

Shepherd of Bambury's
Rules

By John Claridge

Scotch unnumbered Edition

OB

C591

1755

Edinburgh
1755

National Oceanic and Atmospheric Administration

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T. H. E.
SHEPHERD of BANBURY'S
R U L E S
TO JUDGE OF THE
C H A N G E S
O F T H E
W E A T H E R,

JAN 26 1855
BUREAU
RARE BOOK
OC
995
CS2
1755

Grounded on Forty Years Experience.

To which is added

A RATIONAL ACCOUNT of the Causes of
such Alterations; the Nature of Wind, Rain,
Snow, &c. on the Principles of the *Newto-
nian* Philosophy.

BY JOHN CLARIDGE.

EDINBURGH:
Printed for JAMES REID, Bookfeller in *Leith*.
M.DCC.LV.

Almost identical with the
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and bound at the end of
Reid J. The Scots Gardener
1766

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INTRODUCTION.

AS we very justly esteem it a fit tribute of admiration to adorn natural curiosities, by setting them as richly and as advantageously as art can direct, so the following observations of the shepherd of Banbury have appeared to me worthy of being presented to the eye of the public, with all the lustre that it was in my power to give them. It is one thing to observe, and another to reason upon observations; and it very rarely happens that both can be taken into the compass of one man's life. We ought therefore to consider it as a very lucky incident, when the observations of another man, upon whom we can depend, fall into our hands, and enable us to add natural experience to the notions derived to us from books of philosophy.

There is a degree of pedantry in desarts as well as colleges. Men who derive their knowledge entirely from experience, are apt to despise what they call book-learning; and men of great reading are as apt to fall into a less excusable mistake, that of taking the knowledge of words for the knowledge of things: whereas there are not any two points more opposite in nature, since we very rarely see, that either true scholars are talkative, or that talkative men are true scholars.

The shepherd, whose business it is to observe what has a reference to the flock under his care, who spends all his days, and many of his nights, in the open air, and under the wide-spread canopy of heaven, is in a manner obliged to take particular notice of the alterations of the weather; and when once he comes to take a pleasure in making such observations, it is amazing how great a progress he makes in them, and to how

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great a certainty at last he arrives, by mere dint of comparing signs and events, and correcting one remark by another. Every thing in time becomes to him a sort of weather-gage. The sun, the moon, the stars, the clouds, the winds, the mists, the trees, the flowers, the herbs, and almost every animal with which he is acquainted; all these, I say, become to such a person instruments of real knowledge.

There are a sort of half-wise people, who, from the consideration of the distances of things, are apt to treat such prognostications, as they phrase them, with much contempt. They can see no connexion between a cat's washing her face, and the sky's being overspread with clouds; and therefore they boldly pronounce that the one has no relation to the other. Yet the same people will readily own that the fluttering of the flame of a candle is a certain token of wind, which however is not discernible by their feeling; because it lies within the compass of their understanding, to discern that this fluctuation of the flame is caused by the wind acting upon it, and therefore they are inclined to believe this, tho' it does not fall actually under the cognisance of their senses. But a man of a larger compass of knowledge, who is acquainted with the nature and qualities of the air, and knows what an effect any alterations in the weight, the dryness, or the humidity of it has upon all animal bodies, easily perceives the reason why other animals are much sooner sensible of any alterations that happen in that element than men; and therefore to him the cawing of Ravens, the chattering of swallows, and a cat's washing her face are not superstitious signs, but natural tokens (like that of the candle's fluttering) of a change of weather; and, as such, they have been thought worthy of notice by Aristotle, Virgil, Pliny, and all the wisest and gravest writers of antiquity.

But still a few slight and trivial observations of this kind, and such as are in the power of every man to

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make, go but a very little way in furnishing us with an useful knowledge of the indications of the weather. To supply these, and to have constantly at hand the means of judging of these alterations, men of great genius have invented, (and wonderful inventions they are!) instruments for measuring the heat, the cold, the weight, the dryness, and the humidity of the air, with great exactness, and upon these they reason as to the changes of weather with great accuracy and certainty. It would undoubtedly be a great folly to pretend to question either the truth of their observations, or the usefulness of them: but then we may have leave to consider how far, and to how great a degree they are useful. The thermometer measures exactly the degrees of heat; but the air must be hot to such or such a degree, before it is discerned by this instrument. The barometer indicates the weight of the air, and the rising and falling of the quick-silver expresses the alterations in its weight with wonderful nicety; but then those alterations are the cause of this. In like manner the hygrometer, or hygroscope, measures the dryness or humidity of the air very plainly and very exactly; but the weather must alter, must become drier or moister than it was, before these alterations are visible; and therefore however ingenious, however curious, however useful these instruments may be in other respects, they undoubtedly contribute very little to the prognosticating a change of weather at a distance; and it is from the experience of this, that they are so little esteemed, so lightly regarded by the common people.

Our shepherd's observations are of quite another nature: most of them give us a day's notice, many a week's, and some extend to several month's prognostication of the changes of the weather: and of how great use these may be to all ranks and degrees of people, to the sedentary valetudinarian, as well as the active tra-

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ve'ler; to the sportsman who pursues his game, as well as to the industrious husbandman, who constantly follows his labour; in short to every man in every situation, in some degree or other, is so very clear and intelligible, that it would be a mere waste of words, and a very idle display of rhetoric to attempt the making it clearer. Every man living would be glad to foresee the alterations of weather if he could; and consequently to most people, if not to all, these observations, grounded on no less than forty years experience, cannot but be acceptable.

To make the best use of one's talent, and to employ the lights derived from the station in which providence has placed one, for the benefit of mankind, is undoubtedly discharging one's duty, answering the end of our creation, and corresponding with the oeconomy of nature, which does nothing in vain. This proposition is equally true, let a man's station be what it will. It is the manner in which we perform, and not the character that makes the player; and in this sense what man is not a player? Here then is an instance of one who has for many years studied his part, and now communicates his discoveries freely. In a physician, in a philosopher, in a mathematician, this would be highly commendable; and why not in a shepherd? We do not cast our own parts in the drama of life; no, this is performed by the great author of nature. He who adjusted every thing on earth with such beauty and harmony; he who taught the heavenly bodies to move, the same distributed their several offices to men. May we not therefore suppose, that every man's part is well cast, and that our abilities are exactly proportioned to our Stations? If so, he who does all he can, does all that ought to be expected from him, and merits from impartial judges the most general and just applause. To be convinced of this, we need only reflect on the nar-

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row and selfish conduct of some, who, either by study or by chance, have acquired certain valuable secrets, which, with the utmost industry, they conceal, in order to be the more admired, or that they may render them beneficial to themselves. How contrary the conduct of our shepherd! His pains were all his own, but the Fruit of them he thus generously offers to the public. Good sense and the dictates of nature taught him this maxim, "That what might benefit *many*, should not be concealed by *one* from views of *profit* or of *pride*."

In my remarks upon the shepherd's rules, I have sometimes endeavour'd to support them by authorities, which I must confess would have been of little use if the author had been a person of learning; but when it is considered, that these observations were purely the effect of his own attention and experience, it certainly strengthens them, and adds greatly to their credit, that they have been esteemed evident signs of the same effects, by the greatest masters in this kind of science. The art of prognosticating the weather may be considered as a kind of decyphering; and in that art it is always allowed a point of great consequence, when several masters therein agree as to the meaning of a character: and it is from thence very justly presum'd, that this character is rightly decyphered. I have also endeavour'd to explain most of his observations according to the rules of the new philosophy, which, as it is grounded upon experiments, so it, generally speaking, enables us to give a fair and rational account of almost all the phænomena taken notice of by the shepherd of Banbury. I likewise have added some other rules in relation to the weather, taken from the common sayings of our country people, and from old English books of husbandry; but I have distinguished all these from the observations themselves: so that the

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reader will have no trouble to discern the text from the commentary, or to know what belongs to the shepherd of Banbury, and what to the editor of his observations. This, I think, may serve by way of introduction: let us now proceed to the rules themselves.

