AVALANCHE AT LEWES.

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From a Painting by W. Westall A. R. A.

# WINTER.

BY

ROBERT MUDIE.

AUTHOR OF THE HEAVENS. THE EARTH. THE AIR. THE SEA.

&c. &c. &c.

WINTER BIRD.

LONDON.

THOMAS WARD & CO. PATERNOSTER ROW.

MDCCCXXXVII.

# WINTER;

OR,

## THE CAUSES, APPEARANCES, AND EFFECTS

OF

## THE GREAT SEASONAL REPOSE OF NATURE.

BY R. MUDIE,

AUTHOR OF "THE HEAVENS," "THE EARTH," ETC.

SECOND THOUSAND.

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# PREFACE.

WINTER is the season of nature's annual repose,—the time when the working structures are reduced to the minimum of their extent, and the energies of growth and life to the minimum of their activity, and when the phenomena on the earth are fewer, and address themselves less pleasingly to our senses than they do in any other of the three seasons. There is hope in the bud of Spring, pleasure in the bloom of Summer, and enjoyment in the fruit of Autumn; but, if we make our senses our chief resource, there is something both blank and gloomy in the aspect of Winter.

And, if we were of and for this world alone, there is no doubt that this would be the correct view of the Winter, as compared with the other seasons; and the partial death of the year would point as a most mournful index to the death and final close of our existence. But we are beings otherwise destined and endowed,—the world is to us only what the lodge is to the wayfaring man; and while we enjoy its rest, our thoughts can be directed back to the past part of our journey, and our hopes forward to its end, when we shall reach

our proper home, and dwell there securely and for ever. This is our sure consolation—the anchor of hope to our minds, during all storms, whether they be of physical nature or of social adversity; and let the one or the other be ever so dark and gloomy, this hope can limn them with hues of the most enchanting delight; and in the very depth of the Winter, we can command the spring, the summer, and all the gay seasons of the times and the lands of the sun, to stand mustered before us in full array, and clothed in variety and beauty, which never could by possibility fall on the retina of the eye of some, though we were to ransack the world for its chosen landscape, and tax the year for the very hey-day of its perfection. We can do this, and we can do it when the Winter night is moonless, starless, and dark as a pit dug to the earth's very centre where sunbeam never came, and when all the angry voices of the Winter are howling and thundering around us, with far more certainty and mental satisfaction than we could do, if laid on the most flowery bank, in the sweetest day in which summer ever beamed on the earth.

We are beings of sensation, certainly; many and exquisite are the pleasures which we are fitted for enjoying in this way, and much ought we to be grateful for their capacity of giving pleasure, and our capacity of receiving it; for this refined pleasure of the senses is special and peculiar to us out of all the countless variety of living creatures which tenant the earth around us. They eat, they drink, they sleep, they secure the succession of their race, and they die; but not one of

them has a secondary pleasure of sense beyond the accomplishment of these very humble ends. We stand far higher in the mere gratifications of sense; and in the mental ones there is no comparison, as the other creatures have not an atom of the element to bring to the estimate.

The Winter is, therefore, the especial season of man —*our own* season, by way of eminence; and men who have no Winter in the year of the region in which they are placed, never of themselves display those traits of mental development which are the true characteristics of rational man, as contrasted with the irrational part of the living creation. It is true that there must be the contrast of a summer, in order to give this Winter its proper effect; but still, the Winter is the intellectual season of the year,—the season during which the intellectual and immortal spirit in man enables him most triumphantly to display his superiority over "the beasts that perish."

Such are the feelings with regard to the Winter season, under which the following pages were composed; but whether the execution does or does not come up to this feeling, is a matter to be determined by the reader, not by the author.

In order that this volume might be somewhat in accordance with the character of the season after which it is named, I have endeavoured to make it more reflective than the former ones of the series. But the matter of it does not easily admit of prefatory analysis, and therefore I must refer to the Table of Contents, and especially to the book itself, which, if it should be found

to have no other recommendation, is at least original, and different from any which has been previously written on the subject, numerous as these are, and valuable as are some of them.

There are two points of difference between the volumes both of this series and the former one, and most books upon similar subjects, to which it may be as well to call the attention of the reader, lest that which has been done purposely, and in the belief that it is an improvement, should be regarded as oversight and imperfection.

In the first place, every thing like system has been avoided with the utmost solicitude; and thus, the transitions from the earth to the air or the sun, from one part of the earth to another of the very opposite character, from plant to animal, from sea to land, from natural appearance to moral reflection, and from nature to the Author of nature, may seem abrupt, and without any obvious connexion. That they have none of the apparent regularity of the systems of the schools, I will admit; but then, the regularity of these is only in the artificial parts of the systems, and not in the nature of the subjects which they embrace; so that, if a student were to go forth to any locality, be that locality what it might, he would not be able to trace a correspondence with the system there, but would find himself in a state of constant transition from one part of the artificial system to another, if he followed the succession of subjects as he met with them in nature.

Now if the observation of nature is to be pleasant, and to operate profitably in teaching us to take heed of every thing, which is clearly the grand practical use

of it, we must not go forth in quest of a genus, an order, or a class, we must be equally prepared to understand and enjoy all that we meet with, in the order in which we may happen to meet them; and over that order we ourselves have no control. This is the system of nature which presents itself to our observation; and though, as compared with the artificial systems of the learned on these subjects, it appears to be no system at all, yet it is the only natural one. There is always a natural reason why any production or appearance is met with in one place and at one time rather than another; this reason should be one of the main objects of our observation; and it is one upon which, from the mode of their arrangement, the natural systems can afford us very little assistance. These systems all have reference to the productions of nature as if they were dead subjects, which we could place in any juxta-position which suited our fancy; and what we meet with is living and active nature, of which all the parts and all their changes have adequate causes, which tie them down to place and to time.

The other part refers to the natural theology; and in this I have endeavoured to avoid what appear to me to be the chief errors of those who have treated of the subject,—namely, that comparison of the working of God with the working of man, by means of which it has been attempted to heighten our admiration of the former; and that comparison of the instincts of animals with human reason, by injudicious allusions to which, our belief in the immortality, and even the existence of the mind, is apt to be shaken.

It was my original intention to follow up the four volumes on the Heavens, Earth, Air, and Sea, and these four on the Seasons, by other four on the Natural History of Man, as a physical, intellectual, moral, and social being; but as a series of books may be too long, as Man stands in many respects insulated from the rest of nature, and as the work which I intend to publish respecting him must necessarily be of a different character from this and its precursors, I have, on mature reflection, deemed it better that it should appear in another shape, and thus be a distinct work in form as well as in substance.

ROBERT MUDIE.

*Grove Cottage, Chelsea,*
*November*, 1837.

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## ILLUSTRATIONS.

THE Frontispiece represents, from a drawing made upon the spot at the time, the Avalanche, or slipping of the snow at Lewes, in the Winter of 1836, an occurrence which is rare in this country; and which is much more frequent in the mountainous parts of warm countries than in cold ones, as the heat of the earth softens the under part of the snow, and makes it slide. After heavy falls of snow the small avalanches from the roofs happen sooner in houses in which there are fires than in empty ones.—The Vignette represents a Cottage Window and some Birds.

# WINTER.

## CHAPTER I.

### GENERAL OBSERVATIONS.

No portion of the year has been more loudly declaimed against—we may say, calumniated,—than the Winter. It must be admitted that it is the opposite of summer, the contrast of repose to activity, in so far as the vegetable world, and many of the smaller kinds of animal life are concerned. But alternations of activity and repose are essential to the healthy condition of the whole of growing and living nature, whether animal or vegetable; and in the case of many animals—indeed of the most of them—the alternations are far more frequent than those which, in the whole of nature, correspond with the different positions of the earth's surface to the sun in its annual course around that luminary.

Besides the summer and the winter of life, which, in the ordinary course of nature, fall to the lot of every individual of the human race who is spared to enjoy or

to suffer, as it may be, the customary term, which is, in the end, closed by decay, and not by disease;—besides this, man has really a summer and a Winter, and indeed a brief, but not inappropriate or uninstructive epitome or type of all the seasons of the year, in the lapse of every day of life, every rotation of the earth upon its axis.

In the whole of nature, indeed, the day is beautifully emblematical of the year; and they who have discernment can, between any one sunrise and the next succeeding one, bring all the seasons under their review, and thus have a type or monitor of the year in every day of their lives.

Very little reflection may suffice to show us that such must be the case. The system of nature is one—the workmanship of one Creator, and the obeying of one fundamental law; and, therefore, throughout the whole of it, similar causes must produce similar effects. Now the seasons of the year are the result of one revolution—that of the earth round the sun, in the course of three hundred and sixty-five days and a fraction, at an average distance of ninety-five millions of miles from the centre of revolution; and the times or tides of the day, at any place on the earth's surface, or at any season of the year, are also the result of a revolution—that of the particular place, through the circumference of the parallel upon which it is situated, in the course of twenty-four hours, as measured by the sun. If the place be immediately under the equator, its distance from the axis of rotation is about four thousand miles, and the portion of space through which it is

carried in the course of the twenty-four hours, is about five and twenty thousand miles; and, according as the place is distant from the equator, its distance from the axis of rotation diminishes (as the co-sine of the latitude); and the space through which it travels in the twenty-four hours diminishes in the same proportion, till the pole, or extremity of the axis, is arrived at; and there it is the mere turning round of a point, which, as it occupies twenty-four hours, the same as the twenty-five thousand miles under the equator, could not be discerned, even if we were to suppose a human being insulated in the air, so as to notice the whole diurnal rotation of the earth.

In the effects which result from each of these, there is a gradual succession; and though there are not, in the revolution of the year, except in those climates where the sun is absent or present for days or weeks, any phenomena so marked as the rising and setting of the sun at the beginning and end of the solar day, yet there is the same gradation of temperature, if not of light, in both. In the soft tints and freshness of the morning, we have a most appropriate type of the spring, which advances into summer as the day advances; and as the greatest heat of the year, under average circumstances, is after midsummer, so the greatest heat of the day is, under ordinary circumstances, after mid-day, and longer after it in proportion as the whole day of the sun's presence is longer. Then the evening is beautifully emblematical of the autumn, even in the richness of its colours, told upon both the earth and the sky, as compared with the morning.

In this daily revolution, there comes a succession of changes upon all that grows or lives, similar to what takes place in the course of the year, but much more conspicuous in animated nature than in the vegetable kingdom. In both, however, it is sufficiently conspicuous to attract the attention of even a careless observer, though in both kingdoms some species are more diurnal and others more nocturnal in their activity. Mankind, as being naturally diurnal, have most lively perceptions of the first of these; and if this general law of nature is violated, the violators are sure to pay the penalty, both in body and mind. They who, from dissipation, the habits of fashionable life, indolence, or even from causes which are justifiable in their objects, turn a portion of the natural night into day, and a corresponding portion of the day into night, always impair and derange the system of their bodies; which derangement is, as matter of course, accompanied by incapacity for thought, and a fevered state of the feelings, over which the natural reason, and every species of restraint both religious and moral, lose their proper influence; so that, without taking any actual depravity or impurity of motive or pursuit into the account, persons who deviate from this very simple but very essential law of nature, invariably lower themselves both in the physical and in the intellectual scale, and in so far hide their talents in the dust.

On the other hand, those who time the occupations of the twenty-four hours to those portions which nature obviously points out, never fail of enjoying the advantage, even though they may not aim at that advantage,

or even be aware of the possession of it. The sinewed frame, the bounding step, the hand without tremor, the keen eye, and every sense on the alert for its appropriate enjoyment, are the certain rewards of adjusting the hours of labour and of rest to those periods of the day which nature has obviously intended for the purpose.

There is one coincidence between what may be called the seasons of the day and the seasons of the year, which is not a little remarkable. In the cold and the temperate latitudes, the Winter, both of the day and the year, is occasioned by the absence or the diminished action of the solar beams; and in both cases the maximum of cold is, in consequence of physical causes requiring time to produce their effects, thrown later than the time of the sun's greatest absence,—after the Winter solstice in the case of the year, and after midnight in the case of the day. In tropical climates, again, there is a double Winter of the day; one arising from the absence of the sun, uniform in its character all the year round in proportion as the place is near to the equator; but there is another one which resembles the Winter of the dry season in the same latitudes. A little after mid-day, towards that hour when the solar heat produces its greatest effect, the people are overcome by it, obliged to remain within their houses; and they spend this portion of time, which is unbearable for any purpose of activity, in a *siesta* or mid-day sleep, from which they rise refreshed, and pursue their labours until the night is far advanced.

In the warm season, the necessity of this is felt in Spain, and in several other parts of the South of Europe;

but during the Winter season it ceases to be necessary. In like manner, it ceases to be necessary in tropical countries during the period of the rains, at what times soever these rains occur; and in some places on the sea coast it is rendered unnecessary by the refreshing breezes which set in from the sea, as soon as the land becomes sufficiently heated for causing a continual ascent of the air from its surface. But in countries which are flat and inland, so that there is nothing to cause a circulation of the heated atmosphere, two or three o'clock comes every day upon the people, with all the withering and enervating influence of a burning Winter. In the cities of South America, eastward of the Andes, the effects of this are probably more striking than in any other part of the world; and if one passes along the streets during those sultry hours which are devoted to the siesta, one finds the same stilly repose which might be supposed to reign in a city over which the destroying angel had just passed, setting the seal of death upon every living thing. Man and beast are equally affected, and there is nowhere either a sound or a sign of life. The doors and windows of the houses are open, and the people with their household animals are stretched prone on the floors, all in the quietude of sleep—sleep much more general, and probably also much more profound, than is to be met with in temperate climates during the silence of the night.

This continues for a few hours, until the heat abates; and then the people come abroad to occupy and to enjoy the evening with the same renewal of freshness

and vigour, as early risers in temperate climates enjoy the morning. Under such circumstances, though there is a diminution of the length of the active day, from its being only upon the average equal to our equinoctial days, or only twelve hours of sunshine, and the warm night, or time of the siesta, occurring in the middle of it; yet the people have the advantage of two morning freshnesses in the course of it; and as mere length of time is only one element of activity, and energy the other,—each of which may be diminished without any lessening of the effective result, if the other is increased in the same proportion,—the high temperature of tropical climates is by no means so unfavourable to human exertion as a superficial view of the matter would lead us to believe. In all climates, indeed, there are wonderful compensations, which clearly prove that man is a universal inhabitant of the earth, and the only inhabitant of it which can be said truly to possess this character.

This universality is as true in respect of times of the day and seasons of the year, as it is of local position upon the surface of the earth; and though the enjoyments of human beings vary, and indeed must vary, with all those variations both of time and of place, it is difficult to say which is calculated to afford the highest degree of pleasurable enjoyment, or which presents the widest and the most gratifying field of contemplation to the well-informed mind. It is true that the circumstances of locality, and even those of season—though perhaps in a much lower degree—modify the general character of the inhabitants of different regions; but

still the enlightened mind, imbued with true love of the knowledge of nature, and of nature's God, never finds a desert in any place, or desolation at any season. From the equator to the highest latitude which can be trodden by human foot, and from the ardour of summer to the extreme depth of Winter, even where it falls most heavily upon living and growing nature, there is always enough for instruction and for gratification; and we have evidence, in some of the accounts of recent voyages and journeys to the extreme north of the American continent, that those regions, though very different in their character, are not less redolent of instruction and pleasure than the most sunny lands on the surface of our planet.

But though such be the fact in nature, and such the evidence placed upon record by those who take nature honestly for their guide, yet we find, in very many of the accounts, and more especially in those which purport to be drawn up expressly for popular reading, a very different delineation of the state of things, with regard both to places and to seasons.

This arises from narrow and partial views,—from taking the agreeable of one place or one season, and the disagreeable of another, instead of fairly balancing all the elements of each. Thus, in the case of Winter, if we examine the accounts which are given of this season, even by those who are understood to view it with the most philosophic eyes, we find in them little else than an accumulation of horror upon horror, and ruin upon ruin; as if one part of the year were brought about expressly and for no other purpose than that of

spoiling the beauty and destroying the productions of the other parts! Congregating clouds, rolled volume upon volume and mass upon mass, till the sun is hidden, and the darkness of twilight broods over the earth for the live-long day; torrents of rain, in consequence of which the erewhile placidly gurgling brooks of the summer become torrent floods, sweeping their banks with destruction, and converting the meadows into lakes and seas; whelming snows, flung heaps upon heaps by the angry winds, crushing the forests under their load, smothering the flocks upon the mountain, and suffocating the weary and benighted traveller upon the heath; intense frosts, under the influence of which the waters congeal into crystal, the earth rings like iron, the mountain peaks are rent into fragments, and the powers of vegetation are suspended, while the wild beast cowers in the fastness of its den, the bird closes its weary wing under the thicket, and man has to put all the resources of warm habitations, increased clothing, and artificial fires, into exercise, so that he may preserve the shivering and palsied life till the return of the sun and the spring;—these, these are the colours in which even the masters of seasonal description limn this portion of the three-score-and-tenth part of the human span: and, were we to rest satisfied with such descriptions, splendid as they are in themselves, they would lead us to the dismal conclusion, that every day of our lives dawns to hope and closes in misery.

Now the effect of those gloom-inspiring descriptions is far worse than if they were merely idle words; for

however powerful or pathetic those delineations of the horrors of Winter may be, and how much soever the marvel-loving mind may gloat over them, as it does over the senseless pages of an unnatural tale of fiction, such as we see issuing from the press in almost daily succession and ephemeral life, for speeding the way of the idle and the dissipated,—*Surgit amare aliquid;* there is some moral bitter which bubbles up with the "dribble," and nauseates the cup to the pure, or poisons it to the tainted. It is not in our nature to lose sight of the analogy which there is between the seasons of the year and the corresponding periods of man's ordinary sojourn upon earth. We cannot help applying those analogies to our own individual case; and thus, if we are taught to contemplate, in the Winter of the year, nothing but those horrors and desolations which are the most prominent characteristics of it in the regions where it is most decided and striking, we can with difficulty refrain from regarding that season of our life which brings us to the tomb, and which should gradually prepare us for it in a better spirit, with any thing but the most gloomy despondency or the most hopeless and bitter despair.

