without being sustained by any visible means, or touching each other.

The cause of this appearance added to the rustling noise like that from the working of a bellows, and the cobweb sensation still on his face, was understood by him; and he accordingly warned the spectators to keep at a still greater distance; nor would he himself venture to take any more sparks from the apparatus.

What immediately followed shewed his foresight and skill. The longest straw was suddenly attracted by the tin tube upon which followed three loud explosions resembling that of thunder. These explosions were by some of the company compared to those of large rockets, and by others to a violent crash of earthenware upon a pavement. They were even loud enough to be distinctly heard in the heart of the city, amidst the various noises which usually prevail there.

From this last account it may be well understood that none but experienced electricians should venture to make these kind of experiments. It may be proper to observe that touching the twine even sometime after the kite has fallen will give violent shocks, so as to occasion severe pain.

These were some of the earliest attempts in Europe to prove the existence of electricity in the atmosphere; which were followed by many others, particularly by Beccaria at Turin; who certainly surpassed all that preceded, and even perhaps to this time, those who have followed him. To serve as an additional precaution, we shall conclude this note with relating the unhappy fate of Richman at Petersburg, who fell a victim to an experiment undertaken by him on the 6th of August 1753.

He was provided with an instrument, called by him an electric gnomon, or electrometer, to measure the strength of the electricity. It consisted of a rod of metal, terminating in a small glass vessel, into which, but for what reason does not appear, he had put some small brass filings. At the top of this rod a thread was fastened, which hung down by the side of the rod, when it was not electrified; but when it was electrified, it avoided the rod, standing at a distance from it, and

making an angle at the place where it was fastened. To measure this angle he had fastened the arch of a quadrant to the bottom of the iron rod. Whilst engaged in observing the effects of the electricity of the clouds, at the approach of a thunder storm upon his gnomon, and consequently standing with his head inclined towards it; a ball of blew fire, of apparently four or five inches diameter, jumped from the gnomon to the head of the professor, and instantaneously killed him. Mr. SOLKEN, who attended him in the experiment, and related the particulars of the accident, was himself struck down, benumbed, and probably almost senseless; for he did not hear the thunder, which by others is said to have been uncommonly violent.

Many experiments of electrifying plants have been made by Mr. NUNEBERG and the Abbe NOLLET; according to the former, most of them encreased in height, and flourished far beyond others not electrified. Some bulbous roots he says which had been frequently electrified, grew eighty-two lines and a half; whilst others of the same species not electrified, grew only in the same period, fifty-two lines and two thirds. But the report of the Abbe NOLLET is not so favourable; he found that the plants electrified by him, at first made vigorous shoots, but he thought their perspiration being

by these means too much encreased, their juices might have been too quickly dissipated; in consequence of which the plants became gradually weak, and at length prematurely perished. We do not hesitate yielding due credit to both these reports, although they seem in some measure incompatible with each other. They may have been made on various plants at different seasons. Mr. NUNEBERG therefore might have succeeded, although those of the Abbe in some measure failed. Besides when administered by art, either to animal or vegetable bodies, the electricity may be given when the plants may already have the proper natural quantity; and therefore in some instances it may be too strong, in others not strong enough, not sufficiently diffused, or it may not be applied to the proper part. The various modifications of electricity cannot well be comprehended, excepting by those who profess considerable knowledge of the theory and likewise of the practice of it, so as to judge of its effects, not only in the atmosphere, but likewise on all animal and vegetable bodies; some of them may benefit by the aura, or mild state of the fluid; and yet be injured by a spark, or even be killed by a severe shock.

Sheep are known to be subject to a disease called the turn-giddy, which produces water in a small blad-

der in the head. They will however live a long time in this state, subject nevertheless for some days in every moon to painful paroxysms of it, which may be imputed to an increase of the electric fluid acting on the water in the head. At the breeding seasons shepherds well know they must be attentive to the ewes at every revolution of the moon; or at yeaning time they are apt to find some of their flock barren.

LUCILIUS, who wrote more than a century before the Augustan age, says "*Luna alit ostrea, et implet Echinos*," and HORACE a hundred years afterwards, observes "*Lubrica nascentes implent conchylia Luna.*" It does not seem improbable that an addition of the electric fluid, from an increase of the tides, may render crabs and oysters, more healthy and plump at the change, and even at the full of the moon, during the spring tides, which has given rise to these opinions.—Sandwich oysters are said to have been in as great request in the luxurious days of the Romans, as those of Colchester and Melton are with modern Britons.—The effects of the electric fluid on shell fish might easily be ascertained. But this opinion must have obtained very general credit at Rome before it could be thought worthy of notice by such eminent poets.

Those who possess a torpedo, a gymnotus, or a silurus electricus, which are all of them supposed to be endued with an innate electrical, or galvanical power would do well to observe if it is increased, or diminished periodically at any particular time of the moon, or tide. The first of these fish is found in different parts of the Atlantic, the second in the South American seas, and the last on the west coast of Africa.

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OBSERVATIONS

ON

The Origin and Use

OF THE

BAROMETER.

A Synopsis

Of the Annual and Monthly heighth of the BAROMETER, at CATHAY, near Cardiff, two miles north of the Bristol Channel, and 30 feet from the level of it at the highest spring tides; registered regularly at Eight in the Morning, and at Two o'Clock in the Afternoon.

Months	1800	1801	1802	1803	1804	1805	1806	1807	*Monthly mean*
JAN.	29 46	29 78	29 94	29 58	29 64	29 55	29 46	29 82	29 64
FEB.	29 70	29 67	29 75	29 83	29 86	29 72	29 81	29 80	29 76
MARCH	29 68	29 70	29 80	29 92	29 51	29 85	29 76	30 3	29 78
APRIL	29 60	29 86	29 91	29 83	29 72	29 80	29 95	29 80	29 67
MAY	29 77	29 76	29 91	29 82	29 87	29 84	29 84	29 70	29 81
JUNE	29 95	30 1	29 90	30 14	29 86	29 93	30 2	29 99	29 96
JULY	30 8	29 79	29 91	30 10	29 99	29 87	29 87	29 62	29 90
AUGUST	29 97	29 93	29 96	30 2	29 80	29 91	29 76	29 91	29 90
SEPT.	29 72	29 80	29 93	29 89	30 11	29 94	29 99	29 82	29 89
OCTOBER	29 73	29 74	29 78	30 6	29 64	29 86	29 99	29 78	29 82
NOV.	29 71	29 61	29 51	29 64	29 71	30 3	29 90	29 72	29 71
DEC.	29 54	29 42	29 69	29 66	29 67	29 69	29 62	29 85	29 64
Annual mean	29 74	29 81	29 82	29 87	29 78	29 99	29 99	29 90	29 79

OBSERVATIONS ON THE ORIGIN AND USE OF THE BAROMETER.

THE barometer was invented by TORRICELLI, about the year 1643, but the proper application of it to meteorological purposes, even at the present day, are but imperfectly understood. PASCHAL and PERRIER sometime about the year 1655, were amongst the first philosophers who entered into this new and extensive field of inquiry. The former however, from the novelty of the investigation, and probably preoccupied with other important pursuits, established at the commencement of his researches some erroneous data respecting its use for meteorological discoveries, which of course could lead to no satisfactory conclusions; nevertheless the world is greatly indebted to both these philosophers for the

application of this instrument to the purpose of measuring the height of mountains. PASCHAL's brother in law Mon. PERRIER appears to have perceived some of his friends meteorological mistakes; but without absolutely arriving himself much nearer to the truth. The fact is now universally acknowledged, contrary to their united opinions; that the density of the atmosphere, and the consequent rising of the mercury, rather indicates approaching fine weather; and the rarefaction of it, which makes the mercury descend; produces either rain, or high wind, or both. But it is now well known from experience that these changes in the barometer do not invariably produce the same effects; and to account for this irregularity has long evaded the researches of even Dr. HALLEY, M. DE LA CONDAMINE, M. DE MAIRAN, BERNOUILLI, MUSCHENBROECK, and many others, whose various opinions have been carefully examined by Monsieur DE LUC in his *recherches surles modifications de l'atmosphere*, published at Paris in 1784. But here again it must be recollected, that the existence of atmospherical electricity has not long been understood. The first suggestion of it, as we have repeatedly observed, came from Dr. FRANKLIN in the year 1752; and the composition and decomposition of water by means of the electric fluid, a discovery of almost equal importance in meteorology, is of a much

later date. Without incurring the imputation of presumption therefore, any person may now suggest a new hypothesis, founded on these additional and important discoveries, entirely different from any of those previously mentioned.

According to our hypothesis, the attraction of the sun and moon may be deemed the primary cause of the tides. The flux and reflux of the tides produces the circulation of atmospherical electricity; and the circulation of the electric fluid in the atmosphere, may be considered as the immediate efficient cause of the changes of the weather. On these principles the grand desiderata in meteorology appear to be, 1st a knowledge of the origin and properties of atmospherical electricity; 2d the various causes of the condensation and rarefaction of the atmosphere; 3d the composition, decomposition, and recomposition of the clouds, together with the means by which they are kept suspended, and put in motion; either from the earth to the atmosphere, or *vice versa;* and also from one part of the atmosphere to another.