T H E
COUNTRY KALENDAR,
OR THE
SHEPHERD of *BANBURY*'s
OBSERVATIONS.

I.

SUN. *If the Sun rise red and fiery---wind and rain.*

THE reason of this appearance is, because the Sun shines thro' a large mass of vapours, which occasions that red colour that has been always esteemed a sign of rain; especially if the face of the sun appear bigger than it ought: for then in a few hours the clouds will grow black, and be condens'd into rain; sudden and sharp if in the summer, but settled and moderate if in winter.

The old English rule, published in our first almanacks, agrees exactly with our author's observation :

If red the sun begins his race,

Be sure that rain will fall apace.

If the reader would see this elegantly describ'd, the master of poets hath it thus : *

Above the rest, the sun who never lies,

Foretels the change of weather in the skies;

* *Sol quoque & exorions, & cum se condit in undas,
Signa dabit; Solem certissima signa sequuntur,
Et quæ mare refert, & quæ surgentibus *Aethris*.
Ille ubi nascentem *maculis* variaverit ortum
Conditus in nubem, medioque refugerit orbe ;
Suspecti tibi sint *imbres*. Namque urget ab alto
Arboribusque satisque notus pecorique sinister,*

For if he rise unwilling to his race,
 Clouds on his brow, and spots upon his face ;
 Or if thro' mists he shoots his sullen beams,
 Frugal of light, in loose and straggling streams,
 Suspect a drizzling day and southern rain,
 Fatal to fruits, and flocks, and promis'd grain.

II. *If cloudy, and it soon decrease*---Certain fair weather.

I Conceive the reason of this to be, that the vapours being then specifically lighter than the air, are still rising upwards, in which they are assisted by the heat of the sun-beams; agreeable to the notion of Dr. Derham, who observes, that after much cloudy weather it is always fair before it rains, because the watry vapours are not condensed till they reach the cold upper regions; agreeable to the common English saying,

The evening red and morning grey,
 Is a sign of a fair day.

It is also an observation of Pliny's, in his natural history: *

“ Si ab ortu solis repellentur nubes, & ad occasum abibunt, Serenitatem denunciabunt:” That is,

If at sun-rising the clouds are driven away, and retire as it were to the West, this denotes fair weather.

There is an old adage to this purpose, which, because it is so very prettily expressed, deserves our notice, viz.

A red evening and a grey morning sets the pilgrim a-walking.

In French thus :

Le rouge soir, & blanc matin,
 Font revivre le pelerin.

The Italians say the same:

Sera rosa, & nigro matino,
 Allegra il peregrino.

* Nat. Hist. Lib. XVIII. Cap. 35.

III. CLOUDS. *Small and round, like a dapple-grey, with a North-wind---*Fair weather for 2 or 3 days.

THIS is differently expressed by other authors. My lord Bacon tells us, that if clouds appear white, and drive to the *N. W.* it is a sign of several days fair weather.

Our old English almanacks have a maxim to this purpose:

If woolly fleeces spread the heavenly way,

Be sure no rain disturbs the summer-day.

And Pliny to the same purpose *, “ Si sol oriens cingetur orbe, & postea totus defluxerit æqualiter, Serenitatem dabit :” That is, if the rising sun be encompassed with an iris or circle of white clouds, and they equally fly away, this is a sign of fair weather.

There is another English proverb worth remembering;

In the decay of the moon,

A cloudy morning bodes a fair afternoon.

IV. *Large like rocks-----*Great showers.

IN the old almanacks, we have this sign of the weather thus expressed,

When clouds appear like rocks and towers,

The earth's refreshed by frequent showers.

The reason of this seems to be, that the watry vapours are then condensed, or condensing, which gives them this rough and ragged appearance: and as soon as the thin films that retain the water are broke by this pressure, these heavy clouds descend in rain.

These observations, as well as some that follow, are agreeable to all climates, which is the reason that they appear in so many different authors, and have been taken notice of in so many ages. This however does not at all diminish the credit, or the merit of our shepherd's observations, who certainly drew them not from books, but from his own experience, and therefore their

* Ut supra.

agreeing so well with the rules of other great masters ought to establish his authority: in such cases as are not supported by a like concurrence from ancient or modern writers, the testimony of nature is always sufficient evidence.

V. If small clouds increase-----Much rain.

THIS and the following observation cannot well be understood, without giving some account of clouds in general: The atmosphere is supposed to extend itself about five miles round this globe of earth, and within that space move all kind of vapours, exhal'd by the sun's force, or protruded by the subterraneous heat. The ascending of these vapours into the air depends upon many things; and is therefore as different as its causes: for instance, their ascent depends, in the *first* place, on the degree of heat with which they are drawn up or forc'd out; *next*, upon the lightness of the vapours themselves; *3dly*, on the density or rarity of the air thro' which they pass; and *lastly*, on the force and direction of the winds which they encounter in their passage.

According to the nature of these vapours, and the circumstance attending their passage, they appear to us differently below. For, if they be extremely subtile, they mount very high, and there, according to the sentiments of Sir Isaac Newton, form by refraction the azure or blue colour that overspreads the sky in serene weather. Clouds, while they remain visible, do not rise above the height of a mile; and we always observe, that the highest are of a very light colour, and hardly seen. If, therefore, small clouds increase, it shews, that the disposition of the air is such, as that these clouds cannot rise therein, either from their own weight, the want of a protrusive force, or from the falling of the wind, which, in cloudy weather, is always a sign of rain.

VI. *If large clouds decrease-----Fair weather.*

THE same kind of reasoning accounts very clearly for this prognostick, since it shews, that the vapours are either exhal'd by the sun's heat, or are driven off by winds, and so resolv'd into smaller clouds, capable of ascending higher in the atmosphere; all which are circumstances that secure us from rain, and afford us a certainty of fair weather.

It is, however, to be observed, that large black clouds are frequently, in a summer-evening, melted into dews; and this much more frequently happens in the autumn, because the evenings are then cooler, and the vapours more easily condensed for that reason. In all observations of this sort, there is a great degree of prudence and good sense required to apply them; and hence it very frequently happens, that such observations are condemn'd as treacherous and abusive, merely because those who would employ them want the sagacity which is requisite to understand them clearly.

VII. MISTS. *If they rise in low ground and soon vanish-----Fair weather.*

THIS is a sure sign, and very well expressed, that is, clearly and in few words, which is the excellency of such aphorisms. In order to be convinced of its good sense and certainty, we must consider a little what Mists are, whence they rise, and what becomes of them.

Mists are, strictly speaking, uncompacted exhalations, which, while they fleet near the earth, are stiled Mists; but when they ascend into the air, are called Clouds. If therefore, rising out of low ground, they are driven along the plain, and are soon lost to the sight, it must arise from some of these causes; That there is an air abroad sufficient to divide and resolve them, or the heat of the sun has been strong enough

to exhale them, that is, to rarify them so as to render them lighter than the air thro' which they were to pass. Which ever way this happens, the maxim remains unimpeach'd.

VIII. *If they rise to the Hill-tops*---Rain in a day or two.
WHEN mists are very heavy in themselves, and rise only by the action of that protrusive force exerted by the subterranean fire, they can rise no higher than where the gravitation becomes superior to that protrusive force; for then they descend again by their own weight: and this occasions the appearance, mentioned in the observation, of their hanging upon hill-tops, where they are very soon condensed, and fall down in rain.

There was formerly a very idle and ill-grounded distinction between moist and dry exhalations; whereas in truth all exhalations are moist, or, in other words, are watry steams thrown off by bodies respectively dry; and the former distinction was invented only to solve these phænomena of which we have been speaking, that is, the mist rising and dispersing without rain, and the mist condensed and resolved into rain, which, as I have shewn may be much better explained without any such distinction.