But the Winter of life is that period of it during which very many of the human race stand especially in need of consolation from every subject with which an analogy can be traced. Under many circumstances, the consolations of religion are capable of supporting the mind amid the suffering of the body; but there are cases in which the agony of the flesh is hard to be borne. The body will not quit this sublunary world, which has been the scene of all its enjoyments, without pangs which

none can feel but they who are actually under the operation of them. Be the lines of life what and where they may, there *is* bodily enjoyment, not only in those blithe years which precede the cares of the world, but also as long as hope in the world continues to gild the black and roughened story of to-day, with that radiance of anticipated prosperity and joy which comes to smooth our nightly pillow up to a very late period of life. This is the real sweetener of life; and but for this, the rubs and disappointments of life could not be borne for one single short day, even in the case of that man whose neighbours envy him the most for the success of his schemes, and the fulness of his enjoyments. Up to a certain period—and, with the majority of human beings, this period is very near to that of final dissolution—this hope in the world can bear us up under the pressure of very great misery, far greater than can be borne by those who impiously rush into the presence of the Almighty, stained with the blood of self-murder. Persons who give way in this cowardly and criminal manner, are of weak minds—that is, the connexion between the mind and the body is easily deranged. Compared with those who are so nerved as that they can bear it out, they are what cast-iron is compared to malleable iron,—they break under the hammer; and they do so just because they have not previously been hammered enough. The world has been too easy to them; and so when even a little hardship does come, the connexion between the senses and powers of action and the reasoning faculty is suspended, and they are no more for this world.

But waiving these, there is a something in the sensal part of the human body which is unwilling to die, and so starts back in horror at the very thought of the last triumph of physical circumstances over us. The eye has seen so much beauty, that it is unwilling to be closed; the ear has heard so much melody, that it too would linger a little space before passing into the region of unbroken and unbreakable silence. It is the same with the other senses that have local organs, and also with that general "sensation of life," which is probably the head of union among the rest, by means of which they sympathize so readily with each other. Our faith in the immortality of the soul and the resurrection of the body may be ever so strong, and, mentally, we may "long to depart;" but still, there is a strife of nature against the thought, that this frame of ours, which has been so active and so full of enjoyment since the very first dawn of consciousness, should mingle in darkness and concealment with the common mass of matter, through the countless years and ages which may pass away, before "the trumpet shall sound, and the dead shall be raised."

It is only by means of experience that we can meet any of the physical contingencies of life; and as we can have no direct experience of this death of mortal hope, or hope in the present life, it becomes our duty to fortify ourselves by all the indirect means to which we have access; and as this must be done before we have the stimulus of necessity—for after that it comes all too late—we must employ the means, while ignorant of the effect which those means are ultimately to produce.

Now, in this, as in all other matters, we find that the bountiful Author of our being has not left himself without a witness, our weakness without a support, or our ignorance without a guide; and as this may be reckoned the extreme of helplessness in our mortal state, the support and the guidance are given equally to the mental and the bodily part of our compound nature. Revelation sustains the mind by the assured hope of that immortality upon which it is to enter, the moment that it is separated from the body; and the hope of the body is sustained by the knowledge that there are other worlds in the creation, and that therefore, when the years of our earth in its present condition are numbered, the gracious promise that, in the fulness of God's appointed time, we shall be called from the long slumber of the tomb, to inhabit a new world, wherein shall dwell righteousness, is in perfect accordance with the economy of the grand system of nature, as we have beheld it with our own eyes.

The ordinary course of nature is, indeed, full of resurrections, which are so general—so universal, we may say—in every thing upon which we can bring our minds to bear, that to decry or to doubt that we also shall partake of this renovation and return which we find to be common to all nature, is impossible.

It is true that we do not, and from the nature of the case it is obvious that we cannot, witness the resurrection of any one individual body, or member, of the great family of creation. There is one stage of the progress from first to second being or life, in which the matter of the being is utterly beyond the reach and ken of

any, or of all, of our senses. This is true to the analogy; and, indeed, a very little reflection may suffice to convince us that it could not be otherwise, without a total change of the laws and economy of nature. In ourselves, the stroke of death puts an end to all sensation of every kind; and very often, before the vital system has ceased to act, and "the pitcher is broken at the fountain, and the wheel at the cistern," as it is figuratively but beautifully expressed, "the lookers out at the windows are darkened"—all sense and perception are at a final end. This is a most merciful provision, and the mercy of it always extends to the full measure in which it is required by the particular state and case of the individual; so that, by means of it, the fearful struggle which the strong man makes at parting, how painful soever it may be to the sorrowing friends around his couch, is not one jot more felt by him, than he felt the pressure of his body on the same couch, while in the balmy sleep of perfect health.

The knowledge of our own bodies is certainly the first knowledge which we acquire on our coming into the world; and, for this very reason, it must be the last which remains with us when we go out of the world. It is not meant to be alleged that this first and most elementary portion of our knowledge extends to the form, or the size, and much less to the structure of our bodies. These are matters of secondary knowledge, obtained in the very same way, or at least by the very same sort of process, as any part of external nature. With regard to the anatomical structure of the body—the parts of which it is composed, and the functions

and uses of those parts,—there is probably not more than one in a hundred thousand of the whole human race that has any knowledge at all; and what is known by the best informed, is small indeed in comparison with that of which they are utterly ignorant.

If one notices the continual motion of the limbs of an infant, especially of the hands and fingers, one can easily see what practice it must have before it can ascertain the length of its arm, or even of its finger; and then, when the eye begins to notice, and the muscular measure is attempted to be used in concert with the optical one, a thousand unsuccessful attempts are made before the most conspicuous object of sight can be touched. The distance of the object is a matter of little moment, so that its optical attraction is strong enough; for the infant's hands are stretched out as readily to grasp the bright lamp in the middle of the room, or even the moon in the sky, as they are to get hold of an object within arm's-length. All these prove, beyond any doubt, that the measuring of lineal distance, which is perhaps the simplest step in our knowledge of external nature, is not a sensal perception, but a mental inference from former experience.

There is one point here which is well worthy of our attention,—the fact that, after the infant can at all use its hands and arms, it never misses the way to its mouth; and this shows clearly how beautifully the deductions of experience adapt themselves to our necessities, even in the most helpless state of our non-age.

We cannot follow this train of argument up to its

source, but probably there is a feeling of life in the first pulse of the embryo, long before the form of its body is completely developed; and, as this is inseparable from life at the opening, so it is the last to cease at the close. But it has nothing to do with the growth of the body, or with its decomposition after death; for both of these are purely physical matters, of which there can be no sensal perception in the subject in which they occur.

This close resemblance which there is between the very beginning and the very end, makes it necessary that we should consider them jointly; it being impossible to understand the one without a knowledge of the other. Nor must it be supposed that this inquiry is foreign to the philosophy of Winter, as one of the marked periods of the revolving year, widely as it may differ from what is usually said or written upon the subject. Winter is not a stage in the progress of seasonal action, during which any specific function, either of vegetable or of animal nature, is performed. It is really an ending and a beginning, with a pause between, of longer or shorter duration, according to the latitude and other climatal causes, and also the habits of the particular vegetable. In the case of some plants, which are quiet or stationary during summer according to the calendar, it is the season of growth; and in such plants—as, for instance, many of the mosses and the seaweeds—it is the natural summer; for the summer of a plant is the time of its growth, and the multiplication or continuation of its species, at whatever time of the calendarial year it may take place.

The proper function of Winter,—if the term function

can be applied to that which is negative, and depends upon the withdrawal or abatement of stimuli, and not on their development or increase,—is the subsidence of that which has come into leaf in the spring, flower in the summer, and matured seed in the autumn, into a state of repose, from which it shall again be awakened, to run anew the annual course, when the stimuli of the following year are applied to it with the requisite degree of intensity.

The *state* of Winter, which may not unappropriately be called the repose of nature, is that which lies between the ending of the action of one year, and the beginning of that of the next. No definite length, as already hinted, can be assigned to this pause between action and action, or state of Winter repose. It may be so brief and momentary, that no note of it can be taken, even by the most delicate measurers of the lapse of time; it may extend to days, or weeks, or months: and, in the case of very many seeds, and some plants, it is protracted by nature, or may be protracted by art, to several years—to an unlimited number, in the case of seeds which are protected from the action of every cause, both of germination and decomposition. Nor are instances wanting, in which, at the very same instant of time, it may be Winter in one part of a plant, autumn in another, spring in a third, and summer in a fourth. Thus it is quite impossible to give a general description of the Winter state, as connected with the revolution of the earth in its orbit, or with the earth's surface, the atmosphere, or the weather, as they are found on the average of years at the particular place referred

to—be the geographical situation of that place upon the earth what it may; and this is, in all probability, the reason why we have no general account of the wintering of nature, which can be considered as philosophical, and reaching the principles of the season and the use of it in the economy of nature. Instead of this, we have descriptions of particular scenes and phenomena, of which, as has been hinted, the terrific ones alway get the preference, — on account, no doubt, of the more striking contrast which they form with the summer, and the wider scope which they afford for lofty and imposing declamation. These may be, and they generally are, very impressive, nor are they by any means barren of instruction; but they do not furnish the kind of instruction which is most desirable, as having a connexion in general knowledge, and a use in an intellectual and moral point of view. They do not form steps in that ladder by which we ascend from nature to nature's God; for this must be done by studying the harmonies of nature, and not the contrast,—the unity, and not the division.

A clear and correct perception of this unity is, perhaps, the greatest benefit which the study of physical nature has derived from revelation; and next to the bringing of life and immortality to light, it is probably the most general and important blessing which the gospel has bestowed upon the human race. It is also the most pleasing, and perchance the most powerful inducement, which we have to the love and the knowledge of divine truth.

It is also a perception which they who undertake

the commendable office of schooling us, should be especially upon their guard against weakening, inasmuch as there is in the observation and study of nature, pursued upon purely human grounds, a tendency to break down this union of nature, and to substitute for the God of nature a pantheon of imaginary divinities, all of them partial and limited in that part of the system which fancy assigns to them; and thus they are not gods, but men, exaggerated in a fanciful and unnatural manner, according to the characters of the notions by which they are contrived.

Observation, in so far as it can be depended upon in a matter to which the application of it is so difficult, does, indeed, lead us to conclude that the very first glimmering which men have beyond the province of the senses, is that of one invisible and incomprehensible governing power. But, as soon as this exceeds the merest glimmering, it becomes a fertile principle, which produces superstition, if there is no light of revelation to guide it to the truth. It leads the mind to the phenomena and the productions of nature, the causes of which become subjects of anxious desire: and this, though the speculations concerning these vary with the physical condition of the country, so as to make some of these false systems monstrous, while others are only absurd. But, whether it be

> "Moloch, horrid king, besmeared with blood
> Of infant sacrifice;"

the car of Mahadeo, to crush the self-devoted victims under its wheels; or, more horrid still, the war-god of

the Mexicans, upon whose loathsome altars the daily victims were immolated;—whether it be the gods of the ancient Egyptians, including monkeys and mice, reptiles and vegetables, in the motley group; the personifications by the classical Greeks, whose gods are stained with every vice and crime that can degrade human nature; mad Ambition, overtopping all in the number of its victims; Mammon, first-born of the horseleech, and far more insatiable than the fire or the grave; or any other of the Christian idols—the idols of those who *call themselves* Christians:—the origin and principle are the same, whatever difference there may be in the modifications.

Such are the results in respect of the general system and phenomena of nature, or rather the mass of detached and contradictory parts of which it is represented as being made up. But this is not the part which applies to that breach of the unity of nature which, we have said, giving the description of Winter in its horrors and its desolation only, and leaving out, or casting into the shade, its use in the economy of the year, is calculated both to produce and to perpetuate. In all conditions of human life, that which affects man himself comes home to him with more lively interest than that which he sees in the rest of nature around him. The events of the external world, if they are not altogether indifferent—as every thing is which is either unknown or unheeded—have, at the most, only a secondary effect, the result of a chain of reasoning, longer or shorter according as our minds are more or less cultivated; but whatever affects us personally, tells at

once upon the feelings, and takes the category of good or of evil, according as the impression which it has is pleasurable or painful. This, being more connected with our merely animal nature, precedes that inquiry into the causes of external events which is the original source of polytheism; and, as it is not necessarily connected with any one particular modification of that, it is more generally distributed, and more inveterate in its continuance. Hence, we find a principle of good, and an opposite principle of evil, with a being, as the source and the governor of each, in many nations, of the rest of whose mythology, if they have any, we find no account on record.

The transfer of this into the system of nature around us, is a very likely consequence, if it be not a necessary and unavoidable one; and we accordingly find that the opposite parts of the year, if these happen to contrast strongly with each other, are embodied in the mythological representation of this natural good and evil. Nor is it unworthy of remark, that the drought or the cold is the evil, according as the one or the other is the season of unproductiveness.

Egypt is a country in which, from physical circumstances, the seasons are very strongly marked; and there is every reason to believe, that the mythology of the ancient Egyptians was of native origin, and not imported from any other country. Now, in so far as that system bore upon good and evil, as connected with the alternating parts of the year, Isis, Osiris, and Anubis were the good gods; and Typhon, as opposed to them, was the malevolent one. There were many

others; and, as has been the case in all countries which have had inferior gods, or heroes, or saints, to whom religious homage has been paid, they multiplied greatly in the course of time; but the four which have been named were the chief, if not the only ones which had particular dominion over the causes of fertility and barrenness in the different seasons of the year.

And this portion of the Egyptian mythology was merely a figurative embodiment of the natural causes which are peculiarly conspicuous in the valley of Egypt. The sun and the rain have much less apparent influence in bringing the fruits of the earth to maturity than they have in most other countries. The annual overflowing of the Nile, and the new soil brought down and deposited by that periodical flood, are the obvious causes of growth; and the thirsty deserts on either side, by constantly draining off the moisture, so that the air is kept comparatively dry, notwithstanding the great evaporation, is the principal means by which the sterile season is brought about. Up to a certain stage, this abstraction of the humid air is highly favourable to vegetation; so that, with skilful culture, the crops of Egypt are excellent in quality, abundant in quantity, and not subject to those failures which are but too common in such countries near the deserts as have to depend on the rain of heaven for their fertilizing humidity.

Of the fertility of Egypt in ancient times, and, indeed, at all times when its political state has been such as that the people could cultivate their fields with safety, there are many proofs on the record, to which

may be added its progressive state at the present time; and we have an instance of the abundance of "corn in Egypt," in the history of Joseph and his brethren, and the subsequent scenes which led to the bondage of the Hebrews in that country; though, in the same history, we have intimation that there were unfavourable seasons in Egypt itself, which did not arise from any thing in Egypt, (for the seasons there are remarkably uniform,) but from the failure of the rains in that upper country, whence the flood of the Nile is derived. When the flood did not rise to a certain height, those parts of the valley most distant from the ordinary bed of the Nile were not watered naturally, and could not be artificially irrigated; and thus, in seasons when the water was low, the desert invaded the cultivated ground, and could be driven back only by an unusually high flood of the river.

To common observation, there was thus a contest between two opposing powers—the fertilizing water and the scorching heat; and as the observation, that this same contest arises from natural powers duly balanced, belongs to an advanced stage of inductive science, and not to such mere beginnings as constituted "the learning of the Egyptians," it was very natural that they, as all ignorant persons continue to do, should regard that power which appeared to counteract their exertions and defeat their purposes, as a natural evil.

Of the three beneficent divinities, Isis was typical of the productive power of the earth; and, by a farther extension of the fable, of the general principle of fertility or maternity. Osiris was typical of the fertilizing

power on the earth, and, by the general interpretation, of the principle of paternity, in every sense in which that principle can be understood. These two, under some names and similitudes, are common to the mythology of every people who have made such advances in knowledge as to be able to generalize natural causes, though they have been differently received by different nations, according to the difference of physical character in the countries where the systems originated.

Though all the systems of this kind of which we have any knowledge are of great antiquity, we speak of them in the *present* tense; and we do so, because mankind in themselves, and uninfluenced by the light of revelation, are the same now as they were then: and, if they were placed in exactly the same circumstances as those ancient nations, they would form similar systems of mythology, and of every thing else.

Anubis, the third of the good gods of the Egyptian year, was typical of the overflowing of the Nile, and in this sense, at least, peculiar to the mythology of that country. The dog, as symbolical of the dog-star, was the emblem of Anubis, as the flood of the river came where that star rose at a certain time. Fanciful analogies may be traced between Anubis and some of the gods of other mythologies; but the following out of these would be foreign to our present purpose, which is not in the least affected, either by the number of the emblems of physical good, whether they be one or many, or by the natural agents which those emblems typify, whether they be humidity of temperature, or any other means or stimulus of productiveness. It is

quite sufficient that they are symbolical of physical good.

Typhon, though in the first instance symbolical of the burning influence of the desert, came at length to be equally symbolical of every kind of evil, moral as well as physical. It was the same with the good gods; and in this lay the mischief of the system, and of the portion of it which remains to the present day—the same in principle and effect as formerly, however it may differ in form; and very many who would spurn the direct imputation, are deeply imbued with it, and tend to its perpetuation, while they fancy that they are inculcating doctrines of very different nature and tendency.

We have felt it necessary to go at some length into the case of the divinities of the Egyptian year; because, with the exception perhaps of Anubis, they are expressive of what has been, and would still be, the belief of mankind with regard to the tropical summer of humidity, and the tropical Winter of drought, if mankind, in tropical countries, were destitute of revealed truth, and sufficiently advanced in natural knowledge for inquiring into general causes.