In the essay on the effects of lunar influence on the weather, an attempt has been made to explain some of these points; but although many philosophers seem to concur in thinking that the clouds are in some

measure formed, and kept suspended by means of a due proportion either of electric fluid, or common fire; they have not yet decided whether common and electric fire are different fluids, or the former only a modification of the latter. The effects of either respecting meteorology will be nearly the same; in order therefore to avoid much circumlocution we shall, as a matter of convenience in discussing this subject, take upon us for the present, to suppose that the electric fluid is the agent which is employed in forming and sustaining the clouds in the atmosphere. In thunder storms when the clouds part with a considerable portion of electricity, rain almost immediately ensues. Every common experiment in electricity shews that it is constantly, but imperceptibly either ascending from the earth to the atmosphere, or in an opposite direction, descending from it. These principles are now by most philosophers pretty generally admitted; we shall therefore proceed to make a further application of them as affecting the state of the barometer.

Suppose for example that a considerable quantity of the electric fluid should suddenly be disengaged from the earth, and ascend into the atmosphere; the air would of course become rarefied, and being by these means rendered much lighter than before, the barome-

ter which always indicates the immediate gravity of the atmosphere, must necessarily descend. For this reason a moderate fall of the mercury denotes rain; and when the rarefaction of the atmosphere is very considerable; the cold air in the adjacent regions will suddenly rush forward with great impetuosity to fill up the vacuum; hence a violent wind attended with heavy showers, is generally preceded by a great descent of the mercury. But it may happen that the mercury when at 30 degrees and upwards, may fall two or three tenths of an inch; and yet no storm of wind or rain happen precisely at the time, when this extraordinary alteration in the barometer takes place. Various reasons may be assigned for this apparent anomaly of the barometer. Amongst others the Aurora Borealis which is always invisible in the day, and very often in cloudy weather not perceptible in the night; may cause such a descent of the mercury. Besides the constant circulation of the electric fluid in the superior regions of the atmosphere, may some times produce this effect without causing any apparent change in the weather; for if the clouds beneath should not be decomposed, or be deprived of the electric fluid, they would not precipitate the water they contain. And the lower stratum of air may not move with such rapidity as to be sensibly felt as wind near the surface

of the earth. It is well known that the superior and inferior strata of air moves frequently at the same time with different degrees of velocity, and even in opposite directions; like the common air in a door way between two rooms; the one hot, and the other cold. This circumstance however will seldom occur; and nineteen times in twenty at least, a sudden great fall of the mercury in winter, especially when at or below changeable (50) will be soon followed by a violent storm of wind and rain: or in summer during extraordinary hot weather, may produce thunder and lightning, attended often by a very heavy shower of hail. When the flashes of lightning are vivid and quick; the hailstones are always either of considerable magnitude, or many in number.

EXPLANATION OF THE CONSTRUCTION OF A COMMON BAROMETER.

THE mercury in the barometrical tube is hermetically sealed at the top, and left open only at the bottom. The gravity of the atmosphere therefore by pressing upon the mercury when it is left open, serves to raise it in the tube. And on the contrary when the air is rarefied, which proportionably diminishes its gravity, the mercury of course descends. The tube

is sometimes thirty six inches long, the lower part of it is not marked; but four inches of the upper part of it which is inserted in an opening made on a white copper or tin plate, is graduated from 27, to 31 inches. Every inch is divided into ten parts, and these parts again are subdivided into tenths; so that each inch is altogether divided into one hundred parts, and may be easily so read by the help of a moveable index. The scale of inches is engraved on the right side of the barometrical tube; the zero or beginning of the scale being at the surface of the mercury in the cistern. The index and nonius are moveable in a groove, which is parallel to the line of inches; and the index should be placed equal to the upper surface of the column of mercury. Some barometers are more minutely divided, but that which divides the inch into one hundred parts only, is found sufficiently minute for all meteorological purposes. In reading off the number of degrees, it is necessary in the first instance, to advert to the number of inches as 27, 28, 29, or 30, each of which being divided as before observed into ten parts, at the place where the nonius edge of the units coincides with those marked on the general index of tenths, is the point which marks the units approaching towards the following tenth, as in the subsequent example. Suppose the general index

points at 29, 50, or what is marked on the plate, changeable; if the line of the nonius falls on the 3d line of the inches, the barometer will then be marked in the table at 29 inches 53 tenths, and so on, according to every additional unit until ten, and then of course it would be stated as 29, 60 and so on to 70, &c. But accurate observers will do well to remember, that the edge of the mercury which comes in contract with the side of the glass tube, will not always readily obey the pressure of the atmosphere; being affected by attraction, the middle of the column of mercury must therefore be attentively observed; and when it is convex the mercury is likely to rise; but on the contrary, when the middle of it is concave, it is inclined to descend; when therefore an observation is to be taken, the side of the case should be smartly struck by the hand; and on the approach of fine weather the mercury will often rise two or three degrees; but on the contrary preceding bad weather when concave, it will descend as much.

PROGNOSTICS OF THE WEATHER FROM THE BAROMETER AND APPEARANCES OF THE CLOUDS.

1. IT is often remarked the most extraordinary changes take place in the barometer during the two first, and the two last months of the year; which is saying only

in the other words, that these changes happen in the four coldest months of the year, from the beginning of November to the end of February. But in the annual table it appears that the mercury is most high in the warm months of June, July, and August; nevertheless especially in high latitudes the most violent and sudden variations will of course take place during a frost, with a north-east, or a north-west wind; and descend proportionably on the approach of a thaw with a southerly wind. When the barometer falls, and the thermometer rises; rain may be expected, especially in winter. In summer during settled fair weather, both are high.

2. In winter, particularly in mild open weather, 24 or 48 hours preceding a fall of snow, the barometer will sometimes rise; but a few hours before it actually commences, the mercury will suddenly fall again; descending daily as long as the snow continues. A severe frost in winter is always preceded by a great rise on the barometer; and a proportionable fall of the thermometer. When the barometer in winter, or near the vernal, or autumnal equinox, is at or below 29, 50 or changeable, and suddenly descends, two or three tenths; a gale of wind, and rain may be expected. When the same change takes place in summer, and early in autumn, it may precede either a gale of wind, or only

a thunder storm. When the gale of wind subsides, and before it is quite past, the barometer will suddenly rise again. But after a thunder shower it will sometimes remain nearly stationary, or the rise will generally be moderate and gradual.

3. When the mercury in the tube is fluctuating, unsettled weather may be expected. A sudden rise in the barometer is no proof, at any time, of a continuance of fair weather; but in rainy and cloudy weather when the mercury is convex and continues slowly and gradually rising for 2 or 3 days successively; settled weather for nearly a week at least may be expected; or in fine weather when the mercury being near 30 degrees and concave, continues gradually to descend for some days; rainy and stormy weather will soon follow.

4. A current of air from the north inclining either eastward, or westward, will produce a condensation of the atmosphere, and consequently cause a rise in the barometer, and usually dry cold or cool weather; according to the season. A southerly wind either easterly, or westerly, especially the latter, will generally make the mercury in the tube descend. A south-west wind seldom fails to produce rain, when it continues twenty-four hours in that quarter.

5. In foggy weather if the barometer remains stationary, and especially if convex, and inclined to rise; and the fog dissipates as the sun advances towards the meridian, fine weather will follow; but otherwise rain. A ground fog in the evening will almost always be followed by fine weather next day.

6. When the mercury in the barometer is concave, although it may have risen in the night in consequence of an hoar frost. If the clouds in the morning towards the east, about sun rise, are of a deep red colour, rain will almost certainly follow; and often in heavy showers in the course of the day.

7. If the wind is westerly a rainbow in the morning indicates rain. The barometer will then certainly descend, and very often the thermometer will be higher than the usual temperature of the season.

8. But with the wind in the same quarter, especially when the western clouds have a bright tinge of red, a rainbow in the evening towards sun set, is almost a sure presage of fine weather the following day.—Hence the old proverb that a rainbow at night is a shepherds delight; and a rainbow in the morning is a shepherds warning.

9. When it rains early in the day, with an easterly wind, it almost always continues until towards noon; but rather in misty or drizling rain than in heavy showers. If it does not then clear, it will not entirely cease before sunset.

10. The wind following the sun in his diurnal course and a gentle breeze is a presage of fine, and generally of settled weather. But if it backs from the west towards the south, rain may be expected.