IX. *A general mist before the sun rises, near the full moon*-----Fair weather.

THIS is a general and a very extensive observation, which enables us to judge of the weather for about a fortnight; and there is very great reason to believe that it will very rarely deceive us. In order to convince the reader of this, it will be necessary to explain as far as we are able the causes of this.

Mists are observed to happen when the mercury in a barometer is either very low or very high: they happen, when it is high, after the region of the air has

continued calm a good while, and in the mean time a great abundance of vapours and exhalations have been accumulated, making the air dark by their quantity, and the disorderly disposition of their parts. They happen, when the mercury is low, sometimes because the rarity of the air renders it unable to sustain the vapours, which therefore descend and fall through it.

But none of these cases agree with the observation we are now considering; and therefore, to form a true judgment of the weather, we must distinguish between them and the case which explains the observation.

X. *If in the new moon---Rain in the old.*

WHEN exhalations rise copiously from the earth into the region of the air, and the air itself is in a proper disposition, they ascend to a great height, and continue a long time before they are condensed; which accounts very clearly and philosophically for the interval of fair weather between the rising of these mists and their falling down again in showers. Their ascending about sun-rise is a proof that the air is thin, but at the same time of a force sufficient to sustain them; since, if the mists were not specifically lighter than the air itself, they could not ascend.

When the moon is at the full, and such exhalations rise plentifully, the time necessary for them to float in the atmosphere, before they are condensed into clouds and rain, extends, generally speaking, beyond the period of that moon; and therefore the observation directs us to expect Fair Weather.

XI. *If in the old-----Rain in the new.*

BUT as it is observed not only in this climate, but all the world over, that great changes of weather happen near the change of the moon, it follows, that this is the season when these exhalations that ascend so

plentifully at sun-rising are condensed, and consequently is the season when we ought to expect Rain.

If therefore the exhalations rise in the new moon, it is a sign that the air is in a fit disposition to sustain and support them for a considerable time, and therefore we have reason to expect that they should continue floating till the next regular change of weather, that is, till the old of the moon, or rather till towards the change: and therefore the observation is very cautiously and very properly worded, directing us to expect rain *in* the old, and *in* the new, and not *at* the old or new; because it is observed that these changes of weather happen not exactly at the change of the moon, but a day or two before or after, of which the reader will meet with many examples in captain Dampier's history of winds and storms at sea.

XII. WINDS. *Observe, that in eight years time there is as much South-west wind, as North-east; and consequently as many wet years as dry.*

THIS must be allowed a very extraordinary aphorism from a country shepherd; but at the same time it is very agreeable to the observations of Dr. Hooke, Dr. Derham, Dr. Crew, and other able naturalists, who, with unwearied pains and diligence, have calculated the quantity of rain falling in one year, and compared it with what fell in another. Lord Bacon, that honour to our nation and the age which produced him, informs us, that it was an old opinion, there was a total revolution of the weather once in forty years, and wishes it was inquired into. I cannot tell whether this has ever been done or not, but I think there is good reason to conclude, that there is a natural balance established of wet and dry weather, as of light and darkness, heat and cold, and other such-like variations.

It may not be amiss to caution the reader against a mistake into which the manner of this rule being stated may easily lead him; it is this, that South-west winds cause rain, and North-east winds fair weather, which however is not a thing clear or certain by any means. This indeed is true, that South-west winds and rain, North-east winds and fair weather come together, generally speaking: But the question is, which causes the other; and a more difficult question cannot easily be stated, because there seems to be facts on both sides. South-west winds seldom continue long without rain; this seems to prove the affirmative: but, on the other hand, when in hard weather rain begins to fall, the wind commonly veers to the South-west; this looks as if the rain caused the wind.

But to keep close to the shepherd's observation. There is one thing seems strongly to confirm it, which is this, that in any given place the quantity of rain, one year with another, is found to be the same by experience, according to which the following table has been calculated, for the mean quantity of rain falling one Year with another in those places that are mentioned, and on this proportion the other seems to be founded.

At		Inches
At Harlem	24	
Delft	27	
Dort	40	
Middleburg	33	
Paris	20	
Lyons	37	
Rome	20	
Padua	37 $\frac{1}{2}$	
Pisa	34 $\frac{1}{2}$	
Ulm	27 $\frac{1}{2}$	
Berlin	19 $\frac{1}{2}$	
In Lancahire	40	
Effex	19 $\frac{1}{2}$	

XII. *When the wind turns to North-east, and it continues two days without rain, and does not turn South on the third day, nor rain the third day, it is likely to continue North-east for eight or nine days, all fair; and then to come to the South again.*

IN my opinion this and the subsequent remarks depend entirely upon observations, and may serve rather to found an hypothesis, than seem to be deduced from one. That the variations of the wind depend on certain causes, and may consequently be reduced to rules, is highly probable; and such observations as these render it in a manner certain. But to explore these causes, and to explain them in such a manner as to account for these phænomena in a satisfactory manner, requires not only great sagacity, but much experience, and many years observation; which however, considering the great benefits that would result to mankind from establishing such a **THEORY**, would be time well bestowed.

We may however easily conceive, that a constant North-east wind must be accompanied with fair weather: for whatever the causes of winds may be, yet, on this side the equator, a strong and settled North-east always buoys up the clouds, and keeps them suspended. This has been long observed by, and passes for a settled point amongst seamen. The reason of it however cannot be so easily assigned, at least a satisfactory reason; for as to suppositions, every fanciful man can furnish them at pleasure.

This, as well as the following observations, very plainly and clearly prove, that, in this part of the world, fair weather attends one wind, and wet another: but which is the cause, and which is the effect, or whether both are not the effects of some other cause, I pretend not absolutely to determine. But inasmuch as it is certainly known, that rains attend, in other climates, those winds that are here attended with

fair weather, it seems more agreeable to suppose, that rainy weather is occasioned chiefly by West-winds, because loaded with moist vapours from the sea.

XIV. *If it turn again out of the South to the North-east with rain, and continues in the North-east two days without rain, and neither turns South nor rains the third day, it is like to continue North-east for two or three months.*

The wind will finish these turns in three weeks.

THIS observation is of the same nature with the former, and is plainly deduced from long experience. Our author seems to contradict himself in saying, that these winds finish their turns in three weeks; but his true meaning certainly is, that they are about three weeks in turning from the South to the North-east again. Some very great men have laid it down as a thing certain, that the variations of the wind are to be accounted for by the alteration of the balance of the air, occasioned by the different effects of heat and cold; but other writers again insist very copiously on the effects which winds have upon the air, and thus confound us in a circle of causes and effects; whence it is plain, that they do not thoroughly understand the subject themselves, and therefore it is no wonder that they are not able to explain it to others.

In some parts of the world, and especially between the tropicks, the winds are regular; and therefore our philosophers seem to talk more rationally about them. But, in our Northern countries, the alterations of the wind are so frequent, sudden, and often so little agreeable to the season, that such general reasonings will by no means serve to explain them. It is however very reasonable to suppose, that the same general cause prevails here as between the tropicks, but with less cer-

tainty; because the power of the sun is not so great, and the determination of the winds depends on the situation of mountains, rocks and woods, which direct the air driving against them into certain courses; so that it is impossible to explain, or indeed to judge of the course of the winds, till the country is thoroughly known, and all those eminences that can affect the winds are well considered.

From these reflexions the value of our shepherd's observations will clearly appear. He was not philosopher enough to talk in this stile, but, by a long and steady attention, he came to know experimentally, what perhaps few philosophers, with all their sagacity, would have been able to have found out.