But men who do not understand the doctrines and the lessons of revelation are just as little influenced by it as though it had not yet come into the country which they inhabit. The influence of revelation has nothing to do either with geography or chronology. It comes not into lands in their breadth, or into ages in their succession. No doubt the means must be in the place, and at the time, otherwise the people cannot profit by them; but then the profit is wholly in their

being brought home in the proper manner to individuals: and if the understanding and the conduct are not influenced by the doctrines and the precepts of Christianity, the inhabitant of the most nominally christian country in the world is, even with the most solemn professions and observances, as much a heathen as if he had lived in an age when the glad tidings from heaven had not been declared to the children of men. Nor does the amount of merely human science, or even of moral conduct, avail any thing in this respect; for though the one may prevent the party from falling into physical absurdities, and the other may make him a good member of society, in as far as human laws and institutions are concerned, they do not reach the spiritual part of his character, which is the only sure foundation of a moral one that will hold fast its integrity amid all the vicissitudes and temptations of life.

When we come to the middle latitudes, in which there are, in many places, two Winters, produced by opposite causes—the one by drought, and the other by cold—we find the evil, as it regards the year, or as it is figuratively transferred to the final retribution of human misconduct, also made up of two parts. Thus, in the notions which the Greeks and Romans had of the future state of the guilty, the punishment alternated between an extreme of heat and an extreme of cold; the one obviously borrowed from the burning up of the dry plains by the summer's heat, and the other from the suspension of growth and the withering of annual vegetation by the Winter's cold.

Then, in countries which are in latitudes so high as

that cold is the only, or by far the more general, check to vegetation,—and where that cold is augmented by the heavy rains of the autumn and the early Winter,—we find that these are the causes of evil in the year, which work in opposition to the genial beams of the sun, as the agents of beauty and fertility, and of all that is pleasing and profitable in the economy of the year. Hence it is that our bards who sing of the year, and all others who address themselves to the fancy and feelings of the people, make their pictures of Winter such contrasts to those of the other seasons. Spring is all freshness and hope, with opening buds, springing herbs, busy birds, sportive lambs, and all the other attributes and accompaniments of young life, full of the most cheering prospects and the most delightful anticipations. Summer is also redolent of every beauty and every charm which can captivate the sense—all beauty to the eye, music to the ear, essence to the smell, and delight to the whole sentient nature of man. Autumn, also, is so full of the realisations of the hopes of spring and the promises of summer, that it is an especial season of joy and joyous description, not merely to those who find, during that season, their chief return for the labours of the year, but to the whole people, in so far as they are dependent on the fruits of the earth, or take their pleasure upon its surface.

It may be partly from the desire of heightening the interest of these by the contrast, that Winter is usually clothed in gloom and desolation, and made, in so far as the year is concerned, the very type of the evil genius

of the mythologists, though it is probable that there is a good deal of mythologic feeling that mingles with this simple desire of producing effect. Ignorant and ill-constituted minds, of which there are but too many in the world, are always much more sensitive to the ills and reverses of life, than they are to its pleasures. They complain when they ought to render gratitude; and by mingling for themselves the cup of bitterness, they turn that which in itself is, and to them should be, the honey of life, into gall; and, if this is done for any length of time, its withering influence is shed upon the whole of nature, as well as upon all the incidents of life; and the hapless self-tormentor may "travel from Dan to Beersheba, and find it all barren."

There is no real security against this unhappy condition, but in the consolations of true religion; for if these are wanting, the man who is envied has no real security against the incurable malady of the mind, and he may rise from success to success, to any height in the estimation of the world, with only a heavier load of misery at every step. Just so, he who is sustained by those hopes which the world can neither give nor take away, may, according to the world's estimation, sink from misfortune to misfortune, and from suffering to suffering, to a far greater depth than unassisted human nature can bear; and yet he shall be more calm, more contented, and more joyous, in the very furnace of worldly affliction, than the man without hope is upon its bed of roses.

Religion alone can furnish the root of this amaranth

of life—this plant of the heart which cannot be withered; and when it has once taken root, there is not an object or an event in nature, but which may be made to furnish a flower or a leaf, to increase the greenness and beauty of the tree. "Seek ye first the kingdom of heaven, and all other things shall be added thereto," is the counsel and the promise of Him who is both "the truth and the life;" and all who follow the counsel, are sure to enjoy the complete fulfilment of the promise. *All things* will not, of course, be added, in the literal meaning of the words; for, instead of knowing all things and doing all things, the knowledge and the actions of every individual are confined within very narrow limits. But still the spirit of the promise is sure; for, according to the measure of all that he knows and does, every man will be complete in the participation of the blessing. The things which a man knows are "all things" to him; for, between the unknown and the non-existent, there is not, in so far as the individual is concerned, a single handbreadth of difference.

It is in this, indeed, that the great superiority of christian consolation above all other consolations consists,—it is full and complete as far as it goes; and, therefore, although the pleasures of the man who knows little are neither so numerous nor so varied as those of the man who knows much, they are as satisfying to the mind, and produce equal contentment and enjoyment. With all mere worldly matters, of whatever kind they be, the case is widely different. Be their object what it may, and the means by which that

object is pursued virtuous or vicious, one and all of them are "daughters of the horseleech," and will not be satisfied. Nay, the more ardently and the more successfully that they are pursued, they become the more insatiable. Learning, honours, fame, wealth—every object of mere earthly ambition, be it what it may, gradually absorbs the whole mind, and becomes both a vice and a misery, for which the world has no corrective or cure, and no opiate but the blank oblivion of extinguished thought. Hence it is that so many who bask for a time in the sunshine of the world's adulation, fall so certainly, and often so suddenly, into the shade of utter neglect; and that he who in middle life was a philosopher, a statesman, or a hero, slides a dotard or a driveller into a neglected grave, known only to the worms. Even if matters ended here, religion would be the pearl above all price to the human race; but when we bear in mind that eternity approaches and brightens as life draws to its close, the gift of revelation becomes truly "unspeakable"—above all praise, above all gratitude.

Those who feel in this manner, aright and in earnest, can find no gloomy object in nature, and no desolation even in the severest depth of the Winter; and when we reflect but a very little, we find that nature and sound philosophy respond to this delightful influence of religion; and thus establish the truth, that the God of nature and the God of revelation is one and the same: and we begin to wonder why, even without the influence of religion, any subject, any scene, or any season, should inspire gloomy thoughts. We find

the explanation in the same inestimable volume which teaches us the only certain way of avoiding the evil in our own case. When the earth was called into existence, clothed with plants, furnished with animals, appointed to run the course of its days, its seasons, and its years, in all the variety of their changes of time and place, and given to man as a heritage for knowledge and for enjoyment,—"when the morning stars sang together, and all the sons of God shouted for joy," over the accomplished work of a new world and a new race, capable of knowing and serving their Creator,—then "God saw every thing that he had made, and, behold, it was very good." Man alone fell from his goodness—man alone was capable of so falling; and therefore all the rest is still under the original benediction—as good as it was at the beginning, in its laws, its productions, and its phenomena, though not so good to fallen man. "Unto Adam he said, Cursed is the ground"—not in itself, but "*for thy sake*," that is, "unto thee;" and the whole passage shows that the curse alluded to the pain and labour which man had to undergo, while estranged from the law and love of that God who alone can restore the lost enjoyment, even in this life. But it is the nature of man to put the evil from himself, and lay it upon creation around him,—to lay the burden of his own curse upon that system of nature which is as fair and as good as ever. There is really no evil except moral evil, or evil done through the ignorance or the vice of human beings. The helplessness of childhood, the decay of old age, sickness, death, and all the contingencies which befall

us without any fault on our part, are not evils; they are part of the constitution of our nature, or results of the laws of that creation by which we are surrounded, and in which we must bear our part; and if we ourselves are not in fault, then there is fault nowhere. It is the same with all the changes of the weather, and with all the vicissitudes of the seasons. Whatever our feelings with regard to them may be, the one is just as necessary, as useful, and as good, in the system of nature, as the other. We cannot change that system, though we would; and it is well for us that we cannot, for assuredly we should spoil it. The fable of the farmer who had the control of the weather, and rendered his farm completely unproductive, is a heathen fable; but the moral will remain a good one in all ages. All seasons are, in themselves, equally beneficial; and if they are not equally so for our operations, then it is we who are out of season—erring through ignorance or waywardness, and paying the forfeit for our own folly or vice.

This is the rational view of the year,—the one under the influence of which we ought to enter upon the study of the whole year, or of any particular season or character of a season; and in this view, the repose of the Winter, whether produced by heat or by cold, and whether of longer or of shorter duration, is just as necessary as the budding of the spring, the blooming of summer, or the ripening of autumn. The natural agencies by which the phenomena of the seasons are brought about, are as much in harmony with each other at one time of the year as at another; and

although there are such differences in the appearance and apparent progress of nature in them, we cannot say with confidence that any one of them is more eminently conducive than another to the crowning of the year with the bounty of the almighty and all-wise Ruler of the year.

## CHAPTER II.

### SOME NOTIONS AND CHARACTERS OF WINTER.

As Winter is the season of nature's repose in the vegetable kingdom, and partially in the animal; and as even the elements are at rest, for a time, in those places where the Winter is of decided character and of considerable duration, it cannot be defined or characterised by any peculiar agent or species of action, as is the case with the other seasons. There is, indeed, a contest in the early part of the season, during the transition from the autumnal to the wintry state; and there is another at its close, in the transition from Winter to spring. These contests are often violent; and they are usually most so, while they last, in places where the repose of Winter is long, and the difference between Winter and summer is great. But where this is the case, they are usually of short duration; though, where the Winter is less decided, they may extend over the whole of it. There are also, as we have had occasion to mention in the volumes on the other seasons, two Winters—a tropical one, resulting from heat, and a

polar one, resulting from cold—for the repose of each of which a very different preparation is necessary. In different years, too, and in places differently situated, even though not far from each other in latitude, the Winter sets in very differently; and thus, whatever has to abide it in a state of repose, has, according to the usual working of the system of nature, to be prepared for it in a different manner.

In tropical climates, the pools and brooks and all the smaller waters are completely dried up, and their beds and channels converted to dry sand or dust, deprived of all those matters which give the mud at the bottom of the stagnant or slow running waters their tenacity. Thus, there is no protection by means of water during the drought, and no stability of place for any germ of life deposited in the bed of the waters when the rains come. The violence of those rains is also generally in proportion to the severity, and often, though not always, to the continuance of the drought; and thus, when the rains come, the channels of the brooks and rapid streams are not only swept to the bare rock, but the rock itself is rent in pieces by the violence of the high-swollen and headlong torrents, or ground and abraded by the sand and gravel which the water hurries along its surface. If those seasonal streams roll prone to the sea along steep channels all the way, then the whole, to the full extent of the flood, is cleared of every substance which the weight of the waters can move; and not a germ of animal or of vegetable life can remain, neither is there any soil left in which the latter could be rooted. Such places have,

therefore, to remain in their desolation, until the winds bring them a supply from other places which have not been scourged by the floods; and this, of course, does not come, or at all events does not remain, until the swelling of the flood has subsided. In many situations, especially mountainous ones, where the rains come with extreme violence, the quantity of matter brought down by the swollen torrent often dams up completely those narrow passages which have been cut through the rocks by former floods. These dams, from the resistance of the rocks on the one side, and the weight and impetus of the water on the other, often become stronger than the undisturbed banks of the channel above; and so the water accumulates till it forces a new channel for itself, through which it rushes with the utmost impetuosity, tearing up the soil, uprooting the trees, tumbling down masses of rock, and converting the whole surface into a ruin. As it rolls onward, the materials which it tears up and hurries along from one place, become auxiliaries, which greatly assist its power in committing devastation upon the next; so that, before it can arrive at the level grounds, where it deposits its rubbish, converting former pools into banks, and former banks into pools, the whole aspect of the surface is so changed, as that those who were previously familiar with it, can hardly know it again.

Such is a specimen of what may be called nature's ploughing; and, violent as it is, it is generally followed by a most luxuriant vegetation, though that vegetation is very different from what we see in our comparatively quiet seasons. It may be said, that this is a spring

action, not a Winter one; and the saying is in part true, for Winter is in itself a repose and not an action. But this alteration of the surface must be completed, and the floods which produce it must subside, before there can be any springing of vegetation upon the newly-formed lands. Thus it in reality belongs to the Winter, as indeed do all those warrings of the elements, whether violent or mild, which precede the annual springing of nature; and though, in the order of time in nature, these Winter contests with the spring come after the repose of Winter, the knowledge of them is necessary, before we can understand either the use or the manner of that repose.

This will readily appear, when we consider that no season, no production, and no power or agency of nature is final and for itself only. They are all for the system, working harmoniously together, so that the economy of things may be conducted according to the established laws of nature; and each so assists another, that the whole working of the system seems one succession of acts of the most disinterested goodness, in which all labour for the good of others, without receiving or requiring any return from those which immediately receive the advantage. But the benefit goes round, and each receives its full and proper share, until the period comes when it has accomplished the whole of its appointed labours; and then it renders up its substance to the general store for the good of the whole.

All the parts of nature, considered in themselves singly, are thus dependent upon other parts, and incapable of sustaining themselves without the assistance

of these; but the whole is self-sustained, or, rather, it is sustained in the golden balance of that law which the Almighty Creator has given it, so that not a jot can fail in obedience to that law; for, when by any of those vicissitudes, which form much of the perfection of the law, and without which it could not be a "law of life"—for life is vicissitude, constant action and change—it ceases to be under the law in one form, it comes under the law in another, without the slightest pause or interval. It is this which raises the works and the workings of nature, or, rather, the wisdom and goodness of God as manifested in them, so immeasurably high above the workings of man, as that they are not subjects of comparison, and shows them to be so different in kind, that though man may and should study them to the utmost of his power, and studying them aright, cannot fail to love them with all his soul, admire them with all his imagination, and so strive to obey his portion of the law at all times, and with his every power and faculty, yet that he cannot even in the slightest degree imitate them.

This view of the reciprocal harmony of all the parts of the system of nature, and the consequent stability and perfect security against failure or derangement, which is obtainable only from a general grouping of nature in all its parts and in all its successions, is so beautiful in itself, so demonstrative of wisdom that cannot be fathomed, and goodness which can never be enough appreciated; and it is, at the same time, so fraught with the most cheering and the most delightful instruction to man, both individually and collectively;

that it is impossible to refrain from dwelling a little upon it, if the slightest pencil of its heavenly light—for truly it is a light from heaven, the illuminating emanation of God, as the God of the material creation, beaming through his works, as the light of spiritual truth beams through his word—falls upon the eye of the understanding. This, too, is the reason why the mere contemplation, in their individual characters, of the most curious, the most extraordinary, and the most striking events and phenomena of nature, have a cold and feeble effect upon the mind, and slight influence upon the disposition and conduct, as compared with those broad and general views in which the law arises high above those that obey the law, and the Lawgiver high to infinitude above both. The lost, or the hidden links of this wonderful chain—they are infinite in number—cannot be discerned, even in fancy, by the most richly endowed mind, even in the moment of its most rapt inspiration, when struggling to cast the incumbrance of the flesh behind it, and be a free spirit in the creation of its God; but still enough is traceable in nature to satisfy us in respect of material things; and though between them and the spiritual world there is a gulf fixed athwart which the mortal eye cannot look, revelation supplies us with as much of the analogy as serves for all purposes of peace, of profit, and of pleasure; and when we reflect on the great privileges which we enjoy in the capacity and the means of this twofold knowledge, our gratitude should know no pause, and our reverential adoration no bounds.

In order that men of all minds and all habits—which

are necessarily as diversified as the associations and the pursuits of men—may have access to those general views, and participate in the advantages which necessarily flow from them, they may be obtained from contemplating nature in a variety of ways; the chief of which, however, may be reduced to two general heads —generalizations of co-existence, and generalizations of succession: and it is not a little encouraging, that these two exactly correspond with the two grand elements of all our intellectual and rational knowledge—of all that can occupy our thoughts beyond what we have directly obtained by the use of our own bodily senses.

If we take our survey of co-existent nature ever so wide, we find the law of disinterested benefit running through the whole of it. The sun is the highest object of physical inquiry of which we have any knowledge; and we know the sun only as a benefactor, though beyond calculation the greatest of all material benefactors; but as to what benefits the sun, so that it continues to bestow its bounty without weariness and without waste, we have no knowledge whatever. It has been observed that comets are lessened in their apparent dimensions as they continue to revolve, and hence some have supposed that the sun is fed by comets. This is, however, a merely gratuitous conjecture, which neither has received, nor, from the nature of the case, can receive, any proof. There is no loss of matter occasioned to the sun by all the bounty which that luminary dispenses to the planets and satellites which compose its circumrevolving train; for the matter of the sun, as indicated by gravitation—the only certain

test of matter—has not diminished in the least, since Philosophy was first enabled to weigh the heavens in her scales; and we have no reason to believe that all the light, the heat, and the other influences which the sun has shed upon its attendant planets, since the moment of its first creation, would turn the finest balance against an infinitesimal monad of gravitating matter. But as the energy of every agent must be great in proportion to the effect which it produces, the action of the sun must be great beyond any thing of which we can form an accurate conception, or, indeed, any conception at all; and as action is as much a work of the Creator as matter, and can no more be originated by a created being than matter can, the analogy of the whole of nature, in as far as it comes within the scope of accurate knowledge, leads us to suppose that the energy of the sun, although standing in need of no supply of matter, must be kept up by the agency of some cause or other, though what "messenger is made a spirit," what "minister a flame of fire," to keep up this energy, without which death would rule the whole planetary host, is above all mortal ken.