11. The barometer being concave, if the highest hills in the neighbourhood in the morning are at the same time cloud-capt, and remain so till afternoon, rain may be expected. But if the morning mist on the summit of the hills gradually dissappears towards noon, fair weather will follow. Those who reside on plains, where there are no high hills in sight, may judge of the weather by the smoke of their chimneys. If it spreads abroad, and scarcely rises above the house, rain may be expected in the course of the day.—When it immediately descends below the roof of the house, rain is almost certain; but when the air is in a condensed state, the smoke will rise rapidly, and perpendicularly, if not immediately dispersed by the wind. It is sometimes unadvisedly said that the air

is heavy, and drives down the smoke; but the fact is precisely otherwise, for when the atmosphere is most condensed, it immediately absorbs the smoke, as it does all other vapours, and exhalations. Whence a condensed state of the atmosphere which raises the barometer produces fair weather; and the contrary high wind, and rain, or both.

12. It is recommended to every person who wishes to consult the barometer to learn to read the height of the mercury by the degrees, and not by the words now engraved on the plate; otherwise the instrument-maker would do well to engrave the words on the plate according to the height of the place from the level of the sea, where the instrument is to be used; for in situations very much elevated, the mercury will be much lower than in vallies, and besides it frequently rains from the causes above-mentioned, when the mercury in common instruments is at fair, and sometimes even near settled fair; and on the contrary the weather frequently continues settled, when the mercury remains stationary at changeable. The principles of the barometer being thus misunderstood, has greatly depreciated the value of this excellent instrument; and made many persons hastily pronounce it to be perfectly useless, as what is commonly called a weather glass.

When the barometer rises as the tides increase, especially in summer, settled weather may be expected. When on the contrary at the same season, the barometer falls with the increase of the tides; wet or variable weather will soon follow. So likewise when the mercury rises, and continues convex, with the fall of the tide, settled weather may be expected; but when the mercury is concave and continues descending, on the decrease of the tides, rainy or squally weather will soon follow. As a general remark on the subject of the influence of the tides on the atmosphere, it may once more be observed, that the principal changes of the weather often do not take place on the days of the full and change of the moon, which is the middle of the springs; or on the quadratures which are the middle of the neap tides. But two or three days before each of these periods, when the springs and the neaps actually commence, the character of the weather to be expected at these periods is very often indicated, both by the appearance the clouds then assume; and also, by the motions of the mercury in the barometer. About 60 hours after the full and change, or as many after the quadratures in stormy or unsettled weather, the most violent wind and rain may be expected; and this crisis past, especially with an increasing moon, a favorable change very often takes place.

In summer a considerable descent of the thermometer and consequently an unseasonable coldness in the air, is a certain presage of unsettled weather, and is often followed by rain. But in winter a sudden rise of the thermometer above 40 degrees, attended by a descent in the barometer, is a certain indication of rainy, and unsettled weather.

GENERAL OBSERVATIONS

ON THE

Height of the Thermometer,

AT CATHAY.

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A Synopsis

Of the Temperature of CATHAY, *near Cardiff, for* 8 *years; situated in the latitude of* 51, 29, 0 *north, and longitude* 3, 26, 0 *west from Greenwich The* THERMOMETER *of* FARENHEIT, *suspended at* 7 *feet from the ground, in a court surrounded by walls, that to the westward the lowest. The height from the level of the Bristol Channel is about* 30 *feet; and the distance from it,* 2 *miles in a right line.*

Months	1800	1801	1802	1803	1804	1805	1806	1807	*Monthly mean*
JAN.	34 50	39 00	34 00	33 50	39 50	35 00	38 50	38 50	36 56
FEB.	38 00	40 00	39 00	36 00	37 50	36 00	39 50	39 50	38 18
MARCH	42 50	44 50	45 50	45 50	39 00	41 50	39 50	40 00	42 25
APRIL	52 50	51 50	49 50	56 00	48 00	47 50	48 50	49 50	50 37
MAY	61 50	57 00	56 00	56 50	61 00	55 50	57 00	59 50	58 00
JUNE	62 50	64 00	61 00	64 00	67 00	61 50	64 50	62 50	63 37
JULY	69 50	67 50	58 50	71 50	66 00	65 50	65 00	67 00	66 31
AUGUST	67 50	68 00	64 50	65 50	63 50	63 00	64 00	64 50	65 06
SEPT.	62 50	60 00	61 50	55 50	62 50	59 00	56 50	52 00	58 75
OCTOBER	51 00	52 50	51 50	51 50	54 50	46 50	49 00	48 50	50 62
NOV.	41 00	41 00	38 50	39 00	43 00	38 50	45 00	40 00	40 75
DEC.	39 50	38 00	29 69	37 50	33 50	37 00	45 50	36 00	37 93
Annual mean	51 87	51 79	49 79	51 00	51 00	48 96	51 04	49 79	50 68

GENERAL OBSERVATIONS ON THE HEIGHT OF THE THERMOMETER AT CATHAY.

IT must be understood that 51 should be considered as merely the mean diurnal heat, that is from six in the morning to ten at night. The remaining eight hours which include the nocturnal heat; the thermometer is found commonly to vary from the diurnal heat about these degrees in winter, seven in spring, eight in summer, and nine in autumn, consequently the mean of these, including all the months of the year, and the proportion of day and night, would be nearly two to be deducted from the mean diurnal heat of the whole year, reducing the mean annual temperature to little more than 49 degrees.

The mean annual maximum of heat at CATHAY upon an average of 8 years, is 66 and a half. The annual minimum for the same time and place, 36, 56, but the greatest temporary heat of one day which has occurred in our remembrance, the thermometer stood between the hours of two and three P. M. at 86. The wind was E. by N. variable, a gentle breeze constantly following the sun's course. Towards the evening it got to the N. W. the preceding night an extraordinary dew fell. The longest regular succession of hot weather began on the 7th of August, 1800, and continued to the 20th; the thermometer at that time fluctuating between 62 early in the morning, 72 near noon, and 82 degrees between 3 and 4 in the evening, with light breezes. It was sometimes almost calm. On the new moon of the 20th, it broke up with thunder and lightning, and a heavy fall of rain.

On the 28th of December, 1798 one year preceding this period, was the severest cold. The thermometer descended to 11 of FARENHEIT, or 21 degrees below the freezing point. At 2 P. M. it rose to 22, and fell again; at 6 the next morning, to 20. The greatest degree of cold we ever observed at CATHAY for many days successively, was during eight days of this month, from the 24th, to the 31st, both days included. The

thermometer at that time never got so high as the freezing point of FARENHEIT until the morning of the 29th. The wind was always between the east and the north until a few hours preceding the fall of snow; when it suddenly varied to E. and by S. and E. S. E. which raised the thermometer to 34 and 35 degrees. The barometer was in general upwards of 30 degrees, but on the 27th it began and continued falling the whole of the day, and ended at 29, 42, but the next day it suddenly rose again, and continued to rise for some days, remaining always above 30 degrees for three weeks.

Notwithstanding the severest cold happened in this instance at the end of December, being soon after the winter solstice; and also that the great frost of 1739 commenced at the same time; it will generally be found that the greatest degree of cold prevails about the middle of January; when from the obliquity of the sun's rays for the preceding three months, he affords but a small portion of heat and light in this part of the globe. Sometimes towards the end of January, when his altitude is increased near six degrees, and the wind gets to the southward; there will be a day or two of warm weather, and the thermometer will rise to 50 degrees. It is however worthy of remark

that November, the first month of the winter is seldom altogether so cold as February, the first month of the spring; whence probably the latter is often ranked amongst the winter months.

August is frequently considered the hottest month of the year, and what is mentioned above seems in some measure to corroborate this opinion; but on the average of eight years stated in the synopsis, the greatest heat prevails in July. The difference however is not very considerable, and may often be imputed to a local, or some other incidental circumstance. These two however are unquestionably the hottest months in the year, which proves that the heat of the weather proceeds rather from the earth, and the surrounding bodies acquiring and retaining the heat, than from the actual height of the sun; for his altitude in June is much greater than in either of the subsequent months; and even the heat of the weather increases for some time, whilst his altitude continues daily decreasing.

In the height of summer the land is much hotter than the sea. A thermometer placed in the shade on the south coast of England, within a few inches of the ground, would often rise at 3 P. M. to the distance of 80, or even 90 degrees. At the same

time, within a few hundred yards, the water of the sea would not even at two or three in the afternoon of a hot day, be more than 65, or 70, close in shore; and not more than 62, in six fathom water. In the morning about eight or nine o'clock, the temperature of the sea in July, and August, is commonly about 62 or 63 degrees.

In the winter on the contrary near the solstice, a thermometer placed within a few inches of the ground in the same place, frequently in a common frost would fall, about eight or nine in the morning, to at least 25 or 30 degrees; and whilst in summer the sea is so much cooler than the land, and in winter on the contrary it is so much warmer; in wells or even in cellars of the depth of 20 feet or more, the heat remains constantly the same at all seasons; which is nearly the mean annual diurnal heat of the country. This by our synopsis appears to be about 50½ in the southern part of England and Wales. It is not necessary at present to detail all the useful inferences that may be drawn from these facts, but when properly considered, they will serve in many respects to explain what has been said in this work on the subject of local temperature at different seasons; and at the same time prove the advantages which may result from having

subterraneous magazines both for liquor and grain, for both these are liable to ferment by an increase of heat, or to be spoiled by excessive cold. It may therefore be worthy the consideration of farmers, whether it would not answer very well to have their dairies under ground, where the milk and cream would not be affected by the heat of summer, nor the cold of winter; and to which may be added a small room or cellar, where they might always salt bacon in the hardest frost, or keep fresh meat sweet for many days during the hot and moist month of July.