XV. S. W. WINDS. *After a northerly wind for the most part two months or more, and then coming South, there are usually three or four fair days at first, and then, on the fourth or fifth day comes rain, or else the wind turns North again, and continues dry.*

THIS is likewise a very judicious and a very useful observation, and yet it is not a difficult matter to account for it. It is a common observation, and a very true one, that there is usually fair weather before a settled course of rain. The winds that bring the dark rainy clouds that obscure the sky, and cause dull cloudy weather, often raise these vapours to such a height, that they are attracted into the cold region above our sight, till being condensed there, they fall down upon us again in snow or rain, according to our author's observation.

But if, after a seeming tendency to rain, there follows several days of fine weather, it is a certain indication that the temper of the air is altered, and that these vapours had been driven off before they had time to condense, which is confirmed by the change of the wind on such occasions

All these observations are to be understood in a proper latitude, and not strictly and according to the very letter: For rain may fall the sixth or seventh day, or the wind may change the second or third. Besides, a man who would make use of these observations in the country, must consider attentively the situation of the place where he lives, the bearing of the sea, marshes, ponds, lakes, woods, mountains, rocks, &c. For without making proper allowances for these, all such observations on the weather will be apt to fail him.

XVI. *If it returns to the South within a day or two without rain, and Northward with rain, and return to the South in one or two days, as before, two or three times together after this sort, then it is like to be in the South or South-west two or three months together, as it was in the North before.*

The winds will finish these turns in a fortnight.

THIS may appear a little perplexed to an ordinary reader, but a little attention will make it very clear and plain; and whoever considers what mighty uses may be made of the foresight of weather for a month or two, will not think this labour ill bestowed. I must confess I look upon these three rules, in relation to the wind, as the most useful in the whole collection; especially to farmers and country people, to whom they are of the greatest consequence.

But it is a common thing for such people to say, What certainty is there that these rules will prove true? What probability is there that the wind should continue so long in one quarter, and then so long in another? How shall we be satisfied that there is any truth in this? Or, if we cannot be satisfied as to the truth of it, why should we depend upon any such-like observations?

To this I answer, That they may have reasonable satisfaction given them on this head. Some of our great naturalists, who had kept journals of the weather for many years, have found that the same wind blows every year very near the same number of days, and that there is a regular continuance of different winds annually in every country. For instance,

At Utrecht they blow thus,		
The North wind	-	42 Days
The N. W.	- - -	33
The West	- - - -	77
The S. W.	- - -	58
The South	- - - -	33
The S. E.	- - -	26
The East	- - -	53
The N. E.	- - -	43
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It is a thing plain to every capacity, that a journal or diary of the winds may be kept any where; and if, from such a journal, it appears, that a given wind blows for a certain number of days, then it follows that if these can be determined with certainty, the time of their blowing may also be determined, at least with great probability; which is as satisfactory an answer as can be justly expected: because it shews that there is a just and rational ground for confiding in such observations, when confirmed by long experience.

XVII. Fair weather for a week with a southern wind is like to produce a great Drought, if there has been much rain out of the South before. The wind usually turns from North to South, with a quiet wind without rain, but returns to the North with a strong wind and rain: the strongest winds are when it turns from South, to North by West.

N. B. When the North wind first clears the air, (which is usually once a week) be sure of a fair day or two.

OBSERVATIONS of this nature upon winds have employed the ablest heads in all ages. Pliny, the great naturalist, has left us a great deal upon this subject, which plainly proves, that it has been the opinion of the ablest and wisest men, that study, and experience might reduce even things of such seeming uncertainty under stated rules, and within the bounds of a regular system: For instance he tells us,

“ In Africa the south wind is serene, the north-east cloudy. All the winds have their turns. To judge rationally of their changes, the fourth day of the moon is to be regarded.----The south wind blows stronger than the north-east, because the former rises from the bottom, whereas the latter comes from the surface of the sea. It is for this reason that those earthquakes are most dangerous that follow after a south wind.

In order to understand this notion of Pliny, we need only advert to the account given us by the reverend Mr. Robinson in his natural history of Westmoreland, which is exceedingly curious, and well worthy of the reader's perusal. This ingenious gentleman is of opinion, that winds have their original from the sea; of which he gives the following very probable account.

“ It,” that is, the wind, “proceeds from vast swarms of nitrous particles arising from the bottom of the sea, which is put into motion either by the cen-

“ tral fire, or by the heat and fermentation which a-
 “ bounds in this great body of the earth ; and there-
 “ fore the first commotion excited by the said fermenta-
 “ tion we call a Bottom-wind, which is presently
 “ discovered by porpoises and other sea fish, which de-
 “ light in sporting and playing upon the waves of the
 “ sea, and by their playing give the mariners the first
 “ notice of an approaching storm.”

“ When these nitrous swarms are risen towards the
 “ surface of the sea in a dark night, they cause such
 “ a shining light upon the waves as if the sea was on
 “ fire. And being delivered from the brackish water,
 “ and received into the open air, those fiery and shin-
 “ ing meteors which fix upon the masts and sides of
 “ the ships, are only nitrous particles condensed by
 “ the circumambient cold, and, like that which the
 “ chymists call Phosphorus, or artificial glow-worm,
 “ shine and cast a light, but have no heat : This gives
 “ the mariners the second notice that the storm is ri-
 “ sing ; for, upon the first breaking out of the wind,
 “ the sea begins to be rough, and the waves swell and
 “ rise, when at the same time the air is calm and
 “ clear.”

“ This boiling fermentation of the sea causes the
 “ vapours to rise, which by the intenseness of the cir-
 “ cumambient cold are condensed into thick clouds,
 “ and fall down in storms of wind and rain, first upon
 “ the sea from whence they arose ; and then the at-
 “ tractive power of the mountain-cold, by a secret
 “ magnetism between vapour and cold, attracts the
 “ waterish vapours, intermixt with nitrous particles, to
 “ the high tops of mountains and hills, where they
 “ hang hovering in thick fogs, and waterish mists, un-
 “ til the atmospherical heat rarifies the nitrous part of
 “ the fog, (which is always uppermost, and appears
 “ white and translucent) into brisk gales of wind, and
 “ the intenseness of atmospherical cold having attrac-

“ ted the vapours into the colder regions of the air,
“ where being condensed into clouds, the wind breaks,
“ dissipates and drives them before it, till they fall
“ down in rain, and water the surface of the earth.
“ And this seems to be the reason why in Egypt, and
“ those level countries where they have no mountains,
“ they have little wind, and less rain.

XVIII. CLOUDS. *In summer or harvest, when the wind has been South two or three days, and it grows very hot, and you see clouds rise with great white tops like towers, as if one were upon the top of another, and join'd together with black on the nether side, there will be thunder and rain suddenly.*

WE may very easily account for this observation; because, in fact, the signs here mentioned are no other than nature's apparatus for a storm of thunder and lightning, which will be perfectly understood, by attending a little to the causes of these meteors. Lightning is a great flame, very bright, extending every way to a great distance, suddenly darting upwards, there ending, so that it is only momentaneous. The matter which produces the fire, is the oil of plants attenuated by the heat of the day, and raised on high. Then whatever has exhaled from the earth that is sulphureous or oily, which is dispersed up and down the atmosphere, and is not continuous, is set on fire by turns, and the flame dilates itself as far as the tract of that exhalation reaches. Some other substance, pendent and floating in the air, meets with this also, with which it excites an effervescence, takes fire and flashes along with it. Thunder is another bright flame, rising on a sudden, moving with great violence, and with a very rapid velocity through the air, according to any determination, upwards from the earth horizontally, obliquely, downwards in a right line, or in several right lines,

as it were in serpentine tracts joined at various angles, and commonly ending with a loud noise or rattling.