The notion of the comets, besides being totally incapable of proof, is one which admits of a reciprocating conjecture, namely, either that the comet feeds the sun, or that the sun lights up the comets; for a comet is generally the brightest, and attended by the largest coma or train, soon after it passes the perihelion. The trains or tails of these bodies are of immense length, and they are sometimes darted out with almost incredible velocity, that of 1680 having been projected to the

length of thirty millions of miles in a single day. All our conjectures about the uses of these vast but filmy and unsubstantial bodies, either to the sun or to any thing else, are, however, vain and unprofitable; and we are left to regard the sun as the ultimate created benefactor, between which and the all-beneficent Creator, we cannot interpolate a single link.

With the moon, the case is nearly the same; and the benefit which the moon confers upon the earth is a mere trifle compared with that bestowed by the sun. The principal part of it is the influence of the moon, as a mere piece of matter, upon the atmospheric fluid and the waters of the ocean, the tides of both of which are of much use in the economy of the earth. It is true that when the moon shines by reflecting the beams of the sun upon the earth, those beams are deprived of the heating and other energies of the red end of the spectrum; and the opposite energies of the violet end have consequently a larger share in such effect as is produced than they have in the case of the undecomposed beams as they come directly from the sun, but the effect is very obscure; and we do not know of any emanation which the moon sheds of itself, or of any service that it receives or requires from any body in the system, other than the gravitating influences of the earth and the sun, which retain it in its orbit. These speculations respecting the celestial bodies, are, however, vague speculations; but they are Winter ones, for Winter is the proper season during which to study astronomy.

When we narrow the field of our consideration to

our own planet, we find the same law still in operation; and we generally can obtain a knowledge of the cycle, or circle of reciprocation, which comes round till the benefactor with which we begin becomes the benefited in the end. It is true that we are unable to say what good all or any of those creatures which the earth supports, render to the earth in return for the support which it affords them; though the analogy leads us to conclude, that all the parts do—though we cannot always discern the means or the mode, mutually support each other. Thus, the atmosphere exists not for itself, but for the benefit of the land and the waters, and of all that live or grow in them; and the land and the waters are so constantly restoring to the atmosphere, at one place and by one means, what they are receiving from it at another place, and by other means, that the quantity and composition of the atmosphere appear to vary but little, if indeed, upon the average, they ever vary at all.

The sea and the land also obviously work for each other, at the same time that each of them works for its own living and growing inhabitants, according to their several wants. An enumeration of the particulars would be too long for the general argument, and it is not necessary; but we may mention the single instance of water which the sea is continually receiving from the land, and as continually returning back again to it, though in a very different manner. This water has already performed all its required offices upon the land, and washed that and its productions from many impurities which, were they to remain, would operate

as poisons, so that the beauty and activity which are displayed on the fair earth would perish in the accumulation of their own corruption. This, among other most important services, the running waters prevent; and such of the impurities as are not decomposed and rendered harmless by the maceration of the fresh waters, or taken up by the plants with which these waters abound, more especially in temperate and cold climates, where the decomposing action of the solar beams is less powerful than it is near the equator, are borne onward to the sea, for the economy of nature in which they are peculiarly fitted; it being part of the law of the system, that whatever has become injurious in one part of nature, is, on that very account, highly sanatory for another part. Thus, the discharge of water by the rivers into the sea, not only keeps up the full average in that expanse, but carries along with it many substances which the sea wants, and which have become encumbrances or nuisances upon the land.

In this way the land is the benefactor of the sea, and that it may continue to be so, and at the same time perform its own more immediate part in the grand action of the system of nature, the sea reciprocates, and by so doing returns the advantage. The water is taken up by the atmosphere in a state of perfect purity, and conveyed over the whole of the land, even to the most elevated parts—indeed, in the greatest abundance to them; and the comparatively uniform temperature of the sea in all climates and at all seasons and times of the day, while the land is almost continually in a state of change, from cold to heat, or the reverse,

cooperates with other causes in making the air to circulate so as not only to distribute generally the water which it holds in the state of vapour, but, by the friction of contrary currents, to cause that water to accumulate into clouds, and fall to the earth in rain or snow. It is worth while to notice the *accommodation* which is afforded to the land by the falling of water in a liquid or a frozen state according to circumstances. At seasons when and in situations where the water falls liquid in the state of rain, it invariably has some immediate office to perform, either in the way of refreshment to the earth and its productions, or in that of ablution. For either of these purposes, the rain comes exactly at the time when the growing vegetation requires it, or when the earth requires to be washed on the surface, or saturated so as to retain moisture for the roots of plants after the air is dry and the surface parched.

There are some circumstances in the adaptation of rain to seasons and to soils, which are well worthy of our attention, if we would rightly understand the perfect wisdom of design which pervades the whole of creation, and with what benefit to nature and to man that design is carried into execution. We are apt to complain of the gloomy skies and the pelting rains which generally usher in the English Winter, and also of the conflict which, in the average of years, takes place between the Winter and the spring, before the latter season gains the ascendency, and the young year buds and bourgeons in all its freshness. But these come for the most beneficent of purposes; and there are protecting powers in those pelting rains, and

seasonal contests, but for which vegetation would suffer most severely. Were this the case the animated races would also suffer, as the foundation of all support to them, either immediately or remotely, is in the vegetable tribes, whatever may be their habits, or the nature of their food.

The soil in many parts of England is, from its light and porous nature, and the depth to which the action of the summer sun penetrates into it in consequence, so much dried that were it not for the autumnal and the Winter rains, a few years would reduce it to such a state that it would be incapable of producing any vegetation superior to the stunted heath which is found upon the elevated sandy downs in the southern counties. Some of the stiff soils again are so thoroughly baked into clods by the heat and drought, that were it not for these rains, they would speedily acquire the consistency of brickbats, not to be broken but by the blows of a mallet, and not capable of being reduced to a useful tilth for the purposes of agriculture, except by great labour. Such soils absorb the rain which falls, and retain it near the surface; and there are various ways in which the water so retained becomes a powerful instrument in reducing the clods. To a certain extent it does this directly by its own action; but it does more in a secondary way. Remaining near the surface in much greater quantity than where the soil is less retentive and admits of its more free passage downwards, though more of it is retained, there is more evaporated than upon the open and thirsty soils, and this produces a greater degree of cold, both at the surface and in the

air over it. The difference of temperature in these two kinds of soil, even when they are similarly situated both in position and in elevation above the mean level of the earth, is very perceptible to the feelings of those who visit them.

The additional cold brings on frost much sooner—that is, with less intensity or continuance of cold in the atmosphere, as applied to the surface, and not considering the manner in which it is affected there; and the expansion in freezing the water which is in the retentive clods, and which is very generally distributed through their volume, rends them in pieces with giant force. There is also another circumstance which contributes to the same result: the retentive surface, though it becomes very cold in itself, and tends to cool the air over it, yet prevents the radiation of heat from the earth from being so great as it would be were the surface more dry; and this, besides the effect which it has at the surface, is favourable to the roots of trees and other deep-seated vegetables, which usually thrive well and attain a large size upon such soils, compared to what they do upon those that are of a more light and free character. These rains differ from the coating of snow that lies for the greater part of the Winter on places where the climate is more severe, for they throw out the roots of the surface vegetation, whereas the snow protects them while it lies; but still they make a sort of approximation, by preserving that which is deeper in the soil, and while such soils are, in general, not well adapted for Winter crops, the annual weeds are thrown out, and the strength of the land is preserved till the

season comes round at which it may be made available for the purposes of the husbandman.

Nor is the prolonged contest between the departing Winter and the coming spring without its advantages, though it is severe upon those cultivated plants which are too tender for the situation. But there is no doubt that the trials to which the vegetation which is adapted for such places is subjected during the violent action of the spring, tends to harden it, so that it is tempered to endure the cold dry winds of April or May, which would completely destroy it if it had previously been protected from any kind of check. Any one may convince himself of the truth of this, by taking two plants of the same species, the one of which has been sheltered and the other freely exposed during the angry part of the season, and leaving them equally to feel the severity of a bitter night when the season is more advanced.

We have no space for going farther into the adaptations of co-existence, but any reader may, and should, follow out the chain into all the cases which can come within the range of his observation; and if he does so, he will not fail to find that the beautiful reciprocity to which we have alluded, is equally conspicuous throughout the whole, and that the law of nature, in this particular mode of viewing it, is so admirably calculated to ensure the greatest good of all nature, that the hand of the Almighty is as visible in it, as if the evidence thereof were written in a book, or graved with the graving of a signet.

If we take the adaptations in their succession in time, we find that, in whatever subjects we study them, and whether the period at the close of which the one succeeds

the other be longer or shorter, there is still the same perfection—the same benevolence of design in the system. Each works less, apparently, for itself, than it does for that which is to follow. The day is a preparation for the ensuing night, and the night for the day by which it is succeeded; and though some of the growing and living productions of the earth are nocturnal and others diurnal, each is refreshed during the time of its repose in such a manner as that it acts with more vigour and effect in the time of its labour. The growth of the stem and the leaf is often a nocturnal growth, and when this is decidedly the case, the progress made in a single night, after a warm day, and by the radiation of heat from the earth, and the moisture which comes more freely to the plant from the nocturnal air, is often wonderful,—so great, indeed, that were the plant to continue it through the day, it would be worked beyond what it could bear, and so perish, as over-stimulated plants often do, through the excess of their own growth. Whatever the production of nature happens to be, or the time and the length of the time of its natural activity and repose, the one invariably prepares it for the other, and each is equally beneficial in its turn. Every one who is wise enough to be up and feel it, must know how delightfully fresh the whole of nature is in the early morning, not merely in those creatures which are to be active during the day, but in the very air of the time. So strikingly is this the case, that one who has been watching and weary during the night, actually feels an awakening in the coming in of the dawn scarcely less refreshing than

early awakening from wholesome and balmy sleep, and incalculably more so than any thing which is felt by those who doze and loiter upon the bed of sloth until the sun has gained a height in the sky, and the character of day is confirmed.

This, by the way, is a violation of the law of nature, similar to what would take place, if there were, by any strange anomaly of the seasons, an instant transition from Winter to summer, in a region whose natural character it were to have an intervening spring. Langour, prostration of strength, and mental incapacity for any effort of thought, are the price which the sluggard pays during the day for the indulgence of the morning; and if this criminal indulgence is continued until it becomes a habit, there is no return to activity and usefulness, but the unhappy sufferer lives in tenfold fatigue under the mere labour of being alive, compared to what the active do under the most vigorous exertion, until some trifling hardship comes, and then melts away like a mushroom in the Winter flood. It is the same with all the productions of nature, when either a protracted Winter or a premature summer brings those seasons much nearer to each other than the average time of the place where it occurs.

Thus, when we view them in a proper manner, and in accordance with the principle which is so obvious throughout the whole system of nature, we find that, varied as the seasons are in different latitudes and different localities, one of them is just as essential to the well-being and perfection of nature as another; and that, in seasonal climates, we could no more have the

spring without the Winter, than we could have the autumn without the summer.

It is true that as Winter is a pause or suspension of those powers or energies upon the surface of our globe which are most active during the other parts of the year, its coming, and the preparations of nature for its coming, must both be different; and it is equally true that as there are two distinct kinds of Winter, the tropical and the polar, resulting from causes the very opposites of each other, the comings of these and the preparations for them must also be different. Nor are these the only differences; for if they were, Winter would be an easy study compared to what it is in reality. But besides these, which are the extremes of contrast in the Winters of latitude, there are a vast number of minor Winters, arising from local situation, from differences of surface and elevation, from the characters of surfaces as naked, or as clothed with vegetation of different kinds, all of which have their peculiar characters and require their peculiar adaptations of every thing that is exposed to them.

All these circumstances, and many more that might be enumerated, render the Winter a far more extensive and more perplexing study than would at first thought be supposed,—more so, perhaps, than any of the other seasons, though in the majority of the productions of nature they are times of activity, while to a very large proportion of those productions, Winter, whatever may be its predominating cause or its character, is a time of repose. It is necessary, however, that this repose should, taken on the average of seasons, be perfectly safe for

all that reposes; and that, in places which are decidedly seasonal, the pause which takes place in the Winter should be so complete, as that the action which follows in the spring may be a new action.

In the case of annual plants, which are committed to the seed during the Winter, and perish in the whole structure of the parent plant, there is comparatively little difficulty, because while a plant is in the seed, it is more secure against external contingencies and vicissitudes than it is in any other stage of its existence. If a seed, that is, any seed, has been properly matured, and has not germinated, or moved toward germination, there is, perhaps, no natural degree either of dry heat or of dry cold that will injure it, for one season, or in numerous instances, for many seasons. The coats or testæ of most seeds are also of so waterproof a texture that they are not very liable to be injured by humidity, at least at temperatures much below those at which they germinate, though, if they do get soaked they are apt to mould, to dissolve, or to have their texture destroyed by the freezing of moisture within their substance; and any of these is, of course, fatal to their germination. Provisions against these contingencies are made, either in the structure of the seeds themselves, or in the fact of their germinating in the head of the parent plant or otherwise, and being rooted in the ground before the Winter sets in. This last is the case with some of the Alpine plants, and also with plants which belong to those high latitudes where the snow falls early in the season, to a considerable depth, and lies long as a protection to the surface and the surface vegetation.

The case of those small animals which are committed to the egg during the inclemency of the Winter, approaches, perhaps, as near to that of plants committed to the seed as the condition of animals can approach to that of vegetables. It is probable, however, that the eggs of the animals are more delicate than the seeds of the plants, as those in the high latitudes are in great part committed to the waters, where the Winter temperature is but seldom lower than the freezing point of water, and frequently not so low—considerably higher, if the water is not frozen to the bottom. The eggs and other germs of life which are committed freely to the waters, in order to produce new individuals when the warm season returns, sink down before the progress of the freezing; and, probably from the interrupted radiation, there is much more heat accumulated under the ice than one would be apt to suppose. We have examined this on the small scale, and found the effects such as to be conclusive on any scale. This power of the ice to accumulate heat and retain warm air under it, may be no unimportant auxiliary in the conserving of those germs of life which are seasonally committed to the waters in high latitudes, and also in bringing the principle of life in them forward, so as to be ready to start into full activity when the spring returns, or a gleam of the sun over the Winter snow causes a momentary temperature equal to that of spring. The more rapidly and the more intensely that the frost sets in, the accumulation of heat under the ice appears to be the greater. Ice forms most rapidly when an intensely cold wind blows with velocity over the surface; and this is the usual character

of the weather in far northern and mountain districts, when the pools and shallow waters receive their coating of ice in the early part of the Winter, or not unfrequently in the end of autumn according to the calendar. It often comes immediately after a heavy deluge of rain, which converts every shallow into a temporary pool. The cooling of the surface, and the air over the surface, produced by the evaporation of a portion of this stagnant water, is, no doubt, the immediate cause of the frost. But, upon the principle which we have already attempted to explain, the water which tends to produce frost, by cooling the mere surface and the air, tends also to retain in the earth a very considerable portion of that action of heat which, were the ground less humid, and the surface unfrozen, would escape by radiation. In places where the climate is not very severe, and there are no mountains from which air considerably below the freezing point can descend, when the temperature begins to warm at that point, and the frost to give way, then the ice speedily yields to the joint action of the atmosphere above it, and the radiating heat under it; and so familiar are the country people with this, that the brief duration of "frost on the full pool," is a proverbial expression among them. At early times of the season, the very intensity of the night frosts is often the cause of their brief duration, by producing a phenomenon which the same country people call "the leaping of the frost," or "the frost leaping to the sky." This phenomenon is by no means liked by the cultivators in the cold districts, whose scanty harvest is not unfrequently protracted to the verge of Winter or far

within it, and the crop seriously injured by the rains. The cause of this dislike is the fact that the "leaping" of the frost is one of the most certain signs of a rainy day, or succession of rainy days, more prolonged in proportion as the frost has been more intense, and its disappearance more rapid. These treacherous frosts are seldom hoar frosts, or "white frosts" as they are termed, which form speculæ of ice of the dew upon the herbage without coating even the shallowest of the pools. They are "black frosts," or frosts which congeal the shallow waters without forming any speculæ upon the herbage; and, indeed, there is seldom any dew out of which such speculæ can be formed on the nights during which such frosts occur.

The "leaping" occurs in a great measure by the following means:—the intensity of cold at the surface makes the air heavy and little disposed to any kind of motion there, while the congealing prevents the radiation of heat from the earth. The lower air is thus cold and tranquil, but it is shrunken in volume, and the upper strata descend upon it, condensing and giving out both heat and humidity in light clouds as they descend. The lower air is too cold for taking up this humidity, and there is also comparatively little evaporation from the surface, as the cold air there is stationary. The cloud therefore continues to accumulate; and as it does so it tends more and more to interrupt whatever heat may radiate from the earth, and thus the heat remains and raises the temperature of the lower air over the frozen surface. But that portion of heat which the said surface arrests in its radiation from the earth attacks the frozen portion on

the under side. Between the two, the ice soon disappears, and then the portion of radiant heat which is held pent up escapes, and there is considerable evaporation at the surface. The vapour ascends from the surface, as there are no surface fogs in such states of the weather, but it ascends no farther than that region in which the cloud is forming, as the air there is parting with humidity, and not taking it up by evaporative power. By this means the cloud is increased, generally to such a degree as to become a *nimbus*, or rain-cloud, and the rain itself usually comes about twelve o'clock, if not earlier.

This peculiar kind of weather is but little known in the warm and dry districts, where there are no lofty mountains near at hand to bear their part in the production of it. Unfortunately for them, however, the farmers of the cold districts of the north, whose labour, even in the most favourable seasons, receives but a scanty reward compared with that of their brethren in the more favoured districts of the country, know it but too well, for it often ushers in drizzling and continued rains which rot their scanty crops, or more violent weather which beats them into the earth; and in either case they are deprived of that which they can ill spare.

Sometimes, generally indeed, among the more experienced and observant, the signs of its coming are seen, though seldom sooner than the evening before it happens, and then it is too late for any thing but the mere securing of such portions of the crop as are cut down and ready for gathering in.