The expence of making a subterraneous dairy would be no more than that of a range of different cellars for beer, wine, and cider. Barns erected upon arches to cover granaries, would no doubt in the first instance be expensive, but in the course of a few years would eventually prove very economical; for much trouble and waste now incurred from carrying grain backwards and forwards in sacks, would thus be avoided. One roof would suffice for a barn, a threshing machine, and a granary. The roofs of many different buildings are costly in the first erection; and it is also extremely expensive to keep them in repair. But if carefully built, and properly floored, these subterraneous granaries would protect the corn from vermin; and being always

of an equal temperature, would likewise preserve it from the effects of sudden and violent charges of the weather.

From the damp appearance of cellars injudiciously constructed, some doubts may arise whether grain could be kept free from damp under ground. But it is well known that the Turks, Persians, Arabs, and the natives of Hindostan, all occasionally bury their grain, and preserve it many years in perfect good condition; and that it is never injured by vermin, reptiles, or insects of any kind; such kind of depots of grain are very common likewise throughout Asia-minor, and the adjacent countries, and especially at the bottom towards the northern side of mountains, and adjacent to high hills.

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OBSERVATIONS

ON HAIL,

AND

THE DENSITY OF

Snow.

A Synopsis

OF THE

RAIN AT CATHAY,

FOR EIGHT YEARS.

Months	1800	1801	1802	1803	1804	1805	1806	1807	*Monthly mean*
JAN.	3 58	2 61	0 94	0 66	3 50	1 94	3 66	2 61	2 43
FEB.	1 44	1 44	2 38	1 10	0 33	1 77	2 0	1 66	1 51
MARCH	1 38	2 76	0 50	0 91	1 69	0 88	2 33	0 40	1 35
APRIL	1 88	0 16	1 0	2 12	2 0	1 55	0 38	1 26	1 29
MAY	2 19	2 36	1 88	1 70	2 30	1 0	0 91	4 0	2 4
JUNE	0 72	0 61	0 94	2 80	0 65	0 88	1 11	0 66	1 17
JULY	0 52	2 36	4 88	0 63	4 61	1 55	2 5	0 33	2 17
AUGUST	0 47	0 24	1 63	1 10	2 11	2 38	2 27	2 11	1 53
SEPT.	3 52	5 66	0 50	1 10	0 60	2 2	1 44	1 77	2 9
OCTOBER	2 77	1 77	4 52	0 70	3 0	2 25	0 0	2 0	2 12
NOV.	5 66	2 27	1 55	2 83	4 61	0 22	3 38	0 33	2 60
DEC.	2 69	1 86	2 5	4 94	1 61	3 66	7 88	2 55	3 40
Annual mean	26 82	24 10	22 77	20 59	27 1	20 28	27 86	20 68	1 99

General Annual Mean of 8 Years, 23,76.

OBSERVATIONS ON HAIL.

HAIL, in the opinion of BECCARIA, is an aqueous concretion formed in the higher regions of the atmosphere, where the cold is intense, and where the electric matter abounds. The form and dimensions of it are various. It sometimes assumes a pyramidal, as well as a round shape, and at others a stellated figure like snow; but both the shape and size depend very much on the height of the clouds in which they are formed. The largest and those of the most irregular figure, fall from those clouds of the least elevation.—The circumstance however which tends to shew the principal cause of its formation is, that all storms of hail are most violent where the electricity is most intense; on this point BECCARIA, FRANKLIN, the Abbe NOLLET, and Mr. MONGES perfectly agree.

A cloud is said to be only a mass of aqueous and other vapours which are combined and kept suspended in the atmosphere, by means of electric matter. All the electricians abovementioned concur in thinking, that a sudden increase of electricity rarifying the atmosphere, causes a strong current of air, which is known to increase evaporation, and consequently to produce a degree of cold sufficient to congeal the aqueous vapours in the clouds. In summer therefore when sometimes an extraordinary degree of electricity ascends from the earth to the atmosphere, a hail storm is thereby produced, accompanied by thunder and lightning. Mr. Mongè in his answer to the strictures of Mr. De Morveau, observes that the fall of hail and even rain, always increase immediately after a flash of lightning. A fact well known to meteorologists; and when the hail stones are large, he remarks that the hail always precedes the rain; most probably both from its superior degree of gravity, and from the proximity of the cloud; whence the hailstones fall. Hail falling in water generally sinks, and is therefore heavier than ice which floats in it. But M. Camerarius professor in the university of Tubingen, made an experiment of some which fell at that place on the 5th of September 1698, which floated in water. They were however nearly as large as hazel nuts, and instead of a certain degree of opacity in

the interior of them, as hailstones generally have; The spherules were perfectly *pellucid*; and besides they did not appear so compact as hailstones usually are.

The Count De TRESSAN, disolved a certain number of hailstones which fell at Toul on the 11th of July 1753. They produced near a pint of water; in which were found nearly two grains of a calcareous substance, which fermented with acids; and which no doubt had ascended from the earth with other vapours.

ON THE DENSITY OF SNOW.

Monsieur De La HIRE found the density of snow, compared with water, nearly as six to one. That is six lines of the former, produced one of the latter.—Pere COTTE likewise sometimes found nearly the same proportions, but much more often one to eight; the difference may probably be ascribed to the size of the flakes, and the temperature of the air. Mr. Van SWINDEN, an able and correct philosopher, observes that in 80 experiments which he made, at Franeker in Friesland, in the years 1772, 1773, 1774, and 1775;

he found in 18 of them the proportion was less than six; but he seems to think the result of the whole would amount to nine and three quarters to one.— Monsieur De Flaugergues *the younger, who lived* at Viviers, says that he *found a cubic foot* of snow, sometime *after it had fallen*, weigh 28 pounds, but that which had recently fallen, weighed only 16 pounds.— He supposes the reason of this difference to be, that in reducing the former to powder, it becomes harder than the latter; which by the same force, cannot be rendered so compact.

THE TEMPERATURE

OF DIFFERENT LATITUDES,

INDICATED

BY THE

Calendar of Flora.

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THE TEMPERATURE OF DIFFERENT *LATITUDES* INDICATED BY THE *CALENDAR OF FLORA*.

IT has been observed in a preceding essay, that during the infancy of astronomy, the heliacal rising of particular stars, and even the emigration and return of certain *birds of passage*; were formerly consulted as the most *certain indications* of the approach of those seasons, when the mariner *might venture* to navigate the Mediterranean sea; and also when *the* husbandman in Greece, or Italy might commence his various operations in the garden or the field. But owing to the precession of the equinoxes, and other circumstances every presage derived from the situation of the stars, must be as before *observed* both local and temporary, according to the age and place *in which the* observations are made.

So likewise the return of the swallow, or of any other bird of passage, should rather be ascribed to the state of the weather in those countries whence they depart; than of those in which they seek for a milder climate, but which must be unknown to them. Those long established opinions of ornithomancy, however erroneous as they are, most probably gave rise both to natural and religious augury; particularly amongst the Romans. It is far from impossible that this superstition originated in an opinion that when soaring in the air, they held communications with the gods, who took that opportunity of revealing to them the secrets of futurity. In like manner they might have thought that wolves and other beasts of prey which descend from the mountains in search of food, or mountain hares, that in deep snow seek for nourishment and shelter in the vallies, are endued with an instinctive prescience of the changes of the weather. But when these quadrupeds suffer from excessive cold, which of course also deprives them of the means of subsisting; they naturally quit those places where they find themselves incommoded; and probably they perceive verdure in the vallies beneath, at no great distance from them; to which they immediately resort. Birds in particular in their lofty flights easily distinguish those countries which are not covered with snow, and gradually pursue their course, until they have reached a place where they find themselves comfortably at rest.

But it is now no longer necessary to consult the habits of birds, nor even the variable rising of particular stars, to judge of the return of the seasons; they are well known to the mariner by the revolution of the heavenly bodies in general. From a simple art, navigation is now become a profound science. Instead of cautiously creeping along the coast in a particular season; he now at all times boldly explores his way across the ocean out of sight of land, previously knowing that at certain latitudes he will meet with particular winds, by which means he can calculate the length of a voyage of several weeks, or even months, within the limits of two or three days.