It is observed that it thunders most when the wind blows from the South, and least when it blows from the East. The great principle of thunder is sulphur, as is evident from the smell it leaves behind it; but, in order to occasion such an explosion, there must be other ingredients mixed therewith, especially nitre, of which the air is always full; besides other things of which it is impossible to give any account. The tracts of this sort of matter fly about in the air, and are as it were lines of gun-powder; and as, in the firing of that powder, the fire begins at one end, and pursuing its aliment proceeds to the other extremity, and so the whole mass of powder is fired, we may from thence account for the phænomenon of thunder. For, in like manner, those inflamed tracts which are suspended in the air, flash from a flame that runs from one extreme to the other, wherever the vein of nourishment leads it: Hence those rays of thunder, which seem to be brandished through the air, and sometimes to be split in two or more tracts, and sometimes to return back at other times; to be projected in lines that are joined by various angles; and this only because the flame meets with tracts lying in various situations that cohere one with another. Therefore thunder seems now to run horizontally, now from above downwards, now upwards from the earth; for, if the matter of thunder pressing out of the earth is enflamed near the ground, the flame darting upwards, the thunder will seem to be projected out of the earth. If the same tract be set on fire at its upper end, the flame will move downwards, and the thunder will seem to descend out of the sky.

Hence we easily understand, how it comes to thunder oftner in one place than another; but most frequently in those where the soil produces odoriferous

Herbs and abounds with sulphur, and where the people are much exposed to the extreme heat of the sun. Thunder is less frequent in places where there are few odoriferous herbs, very little sulphur, or where the climate is watry and moist. For instance, it thunders very much in Italy and Sicily, and very rarely in Egypt and the adjacent countries. If it be demanded, how it comes to thunder in the midst of the ocean? The answer is easy, Because, from the bottom of the ocean, vast tracts of sulphureous matter are cast up through the waters; as it happens to spring-waters in several places, the streams of which will take fire from a lighted candle. For sulphureous exhalations bursting out together with the waters, the fulmineous matter in the air is set on fire when it meets with exhalations or vapours, with which it can exhibit a vehement effervescence. It is very clear from this account, that the clouds mentioned towards the head of the 17th page, are thunder-clouds, or clouds big with the materials of thunder.

XIX. *If two such clouds arise, one on either hand, it is time to make haste to shelter.*

AS this observation is of the same nature with the former, we shall continue our remarks. The reason why it seldom thunders in winter is, because the exterior parts of the earth are so contracted by the cold, snow; and ice, that sulphur cannot perspire in any great quantities; but as soon as the earth begins to be opened by the sun in the spring, something transpires in the month of April which takes fire. But, by the greater heat of the sun penetrating deeper into the earth, the cortex is more opened in May; and now there is a more copious perspiration of the fulminating matter, and whatever was collected and shut up in winter, is now released and snatched up in the air: and thence pro-

ceeds the most frequent thunders in the month of May, and chiefly, when a very hot day or two has gone before. A less quantity of the same matter remains in the upper cortex of the earth for the month of June; but, in the mean time, a stock arises out of the deeper bowels of the earth, which is attenuated and prepared, so that, by the very fervent heat of July, it is elevated, as it were in heaps, and set on fire. Hence thunder is as frequent in July as in May. And the heat decreasing in the succeeding months, the exhalation of the fulminating matter out of the earth is more sparing; and thence also the thunder is less frequent, till, in October and the other winter months, the earth is bound up with us, and hardly perspires any more. Hence we see, why it very seldom thunders when the northerly winds blow; for these winds constrict the earth with their cold; and so hinder the fulminating matter from bursting forth; and when they are burst forth and floating in the air, they hinder their effervescency. But, on the contrary, when the warm and moist South wind blows, which opens every thing, the earth likewise is opened, and abundance of fulminating matter perspires and ascends on high, which is there easily enflamed.

As the flame runs very swiftly, it seems to carry along with it particles which it could not so easily set on fire; and when any of these particles are drawn together, and heated to a certain degree, they at last take fire with a sudden and great explosion, and thereby produce what we call a thunder-clap. Now tho' this be only a single sound, yet it is often heard in the form of a great murmuring noise of a long continuance; sometimes for thirty or forty seconds, because of its various repercussions by the clouds and terrestrial obstacles. Hence it is, that in valleys which are surrounded by mountains of a different height, there is a terrible and long continued bellowing of thunder-claps;

whereas, for one explosion, it has been observed, that there is but one clap: Yet however, if the flame set fire to two, three, or more fulmineous tracts, each of them at last will end in a clap, and thus, several sounds may be heard together, or quickly succeeding one another.

XX.- If you see a cloud rise against the wind, or side wind, when that cloud comes up to you, the wind will blow the same way that the cloud came. And the same rule holds of a clear place, when all the sky is equally thick, except one clear edge.

THIS seems to arise from hence, that wind being nothing more than air in motion, the effects of it first discover themselves above, and actually drive such clouds before them. This was long ago observed by Pliny: When clouds, says he, float about in a serene sky, from whatever quarter they come you may expect winds. If they are collected together in one place, they will be dispersed by the approach of the sun. If these clouds come from the North-east they denote winds; if from the South great rains. But let them come from what quarter they will, if you see them driving thus about sun-set, they are sure signs of an approaching tempest.

If the clouds look dusky, or of a tarnish'd silver colour, and move very slowly, it is a sign of hail. But, to speak more plainly, those very clouds are laden with hail, which, if there be a mixture of blue in the clouds, will be small; but if very yellow, large. Small scattering clouds that fly very high, especially from the South-west, denote whirl-winds. The shooting of fallen stars through them is a sign of thunder. We meet with many observations of this sort in our old writers on husbandry; and we have abundance of proverbs relating to this subject, which are worth observ-

ing; and the rather because the most of them are not peculiar to our language only, but common to us with many of our neighbours. It is the remark of lord Bacon, and a very judicious remark too, that proverbs are the philosophy of the common people, that is to say, they are trite remarks founded in truth, and fitted for memory. I must confess that there are some of them that seem either false, or of no great consequence; but then I am apt to suspect, that, by various accidents, we have lost their true meaning, or else that, in length of time, they have been altered and corrupted, till they have little or no meaning at all.

I cannot help taking notice, in regard to the rule before us, of what captain Dampier tells us, that in the East Indies they have always notice of a tuffoon, by the skies being first clear and calm, and then a small white cloud hanging precisely in the point from whence the storm comes, where he observes, that it remains sometimes twelve hours or more; and adds, that as soon as it begins to move, the wind presently follows it. When Sir John Bury, who died an English admiral, had the command of a small frigate in the West Indies, he escaped a hurricane in the Leeward islands, by taking the advice of a poor negro, who shewed him a small white cloud at a distance, and assured him, that, when it came to the Zenith, the hurricane would infallibly begin, as indeed it did.

XXI. Sudden rains never last long: But when the air grows thick by degrees, and the sun, moon and stars shine dimmer and dimmer, then it is like to rain six hours usually.

RAIN is, properly speaking, a multitude of small watry drops, falling from the upper air at different seasons. When the upper regions become cold of a sudden, the watry clouds are condensed and fall in hasty showers. It is observed, that mountainous coun-

tries have most rain; and the reason seems to be the winds driving the clouds against the rocks and hills, and thereby compressing them in such a manner, that they are immediately dissolved, and fall as it were at once. This is the reason that in Lancashire there falls twice as much rain as in Essex; and it is probably from the same cause that, in the ocean, over against the mountainous coast of Guinea, showers sometimes fall as it were by pail-fulls.

This observation of our shepherd is very just and reasonable, and I dare say will hardly ever fail such as observe it. The dimness of the stars and other heavenly bodies, is one of the surest signs of very rainy weather. It is likewise to be observed, that when the stars look bigger than usual, and are pale and dull and without rays, this undoubtedly indicates, that the clouds are condensing into rain which will very soon fall; and it has been observed, that when the air grows thick by degrees, and the light of the sun lessens so as not to be discerned at all, and again when the moon or stars have the same appearances, a continued rain for at least six hours is sure to follow.