The experienced rustic knows the signs of the coming

of this peculiar state of the weather, and probably knows them much better than the most profound of our philosophers, albeit he is unacquainted with any philosophy upon the subject. There is a peculiar stillness of the air on the preceding day, and the curious little spiders that weave the gossamer which festoons the sky, and enmeshes the stubble fields in a flimsy but lustrous network, are busy in their aerial voyages and their terrestrial labours. Not a cloud is to be seen in the autumnal horizon, and the air is so transparent that every leaf of the trees, which are now in the finest of their colours of decay, may be told at a very remote distance. There is something peculiarly refreshing to the feelings in those more than usually clear skies; and the cause of their transparency tells in a way which must be felt, but which cannot be adequately described. The reason is that the saturated atmosphere has no tendency to drain the humidity of the skin. In those tranquil states of the atmosphere, when it is, so to express it, hanging between the dry and the wet, and when the latter is to come through the agency of cold, without any formidable resistance of heat, the electricity of the atmosphere appears to be as passive as any other of those powers of which the air is the vehicle or the medium; and therefore human beings appear to exist and act in it, without its exerting any influence upon them further than as it is taken into the lungs in respiration. This atmospheric tranquillity and passiveness gives wonderful facility to all the senses, because there is not the same drain upon the body as there is when the atmosphere is in a state of activity. External

nature has not, at any time, much influence upon the sense of taste, because that is a sense of contact, and performs its office upon such subjects only as are taken into the mouth; but it is really wonderful how much the eye becomes piercing and the ear keen in those peculiar states of the atmosphere when its evaporative power is nearly suspended, and the cloud has not yet begun to be formed so as to obstruct the vision. Objects are much more distinctly seen than they are when the atmosphere is in a state of active evaporation, even though the degree of light is both apparently and really the same; and although theory would tempt us to the opposite conclusion, there seems to be more refractive power in the transparent air at those times than there is when vapour is rapidly ascending from the surface of the earth. That the sight should be more perfect we can readily understand, because the particles of vapour in the atmosphere, though much too minute for being individually discerned either by eye or instrument, must be found out by so very subtle an agency as light, and must oppose and disperse it. We cannot so well understand why very low and remote objects, such as rocks on a distant shore, should come into the visible horizon in those peculiar states of the atmosphere, and not when the set-fair sky is cloudless; but still the fact is beyond question, as any one who has the opportunity and chooses to use it may verify by personal observation. Very curious refractions and reflections of the rays of light, both of the direct light of the sun and moon, and light reflected from the earth, or from one cloud to another, are often produced in fogs and hazes, especially

near the sea; but it does not appear that the ascent of vapour through the dry air increases the refractive power of that fluid, although we have the evidence of the barometer to the fact of its increasing the weight.

This is not only a curious fact in the action of the atmosphere upon light, but it is one which is of considerable use to us in the observation of nature, especially in that part of it which relates to the weather and its changes. The general conclusion is, that the refractive power of one transparent fluid is lessened by the admixture of another transparent fluid in a state of extremely minute division, though the divided fluid is naturally, and when in its own continuous mass, by far the more refractive of the two; and this militates against the hypothesis, that the refractive power in all cases increases with the density; and thus gives us a hint that, notwithstanding all that has been said and written, we still have much to learn on the very curious and highly important subject of light.

The upland farmer, whom experience has taught to watch for, and in as far as he can avert, the various effects of those unfavourable changes of the weather, is in all probability quite innocent even of that slight degree of speculation upon the subject to which we have alluded; and, though his judgment is in most cases quite correct, he is in all unable to mention with precision any one of the circumstances upon which that judgment is founded. Still the judgment itself is not the less accurate on this account; and while, according to our ordinary notions, the farmer is ignorant of all philosophy, he is in truth an experimental philosopher

of the very best description; and the great merit of the improvement introduced into the philosophy of the schools by the illustrious Bacon consisted mainly in persuading mankind to discard the idle dreams of fancy, and form their judgments of every case upon its own proper evidence. By this means much mysticism and absurdity have been got rid of, and the difference between the rustic observer and the sage has become merely one of degree, and in many matters they are reciprocally the instructors of each other,—nor is it easy, in many cases, to say which of the two is the more benefited.

In this we have another striking proof of the identity of the God of nature and of revelation. The hopes of revelation are full and complete to every one according to his acquirements, and so also is the knowledge of nature, and the application of that knowledge to useful purposes, to all who seek it in the way of well-founded experience. It matters not whether the subjects of that experience are many or few; for they are complete as far as they go; and the feeling of this completeness not only gives confidence and pleasure, but it is a vital and growing principle, and produces a constant desire of knowing more and doing better, not from the vain desire of superiority and fame, but from the pleasure of the occupation itself. This delightful power and temper of mind, and also the complete and satisfactory view of the phenomena and the laws of nature, in so far as these are known to the party, cannot be obtained upon any other than a religious basis; for without that, knowledge is painful to us, as well as labour or disease. If the

faith and the hope which religion alone can inspire, are not within us, and in constant and lively exercise, there are places in the path of every kind of knowledge which we fear to tread; and the more lovely that creation seems,—and it is ever the more lovely in proportion as our knowledge of it is the more extended,—the more lovely that it seems, the thought of it is the more agonizing. There is doubt and fear on every side; and unless our confidence of immortality is founded upon "the Rock of ages," the terrible spectre of annihilation is ever and anon starting up to the alarmed mind, and entering into the soul with a direfulness of torment which no language can describe.

Truly it seems in tender mercy to the frailty of our nature that God has so ordained that the true philosophy—the grandeur and perfection of the system of nature—cannot be appreciated, or even seen, but through the medium of revelation. Could it be so, the burden of life would be too heavy for any mortal to bear. To leave all those connexions and possessions, the knowledge of which is open to the capacity of every man,—to forget, to be forgotten, and never again to remember or to be remembered,—to leave relations, friends, possessions, pursuits, all that give us pleasure,—aye, even to lose the gratification of the senses once and for ever, is agony enough for a heart of any feeling. But when we are so far informed as to be able to look abroad over the wonderful structure and system of the universe,—to contemplate sun after sun, planet after planet, and combinations of suns accumulated without end, in that space "whose centre is every where, and whose circum-

ference is no where," and to which even the very boldest flight of imagination cannot assign a limit in any one direction; and when we are able to see and to appreciate with what wonderful perfection and skill the whole is framed, from this stupendous vastness to the atomic plant and the exquisitely organized animalcula, as perfect in all its parts and as instinct with life as the oak or the elephant, at the same time that it defies the natural vision of our eyes, and leaves our finest instruments on the verge of uncertainty;—when we are capable of understanding all this, and also the wonderful endowment by means of which we are so capable:—then, the awful thought that, after a few years spent in pain and toil, all this shall be blotted out, and we shall be as though we had never been—senseless and lifeless matter,

"To lie in cold obstruction and to rot"

for ever and ever, without consciousness and without hope of any return to the knowledge even of our misery,

"Oh! 'tis horrible;"

indeed, the hell-torments which the guilty mind ever pictures in the agony of its fearful conviction, are only greater than the direful withering of this terrible boding of annihilation—the most sternly and stubbornly dreadful of all the agonies to which a being on earth can be liable.

And, unless in the way of life—the good tidings of immortal life and immortal bliss of unspeakable comfort and delight to a redeemed race, which is freely declared and fully made manifest in the gospel of the Eternal

Son of Jehovah — we have no security that the terrible phantom above alluded to shall not invade us at any and at every moment of our lives. If the delightful volume of the word of the ever blessed God had taught us nothing more than this, it would have been to us "the unspeakable gift" of its holy Author; and the delivery from the direful horror of this annihilation would be cheaply purchased by a long endurance of the severest suffering which conscious existence can be made to endure.

Winter is the season during which this fearful thought is most apt to arise in the minds of those who have not the well-grounded hope of religion to sustain them, and it is also the season at which the consolations of religion come most readily and most powerfully to the minds of all who have this hope. There are many reasons why this should be the case, both in the Winter of the year and in the Winter of life—and even in the Winter of the day; and without a knowledge of these it is not possible to enjoy any of those Winters as they ought to be enjoyed.

In all the three, there is an abatement of the objects which excite the senses, and in the Winter of the day and that of life there is a lessening of the energy of the senses themselves. When the shades of night begin to veil the landscape from our view, and terrestrial objects are withdrawn from our eyes, the thoughts, as it were, come home, and our trains of reflection become of a less cheering and discursive character than they are when all nature is freely displayed to the senses—more especially in the morning, when the refreshment of

sound and balmy sleep has renovated all our bodily powers, and rendered our whole frame capable of bounding with new life in obedience to every stimulus from without and every mental suggestion from within. Every one feels this; and the different feelings of the morning and the evening come so near to each other in time, and are so often repeated in the course of our lives, that they form, under all circumstances, a most ready and convenient epitome of the contrasted seasons both of the year and of life. So exceedingly useful, indeed, is the day to us, as an artificial memory and constant monitor, that it not only bears but yields pleasure and instruction in a frequency of repetition, which would be all but intolerable upon any other nameable subject. It has also this advantage, that the enjoyment which it imparts and the lessons which it teaches, are such as to address themselves to every individual of the human race, whether his acquired knowledge be small or great, and his mental powers neglected or cultivated. The obvious reason of this is, that the varying stimuli of the day address themselves equally to both parts of our compound nature,—they are equally for sensation to the body, and for reflection to the mind; and according as the one or the other of these is most in exercise, the occupation and enjoyment of the day are physical or intellectual. It is the same with the seasons of the year and the ages of life; but for the reason already mentioned, the day, as the easily-observed and brief epitome, is the one upon which to ground the illustration; and then the application to the others follows almost as matter of course.

In the morning, the address to the senses comes first and most powerfully, and it comes wholly from the earth and its productions and inhabitants; for the same sun which gives us a new and fresh revelation of terrestrial nature every morning of our lives, veils all else from our view in the very brightness of its beams. The sun alone rides dominant in the sky; and to our observation at the time, appears to exist wholly for the benefit of ourselves and the rest of nature around us, as if the radiant and glorious orb were nothing but an appendage to our earth. All the incentives to the hourly, diligent, and joyous performance of our daily labours which could possibly be drawn from human sources are nothing in comparison to this. The dread of want, the desire of wealth; the fear of shame, the ambition of fame;—all of these, and every other human motive, named or unnamed, which operates either as a whip to drive or a cord to draw us in the path of activity, are insignificant as compared with the silent morning call from all nature around us, to be "up and doing." They are partial, one addressing itself more to one individual, and another to another individual; and they are fitful and uncertain in their occurrence, the very opposites often alternating with each other in the case of the same individual, and with very brief intervals of time. Thus, the miser of the one hour or minute is often a very prodigal the next —aye, he is a miser with the one hand and a prodigal with the other at one and the same instant. In hoarding and hedging his money he squanders his time; and purchases full coffers at the expense of a hollow heart and a vacant head—the first destitute of any thing

which can be called a feeling, and the second equally guiltless of all that is worthy of the name of a thought. A man who is thus motived, may be the nominal owner of what would make thousands happy—in the *expectation*, but leave them miserable to their heart's content in the possession. To him, the dawn of the morning brings no hope, and the closing in of the evening no repose; while, in the darkness of the night, he is "scared with dreams, and terrified with visions,"—"his bones are pierced in him in the night season, and his sinews take no rest." That which he cherishes, and which holds dominion over his soul, with a grasp not to be loosened, was not secure in the possession of those from whom he obtained it, and this forbids the feeling that it can be secure in his. Thus, the hum of the gnat, the chirp of the cricket, and all the small voices of the night, sound in his alarmed ears like the tapping of hammers and the grinding of centre-bits; and midnight robbers are certainly attempting an entrance. The hungry cat, become desperate in the extremity of her appetite, collects all the strength which she has left into one daring effort—springs toward the shelf upon which stands a plate with a fragment of meat, scarcely discernible by the eye during the day, but palpable enough to another sense in the night. Her strength is nearly sufficient to reach the prize, but not quite. She impinges upon the edge of the plate, and down come plate and fragment and cat, the first with a crash, which shivers it to fragments on the cold and carpetless floor. "The house is burst open! Thieves! Murder!" But, mum: fear is the

inseparable adjunct of extreme covetousness; and so the miser is mute, from the habitual dread that "every one that findeth him shall slay him." Then comes the torture: he dares not move; and the breath which he labours to stifle as a means of concealment, bursts from him in groans of inexpressible despair. There he lies, prone on his back, with his teeth set, his lips and eyelids widened to the utmost, and his whole visage knotted and corrugated, like that of a man who has been thrust through with a ragged spear in the frenzied fury of a battle-field. And well had it been for him, had he been thrust through by any spear, or laid on the bed of death, feeble and flexible as the rag which even a beggar casts away, by the withering destruction of a gun-shot wound. But the man is alive in every nerve, and life in each is an extreme of anguish, which could not be exceeded in that place of final retribution, the thought of which at all times "dogs him like an injured ghost." Every sense is on the rack; but none of them brings one tittle of information; and the pain of the uncertainty could not be compensated by all the wealth of the world. The body is at length overcome, and the senses forego their watching. He dozes; yet the tendons start, the muscles quiver, and his very sleep is the extreme of fatigue and exhaustion. But the agonized mind knows not the oblivion of sleep any more than the body enjoys its repose. The barb of the arrow rankles in his soul; and his dreams are so terrific that, in mercy to the reader, we must leave them under the veil of silence—they *may* be imagined: they *cannot* be described.

Such is a slight delineation of some of the circumstances of one mode of engrossment of the whole man by a motive purely human. It is a matter of feeling, not of quantity; and therefore, the rank and habitation of the party, or the kind or tale of the hoard, does not affect the general condition. He may be a monarch or a beggar; his dwelling may be a palace or a hole in the earth; and his darling wealth may be the price of nations, or a single old farthing hidden under a clod. It is the total engrossment of the man, soul and body, by a motive which is merely human, which gives the picture its truth and character; and all the rest is a question of mere differences.

It may be said that, in the miser, we have selected the most sordid character in the whole list. There is a mistake in this; for there are many who are deeper both in crime and misery than the miser, and who yet carry their heads high, and by general admission honourably before the public. But the miser possesses that which many covet, and this brings down the odium upon him. But be it so that the miser is the most sordid character, and as such an unfair specimen; and so let us take another.

Glory—military glory, has been, in every age, placed foremost in the list of merely human motives; and although there are some who do not, at the present day, rate it so high as it was wont to be rated, it is still the most gorgeous idol of a very large majority of the human race; and in such esteem is it and all its insignia held, that the most royal and appropriate costume in which a monarch can appear, upon the chief occasions

for displaying his regal splendour, is that in which he would be most appropriately bedight were he to march at the head of a mercenary army, for the purpose of cutting his liege subjects to pieces, levelling their habitations to the ground, burning their crops, and carrying off their flocks and herds as food for their wholesale butchers—according to the ancient and most honourable practices of war.

What may be the original cause of the high estimation in which the perpetrators of such doings have in all ages been held, we presume not to divine. Some nations pretending to a little civilisation, have chosen for the emblems of their divinities the most ravenous of beasts, and the most poisonous of reptiles; and among the hieroglyphics of honourable distinction, as they are awarded by kings and continued by heralds, the lion and the eagle have always been held in more estimation than the lamb and the dove. The devil has not unfrequently been the chief and sometimes the only object of adoration, while the ministers of good, under what figure soever they have been represented, have been left in utter neglect. It may be said, indeed, that all the idols of rude nations are worshipped more for their barbarity than for any thing else, and that the primary sacrifices are usually characterised by the most revolting cruelties, as though that God of whom the mind at its first awakening cannot remain utterly ignorant, delighted more in the blood and the mangled carcases of his creatures than in any thing else. Then if the gods of the more civilized of the heathen nations are a little more free from the horrors of those of a ruder stage of

existence, their crimes—crimes after the manner of men, but exaggerated above the standard of human atrocity—are more conspicuous than their virtues.

All this tends to show that, in a state of nature, and without that light which is from above, men live in much more strong and habitual fear of evil, than they do in gratitude for good. This is "the old Adam," and perhaps it is never wholly subdued. Our self-love makes us prone to attribute to ourselves all the good that falls to our portion, and to attribute all the evil to some cause without; and if our belief be that that cause is too wise for our cunning, or too mighty for our strength, we go about to wheedle it with prayers or appease it by sacrifices. This, modified by the habits of nations and the characters of times, appears to be the real source of military glory,—the cause why he who has been the instrument in the slaughter of the greatest number of thousands, has been placed first in the foremost rank of the human race.

When we divest our notion of a hero of this remain of the superstition of the most barbarous times; and farther, when we compare the tinsel and the strut of the professional slaughterer of man with the humble attire and unheeded life of the slaughterer of those animals upon which man feeds, we cannot fail to observe that there is something not only humbling to human pride, but absolutely ludicrous in the pomp and circumstance of the former; and if a soldier were to appear in the ordinary costume of other people, bearing about his person the tools of his trade, the pointing finger and the grinning face would soon sneer him out of society.

The words of the satiric poet present so very graphic a picture of this species of delusion and folly—one may almost say mania—that if any one studies it he is not likely soon to forget it:—

> "O, valiant man, with drawn sword and cock'd trigger,
> Pray tell me, don't you cut a pretty figure?"

It would be no bad *tentamen* of the influence of military glory upon the heart and the feelings of men, to see a hero of name, who was at the same time a man of good sense and calm reflection—for assuredly soldiers, and especially soldiers of eminence, possess those qualities in no inferior degree—read that short passage, and hear him speak out candidly as to the figure which he made. Soldiers are often styled the defenders of their country, and there may have been many occasions upon which they have deserved the appellation; but there is always a fault somewhere when such defenders become necessary; and if the annals of all the wars that ever were waged were to be fairly scrutinized, it would be found that the real and original cause of each and all of them has been either frivolous or criminal,—criminal, indeed, in all cases; for frivolity becomes a crime of no common enormity if it leads to the wholesale destruction of human life.