It has already been repeatedly observed that the calendar of Flora, is the only true criterion by which in the present state of meteorology the husbandman who is stationary, can ascertain the most advantageous seasons for his different operations. By these means only the temperature of a garden or farm can be clearly ascertained, according to the latitude, elevation, aspect, and soil. In the following tables the flight of some birds, and the song of others, which are usually inserted in these calendars, are purposely omitted; as having no probable analogy with the progress of vegetation; and therefore serving only to

deceive and mislead those who are disposed to follow such delusive guides. At the same time it is earnestly recommended either in planting, pruning, or sowing, to advert rather to the state of the surrounding vegetation, than blindly to follow any general direction respecting particular seasons; which as indicative of temperature, cannot universally apply to all latitudes, and to every degree of elevation from the level of the sea. On this subject it will be sufficient in this place once more to remark, that a valley in the latitude of 56, especially in summer, will be warmer than a high hill of 500 feet high in the latitude of 52. Nor will there ultimately be much difference in the harvest of vallies to the northward; for even in the latitude of 56, as the days begin to lengthen, they have nearly on an average one hour's additional heat and light of the sun, during all the summer months; which will bring vegetation almost as forward in the autumn, in a valley near Edinburgh, as on any hill, or even in any valley near London.

THE CALENDAR OF FLORA AT ATHENS.

	FEBRUARY.	
1*st*	Violet early Bulbous	F
	Wall Flower	F
	Cornel Tree	L
	Dogberry	L
14*th*	Bay Tree	L
	Alder	L
	Abele	L
	Elm	L
	Sallow	L
	Poplar	L
	Plane Tree	L
12*th*	MARCH, *beginning of Spring.*	
	Fig Tree	L
	Alaternus	L
	Hawthorn	L
	Turpentine Tree	L
	Chesnut	L
	Walnut	L
	Lilly of the Valley	F
	Narcissus	F
	Daffodil	F
	Corn Flag	F
	Hyacinth	F
	Rose	F
	Elder Tree	L
	Fleawort	F
	Oak quercus robur	L

	MARCH.	
	Fig Tree	L
	Oak quercus esculus	L
	Lime Tree	L
	Maple	L
	Apple Tree	L
	Ivy	L
	Beam Tree	L
26*th*	Tree of Life	L
	APRIL.	
	Succory	F
12*th*	MAY, *beginning of Summer.*	
15*th*	Wheat harvest	
	Turpentine Tree	F R
	Flower of Constantinople	F
	Rose campion	F
	Asphodel yellow	F
	Ash Tree	F R
	Maple	F R
	Pine	F
	Fir Tree. common	F
	JUNE.	
20*th*	Fir Tree, yew leaved	F
	Yew Tree	F R
	Cornel Tree	F R
	Midsummer shoots of the Oak,	
	The Fig, Vine, and Pomgranate shoots later.	

	JULY.	
30*th*	Etesian winds blow.	
19*th*	AUGUST, *beginning of Autumn.*	
	Lilly	F
	Crocus	F
	Dogberry	F R
	Alder	F R
20*th*	SEPTEMBER.	
	Autumnal Shoots of Trees	
	OCTOBER.	
12*th*	Oak	F R
	Chesnut	F R
	Christ's Thorn	F R
	Hawthorn	F R
	Holm Oak	F R
	Alaternus	F R
29*th*	Venice Sumach	F
	Apple Tree	F R
	Beam Tree, white	F R
	Lime Tree	F R
	Box Tree	F R
	NOVEMBER.	
	Ivy	F R
	Juniper	F R
	Tree of Life	F R
	Yew Tree	F R
	Pear Tree	F R
	Arbutus	F R

This calendar notwithstanding the want of a regular series of dates will indicate, in some measure, the state of vegetation near Athens, 300 years before the christian æra. At this time the climate was probably nearly the same as at present, for the adjacent country was then cleared of wood, and probably was sufficiently drained and well cultivated. The elevation of the plain near Athens may be estimated at not more than sixty feet above the level of the sea, in the adjacent bays between which the city is situated.

But the date of the commencement of the spring, according to this table, is retarded at least a month longer than it ought to be; for the leaves of many trees and of some flowers appear to be in an advanced state early in February; and the beginning of spring is dated on the 12th of March. This is the more exceptionable as many extraordinary late trees for instance, the oak and the walnut put forth their leaves in that month. The summer is fixed from the 12th of May, so that by this arrangement he allows only two months for the spring quarter, which does not correspond with the well known division of the year into four seasons; and especially in the southern latitudes of the temperate zone, where each particular season is very clearly defined.

CALENDAR of FLORA at MONTMORENCI.

Forest Trees and Shrubs.	*Dates.*	*Fruit Trees.*	*Dates.*	*Corn and Pulse.*	*Dates.*	*Remarks.*
White Thorn . . B	*April* . 30	Apricot B	*March* . 18	Oats grain	*June* . 16	*The heat of the different months mentioned in this account according to* FARENHEIT *is as follows:*
Black Thorn . . B	*Ditto* . 10	Apricot R	*July* . 28	Oats ripe	*August* . 1	
Ash . . . . . B	*Ditto* . 25	Cherry B	*April* . 20	Wheat grain	*June* . 16	GREATEST
Lilac . . . . . B	*Ditto* . 26	Cherry R	*June* . 16	Wheat blossom	*July* . 10	March 64
Chesnut, Horse L	*Ditto* . 4	Chesnut B	*July* . 1	Wheat ripe	*August* . 10	April 72
Chesnut, Horse B	*Ditto* . 26	Chesnut R	*October* . 3	Barley grain	*June* . 20	May 72
Elder . . . . B	*May* . 20	Fig B	*April* . 20	Barley ripe	*August* . 1	June 84
Linden B	*April* . 10	Fig R	*July* . 28	Rye grain	*May* . 1	July 89
Linden F	*June* . 15	Strawberry B	*April* . 20	Rye blossom	*Ditto* . 20	August 89
		Strawberry R	*May* . 24	Rye ripe	*July* . 25	MEAN.*
		Currant B	*April* . 6	Beans blossom	*May* . 13	March 44
		Currant R	*June* . 26	Beans ripe	*June* . 14	April 52
		Mulberry . . . L	*April* . 28	Pease blossom	*April* . 30	May 58
		Walnut L	*April* . 22	Pease ripe	*May* . 26	June 61
		Nut	*August* 5			July 68
		Peach B	*March* . 18			August 68
		Peach R	*August* . 12			LEAST.
		Pear B	*April* . 10			March 40
		Pear R	*August* . 10			April 48
		Apple B	*April* . 26			May 55
		Apple R	*July* . 27			June 58
		B	*April* . 18			July 65
		R	*July* . 26			August 65
		Vine Sap rising	*March* . 29			
		Vine Leaves	*April* . 23			
		Vine Blossoms	*June* . 22			
		Vine Green Grapes	*July* . 11			
		Vine Turned	*August* . 17			
		Vine Vintage	*October* 7			

The town of Montmorenci is situated on a gentle rise in the midst of a fertile and extensive valley about ten miles north of Paris, and was once the favourite residence of JEAN JACQUES ROUSSEAU. Although the indefatigable meteorologist PERE COTTE, probably resided in the town, or at least in the environs of it; yet almost all his observations on the rise and progress of vegetation, must necessarily have been made in the adjacent valley. This calendar is extracted from a register kept by him at that place for thirteen years, beginning 1768. The temperature of the latter spring months in this valley, according to his journals, corresponds nearly with that of the warmest vallies in the south of England; but on the contrary, from the beginning of May to the end of October, the weather must always be much warmer on the continent than in England; for at that time of the year the light and heat derived from the sun, is more strongly retained and reflected by the earth than by the sea, and consequently *cæteris paribrus* in summer the continent must always be warmer than Islands; whereas on the contrary, late in autumn, all the winter, and early in spring, when the ground is often covered with ice and snow, or is chilled by cold winds coming from adjacent mountains, or from countries situated to the north. Islands surrounded by the sea, which in these latitudes never freezes, must be warmer than places on the continent of the same parallel of latitude, and nearly at the same degree of elevation. Hence it follows, that early in the spring vegetation is rather more forward with us than in the north of France; but then again, the fruit in autumn is known to come to maturity sooner, and in greater perfection with them; whilst from the moisture and moderate temperature of our atmosphere we excel in herbage, and pasture; by which means, and the superior management of our hay, we possess a much finer breed of horses, and cattle, than almost any of our neighbours on the continent. With respect to sheep we have mutton of equal, if not a superior quality to any in Europe; and were we to adopt the same mode of managing our flocks, as is practised by the Spaniards, in the course of few years we should rival the finest fleeces of the Merino breed.

* The mean heat above-mentioned is evidently not the mean between the two extremes of the year 1768; but the usual mean heat of the country in those months.

BRITISH CALENDAR OF FLORA,

From the 1st of March to the 30th of September, calculated for a place in the latitude of 51, 30, and elevation from the sea 50 feet at high water.