To be the better informed in such cases, it is best to have recourse to a variety of signs; for it is not only the clouds and sky, or the sun, moon and stars, that give us previous notice of rainy weather, but almost every thing in the creation, and vegetables particularly: As for instance, the Pimpernel, which is a very common flower, shuts itself up extremely close against rainy weather. In like manner the Trefoil swells in the stalk against rain, so that it stands up very stiff, but the leaves droop and hang down. Even the most solid bodies are affected by this change of the atmosphere; for stones seem to sweat, and wood swells, the air driving the moist particles, with which it is filled, into the pores of dry wood especially, making it swell

prodigiously; and this is the reason the doors and windows are hard to shut in rainy weather.

This is so true, that there has been a method found of dividing mill-stones by the mere force of the air, which is done in this manner. They divide a block of this kind of stone, as big as a large rolling-stone, into as many parts as they design to make mill-stones, and, in the circles where this block is to be divided, they pierce several holes, which they fill with Sallow-wood dried in an oven, and expose the stone to the air in moist weather, when the wood swells to such a degree as to split the stone, as effectually as if it was done by iron wedges driven by Sledge-hammers. This curious and extraordinary method of dividing mill-stones is related by the famous Mr. Ozanam, of his own knowledge.

XXII. *If it begin to rain from the South, with a high wind for two or three hours, and the wind falls, but the rain continues, it is like to rain twelve hours or more; and does usually rain till a strong North-wind clears the air. These long rains seldom hold above twelve hours, or happen above once a year.*

THIS depends entirely upon observation; and experience shews us, that whenever the wind falls, rain follows. It has been likewise observed, that when the wind changes often, there fall heavy rains. All these alterations in the atmosphere are less observed by men, than by animals, for two reasons: The first is, that we live much within doors, by which they are less obvious to us; and it is for this reason that the husbandmen, seamen, fishermen, but above all shepherds, who are more in the open air than other men, are better acquainted with, and more able to distinguish and judge of the signs of the alterations of the weather, than those who live altogether within doors, or go out but seldom. Another reason is, our having so many

things to mind, which takes off our thoughts, and renders us less attentive to the signals which would give us notice of such alterations. It is for this reason that we ought to serve ourselves of that sort of instinct which nature has given to other animals, and which, as it is a gift of nature, is in a manner infallible.

Thus, if small birds prune themselves, and duck, and make a shew of washing; if crows make a great noise in the evening; if geese gaggle more than usual, these are all signs of rain; because these animals love wet weather, and rejoice at the approach of it. On the other hand, if oxen lye on their right sides, look towards the south, and lick their hoofs; if cows look up in the air, and snuff it; if asses bray violently; and if cocks crow at unusual hours, but especially when a hen and chickens croud into the house, these are sure signs of rain.

Insects also are very sensible of such changes of weather: Frogs croak more than ordinary, worms creep out of the ground, moles throw up more earth than usual, because such weather is more agreeable to them. Hornets, wasps and gnats, sting more frequently against wet weather than in fair. Spiders are restless and uneasy, and frequently drop from the wall, the humid air getting into their webs and making them heavy. But the surest and most certain sign is taken from bees, which are more incommoded by rain than almost any other creatures; and therefore, as soon as the air begins to grow heavy, and the vapours to condense, they will not fly from their hives, but either remain in them all day, or else fly but to a small distance.

XXIII. *If it begins to rain an hour or two before sun-rising it is like to be fair before noon, and so continue that day; but if the rain begin an hour or two after sun-rising, it is like to rain all that day, except the rainbow be seen before it rains.*

THIS is a short, clear and easy observation, and therefore I shall not dwell long upon it, but rather entertain the reader with a few observations on the rainbow. Whenever it appears, things are thus circumstanced: The Spectator has the sun behind him, and clouds with the bow in them before him. Sometimes there are two and even three bows seen, but this is very rare. The colours in the bow are ranged in this order, *viz.* violet, purple, blue; green, yellow, orange, red. After a long drought, the bow is a certain sign of rain; after much wet, of fair weather. If the green be large and bright, it is a sign of rain; but if the red be the strongest colour, then it denotes wind and rain together. If the bow breaks up all at once, there will follow serene and settled weather. If the bow be seen in the morning, small rain will follow; if at noon, settled and heavy rains; if at night, fair weather. The appearance of two or three rainbows shews fair weather for the present, but settled and heavy rains in two or three days time.

Lunar rain-bows are sometimes, but very seldom seen; they are extremely beautiful, but much less than those that appear in the day-time, and a yellow or rather a straw-colour prevails most. As they happen so seldom, they cannot well be reckoned amongst the signs of weather. But now, after speaking of so many different methods of judging when rainy weather will be of a short or long continuance, give me leave to describe two or three instruments, easily made, which will shew the alterations of the weather certainly, constantly, and early enough for most uses.

There were, some years ago, a sort of toys sold, with a man and a woman so fixt before the door of a house, that at the approach of wet weather the woman entered it, and when the weather grew fair the man: This was done by the help of a bit of cat-gut, which shrinks in wet weather, and stretches again when it is fair. This appears better by a line and plummet; especially if the line be made of good whip-cord, that is well dried; for then if it be hung against a wainscot, and a line drawn under it exactly where the plummet reaches, in very moderate weather, it will be found to rise above it before rain, and to sink below when the weather is like to become fair. But the best instrument of all is a good pair of scales, in one of which let there be a brass weight of a pound, and in the other a pound of salt, or of saltpetre well dried, a stand being placed under the scale, so as to hinder its falling too low; when it is inclined to rain, the salt will swell and sink the scale; when the weather is growing fair, the brass weight will regain its ascendancy.

XXIV. SPRING and SUMMER. *If the last eighteen days of February, and ten days of March, be for the most part rainy, then the spring and summer quarters are like to be so too: And I never knew a great drought, but it entered in that season.*

IT is easy to discover by observation whether this rule be well or ill founded, that is to say, whether our shepherd's observation will serve for other places or not, and where it will serve and where not. But it may not be amiss to remark, that it is highly probable, or rather absolutely certain, that the weather in one season of the year determines the weather in another: For instance, if there be a rainy winter, then the autumn will be dry; if a dry spring, then a rainy winter. Our fore-fathers had abundance of odd sayings upon this subject, and some proverbs for every month in the

year; but I doubt they were indifferently founded: however, there can be no harm in observing them, in order to discover whether there be any thing in them or not.

Janiver freeze the pot by the fire.
 If the grafs grow in Janiveer,
 It grows the worfe for't all the year.
 The Welchman had rather see his dam on the Beck,
 Than to see a fair Februeer.
 March wind and May sun
 Makes clothes white and maids dun.
 When April blows his horn,
 'Tis good both for hay and corn.
 An April flood
 Carries away the frog and her brood.
 A cold May and a windy
 Makes a full barn and a fendy.
 A May flood never did good.
 A swarm of bees in May
 Is worth a load of hay;
 But a swarm in July
 Is not worth a fly, &c.

XXV. WINTER. *If the latter end of October and beginning of November be for the most part warm and rainy, then January and February are like to be frosty and cold, except after a very dry summer.*

IT is very evident, supposing this observation to be true, as I am pretty confident it is, that the reason of it is to be sought in that balance of the weather which providence has established. There is not only a time to sow, and a time to reap, but there is a time also for dry, and a time for wet weather; and if these do not happen at proper seasons, they will certainly happen at other seasons: for not only the wisdom of philosophers hath discerned, but their experiments and obser-

vations hath put it out of doubt, that there is a certain rule or proportion observed between wet weather and dry in every country ; so that it is nearly the same in every annual revolution : neither is it wet and dry weather only, but hot and cold, open and frost, that are thus regulated ; from whence we see, that when the scripture represents to us God's settling things by weight and measure, it speaks not only elegantly, but exactly. For we do not mean by providence any extraordinary or supernatural interposition of almighty power, but the constant and settled order established by the will of that almighty being, which we commonly call Nature.