It is not our wish, however, to enter into the social or the political merits or demerits of any one denomination of human beings, our object being merely to show that there are certain invisible but very powerful agencies in the times of the day, the seasons of the year, and the ages of life, for which no substitutes or

compensations can be in any station, employment, or pursuit of mankind. It may be thought that these have little or nothing to do with the Winter; and we must admit that, though the analogy which we wish to trace is both strong and general, it is by no means obvious, nor does it lie upon the surface. But the Winter of the year is a pause of seasonal nature generally, after it has completed one periodical effort, and before it begins another; and as the day, and human life, and every thing which is periodical, follows a law which is analogous in principle, though differing in the details and the phenomena, we can best arrive at an accurate knowledge of any one of them by considering and comparing them all; and the general repose with its uses can be best understood, through the medium of those which mark the pauses of a more brief or more individual cycle.

Whatever point of view we may consider them in, the action of matter is, in all cases, more powerful than the substance of matter; so that, by the influence of the former upon it, the power of the latter is, in time, and often in a very short time, worn out. When this is the case, a pause becomes necessary; and that pause is one of rest and refreshment, or of death and dissolution, or the passing of the same matter into a new form, according to circumstances—circumstances which we can, in but very few cases, understand.

But still, the understanding of these principles, in as far as it can be obtained, is a matter of the greatest consequence, not merely for professional or professing philosophers, but for every individual of the human

race. It involves the most extensive and sublime generalisation; and is, in fact, the ultimate and completing step in the true knowledge of the material creation, without which all the rest, by whatever name it may be called, is nothing but mere beginnings, unworthy alike of the subject, and of the faculties of reason and reflection which the Almighty has kindly bestowed upon the student, and for the use of which that student shall be called to account. For this reason, and also because it is wholly omitted or but slightly passed over in the books which are commonly in the hands of popular readers—indeed in all books that have come under our notice,—we propose to consider it at some length, being fully convinced that if we can succeed in making it intelligible to the reader, neither our labour nor his time will be lost; but that, on the contrary, many grounds of difficulty and doubt will be cleared, and that connexion between the Creator and his works, which many pretend to see when they do not, will be felt in all things with that assurance of faith which alone can give peace and confidence in this world, and hope in the world to come.

It may be supposed that this should have been done at a more early stage in the progress of these little volumes on the year; but the truth which we wish to illustrate is an inductive truth, which cannot fully be appreciated until we are in possession of the facts upon which it rests; and for this reason we wished to have at least an outline of the four seasons, in some sort, before us, previously to entering formally upon it. We have felt in our own case, seen in the cases of others,

and are convinced that, if the object were to prevent the bringing home of a general truth to the mind so as that it should produce no real conviction, the surest way would be to give an *à priori* enunciation of it. This is the case, as every man may ascertain in any place or among any class of society, with all those subjects which are professed to be taught by formal rules, without demonstration, reasoning, or explanation of any kind, other than the mere fact of the mechanical application of the rule. In technical matters there are many things which must be taught in this manner, because the use of them does not depend upon the knowledge of their nature,—as, for instance, it is not necessary to school a man in the full knowledge of the making and the properties of iron and steel, and the growth of ash-trees, or their superiority for spade handles, in order that he may better know how to use a spade in digging the ground. In every thing merely mechanical it is the same, for in learning to do, we must imitate, though we may improve upon, our patterns. But when our object is to know, especially to know some very general and very important principle, the method of proceeding must be different; for we must understand the particulars, before we even attempt to state the general conclusion which is to be drawn from and supported by those particulars; and the more general the truth which we wish to inculcate, the more necessary it is that we should see that it rests upon clear and satisfactory evidence.

Now, when we contemplate the periods of all

material things that run in cycles or courses, of which we have the beginning, the continuance, and the end presented, either to our personal observation, or by the record of authentic history, we find that they are in the balance between two principles, the one of which originates and maintains the succession, and the other tends to bring it to an end, and constantly succeeds. In some cases there is only a temporary pause for rest or refreshment, after which a similar cycle is performed anew; and in other cases there is the final pause of death or dissolution, after which the matter composing the being or thing passes into a new form, and yields obedience to other laws. Of the two principles or powers which are thus set in opposition to each other, and upon the contest between which, motion, and growth, and life, and all the other actions and displays which occur in the material creation, obviously depend, we have no general names, and can frame no definitions which will equally meet all the various cases. One of the most convenient substitutions which we can make, is that of *substance*, or being, simply considered, on the one part, and *action*, or state of being, on the other part; and it is a very remarkable coincidence, and strongly confirmatory of the propriety and truth of these distinctions, that they should agree exactly with the two essential parts of human speech, *noun* and *verb*, into which the whole of every language may be resolved—the other parts of speech, whatever may be their number and the way in which they are used, being merely modifications of these two, or abbreviated forms of expression, in which the sense of a phrase or

sentence is embodied in a single word, and that often a very short one.

This correspondence between the two essential parts of human speech and those of the natural subjects of human thought, proves more than one would be apt to suppose. It furnishes indubitable evidence of one of the most important, and, at the same time, the most delightful adaptations to be met with in the whole system of nature, full as that glorious system is of proofs that all the parts of it are made for each other. The world, the complete and the sole subject of man's observation as an inhabitant of the world, and the medium through which man receives all his knowledge, except the portion which he obtains from personal observation,—and that is but a trifle as compared with the whole, even in the case of those who are not very learned,—are, in their two most essential parts, completely adapted to the two essential parts of that knowledge. Such being the case,—and that such is the case must be seen and felt by every one who reflects but for a moment,—it is impossible to feel or to express enough of gratitude to that all-bountiful Being who has so admirably fitted man the student, and nature the subject to be studied, to each other. So forcible is the lesson which this implies, and so clear and legible to all are the terms of the implication, that we must stand self-condemned if we neglect to profit by that which is so especially adapted to our faculties and our nature. The further we pursue this subject, it appears the more beautiful, the more instructive, and the more delightful. Language, in its practice, is not a specific gift to the

human race, as is the structure of the body or any of the organs of sense; for if it were so, then it would, as these are, be the same to the whole of the human race, whatever part of the globe they happen to inhabit, in like manner as the general anatomical structure of the body, and the allocation of the senses and the forms of their organs, are the same in their more essential characters, in the people of every land under the sun. But language is conventional as well as acquired—human beings do not possess it naturally, they only possess the faculty of acquiring it, just as they do that of acquiring any other art; and this faculty is brought to be a habit by practice and communication with each other.

That a single human being placed alone in the world would ever of himself acquire any language, is by no means likely; for there is no transmission of language by hereditary descent, farther than as the organs of speech in the children may resemble those of the parents, and thus be better adapted for articulating similar sounds; and the influence of this is much slighter than we might suppose, for we find that children acquire the particular sounds of the district in which they are born, even though not used by their parents and those immediately about them. Connected with this, there is one matter worthy of notice, as showing how far an analogy will extend in nature, and how closely it will hold even where we should not expect it. The more nearly that the parents speak the natural dialect of the place from which they come, the more their children retain both the enunciation and the

idiom; while the children of those whose speech has been more refined and cultivated, fall more readily and completely into the idioms and the peculiar sounds of the new place. The children of a vulgar Scotch family continue to speak vulgar Scotch in London; and so do those of the lower Irish retain the brogue of that country; while the children of educated parents from either country not only show little or none of the peculiarities of that country, but have much proneness to acquire the peculiarities of the place. The same holds in the case of cultivated animals and plants; the more highly that they are bred, that is, the more that their characters and qualities depend upon the operations of art, the more prone are they to degenerate and take up a particular character from the district; and so inveterate is this tendency that it cannot, in many cases, be prevented by any means, except a change or renewal of the breed from another district. This, equally with the case of human speech, shows that there is no assistant principle in nature by which human art, or the productions of human art, can be in any way perpetuated. On the contrary, there is always a resistance of nature to the operations of art, whatever those may be; and, indeed, it is this resistance, and this standing up of nature to the tool of the workman, which enables him to perform his labour and accomplish his purpose.

Human art, whether rude or refined—whether it be the application of the most profound science, or of so little science (there is no art without some science,) as that it passes unheeded—is, therefore, no part of the system of material nature; and when we speak of the

action or the working of that system, we must leave all human action and working out of the question, as being foreign to the subject of our inquiries.

There are two advantages in this, and they are both very important ones. In the first place, our subject is quite untrammelled by foreign considerations; and so we can go directly to it, and pursue it upon its own grounds, with no embarrassment, and comparatively little chance of error. In as far as philosophy and its practical results as conducive to our comforts go, this distinction is of the utmost importance. The want of making it was, in fact, the trammel, which so long kept the philosophy of the schools chained to visionary and absurd hypotheses, inapt as an instrument of wisdom, and inapplicable to any useful purpose; so that the philosopher dreamed away, "refined from reason," and sublimed into a visionary region in the cold clouds above all usefulness; while the labouring man went round and round, like a mill-horse, in the same confined and beaten track, without any assistance from the light of philosophy, or the inventive and improving faculties of his own mind. If any man of more mental energy than the rest attempted to generalize farther, he was instantly caught between the horns of a dilemma, or had to steer his course between a Scylla and a Charybdis, against the one or the other of which he was in continual danger of being driven by one or another of those currents of thought, over the course of which the thinker has really no more command than the mariner has over the currents of the sea. The mixing of man as a rational being with that system of nature,

in which all is obedience, perfect obedience, to the law without any reasoning, was such, if pursued far enough, as to lead to the one or the other of two results, both of which are equally withering to the mind, and equally destructive of that confidence without which there is no sure happiness for man even in this world. In this state of matters, the words of "The Preacher," which are intended to portray the vanity of all the occupations and acquirements of man, when he does not "remember his Creator," are most emphatically expressive: "In much wisdom is much grief: and he that increaseth knowledge, increaseth sorrow." The alternatives are the mortality of man, or the doctrine of *Materialism*, as it is usually called; and the eternity of matter, or in other words *Atheism;* and between these, it is impossible for any one, who takes the whole compound man along with him as part of the system of material nature, to steer, without running upon and being entangled by either the one or the other. It is doubtful to say which of them is the worst, for both strike at the roots of all moral obligation, reduce man to a mere creature of this world, lead him to make the most of its enjoyments by what means he can, and, like a dog, "have his day."

Secondly, when this separation and distinction of man as the observer, and the system of material nature as the subject of his observation, is once clearly seen and duly felt, it becomes the strongest of all philosophical arguments for the immortality of the intellectual part of man—an argument so strong indeed, that we are not aware of any that has been brought or can be

brought on the other side, capable of shaking it in the least. As the mind of man forms no part of the system of material nature, it cannot be in any way under the laws or subject to the contingencies of that system; and cannot be in any respect more subject to disease or death, than it is to mechanical division or chemical decomposition. Death, in our common understanding of it, and as it is in the ordinary course of nature, or accelerated by those events which, from our imperfect knowledge of their real causes, we call diseases and accidents—the disease meaning some state of the body in which it is "not at ease," and life does not part in that gentle manner which marks its close in the regular course of nature, and accident something which "falls upon" the body from without, without any particular affection of the body itself to impair its functions, —death in either of these ways, or in any other in which we can have any experimental knowledge of it, is not, neither can it be, the death of matter, it is only the final stoppage of a certain kind of action in a certain portion of matter, not one atom of which, considered as mere matter, is one jot nearer death, when the life of which it is the instrument ceases, than when that life is in the prime and meridian of its activity. Different kinds and combinations of matter, as they are perceptible by our senses, have different species and degrees of life; but the life of matter (if the term may be allowed,) taken in the abstract, or generally as the substance of the whole material creation, is nothing more than the simple fact of existence. Such life as it has in this very general sense is nothing more than the fact of having been

created; and the reversal of this, which is annihilation, is the only death that it can undergo; and that, should it ever take place, must be nothing other than a passage into a state of utter and final non-existence, which is an operation that we can no more understand than we can understand the act of creating; but assuredly it must be an immediate operation of the Divine Being, and not obligated to any created agent, for it is inconsistent and absurd to suppose that any one created being can put another out of the pale of the universe, to whatever extent it may be capable of acting upon and changing it within that pale.

This brings us exactly to the philosophical proof of the doctrine of immortality:—The only knowledge that we have or can have of mind, bears a very close resemblance to our abstract notion of matter; for all the explanation which we can get or give of either of them consists of negatives. Matter in the abstract is nothing else but matter considered apart from every quality which belongs to any of its particular states; or, if we cannot separate the idea of substantive matter from that of having weight and occupying space, yet we can follow both of these down to the very confines of nothing. In like manner we cannot, perhaps, altogether separate the idea of knowing from that of mind; but we can imagine the knowledge to be so feeble and so fleeting as to pass away like an unconnected part of an unremembered dream; and by far the greater number of our own thoughts belong to the same category; and if any one tries without preparation—and preparation would reduce it to no trial at all—to recollect a thought,

unconnected with action, for every day during the last month, the number of blank days will appear not a little startling.

The general argument from the system of material nature which we have already adduced, as excluding mind from that system, renders the impossibility of the mind being at all affected by matter self-evident; and as it is utterly inconsistent with those notions of mind which are grounded upon revelation, (and they are the only true notions of it that we can have,) to suppose the mind capable of any dissolution, so that it could pass into another mind in a manner similar or analogous to that in which the same identical quantity of matter passes from the body of one material being to that of another,—there is really no species of death to which mind can be subject, except that final passage into nothing to which we have alluded under the name of annihilation. But we have seen that this is a work of the Divine Being only; and it must be palpable to the understanding of every one that can think, that one created spirit can no more annihilate another, than one material body can turn another material body into nothing.

Such is the philosophical argument for the immortality of the human mind, when it is divested of all the technicalities of the schools; and it is equally consistent with the words of inspiration and with the common sense of mankind. Thus far it is necessary for us to know and to understand, before we can be in a fit condition for considering that general analogy of the various parts of the system of nature, the mention of which has

led us to these remarks; and so we shall proceed to give a very slight outline of that analogy—such as we give of most subjects, but which may perhaps have a better chance of being read than if it were more prolonged and elaborate.

All the parts of the system of material nature are, then, as we have said, made up of two general elements—*substance* and *state;* the former having weight in the scale and occupying space, and the latter not. "State" is a more convenient term than action, because some states are, according to our ordinary modes of expression, passive or neuter; but still, every state and every change of state is the result of action; and thus the real allusion in every case is to action; and the distinctions are, whether the subject or substance acts of its own energy, is acted upon by some energy from without, or appears for the time to be under the influence of no kind of action; though the influences of the different objects in nature upon each other are so many, and act in ways so varied and so little known to us, that however permanent and quiescent the state of any being or body may be, we never can with certainty pronounce that it is neuter. Water is really more active in itself—more under the dominion of its own powers, when lying still in ice or snow, than when rolling in waves, or thundering over the rocks in a cascade; and it is more under its own action when liquid, than when expanded into steam, and exerting a force little short of that of gunpowder.

We shall not however allude much to the inorganic parts of the material creation, for they have but little

to do with the common phenomena of the seasons, or of those other periodical changes which come more directly and properly within the scope of our analogy. Vegetables and animals do this, and therefore we shall direct most of our observations to them; and here we have to include man in so far as he is merely animal,—that is, as he is born, comes to maturity, and dies; and is, like the rest of animated beings, supported by food, and affected by the seasons, the weather, and other external causes, the same as that material nature by which he is surrounded.

Thus restricted, we may say that every vegetable and animal, every growing and living thing in the material creation, is made up of two parts,—its material substance, of which the being itself can neither originate nor destroy a single atom; and its peculiar action or life, which makes it an animal or a vegetable, or one species of either and not another; and this begins and ends with the individual in such a way as that we know not whence it comes or whither it goes. This last, as determining the grand outlines of the character of every individual, may be considered as the essential part of it, as the *agent*, while the mere matter—the substance of which its frame or body, however shaped or organized, or whether large or small, is composed—can be regarded only as the *instrument* with which that agent works. The identity, or oneness throughout the whole period of its existence, by means of which the plant or the animal is all along itself and not another, is in the agent, and not in the instrument. It is true that there is an external identity by which, in all species where the

knowledge is of sufficient importance, the individual may be known from other individuals; but this is always produced by the agency of the life, or that agency modified by external causes, and never by the passive instrument or mere matter of which the structure or body is composed. This is proved by the fact, that the external marks of identity do not change with the changes of matter in the body. These take place more slowly in plants, and more rapidly, as well as more completely to the whole body, in animals. No calculation upon such a subject can rise much higher than a guess, and that only a rude one; but it has been estimated that the whole matter of the human body, under certain circumstances, must be changed every seven years, while some parts are removed and replaced many times in the course of one day, or even of a single hour. In some animals the change may be quicker than in man, and in others it may be slower; but, whatever may be its rate, it is never the immediate cause of any change in those external appearances upon which we ground the bodily identity. "The Ethiopian does not change his skin," although the epidermis is constantly scaling off; neither does "the leopard change his spots," though his covering moults regularly; and, to some extent or other, it is the same with every creature. Nor, when the external identity passes away, does it in the least alter the identity of the agent, that is, of the life. Even in those cases in which to common observation all apparent identity is lost, the identity of the agent remains the same: the egg and the bird—the spawn, the tadpole, and the frog—and the egg, the caterpillar,

the inert pupa, and the airy and brilliant butterfly—are, in each case, through all their changes, the same identical life.