Forest Trees and Shrubs.		*Fruit Trees and Flowers.*		*Corn, Pulse, and Vegetables.*	
MARCH.	MARCH.	MARCH.	MARCH.	MARCH.	MARCH.
Sallow f	8th	Gooseberry l	2nd	Veronica F	7th
Aspern f	11th	Currant l	6th	Primrose F	13th
Hawthorn b	17th	Bay l	8th	Tansey E	18th
Larch Tree b	20th	Cherry B	12th	Sow Oats any time between the 1st and 31st	
Chesnut, horse b	24th	Gooseberry B	14th	Plant Potatoes	20th
		Apricot and Peach B	20th		
APRIL.	APRIL.	APRIL.	APRIL.	APRIL.	APRIL.
Birch B	1st	Raspberries L	2nd	Wheat	all forward.
Willow weeping L	2nd	Currants F	2nd	Oats	
Elm l	2nd	Gooseberries F	2nd	Early Grasses	
Bramble L	3rd	Apricot and Peach B	3rd	Broad Clover	
Maple B	2nd	Apple B	3rd	Rye Grass	
Alder L	2nd	Pear B	5th	Trefoil	
Oak f	4th	Plumb B	6th	Burnet	
Sycamore L	4th	Lilac l	6th	Winter Barley	
Chesnut, Spanish L	4th	Dandelion l	6th	Sow Barley to the 30th	7th
Black Thorn F	5th	Mulberry l	7th	Wild Chervil f	15th
Ash f l	5th	Lime or Linden l	7th	Cow Parsnip f	15th
Beach l	6th	Strawberry F	7th	Pease b	18th
White Thorn f	12th	Walnut F l	8th	Beans b	20th
Birch Tree F		Young Apricots, Peaches and Nectarine	10th		
		Lilac F	10th		
		Jessamine l	12th		
MAY.	MAY.	MAY	MAY.	MAY.	MAY.
Oak F L	2nd	Cowslip F	1st	Wheat swelling	1st
Ash F	4th	Hounds Tongue F	1st	Barley come up	1st
Chesnut, Spanish F	5th	Quince Tree F	5th	Oats begin to ear	4th
White Thorn F	5th	Mulberry L	6th	Rye in ear	4th
Chesnut, horse F	6th	Ditto f	15th	Turnip, Swedish, begin sowing	15th
Alderberry F	18th	Chervil, wild F	17th		
		Gooseberries f	18th		
		Currant f	19th		
JUNE.*	JUNE.	JUNE.	JUNE.	JUNE.	JUNE.
Evergreen Thorn F	1st	Raspberry F	1st	Wheat Ear B	2nd
Bramble F	2nd	Strawberries r	5th	Barley do. B	2nd
Elder F	2nd	Ditto R	20th	Oats do. B	2nd
St. John's wort F	12th	Cherries, duke r	15th	Rye do. B	2nd
Oak, Beach, Elm, midsummer shoots	15th	Ditto R	25th	Broad Clover F	3rd
		Currants r	25th	Trefoil F	3rd
		Ditto R	30th	Pease F	3rd
		Gooseberries r	30th	Beans F	3rd
		Ditto R	30th	Rye Grass F	3rd
JULY.	JULY.	JULY.	JULY.	JULY†	JULY.
Beach F	1st	Strawberries R	1st	Wild Carrot F	1st
Willow spiked of Theophrastus F	4th	Raspberries R	1st	Dog Grass F	1st
Lime or Linden F	5th	Lavender F	1st	Hedge parsley F	2nd
Bramble, berries red F	10th	Kidney Beans F	3rd	Potatoes F	2nd
		White Lilly F	3rd	Asparagus F	6th
		Jessamine F	3rd		
AUGUST.	AUGUST.	AUGUST.	AUGUST.	AUGUST.	AUGUST.
Beach mast F	4th	Apricot R	2nd	Oats R	5th
Acorns S	4th	Walnut§ c	8th	Barley R	5th
Ash Keys S	4th	Cerneau	8th	Wheat R	10th
Golden rod S	2nd	Peaches R	18th	Pease R	10th
Haws S	3rd	Nectarines R	18th	Beans R	12th
Sloes S	2nd	Apples, early Pears R	16th		
Travellers joy F	20th				
SEPTEMBER.‖	SEPTEMBER.	SEPTEMBER.	SEPTEMBER.	SEPTEMBER.	
Mountain Ash S	14th	Peaches R	1st	Wheat sowed from the 10th to the 30th of this month. The best season for sowing in all parts of Great Britain, and sown as soon after the plough as possible.	
Laurel S	14th	Nectarines R	1st		
Beach mast S	18th	Plumbs R	5th		
Acorns S	20th	Pears R	5th		
Ash Keys S	21st	Apples R	5th		
Hips S	24th	Grapes R	30th		
Haws S	25th	Ditto R	OCT. 10th		
Sloes S	29th				

* In June almost all the forest and fruit trees are in leaf, and the blossoms of many set; little notice therefore will be taken of them in this month. Dutch clover, rye grass, and trefoil, with broad clover, may be mowed from the 8th to the 12th of June. Other meadow in general, and particularly where the *cynosurus cæruleus*, *anthoxanthum oderatum*, *alopecurus pretensis*, and *festuca pratensis* flourish, when judiciously managed, may be mowed before the end of June.

† The heat and moisture of July produces an infinite number of weeds, which require the unremitting attention of the gardener and farmer.

§ The cerneau of the walnut is the nut opened, when the kernel is just formed, and before it becomes hard. It is then picked out with a wooden skewer, and put in cold water with a small quantity of salt, and is highly esteemed in a French desert; being deemed more wholesome also than when the nut is quite ripe.

‖ The catkins of the hazel are formed early in this month. On the bramble will often be found at the same time green, red, and black berries. The catkins of the alder also form about the middle of the month. Much about the same time the leaves of the birch, sycamore, lime, mountain ash, and elm begin to fade; and towards the end of the month those of the oak and ash; which altogether form the beautiful autumnal tints in the forest so universally admired.

EXPLANATION OF MARKS.

b—Buds swelled
B—Full blossom
c—Emerging out of the ground
E—Emerged
f—Flowers opening
F—Flowers opened
l—Leaf appearing
L—Full blown
r—Fruit beginning to ripen
R—Ripe fruit
s—Fruit setting
S—Fruit set.

The preceding different calendars serve to indicate the rise and progress of vegetation from the latitude of 37, 25, to 51, 30, North. The first is transcribed from STILLINGFLEET, who compiled it from the history of plants by THEOPHRASTUS. The second is extracted from Pere COTTE, who resided at Montmorenci in France. The third is calculated for a valley in England near the metropolis; and the fourth is copied from Alexander MAL BERGER at Upsal, cited likewise by STILLINGFLEET.

Thus it appears that vegetation is more forward at Athens than in England, by at least 90 days. The wheat harvest is supposed at the former to begin on the 15th of May; and in England, very seldom before the first week of August, at soonest. In the plains of Languedoc near Toulouse, the harvest generally begins about three weeks later than either at Athens, or in the Morea, or the plains of the coast of Barbary; which may partly be ascribed to the cold currents of air from the Pyrenees, and also from the Alps, which retard the harvest in the south of France. But as we advance northward the province of Touraine which is considered as the garden of France, the wheat there seldom ripens until a fortnight or three weeks after the summer sol-

stice, and according to Pere Cotte in what is called the Isle of France, in which Paris is situated, the wheat harvest corresponds with ours in the plains of the southern counties of England. But it may be proper in this place to observe, that the obvious appearance of the spring as we advance from the south of France, is nearly in the following rotation. It begins near Montpellier, in the latitude of 43, 56, 50, on the 6th of February. At Tours about the 10th, and near Paris in the latitude 48, 50, 14, about the 15th. In the south and the centre of France, the autumn likewise continues almost to the middle of November. On the 11th, the summer of St. Martin begins and terminates about the 20th or 25th, which consequently in those countries leaves but a short winter of about six weeks, or at most two months; and all the rest of the year the temperature of the air at noon, is seldom below 60 degrees of Farenheit's thermometer. Advancing still further north than England, towards Sweden, we find a different division of the year; a backward cold spring, a hot summer, and a short autumn, with a long and severe winter.

The first month in Sweden is called the reviving month, which begins at the winter solstice, and ends at the vernal eqninox,

The second is the thawing month, from the vernal equinox, to the 12th of April.

The third, the budding month from the 12th of April, to May 9th.

The fourth, the leafing month from May 9th, to May 25th.

The fifth, the flowering month from May 25th, to June 20th solstice.

The sixth, the fruiting month, from June 20th, to July 12th.

The seventh, the ripening month, from July 12th, to August 4th.

The eighth, the reaping month, from August 4th, to 28th.

The ninth, the sowing month, from August 28th, to September 22d.

The tenth, the shedding month, from September 22d, to October 28th.

The eleventh, the freezing month, from October 28th, to November 5th.

The twelfth, the dead winter month, from November 5th, to December 22d.

In the leafing month beginning on the 5th of May, the filberd is very early in leaf. The birch, the barberry bush, and the osier are the next in succession. About the 14th the lilac, and the alder are in full leaf; next follow the elm about the 15th, together with the white and black thorn. On the 16th the apple and cherry shew their leaves. And also the chesnut, beach, hornbeam, and black poplar. The oak and ash leaves burst forth usually between the 20th and 25th. Immediately following the leaden nights, the ash leaves appear discoloured at Upsal, when the green-house plants are brought out into the open air.

Few flowers blow in this month, but they are very abundant in the next; when birds also begin to hatch, and also insects to appear, which serve the young birds for food.