There is nothing easier than for vulgar understandings to mistake the meaning of words, and, by a superstition natural to weak minds, convert what they imperfectly understand into notions that perplex and confound them. Hence it proceeds, that, in common conversation one hears people speak of nature as of a being, or a kind of subordinate deity ; whereas, in reality, the true meaning of nature is, that order or law which God has established in the universe ; and the knowledge of nature is no more than the light we acquire by study into the connexion of those laws. In this sense, experience is a kind of revelation, that is to say, it is a sort of knowledge that comes to us from without, and is infallible in itself. We may indeed go on wrong, and deceive ourselves in the arguments we raise from it ; but the knowledge grounded upon experiments never varies.

This is sufficient to shew us, how much wiser a thing it is to trust this sort of experimental knowledge, than to put any faith in that kind of idle science which amused our forefathers, and enabled almanack-makers to delude and mislead them. It is true, we use the luminaries as well as they, but then we use them in a rational manner, and do not pretend to impose this or

that sign upon other people, but barely set down our own observations, which are to be examined and verified by the experience of those to whom they are submitted. The astrologer, on the other hand, insists on what are not in nature; the twelve houses are a mere invention, and so are all the properties ascribed to the celestial signs, and to the planets; mere dreams and fictions: devised by the cunning to cheat and impose upon the ignorant, and which had been long ago exploded, if people had brought them to the only test of which they are capable, I mean that of experience; with which they never did, never will; and indeed never can agree; whereas the rules given by our shepherd are such as, we have shewn, suit perfectly well with the remarks of other studious persons in all ages.

XXVI. *If October and November be snow and frost, then January and February are like to be open and mild.*

AS this observation stands on the same foundation with the last, we need not dwell upon it particularly: and therefore, I shall proceed with my former reflexions. The only way to be acquainted with nature, is to study nature. All systems of human invention, that are not built upon experiments, are sooner or later found to be false, because, to say the truth, they are nothing better than ingenious contrivances invented by the wit of man, to conceal his ignorance. In order to account for what we behold, we must first of all take pains to be well acquainted with the fact, and not suffer ourselves to be led away by opinion. In order to explain what I mean, I shall give an instance: All the world knows, that not only the vulgar, but the learned, were for many ages in a constant error about corruption, and really believed, that the heat of the sun, and even animal heat produced worms, maggots, and other living creatures. Many grave writers carried the thing farther, and told us of rats, mice, and

other creatures, produced out of the slime of the river Nile, by the heat of the sun in Egypt, which might very well pass for truth among those who fancied they saw every day something of the like nature: I mean in the corruption of flesh and other things, in which we behold thousands of living creatures.

An Italian philosopher destroyed this whole doctrine at once, by a simple and easy experiment. He exposed a piece of raw flesh in a glass-vessel, well covered with gawz, to the air and sun, and found that it putrified, without producing any living creatures. This shews how careful we ought to be with respect to facts; for, till this experiment was made, no body doubted that vermin were bred by, as well as in putrified bodies; whereas we are now satisfied, that the heat of the sun can no more produce a worm or a maggot, than a horse or an elephant. By the same examination we might open the way to knowledge, by driving out a multitude of other errors: But the humour of taking things for granted, without inquiring into them, and then endeavouring to account for them by dint of reasoning, amuses us with a false shew of wisdom, and encourages us to persist obstinately in the maintenance of weak and foolish notions.

To apply this to the subject of which we are treating. It is certainly a curious and an usefull thing to understand the nature of the weather, and to know how the changes that happen in it come to pass. The business is to find out the true way of coming at this kind of knowledge; and upon the principles that I have advanced, it is very evident, that the only certain way of coming at it, is by observation. This is a slow, but a sure method of arriving at truth, and the specimen here given us of one man's observations, is enough to convince us, that a little diligence and application would soon go a great way towards forming a body

of such observations, as might enable us to understand the weather thoroughly, and to predict its changes and alterations with a great degree of certainty. If we will not take this pains, we must content ourselves with what hath been already discovered; or if our conditions of life exclude us from the opportunities of making such observations, it is certainly a right thing to help ourselves by inquiring into, and reasoning upon such observations as other people have made; and to facilitate this as far as possible, I have taken the pains to write this commentary upon our shepherd's rules, which, I hope, will render them more useful, or, at least, secure them that regard which they deserve.

There remains therefore nothing more for me to do, in order to recommend these observations, but to say somewhat with respect to the utility of the alterations of the weather in general, and in particular. In order to satisfy the reader, that there is nothing of chance or accident in such alterations, but that they are governed in every respect by the same unerring wisdom, that at first framed, and constantly preserves the universe: all weathers are at sometimes seasonable, which shews that they are good in themselves, and only accidentally evil. We ought not to measure things of a general nature by particular rules. If, by the direction of providence, the succession of seasons be such, as that they turn to the good of mankind in the whole; it is no objection to, or diminution of providence, that this succession of seasons should at different times be injurious to certain countries, because this may likewise be accounted for.

As to particulars, we will begin with the air, which is composed of exhalations of all earthly bodies, as well solid as fluid; as also of fire, whether of the sun or the stars, or of earthly bodies burnt, or of fire breaking out from the entrails of the earth, and ascending: and tho' it be thus compounded, and hath swimming in

it multitudes of other things, yet we find that it is perfectly wholesome, is the spring of motion and of life to men, and all other animals: so that tho' we cannot account for, and perhaps have not a power of comprehending, how such a mixed body can be rendered salutary; yet since it is certain that so it is, we have no right to complain either of the evil consequences that sometimes attend the exhalations with which it is filled, or the accidents that flow from the frequent alterations that happen therein; because these have a visible tendency to the general good, and are apparently necessary to the preservation of the universe: so that before we can have any title to find fault, we must first shew that we are capable of understanding them in their full extent; and as *this is impossible*, it follows *that must be unreasonable*.

But this appears still the more clearly, when it is considered, that all such alterations may be shewn, even from the light of reason, to be generally useful, notwithstanding they sometimes appear troublesome and noxious: For instance, such quick streams of air in motion as we call winds, though they sometimes swell into storms and tempests, yet are they of great benefit to mankind, by purging the air, and many other conveniencies. It is a proverb at Vienna, "that if Austria be not windy, it is sickly," and this saying is no less true in other countries; for, by consulting the history of the last great plague that raged here in 1666, it will be found that there was in a manner a dead calm during the time of the sickness; and it is known in Egypt, where they have plagues annually, that the change of the wind delivers them from that evil. Add to this the great use of winds in navigation, and reflect on the benefits that accrue therefrom, and we shall see no cause whatever to doubt, that this motion of the air is a very wise contrivance.

The condensation of vapours, which is the cause of rain, is another great benefit to the world, in as much as this is very probably supposed to be the source of fountains, rivers, lakes, and other magazines of fresh water, without which the earth would be uninhabitable, and to which, in a very great measure, its fertility is owing. We ought likewise to remember, that tho' this be in itself so clear, and, at the same time, so certain, yet there are countries in the world where it very seldom rains, as in Egypt, and others where it hardly ever rains, as in Peru; so that we see there is no raising general doctrines upon this subject, which ought to make us the more tender in disputing the will of providence, or repining when it happens to cross our own.

The uses of snow are as great, tho' less apparent, of which I shall mention but three. The *first* is, Its preserving herbs and grass in the winter against the severity of frost; *secondly*, Its supplying water to brooks and rivers; and, *lastly*, Its furnishing the earth with vast quantities of nitre, and thereby conducing greatly to its fertility; and perhaps the same thing may be said of frost, hard winters being often succeeded by luxuriant summers; and thus we find, that what, in appearance, causes scarcity, may, in reality, produce plenty.