In all the details of terrestrial nature, whatever they may be, it appears that the properties of the instrument as matter, and the interferences of external agencies, always become, in the course of time, longer or shorter according to circumstances, too powerful for every individual agent, and ultimately put an end to its working; and not only this; but, before the final pause comes, and the action of the individual is never again to be revived, many shorter pauses are required; and if they are forcibly withheld beyond a certain time, the agent loses command over its instrument, and the final pause comes on.

This final victory of the dull and silent properties of mere matter over the activity of the most energetic life in matter, is in accordance with all the terrestrial actions which we witness in those parts of matter which are not under the influence either of life or of growth. The only exceptions which we know, are those of the motions of the planets, and the action of the beams of the sun; and they are so stupendous, and we know so little of their causes, as existing in any thing but the mere phenomena which we see, that we cannot bring them into the comparison. All mechanical actions in terrestrial matter, however powerful their causes may be, are ultimately brought to an end by gravitation; and compounds and aggregates are liable to be dissolved by so many chemical agencies, that we cannot confidently assert that any one inch of the solid, any one drop of the liquid, or

any one breath of the aërial contents of our globe, is in the same state now as when first created. The probability is that it is not; for all that we meet with on the surface of the earth, or dig from under it, is either a ruin, or a new individual formed out of the old materials of something else.

It is this inability of the agencies of the individual beings of nature to maintain their power over their material instruments, without temporary pauses, and a final stop, which forms the beauty of nature's adaptation to days, and seasons, and durations of different species of life, and makes the study of these successions so profitably and so delightfully instructive. The times of duration in some are so brief, that we cannot distinguish their labour from their rest; and the action of others is so slow, that we can take no note of it excepting after long intervals; but we have no reason to suppose that mere difference of time can remove any of them from under the power of the general law. If the action of life in any thing whatever extends beyond the limit of a single day, or even one changing tide of a day, there is always a pause in some part of its action, or a portion in which it works with more energy, and another in which it works with less.

The agent in the being, whether that being is vegetable or animal, is so adapted as that it can elaborate its body or instrument out of the materials which are around it; and it can in so far yield to circumstances, and have its appearances modified by them; but it can no more tune its instrument or keep it in tune for an unlimited time, than it can originate itself at the first.

Of the transmitted origin of generations in the vegetable kingdom, some notice is taken in our volume upon Summer; and that of animals will be readily understood, in as far as it is understandable or the understanding of it is necessary by any one who chooses to attend to it with the requisite consideration. In all cases, however, it is deeply mysterious; and the very point upon which we most ardently desire to obtain knowledge, is the one upon which Nature lets fall her impenetrable veil. We can, in imagination, and partly also in reality, follow the investigation either way, until substantive matter eludes our ken; and we are constrained to admit that, in the cases both of animals and of plants, the transmission from generation to generation is not, in any sense of the word, a transmission of matter, but only a transmission of agency. This, however, is one of the most obscure subjects which can occupy the mind even of the most profoundly learned and most reflective of the human race; and therefore it is no fitting subject for a small popular volume, which courts and addresses itself to the public generally, and not the learned. Our principal concern, too, is with the plant or the animal only in those stages of its existence in which it can be a proper subject for popular observation; and therefore we waive all the more intricate and obscure portions, only remarking that no vegetable or animal has any more power in itself of prolonging its existence beyond the period which is natural to its being, as modified by the circumstances in which it is placed, than it has to command its own origin, or create out of nothing that

matter of which its organization during its appointed period is composed.

The pauses of nature to which we have alluded, by whatsoever names they may be called—whether nights, ardent heats of days, Winters of cold or of parching drought, transmissions from generation to generation, simply rest to the wearied without reference to times and circumstances, or any thing else—and they all partake more or less of the characters of Winter, as we understand those characters—are really the tunings of the instruments of nature, which fit them for the more vigorous exertion of the same or of new agencies, according to circumstances; and, be the pause or the transition what it may, there is a freshness and vigour of renovated or young life after it, for the occurrence of which, by any other means, it would be in vain to hope. If it were not for the pause and the repose of the night, we could not have the freshness and the inspiration—the bodily inspiration, and the ready obedience of the body to the mind, which is the natural consequence—which we feel and profit by every morning of our lives, and which no means of our own can procure. If it were not for the pause of the Winter, we could not have the activity of the spring; for all nature is exhausted and languishing even before the heat of our summer is nearly over; and a very few months' continuance of the same ardour would exhaust every growing thing, and, by necessary consequence, every living one; so that the whole would be gone without any adequate provision for a succession of the same species, or, indeed, any provision for them

at all. So, also, if there were no renewal by generation, the wearing out of the individuals would be a final ending of the race, whether animal or vegetable; for even in those vegetables which are capable of being continued by division of the parent plant, there is a tendency to decay which is not to be found where the continuation is by seedlings, or in the ordinary way of generation.

That all these pauses and renovations are part and parcel of the system of nature, and essentially necessary to the proper working of that system, no one can venture to deny; and it is equally clear that the individuals acted upon, and the agencies which act upon them, are equally well adapted to each other, so that each must, before they came into existence, have been equally known to the Author of the whole; and that both the law and the lawgiver are one. It is thus that the more we generalise in our considerations of nature, whether as co-existent, or as successional in time, the more we are impressed with the conviction that the whole is the production of One Intelligence, whose wisdom and whose power know no bounds; but who has ordained that every creature which he has made shall be, and is, the best adapted to the place, the season, and all the other circumstances in which he has seen meet to place it.

In this view of them—and it is the only correct and rational one which we can take—the pauses of nature, at whatever intervals they may occur, and whether in their duration they be long or short, are as essential to the proper working of the system as the times of its

greatest activity. They are, indeed, even more so, if we can admit of any distinctions of this kind in a creation which is equally perfect in all its parts and all its occurrences. For, as there is no healing power inherent in any one production of nature, by virtue of which it can recruit its activity of itself, the reactions of those pauses, which all have more or less of the character and the effect of Winter, restore it again, so that it runs its course anew with renovated vigour.

Taking all the organs and means of sensitiveness, the human race, as they are, independently of mental considerations, the most generally observant of the whole terrestrial creation, are also the most generally affected by all those seasonal circumstances; and man is affected by them in a different manner from any of the rest, and for a different purpose, namely, that of acquiring knowledge, while all the others yield only a brute and unconscious obedience.

The freshness of the dawn, the breath of spring, and the morning of young life, be it what life it may, all have a most wonderful effect in tuning the instrument of plant and animal, so that the extent to which it can work is far greater than at any other time; and they who understand these things, and have resolution and industry to avail themselves of them, never fail in reaping the advantage. But the refreshment and renovation which come after the pauses of the night or the Winter, and also the vigour of young life, belong wholly to the system of material nature; and even with man, they are first and chiefly for the present world. They have their uses to the immortal or intellectual

part of man, no doubt, because the body is the medium of instruction to the mind; and even when the subjects are of a spiritual nature, referring chiefly to the future state of man, and to him in the present life rather as a moral and accountable being than as a merely animal one, the lessons can still be addressed to the mind only through the medium of the body. The eye and the ear, in reading and hearing, are the organs by which even sacred information is communicated; and though we who are in possession of these organs are unable to tell how the mind may commune with its God when all is dark and silent to the sense, and has been so from the very commencement of life, we must believe that the mental impressions are very different from those at which we arrive through the medium of the organic senses. There is no doubt that, in a human being possessing life and feeling, there must be some awakening of the mind, however slight, and different from that of those who are in full possession of their senses as the inlets of knowledge. We have every reason to believe that, in the case of all human beings, the general sense of life or of being alive,—or, as it has been called, the sense of muscular resistance,—is the foundation of all the allocated senses, or the one which exists before any of them is or can be exercised, and of which one and all of them are nothing more than organic modifications. But as the single and unaccompanied exercise of this general sense is long anterior to the use of speech or any other means of communicating information, it cannot possibly be made matter of philosophy.

Yet still this general sense continues through life to be the most sensitive of the whole, to be the soonest worn out by fatigue, and the most refreshed by repose. It is upon this sense, far more than upon any of the senses which are allocated to specific organs, that the influence of the morning, of the spring, and of all the other seasonal refreshments of nature, tell, and perhaps tell with greatest and most beneficial effect, when there is no object present to attract strongly any of the other senses. Those tormenting affections which are usually called by the names of languor, listlessness, lowness of spirits, and ennui, and even that which we misname mental derangement, are nothing but deranged states of this sense; and under the strong influence of them, the local senses can afford but little relief, let the objects presented to them be as choice, and in healthy states of the body as delightful, as they may. Let one of these modes of general derangement of the sensal system be but severe and confirmed enough, and the sweetest music grates upon the ear like the sharpening of a scythe or saw, or the crushing of a cinder; the most lovely forms and the most delicate colours pain the eye; the finest perfumes are repulsive to the nose; and the choicest viands taste of rusty brass, or some other mineral poison equally offensive.

It would be foreign to our purpose to offer any remark either on what may be called the medical causes, or the medical treatment, of those most heavily afflictive states of the system, in which all is ailing, and yet no specific ailment can be complained of or named. But there are few of the more reflective part of man-

kind who at all times escape them; and they seem to fall most heavily upon those who are least able to bear them.

In their severity they set all the ordinary resources of nature at defiance. Sleep, which comes in the extreme of fatigue, of hunger, and of cold, and which, in excessive cases of these, appears to lay the sorrower gently on the pillow of his long and last slumber, flies the couch, be it the most downy, of those who are afflicted in this manner. Then, the visions or spectres of the night are fearful; and as no eyelids nor muffling up in the clothes can exclude them, and no resolution can drive them away, they "make night hideous." Those spectres of the sleepless night are curious subjects, and set our philosophy at defiance. We know that they are mere phantasma—creations, or rather feelings without any creation, of the disordered sense; but they come so palpably, and so like objects of real vision, that the fevered frame starts and quivers at their phantasmic approach as much as if they were realities which could and would hurt. An allusion seems to be made to them in the night vision of Eliphaz the Temanite, which is so powerfully described in the fourth chapter of the Book of Job: "In thoughts from the visions of the night, when deep sleep falleth on men." [That the narrator is represented as sleepless—as in the state to which we have alluded, is clearly implied.] "Fear came upon me, and trembling, which made all my bones to shake. Then a spirit passed before my face; the hair of my flesh stood up: it stood still, but I could not discern the form thereof." The state of

the system to which we are alluding, as being painful beyond the utmost extreme of known and localized pain, could not be more truly or graphically described than it is in this quotation. The fear, the trembling, the shaking of the bones, are the last feelings which the patient has of himself before the phantasma begin to haunt him. Then a spirit—πνοὴ—an unsubstantial —passes before his face, and stands still, but as formless as it is substanceless,—"I could not discern the form thereof." Even so with the phantoms which haunt the couch of him whose general sense is untuned, and who yet cannot sleep. The phantasma welter and tumble like waves, and seem to be living things, but they have no resemblance to any living things that we can see with our eyes when the light of the day is abroad. Such as we speak of are confined to the night; but there are some diseases during which day phantoms make their appearance, and will not quit until the disease abates, even though the person whom they haunt is all along quite aware that there is no reality in them. The day phantoms are, however, in general more definite than the night ones, and consist of human beings and other resemblances to which names can be given. The night ones, so far as we are aware, are always formless. They seem to come out of the depth of the darkness, into which their outlines melt and vanish, so that only a portion is seen. This portion is usually, if not invariably, a head or face of some kind or other, always ugly or horrible, and often seeming to mock the sleepless sufferer with the most grotesque but insulting grins; sometimes the phantom

advances, magnifying as it proceeds, like the shadow in a phantasmagoria, till it seems close to the face, and about to overwhelm the patient; but just at that instant it vanishes, or changes to another which is dimly seen in the distance. In this way horror and torment are often suffered during the whole of the night, which is lengthened to an age; and the miserable sufferer can neither rest his body nor exercise his mind. Thought in bed, after a refreshing sleep, when there is nothing to attract the eye or the ear, is often one of the most pleasing and satisfactory occupations in which one can be engaged; but such a state as that mentioned is the very opposite; and yet the sole cause is a peculiar exhaustion of the nervous energy, to which no appropriate name can be given. Gloomy states of the weather, and gloomy seasons of the year, are apt to produce this state, though in a slighter degree and without the phantoms; and we believe that the most effectual remedy is vigorous bodily exercise, which shall bring down the tone of the motive system to that of the sentient one, and by that means procure sleep, which is in all cases a temporary cure; and this shows that repose is wanted, but that one part of the system is not exercised to the requisite degree for it.

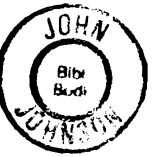
In the morning this disordered state is never experienced, especially by those who are up and active betimes; neither is it ever felt in the morning of life, or at an early stage of it, unless by those whom the fashions of society prevent from having the proper exercise of their muscles. It seems, indeed, that the extreme energy and readiness of muscular action, of

growth, and of all the other energies of nature which are displayed after the pauses, is an accumulation which has been making during the pause; and though nature has so adapted it as that it carries on the individual till the next pause, yet that it gets weaker and weaker as that pause approaches, more especially if that pause is to be final, and not a mere temporary rest.

We find this exemplified alike in the day, the year, human life, and every other periodic time to which we can have recourse. It is found even in the varied motion of a planet in its orbit. There is a serenity, a stillness and repose about the evening, especially after a sultry day, during which nature has been fatigued by the action of the sun, which is not felt in the morning, although the air is equally free from clouds and wind. It is true that we may in so far go along in this difference, because we in so far partake of the activity of the morning and the tranquillity of the evening. The autumn, too, is, in countries like Britain, usually the most tranquil season of the year; and until the weather actually breaks, the nearer that it is to the Winter, it is the more tranquil; and we may, so to imagine it, see the seasonal part of nature preparing to lie down in peace upon its couch for the period of rest. The "green old age" of human life, after the restlessness of youth and the passions of middle age have subsided,—after we have been taught by experience, (the only teacher to whom we will listen in such matters,) that pleasure is a delusion, and ambition a phantom, and that success and renown in the pursuits of life are apt,

like the light of the sun, to shine equally upon the evil and the good,—that particular stage of life bears some resemblance to the tranquillity of the closing day and the closing year; and we believe that the balance of experience is in favour of all those three periods, as being the best in their several cycles for the exercise of profound and continuous thought.

Thus there are many circumstances which render the Winter of the year a most necessary and desirable season; and were we to add to the list all that it does in the way of bringing families and individuals into closer contact with each other, and thereby giving scope for all the courtesies and charities of life, we should not fail in being convinced that it is not behind any of the other seasons in real interest and value. Our business, however, is more with the appearances of nature in the Winter; and these can be best understood by shortly noticing some of the preparations which nature makes for the Winter, the more marked styles of its coming, and some of their actions which are continued through the season, or are in a state of the greatest activity during the pauses of the rest.




## CHAPTER III.

### THE COMING OF WINTER.

As that pause in the activity of nature, which properly deserves the name of Winter, is owing to two causes, the very opposites of each other, and as both of these causes are subject to many modifications, the coming of the season is necessarily of that varied character of which no general description can be made accurately expressive. These two causes, to which we have had occasion to allude again and again, may, perhaps, in their primary signification, be regarded as modifications of only one active cause—the beams of the sun—which are the grand agent in vegetable action, and also in animal life in as far as it is connected with the year, and changes with the vicissitudes of that. Water, which is the other stimulus to plants and animals, is more passive in its nature, and seems to have no influence either on the one or the other; unless when it has a certain temperature,—or in other words, when it is under the influence of such a degree of the action of heat as suffices to restrain its natural tendency to

crystallize; under the full influence of which it has no more stimulating effect upon any thing that grows or lives, than the crystals of any other mineral have, be that mineral as stubborn as it may.

We cannot, in strict propriety, say that the beams of the sun—or rather the heat of those beams, for that is their most general and powerful influence—and water, are not, logically, the antagonists of each other; as the one is known to us only as action, or in the effects which it produces, while the other is known as substance, having qualities, and subject to effects produced upon it. This distinction may, to some, appear to be a nice one, and to belong to the category of subtleties, rather than to that of useful distinctions; but it is a very useful one, and indeed indispensable, if we wish to have clear and satisfactory notions of the general principles and working of the system of nature.

Heat, though a different mode of action from life, whether animal or vegetable, yet belongs to the same class; while water, and even that action of water which characterises the polar Winter as distinguished from the tropical one, belongs to the class of substances, and not to that of actions properly so called. Therefore, when a vegetable passes into the state of quiescence from the influence of that superabundance of heat above moisture which brings on the tropical Winter, it does so without any violence of contest with the principle of life in it. The very same agency which, exacted in a more moderate degree because of the cold produced by evaporation in the rainy season, stimulated the plant to activity, brings it to its seasonal repose during the ardour of the dry season.

Thus, the plant of the tropical climate needs no specific preparation for the dry and warm season during which it is to remain in a state of inaction. It passes quietly into that state as into a sleep after fatigue; and very often it is so constituted as that no ordinary climatal heat, and no continuation of such heat, if the natural concomitant of dryness is along with it, can do it the smallest injury. But if, on the other hand, those plants which are specially adapted to the seasons of tropical countries, are exposed to moisture in the season of their natural repose, they are as certainly destroyed as they are when exposed to frosts in the season of their activity.