On the 7th of June the summer is considered at Upsal in its highest beauty, and the greatest heat in

the shade is near 86 degrees of FARENHEIT. Trees seldom grow much after the solstice, at this time therefore the hedges are usually clipped.

The hay harvest commonly begins about the 7th of July, at which time the briar or dog rose blows; and also the lime or linden tree is in blossom. Barley is in ear, peas ripe, and both the cherries and currants, begin to ripen about the 15th of this month, which is considered as the middle of the hay harvest.

The barley harvest usually commences between the 15th and 20th of August near Upsal; before the end of the month meadow-saffron blows, and the iron nights begin when all tender plants are carefully housed, which would otherwise be destroyed. At this time also there are heavy squalls of wind which shake off the ripened seed, unless gathered in due time. Soon after the autumnal equinox, the leaves of the trees change colour; the oak, the maple, robinia, caragana, elm and lime become yellow; the aspen brown, the quicken and the sumach red. At this period likewise, storms prevail. Between the first and the end of October, almost all the leaves fall, towards the 10th of the month the frost sometimes becomes severe; and on the 20th the winter decidedly commences

An observation of Mr. TOURNEFORT is often quoted, to prove that the same plants are found on the sides and summit of lofty mountains to the southward, as on those plains which are situated within the arctic circle. He observes that at the bottom of Mount Ararat, he found the common plants of Armenia; a little higher those of Italy; then those which grow near Paris; to those succeeded Swedish plants; and finally on the summit those of Lapland and Siberia. It is to be regretted, that Mr. TOURNEFORT has not mentioned the kind of plants to which he alludes. For although during the end of autumn, the whole of the winter, and at the beginning of spring, the temperature of the summit of Mount Ararat, may according to its height be nearly the same as that of the plains in the arctic circle; nevertheless when the snow has melted, as it annually does in Siberia, and Lapland, in the months of July and August; vegetation will be in a very different state in those countries during the hot summer months; to what it will be at the same time on the summit of a cold lofty mountain to the southward, where perpetual winter prevails. It must not be supposed that this remark is meant wantonly to impeach the veracity or judgment of an ingenious philosopher; it is intended merely to suggest to other travellers the necessity of giving a more circumstantial account of the

plants in question, as well as the exact height of that part of the mountain on which they grow. Geographers in general are not agreed respecting the name or true situation of mount Ararat. But it is probably the highest hill of that range which is situated near the city of Irivan, or as some write it Shirwan, in Persia, near a lake of the same name, situated in the latitude of 41, 15, 0, north. Sir J. CHARDIN, whose travels may be considered as a classical work, speaks of this range of mountains in general, as both bleak and barren. All that part of the mountain over which he passed, he says, was entirely covered with snow; nothing else was visible, neither tree, nor plant. The road was merely a path of snow hardened by the feet of horses, and travellers; but which he expressly asserts never melts. At the same time he remarks that in sacred writ, the whole country of Armenia is always called Ararat. It is watered by seven beautiful little rivers, for which reason the old interpreters of the bible have considered it as the situation of Paradise. The lake is called by the natives the fresh water sea, and produces abundance of fine fish. The rivers Zengui and Araxes originate in this lake, and after traversing a considerable extent of country, they enter the Caspian sea. But neither the lake nor the rivers are yet noted in common maps.

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NOTE ON LATE HOURS.

IT is within the recollection of many whose memories are not yet impaired by time, that the nobility and gentry of England formerly retired to the country in the month of May; where by a familiar intercourse with their friends and tenants, they enjoyed the rational pleasures of society, with the heartfelt satisfaction of spending a considerable portion of their annual income amongst those from whom it was originally derived.—When any casual misfortune made pecuniary assistance necessary, the landlord and his family being frequently on the spot, they were able to judge of the character and conduct of those who might require occasional relief; which seldom was witheld where the claim for assistance was known to be well founded. Such a

rational state of society, in which all the links of it were strongly united, could not fail to render Great Britain at that time the happiest and most powerful nation upon earth. But the modern refinement of a late residence in town during the summer, has blotted the spring out of the British calendar, and thus entirely broken this admirable chain. The landlord and tenant are no longer acquainted, and the poor labourer instead of having his heart animated with love and respect for a generous benefactor, who studiously conceals from all the world those bounties he secretly bestows; is now compelled openly, and very assiduously to seek relief from the parish officer, who too often refuses it where it is most wanted; and too often grants it, where it ought to be refused. Besides even where it is liberally given, the independant spirited freeman is thus converted into a miserable broken hearted pauper, unwilling to dig, but now no longer ashamed to beg. In this, as in most other deviations from the path of reason and nature, however, the crime carries the punishment with it. Those who thoughtlessly run into the excess of this fashion, are tempted by the late hours now almost universally adopted in the metropolis, completely to turn day into night; and for the reasons already stated in the essay on this subject, they irreparably injure their health. A cursory view of their habits

will clearly prove the fact. They carefully exclude both light and air from their bed rooms, and having respired a contaminated atmosphere for eight or ten hours, whilst they lie immersed all that time in a hot bath of mephetic vapour; they rise oppressed instead of being refreshed with sleep; with their blood heated, and every nerve unstrung. Even those who reside in the country and observe the rational hours of our ancestors, are too apt to run into this mistake; but those who live in London all the spring and great part of the summer, cannot possibly avoid it; they retire to rest only an hour or two before sun rise, and consequently remain in this wretched state, with the sun constantly encreasing the heat of the atmosphere and the thermometer; which was perhaps at 60 degrees when they retired to bed, will rise ten degrees before they quit it again. The remedy for those who are inclined to keep good hours is very easy; but a considerable change is necessary even for them in the whole arrangement both of the bed and the room. In making the bed for example it is customary to bring up the sheet, the blanket, and the coverlid very high, and then the whole of them are doubled back again so as to form a mass of covering over nearly one half of the body.—It is surprising such an error should have crept into almost general use. For the most regular heat of course

lies about the region of the heart, where the circulation of the blood is most active; and also in the stomach where a mild fermentation is insensibly kept up for the purpose of digestion. The warmth of these parts when in health, is nearly 98 degrees of FARENHEIT. It is the feet which require additional covering, and for this reason the French use a couvre-pied, consisting of a light coverlid which remains folded at the bottom of the bed, to be employed as occasion may require. It is recommended to keep a thermometer in the bed-room, by which the arrangement of the bed-cloaths may be regulated. When it ascends 2 or 3 degrees, the quilt which with the other coverings should lie single over the shoulders, may be lowered eighteen inches or two feet; when the thermometer rises 5 or 6 degrees, it may be removed still lower. But on the contrary when the thermometer descends 2 or 3 degrees, the couvre-pied may be drawn half way up the bed; and when the difference is 5 or 6 degrees, it may be prudent to bring it up as high as the rest of the bed-cloaths.

With a thermometer in the bed-chamber, especially without a fire, these precautions are easily taken; and they are particularly necessary early in the spring, and late in the autumn; when in the course of twenty-four hours the temperature of the air will sometimes vary

near 20 degrees. Many colds, and still more fevers are caught by inattention to these circumstances than is generally believed. In the winter and summer these changes are not so common; and besides the temperature of air in the house for the night at these seasons is usually settled before eleven o'clock.

It is too much the custom in England also to sleep on a feather bed, which is much better calculated for the frozen regions of Sweden and Russia. A good hair mattrass covered with a fine blanket is much more salutary. With respect to the management of the window and the bed-curtains, the less they are drawn the better, particularly the latter; for a stagnant air thus breathed for eight or ten hours must be excessively unwholesome, even where the parties are in perfect health; and where they are indisposed, is almost poisonous. It has already been observed that the atmosphere consists of two gases, oxygen and azote. Without affecting chemical precision on this subject, they may be stated as being nearly in the proportion of 27 to 73 of 100 parts. When a quantity of atmospheric air by means of the curtains is shut up in the bed, in which often two persons sleep; the air is repeatedly respired, and is at length deprived of a great portion of the oxygen or vital air; the remainder, as the name itself implies,

then becomes destructive of life, and were it not imperceptibly changed, notwithstanding it is studiously wished to exclude it, few people could survive the night. In this place likewise it may be proper to remark that some ladies, in addition to this unwholesome practice, keep sweet scented flowers in their bed-rooms; which at night give out a deleterious air, that may in excess prove fatal, and must always at least greatly injure the nerves.

It is much the custom, particularly in towns, to burn a lamp or rush-light in a room, which in the opinion of the late Sir John Fielding, who was well informed on these subjects, is an excellent precaution against house-breakers; and besides, it is certainly useful in case of any alarm, in one or two rooms of every gentleman's house. But then lights should always be carefully placed in the chimney to avoid the danger of fire; and still more to preserve the purity of the air in a bed-chamber, for otherwise the atmosphere of a small room is soon impregnated with this greasy vapour, which before morning will be repeatedly inhaled, and consequently injure the respiration by preventing the lungs throwing off the moisture and azote which would otherwise be constantly discharged at every expiration.