Lastly, Even thunder, however terrible in its appearance, and sometimes fatal in its effects, is nevertheless very useful and beneficial upon the whole; for this likewise purifies the air from sulphureous and oily exhalations, and the rains that fall with it fertilize the earth exceedingly: it also moderates the heat, as experience teaches us; for, as it is always gloomy and sultry before thunder, so it is afterwards generally cool and pleasant. These remarks, tho' very short, may give the reader an opportunity of extending his observations throughout all the variations of weather, and enable him to discern how useful and instructive a thing

the study of its alterations may be, and how probable it is, that, by proper care and attention, we may arrive at a much more useful, as well as a much more certain knowledge in regard to the weather, than hitherto has been attained.

I shall conclude, by recommending to the reader's perusal a very curious and entertaining letter, tho' written in a plain familiar stile, which will serve to exercise his thoughts, by affording him an opportunity of endeavouring to account, upon the principles before laid down, for the surprising varieties in that climate, which has been hitherto reputed the most irregular, and the most unwholesome in the world.

To Mr. W. D.

S I R,

I HAVE been very ill since my return home with the gout, so that I have not been capable of answering your expectation; but being a little better recovered, I shall make as good a return to your inquiry of the Harmatans on the coast of Guinea, as my circumstances will permit. Their usual time of blowing is between the latter part of December, and the beginning of February, before and beyond which seasons they never exceed. They are of so very cold, sharp and piercing a nature, that the seams of the floors of our chambers, and the sides and decks of our ships (as far as they are above water) will open so wide, as that, with facility, you may put a chalking-iron a considerable way into them; in which condition they continue so long as the Harmatan blows, which is sometimes two or three, and very rarely five days, which is the very utmost I ever observed or heard of; and when they are gone they close again, and are as tight as if it had never been. The natives themselves, and all persons that inhabit those parts (during that short season) to prevent their pernicious effects, are obliged

to confine themselves within doors, where they endeavour their own security, by rendering their habitations as close and impenetrable as possible: Neither will they once stir abroad, unless induced thereto by a more than ordinary occasion. It is as destructive to the cattle also, whose safeguard consists in their proprietors care, who, against this season, ought to provide some such-like place for them, otherways they must expect but a pitiful account when the season is over; for it most certainly destroys them, and that in a very short time.

This I accidentally experienced, by exposing a couple of goats to the asperity thereof, which, in four hours space, or thereabouts, were deprived of life: Nay, we ourselves (unless assisted by the like conveniency, and the benefit of some sweet oils to correct the air) cannot fetch our breath so freely as at other times, but are almost suffocated with too frequent and acid respirations. They generally blow between the East and East North-east, to the Northward of which they never exceed, being the most settled and steady, but fresh gales, I ever observed; coming without thunder, lightning, or rain, but close gloomy weather, the sun not shining all the time: And when they expire, the trade-wind (which constantly blows on that coast at West South-west and South-west) returns with the accustomed seasonableness of weather.

The coast of Africa, from Cape Palmas to Cape Formosa, lies East and East by North, and near those points the land-breezes blow on that coast, which commonly begin about seven in the evening, and continue all night till near that time the next morning, during which interval, we are troubled with sinking fogs and mists off shore, which, by the return of the sea-breezes upon the opposite points, are all driven away, and we have the benefit of them in a curious fresh gale till about five in the afternoon.

And here let me note it for a general observation, that in those and all other places within the tropics (as far as ever I took notice) the wind is drawn by the land; for, if an island or head-land were inclining to a circular form, the sea and land-breezes fall in diametrically opposite to that part where you are: So that, if you are on the South-side, the sea-breeze shall be at South, and the land-breeze (when it comes in its season) at North.

In getting on the coast, we endeavour to fall in with Cape Mount or Cape Miserada, which is about eighteen leagues to the East South-Eastward thereof, and after that we double Cape Palmas, (whence, as aforesaid, the land trends away East by North) the current near the shore sets upon that point down into the bite. But in getting off, we attempt as much as possible to lay hold of St. Thomas, and thence to run to the Southward of the line, perhaps three or four degrees; for the further to the South we go, the stronger we find the gales, and more beneficial for getting off the African coast, but those who keep to the Northward thereof generally meet with more calms, and consequently longer voyages ensue. In or about those latitudes we continue, till we are got between twenty-five and thirty degrees to the Westward of Cape Lopez de Gonfalvo, and then we cross again to go either for England or the West-indies. But by the way, let me observe to you, that when once we are to the Westward of the Cape, and in South latitude, the current sets Northerly, and the wind, to twenty degrees of latitude, is at East South-east, as (to the like number of degrees) on the North-side of the line it blows at East North-east; neither did I ever observe any mutation of the currents, unless in the Tornado-season, when, during their blowing, they commonly set to windward, tho' perhaps the moon, upon full and change, may

have the like influence there as in other places; but I never took any particular notice thereof.

The said Tornados usually come in the beginning of April, and seldom relinquish the gold-coast till July commences, and, with frequent visits, make us sensible of their qualities. We have sometimes three or four in a day; but then their continuance is but short, perhaps not above two hours, and the strength or fury of it may be about a quarter or half an hour, but accompanied with prodigious thunder, lightening and rain, and the violence of the wind so extraordinary, as that it has sometimes rolled up the lead wherewith the houses are covered, as close and compactly as it possibly could be done by the art of man. The name implies a variety of winds; but the strength of them is generally at South-east, and, by ships that are bound off the coast, they are made use of to get to wind-ward.

I shall conclude with that most worthy observation of the season wherein the rains begin, which, on the Gold-coast, is about the 10th of April; and this may be generally remarked, from thirteen degrees North to fifteen South-latitude, that they follow the sun within five or six degrees, and so proceed with him till he has touched the tropic, and returns to the like station again. This I shall illustrate by the following example; viz. Cape Corso-castle lies in 4 d. 55 m. North. About the 10th of April the sun has near 12 d. North-declination. At that time the rains begin and continue with the inhabitants of that place, until he has performed his course to the greatest obliquity from off the equator, and returned to the like position South. The same I suppose may be observed and understood of other places within the tropics.

The variation (of which, in the year 1680, I made frequent observations) was 2 d. 14 m. Westerly, and it generally flows at the aforesaid place, South South-east, and North North-west, upon the full and change,

the water rising upon Spring-tides about six or seven feet up and down.

I remain, Sir,

Your humble-Servant,

J. G.

Those cold winds, called Harmatans, are not at all more extraordinary than the burning winds on the coast of Persia, which are terrible to the last degree, and in the months of June, July and August, render Gambroon, the only port which the Persians have on that side, uninhabitable. These winds blow in a very narrow compass, and are visible, and therefore avoidable, which is done by throwing one's self flat on the ground till they are past over. If a man is on horseback when he meets them, he must dismount, and turn his horse's tail to the wind, and then, lying down by him, he preserves the beast's life and his own.

There was, in the year 1712, a very singular instance of the malignity of these winds. Two French gentlemen would needs travel, in the month of July, from Gambroon to Isphahan, notwithstanding all that the chief of the English factory could say to dissuade them, believing probably, that what he told them was only the fables of the country, for which they paid dearly. The general rule for travellers is, to set out between three and four in the morning, and travel till nine, which rule these French gentlemen observed; and, being fatigued by their morning's journey, as soon as they came to a Caravansary (which are lodgings built at every stage's end, a stage being about fifteen miles) they were disposed to rest, and ordered their servants to make their beds ready, (for even those necessary furniture travellers are obliged to carry along with them on carriage-beasts) directing them to call them when

dinner was ready, and withall ordered a sheet for each of them to be dipped in water, to lay over them to cool them. One of these hot blasts unfortunately came whilst the gentlemen slept, and had left the windows of the room open, and the wind blowing in at the windows, scorched them both to death on their beds, where the servants found them when dinner was ready, and, pulling off the sheets, the skin and some flesh came off with them.

It is certainly a great happiness to our country, that we have none of those dreadful winds: but this however need not restrain us from endeavouring to discover their causes, and the manner of their extraordinary operations, which might perhaps be of use in accounting for damps in mines and other places, which induced me to give them a place here, as matters that could not be unacceptable to the curious.

F I N I S.