Those who live much in the country may adopt any of these suggestions which they deem worthy of their attention; and even those who think proper to persevere in keeping late hours, and pass nine months of the year in the metropolis will excuse what possibly they may consider as trifling and presumtuous observations on their present habits; which it is much wished they may not find, when too late, they have too much cause to repent.

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Pronostics du Barometre observe sur mer, relativement aux tempetes.

MON. BLONDEAU *rapporte (c) que le 4 Octobre* 1765, jour ou il y eut un coup de vent violent, le capitaine d'une flotte marchande qui etoit sur le point d'appareiller de Bayonne, s'apercut que son barometre etoit descendu plus bas que dans les autres coups de vent: il dit donc aux armateurs, qu'il prevoyoit pour ce jour-la une tourmente des plus violentes. On se moqua de lui, on lui reprocha meme d'avoir peur: "oui, dit-il, je crains de commetre une temerite en agissant contre less lumieres certaines qui j'ai, mais je crains encore plus la tache qu'on voudroit imprimer sur mes sentimens; nous sortirons, malheur a ceux qui en seront cause." Le lendemain corps, et biens, presque tout etoit perdu.

Mon. Rosnevet qui accompagna Mon. De Kerguelin, dans sa seconde campagne aux *terres australes*, a declare a son retour, de *concert* avec les autres officiers, qui le barometre leur avoit ete fort utile, en leur indiquant a propos les changemens de temps, sur-tout les momens ou il convenoit de s'ecarter de la terre, et ceux ou on en pouvoit approcher sans risque.

Mon. le Chevalier De Borda a reconnu aussi dans ses voyages, l'utilite du barometre pour prevoir les temps facheux ; *son equipage avoit* pris une telle confiance dans cet instrument, qu'il suffisoit de dire, pour etre obei sur le champ, que le barometre indiquoit la necessite de prendre telle ou telle precaution.

Enfin. Mon. Blondeau rapporte le temoignage de Mon. De Vigny, qui dans un voyage de Chine, eut lieu de se louer de l'utilite qu'il avoit retiree de *son* barometre, quoiqu'il *fut fort defectueux* lui arriva aux *environs* du cap de bon esperance, d'ordonner des manœuvres propres au gros temps, en consequence d'un tres-grand abaissement qu'il venoit d'observer dans son barometre : tout le monde repugnoit a cet ordre, parce que les apparences etoient contraires a cette prediction du barometre ; cependant a *peine avoit on* fini les dernieres manœuvres, que le vaisseau fut accuelli d'une tempete tres considerable.

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Table of Lunar Cycles for 228 years.

1st Period.	2d Period.	3rd Period.	4th Period.	5th Period.	6th Period.	7th Period.	8th Period.	9th Period.	10th Period.	11th Period.	12th Period.
1681	1700	1719	1738	1757	1776	1795	1814	1833	1852	1871	1890
1682	1701	1720	1739	1758	1777	1796	1815	1834	1853	1872	1891
1683	1702	1721	1740	1759	1778	1797	1816	1835	1854	1873	1892
1684	1703	1722	1741	1760	1779	1798	1817	1836	1855	1874	1893
1685	1704	1723	1742	1761	1780	1799	1818	1837	1856	1875	1894
1686	1705	1724	1743	1762	1781	1800	1819	1838	1857	1876	1895
1687	1706	1725	1744	1763	1782	1801	1820	1832	1858	1877	1896
1688	1707	1726	1745	1764	1783	1802	1821	1840	1859	1878	1897
1689	1708	1727	1746	1765	1784	1803	1822	1841	1860	1879	1898
1690	1709	1728	1747	1766	1785	1804	1823	1842	1861	1880	1899
1691	1710	1729	1748	1767	1786	1805	1824	1843	1862	1881	1900
1692	1711	1730	1749	1768	1787	1806	1825	1844	1863	1882	1901
1693	1712	1731	1750	1769	1788	1807	1826	1845	1864	1883	1902
1694	1713	1732	1751	1770	1789	1808	1827	1846	1865	1884	1903
1695	1714	1733	1752	1771	1790	1809	1828	1847	1866	1885	1904
1696	1715	1734	1753	1772	1791	1810	1829	1848	1867	1886	1905
1697	1716	1735	1754	1773	1792	1811	1830	1849	1868	1887	1906
1698	1717	1736	1755	1774	1793	1812	1831	1850	1869	1888	1907
1699	1718	1737	1756	1775	1794	1813	1832	1851	1870	1889	1908

IN the *connoissance des temps* of the year 1780, page 324, a striking resemblance is noted by Mr. DUHAMEL, in the temperature of the years 1701, 1720, 1739, 1758, and 1777. But to come nearer to our own time, the warmth and drought of the summer of 1781 and 1800 must now be well remembered by many. The former has been repeatedly mentioned in a variety of foreign journals; and the latter is recorded, as before observed in our own tables; and also by Mr. BENT, who has published meteorological journals kept by him in London for many years. In his general remarks on the year 1800 he says, "the distinguishing feature in this year is a hot and dry summer, little more than an inch of rain, fell in the former part of June; and from the 22d of that month a continued drought prevailed for 58 days to the 19th of August." But the truth of our hypothesis respecting the effects produced by the circulation of the electrical fluid from the periodical return of the tides, which are coincident with the revolution of the moon; need not rest on the bare testimony of one or two solitary facts.—

Toaldo, than whom no person has paid more attention to this subject, in a new edition of his *Saggio Meteorologico* published in 1781, very confidently asserts that the return of cold and warm, wet and dry years, evidently corresponds with the return of eclipses; which of course only occur at the expiration of about 18 years and 11 days; and in a subsequent work entitled "The Meteorological Saros," he strongly insists on being able to prove the existence of lunar influence on the weather, during 57 years, or three lunar cycles, from 1725 to 1781. Thus far we proceed from what may be deemed authentic records. But still not to depend solely on retrospective enquiry, though sanctioned by such respectable names as Duhamel & Toaldo; we recommend having recourse to a more easy and obvious mode of establishing this important point, by observations made as the events are daily passing before us.

Suppose for instance we take the correspondent cycles of the following years 1809 and 1810; the former will include the years 1771, 1790, and 1809. The latter 1772, 1791, and 1810, after having made a comparison of the two preceding years of each cycle, carefully noting the weather that may be expected for the existing or ensuing year. The fact of the resemb-

lance or difference of these correspondent years must evidently appear successively every day, admitting of no deviation or mistakes either by design or accident. It must however be remembered that according to our hypothesis the weather varies in almost every different degree of latitude; and even frequently in different places of the same parallel, for it evidently depends on the nature of the country; whether it be mountainous, or plain; covered with wood, barren, or cultivated; situated near the coast or remote from the sea. It will therefore be necessary that meteorological journals should be considered as local and temporary records; and therefore they must be kept and published in different parts of every county in these united kingdoms, in which must be carefully noted the heights of the barometer, and thermometer; and the variations of the electrometer. the direction and rapidity of the wind; the changes of the moon, and the state of the tides on the sea coast, omitting no other circumstance that can reasonably be supposed to be connected with the weather. It would be difficult to procure journals for the years 1771, and 1790, and a comparison having thus been made at any given place between the weather of the two preceding cycles the daily appearances of the weather for the existing or ensuing year of the same cycles would be easily noticed as they

pass; but time must be given for the general adoption of this plan. It may therefore be as well to postpone these observations another twelve month, when the correspondent years of 1772, 1791, and 1810 will equally well answer the purpose. By these means likewise time will be given for the collection of the necessary materials for such a publication, even in the most remote parts of the kingdom. After this experiment has been judiciously made; should no general resemblance of seasons or uniform character of weather be discovered in the same places, and during the correspondent years of each cycle; the opinion of lunar influence either proximate, or remote, would with great propriety be hereafter abandoned.

Still however admitting that such a decisive conclusion should be the result of this enquiry; which from our own experience we confidently expect will not be the case; the time thus employed would not have been entirely thrown away; for not only by these means an *Ignis Fatuus* which has long misled the world, would be for ever extinguished. But an active spirit of investigation on this interesting subject, would likewise be universally excited; and it is far from improbable that in the course of a few years it may become as easy to judge of the approaching changes of the

wind and weather, as to predict the flux and reflux of the tides; or to calculate an eclipse either of the sun or the moon. Many of these different revolutions are known to be subject to fixed, and immutable laws; some of them are already well understood; and those on which meteorology depends; are in all probability equally attainable if diligently and intelligently pursued.

All nature is but art unknown to thee.
All chance direction, which thou can'st not see.
All discord, harmony not understood.
All partial evil, universal good.

POPE.

FINIS.

ERRATA.

PAGE 59, line 12, vernal read *autumnal.*

114, 8, before vacuum insert *a.*

123, 8, through read *although.*

154, 2, moves read *move.*

167, 8, there read *three.*

In the 3d line from the bottom of the first column, of the Calendar of Flora at Montmorenci, for paribrus read *paribus.*

Bird, Printer, Cardiff.