It is not possible to lay down any law in these matters, which will any thing like agree with the latitudes, or the succession of the seasons, as these would be produced by astronomical causes alone, upon a globe of uniform surface both as to level and as to component matter. In almost the extreme of both Winters, too, there still remains something for the vegetable kingdom to do—something that would run to waste by being carried into a region in which it could not be available for any natural purpose: and the law of nature is, that not a tittle of the action of nature shall be exerted in vain, any more than an atom of the substantive matter of nature shall be lost. In the colder regions we have the mosses, which are to languish and become inactive in the summer, but, as will be more particularly shown in another chapter, are in vigorous growth when that of the flowering vegetation of the place is over for the season. The plants which in

this manner continue to grow in the winter of the cold latitudes, (which they do—not only in situations where the humidity on the exposed surface, though not actually frozen, is on the verge of freezing; but also in places where a coating of snow or ice cuts off for the time all communication between the atmosphere and that part of the earth which is seated deeply enough for remaining unfrozen, and therefore tends, by the uniform disposition of heat, to diffuse its action equally in all directions, to impart a portion at least of its action to the colder surface, stratum, and atmosphere over it) prevent the waste of this action, which, were it to get to the frozen surface and the wintry air, would be so diffused through the latter as to be incapable of producing a useful effect at any given point. The frozen surface, whether it comes under the denomination of snow or of ice, works in concert with those vegetables, just as in all latitudes and situations the parts and productions of nature work in concert with each other; and thus, if there is any energy of nature, however small, available for any purpose of nature, there is always some production of nature ready to profit by it, so that not a nameable fraction of the energy of the system shall be lost.

Though different in mode, it is the same in principle in those climates and regions where the Winter is the result of an excess of heat and drought. For as, in the cold latitudes, there is a constant tendency to the radiation, from the earth to the atmosphere, of heat—which, were it to reach the latter, would be dissipated, and so produce no useful effect in nature—so there is in the dry

and parched Winter of the warm latitudes, a constant tendency to the evaporation—it may almost be called the radiation—of moisture from the depths of the earth; and were this moisture to reach the atmosphere, dry and thirsty as that is, it would be lost and dissipated without producing any useful effect. This waste of humidity in the one extreme of the Winter, would be as contrary to the general and invariable law of the system as the unprofitable waste of the action of heat in the other; and therefore there are, in many situations, vegetables prepared and adapted for turning it to account, in like manner as the mosses of the cold latitudes turn to account the heat which otherwise would be lost in the Winter there.

It must be borne in mind, however, that, as all the powers, functions, and capacities of nature, in whatever beings or substances they may be displayed to our observation, are finite, there must in every case be a limit beyond which they cannot be displayed. This holds very conspicuously in both of the general kinds of Winter. The dry and parching Winter is occasioned by the evaporative power of the atmosphere becoming greater than the attraction of the vegetables for humidity; and though the native plants of hot and dry places are, by the peculiar texture of their epidermis, much more able to bear a parching atmosphere than the native plants of a temperate region in which rains are frequent, yet it is not only agreeable to the system, but a necessary consequence of it, that these plants should, under some circumstances, give way to the drying or evaporative power of the air, so as to leave some spots of the deserts absolutely plantless.

When this shall be the case, is, however, not determinable by any general reasoning, but must depend on the nature of the particular case; and even that is always of a compound and difficult nature, as depending upon many causes, the whole of which require to be carefully observed. Thus, though heat is the general agent in producing the parching Winter, it is not the only one; for the parching east winds, which are often so injurious to vegetation during the early part of the season in Britain, are, usually, if not always, cold winds. Their cold is chiefly owing to their great evaporative power. They are east winds, originating in the flat and fenny parts of the continent, which are completely soaked and saturated with humidity during the Winter; and though the air when it leaves them is loaded with moisture to the full extent of what it can retain in solution, yet when it reaches the land in England it becomes a drying wind. As such, it not only gives us a slight example of the Winter of drought, but is injurious to certain early kinds of our cultivated vegetables; though it must not hence be inferred that it is upon the whole injurious, or that the eastern counties of England upon which those dry and parching winds of the spring and the early summer have frequently an injurious effect, have a worse climate than the western counties which escape them. The truth is, that there is in reality no such thing as a bad climate, a bad season, or even bad weather, though such be our phraseology in our grumbling. No season or weather is ever sent from one place to another in the character of a hostile invader. It always comes in consequence of being exactly what is wanted for the greatest

good of the place at which it occurs, whatever may be the opinion of men respecting it, and whether it be the most favourable for the operations of art or no. We must purchase our experience of the weather and the seasons, as well as of every thing else; and even when we have purchased it we must study and understand it before we can in any way profit by it. Hence it would be wise in us could we spend in the acquisition of this knowledge, and the means of using it, that time which we spend in complaining that the weather is not what we wish it to be—or even in the offering up of needless, unavailing, and not altogether unimpious prayers for changes for which we can have no rational ground of hope, and which would, in all probability, be productive of the most mischievous consequences if it were possible for us to bring them about. We cannot even imagine, unless we are out of our senses, that the general laws of nature can or should be changed—especially for the gratification of our cupidity or our caprice, which are the usual sources of our grumblings at the character of the day or the season. Were we to reflect for a moment, we might soon convince ourselves that our arrogance in these matters is fully as great as our impiety. Are we better judges of how any one part of the working of nature ought to be conducted than He who saw the whole history of every individual part of it, before it pleased His almighty goodness to command a single atom of it into being? If we are not, then we ought to leave the government of the world to God, and pray only for his guidance in the governing of ourselves.

The withering winds from the east, to which we have

alluded as giving some very faint idea of the coming of the dry and parching Winter, offer no uninstructive lesson upon this subject. They wither some part of the vegetation, it is true; or if they do not actually wither it, they check its growth; and the places and seasons affected by them, are not so favourable for some kinds of cultivated produce, as those which are free from them. But they have a most beneficial effect in drying the great breadth of the flat lands, which are most valuable to the farmer; and it is not unworthy of remark, that the places both of England and of Scotland which are most subject to these winds, are exactly those upon which the best and most abundant crops of corn are produced.

Though we have instanced those blighting days in the early part of the year in our own country as having some analogy to the tropical summer of drought, yet it is necessary to mention also, in what the two differ from each other. They are both the results of heat in the regions where they occur, for the surface wind always comes from the colder country to the warmer one; but they come upon a different kind of vegetation, and when that vegetation is in a very different state. All that which is properly seasonal in the country which has the tropical Winter, has completed its seasonal action and is in the proper condition for repose when the Winter comes upon it. Our blighting winds of the early season come upon the vegetation in a young stage of its animal career, when the growth of the individual is the greatest possible, and the state of that which is newly grown is consequently the weakest. There is another difference

connected with this one, and in part at least the cause of it, of which it is necessary to take notice. The tropical Winter is ushered in by a constantly diminishing evaporation,—not from a lessened evaporative power in the air, but from the fact of there being less moisture upon which that power can act. The heat is, in consequence, gradually on the increase up to the time of the pause of seasonal nature, in countries of tropical character, and during its continuance, whether that be longer or shorter.

The tropical Winter is therefore a season of the repose of maturity, and comes gradually, and as one may say, pleasantly on, without any disturbance or commotion of the elements. The heat is predominant in the atmosphere, on the surface of the earth, or in the earth itself to a considerable distance below the surface. There is no doubt an action of heat, and a very powerful one, in all the three; but the moisture, by means of which this action has, in the earlier part of the season, had so powerful an effect upon vegetation, is gone—evaporated to the upper regions of the air, and thence conveyed away to other places by the current. Then, though the colder air which comes to the arid place along the surface of the ground may contain moisture up to the point of saturation when over the cold places from which it comes, it becomes a dry and drying air upon the warmer surface, for the very same reason which gives this character to our spring and early summer winds from the eastern sea.

The depth to which the action of these great heats penetrates into the earth and dries it, depends upon

various circumstances, the chief of which are the nature and form of the ground itself, and its height above the level of the sea, or its distance otherwise from water, which the dry season is unable to exhaust. The depth from which, especially in a very porous soil, the action of the great heat of tropical climates brings up, in the state of vapour, as much moisture as suffices for the healthy and vigorous growth of numerous species of plants, when there is no rain or even formation of dew, is much greater than one would be apt to suppose. There are various places in Britain, where the retiring sea has left large breadths of mere sand, not much elevated above the present high-water line, and certainly without any thing else but finely granulated sand, to a depth lower than even the line of spring-tide ebb. But the sea-water percolates through this porous mass, just as the water of the Thames does through the substratum of that level incumbent upon water-washed gravel, and of course once the bed of the river, which extends, with some variations and partial interpolations of clay, from Chiswick to Westminster; and while the sea-water thus percolates through the sand, its saline ingredients are in great part filtered away, and it becomes pure, wholesome, and well-adapted for the purposes both of vegetable and of animal life. Upon such grounds as those to which we are alluding, many species of vegetables have more rapid and more healthy action than they have upon any soils of a different character. Upon those loose and sandy soils, the plants, contrary to what we would at first thought be apt to suppose, do not suffer so soon or so severely from drought as they do

upon the more retentive soils, especially the stiff clays; and from the humidity, even in the most heavy rains to which such soils are subject, the vegetation does not suffer at all. They are also firm under the foot under the influence of every kind of weather; and they may be worked at all seasons, with ease and safety. In passing, we may remark that soils of this description are most frequent in the lower valleys and along the banks of the estuaries of the larger rivers—the very places which are best adapted for the sites of large towns and cities, and the numerous congregating of human beings; and one would almost imagine that those banks of light and porous deposit are formed for the express purpose of furnishing the numerous inhabitants of such places with esculent vegetables, in the greatest abundance, of the best quality, and with the least labour.

In proportion as those deposits are, in their substrata, of a more porous nature, and are nearer the level of the sea, they have more of a tropical character, and the soil obeys, or works to, the influence of the sun to a greater depth. There is far more in this working of the earth in its solidity, as it may be termed, than those who are not in the habit of reflecting upon such subjects would be apt to suppose; for when, by this means, the active depth of the soil is doubled, one acre of surface becomes equal in value to two; and as this working in depth is much more steady and uniform, under all atmospheric vicissitudes, than that of the mere surface or of a limited depth, the value is proportionally increased.

The depth from which moisture sufficient for the vigorous action of some kinds of vegetables will come in some of these situations, is truly wonderful,—so much so as to leave one in doubt whether the very conversion of the surface into sand may not absolutely be, in some instances at least, a means of fertility to those regions which have no rain during great part of the year, and no springs or surface streams. The great desart of Adjmeer, on the left bank of the Indus, which lies between the Punjaub, or Land of Streams, and the singular periodical marsh known by the name of the Runn of Cutch, is a remarkable instance of this. Over a very large extent of that part of the world, there is not one fountain "welling-out," or a single river or rill to be seen on the surface; and even the rains are uncertain, as the clouds which form and fall when the air reaches the comparative cold of the southern slopes of the Himalaya, pass over this thirsty sand in a state of invisible vapour. Even when rains do fall, the thirsty and porous soil very speedily drinks them up, so that their effect upon the surface vegetation is both trifling and momentary. But though the surface is thus parched up, and the inhabitants—for there are inhabitants in this desart—can find no water in quantity useful for drink and other domestic purposes, till they dig wells to the depth of two hundred or three hundred feet; yet the influence of the sun, and probably also that of the radiating heat from the earth, can fetch it from this depth in the state of vapour; and members of the gourd family and other plants can arrest it at the surface and turn it to the purpose of a very vigorous

growth—a growth exceeding any to be met with in places which, according to our notions of their physical condition, are far more favourable for the growth of any vegetable. In the desert which has been mentioned, the water-melon, one of the most cooling and grateful, though, from the coldness of its juice, not the safest of fruits under a burning sun, attains a diameter of a foot or more,—and that on the bare sand, without vegetable mould, manure, or any other attention by man than the mere placing of the seeds or the plants in the situation where it is wished that they should grow.

This protracted giving out of humidity from the ground long after there remains none on the surface, or in the atmosphere over it, and the peculiar structure of many of the plants of such places, make the coming of the repose, or Winter of drought, considerably more mild and slow than it would be if the whole of its supply of water were derived from the surface, the mere depth to which its roots penetrate, and the atmosphere over that surface. It is by no means improbable that some of the species of plants which grow in those situations, and defy the utmost ardour of the heat and drought, may be able to attract humidity by means of the great quantity of alkali which they contain. This alkali is, of course, either potass or soda, but more frequently and more abundantly the latter, especially upon the most arid surfaces; and those alkalis have, generally speaking, a great tendency to attract humidity; and in consequence of this they can maintain their existence in places, where plants which have not these ingredients so abundantly in their composition must yield to

the dry Winter, and repose in their bulbs or their seeds.

But whatever may be the character of the vegetation upon which it comes, the tropical Winter invariably establishes itself without any struggle of the elements; and it does this whatever may be the time of its coming or the length of its duration. It may be the only Winter of the year, as it is in regions of a decidedly tropical character, which have not that supply of humidity which is required for a perennial or unceasing growth; it may be the mere brief power of common growth which, in the temperate climates, arrests the progress of the leaf and the shoot, in order that it may mature the flower and make certain of the perfecting of the seed; or it may be the simple power of the heat of the day, which takes place in all latitudes and climates when the weather is sufficiently dry and warm: but whatever may be its use or its duration, it invariably comes gradually and gently, and very little specific preparation is necessary for its coming.

For this description of Winter no specific preparation of the vegetable kingdom is necessary, as it is, like the fine dry weather of what we consider a favourable autumn in our latitudes, merely a reposing of the preserved parts of the vegetation, which are not liable to have their texture destroyed by the alternate freezing and thawing of their juices, as is apt to be the case in these latitudes, where the Winter is a prolonged contest between the different agencies which disturb the atmosphere.

There is also an astronomical cause for this tranquillity

with which the dry Winter of the tropical climates sets in. At the equator, the influence of the sun upon the surface of the earth differs very little in the course of the year,—so little that, for several degrees on each side of the equator, the only difference of seasons that can be traced throughout the whole course of the year may be said to be owing to terrestrial causes alone. The length of the day throughout the whole year differs but little; and though, at the equator itself, the meridian altitude of the sun shifts about forty-seven degrees in the course of the half-year, and back again the next, yet this is so small a deviation from being directly over head, that the difference of solar influence occasioned by it is but small in comparison with the changes from the same cause in the high latitudes.

At the poles, the celestial causes of the differences of seasons are the greatest possible,—the contrast being six months of the constant presence of the sun, as one summer day, and six months of its absence, as one Winter night. These are not indeed quite equal to each other in length, as the refraction of the atmosphere brings up the sun sooner, and retains it longer, than the absolute mathematical division of the year. But this difference is not great, and so we need not encumber ourselves with the consideration of it in a general sketch. The change of the sun in declination is from about twenty-three degrees and a half below the horizon at the Winter solstice, to the same above it in the summer; and as—the daily change in declination, which is very little at and near the solstices, excepted—the apparent daily course of the sun is parallel

to the horizon, there can be no difference in the temperature of the whole twenty-four hours, either at the midsummer or the midwinter, at the poles. The average annual temperature there, according to the theoretical calculations, is that of freezing, at the mean level of the earth; but as there are causes arising from the nature of surfaces, and the distribution of sea and land, and of the influence of the sun upon these, and the resulting actions of the atmosphere, which, in all latitudes, make the observed temperature differ from that which calculation gives, it is probable that the poles themselves are not the places of greatest cold. Neither pole has been reached: to attempt the south one appears to be out of the question; and though the north may be reachable, it never has been reached. But from the reports of those adventurers who have, of late years, braved the horrors of the polar climates, and brought, as the reward of much toil and danger, a very scanty stock of information, and nothing of practical value—except that there is little more knowledge to be had,—it seems that the greatest cold is toward the magnetic pole, which is about a sixth part of the quadrant from the pole of the earth's rotation.

This is rather a curious matter, at least in the estimation of those who make short work of the economy of nature upon our globe by referring the whole to the celestial causes, which can be stated with mathematical precision; and leave out the terrestrial modifications, which are the most difficult, and therefore the most necessary to be explained of the whole. But it is in perfect accordance with what, upon close and careful

examination, we find to be the case throughout the whole of those more mighty workings of nature, in which the air and the water are the chief parties. The strifes among men and other little things upon the earth, are always productive of heat, or heat is productive of the strife—for it is not easy, or even possible, to arrange them in the order of cause and effect, according to any settled law. But the more mighty strifes of the elements appear to be attended with cold;—the region of cold is the region of storms, and the storms which usher in the cold weather in climatal latitudes are ever the most violent. Thus the tranquillity in the region of the pole is, in all probability, the reason why that is not the place of lowest temperature; and the whole action of nature there, is, very likely, nothing farther than the congelation of a certain portion of water in the Winter, and the thawing of the same again in the summer, performed in the most tranquil manner, without wind or any other angry demonstration in the atmosphere.

This tranquillity may be regarded as the predominating character of both the polar Winter and the polar summer, after they have fairly set in; and the line of the greatest cold is the region where the setting-in of both is accomplished with the most violent action of the elements. This line is not a parallel of latitude, or probably any thing nearly approaching to one; for none of the *isothermal* lines, or lines of equal temperature, are parallel, neither do they remain constant to the same latitude for any two seasons; and, although there are not yet any data for the laying down of this line of greatest cold in all longitudes, or even at a series of

distant points round the earth, yet there is no reason to suppose that it follows a different law from the rest; and is nearer the pole in some latitudes and more distant from it in others, according as it is affected by terrestrial and atmospherical causes.

But in whatever latitudes it may be situated, we are to regard it as the locality of the maximum of the polar Winter, just as the line of greatest heat, whether it happen to be on the equator, or to the north or the south of it, is the maximum locality of the tropical Winter. With regard to this last, there are some indications, in different parts of the circumference, which may guide us in our endeavours to ascertain the position of the other. In the middle of the great oceans, the line of greatest heat is probably upon the mathematical equator of the globe, or at all events it appears to cross that equator at some point in the middle of each of those oceans.

In America it is certainly on the south of the equator; for the snow does not descend so low, or lie so long, upon the mountains in Upper Peru, about fifteen degrees or one-sixth of the quadrant south of the equator, as it does upon those which are immediately under the equator itself. The exact coincidence between the distance of the line of greatest heat south of the equator in the American continent, and that of the line of greatest cold south of the pole in the same, is not a little striking; and it is the more valuable on account of the fact in each case having been ascertained by independent observations, made by men of talents and veracity, without any view to the establishment of any

relation or coincidence between the two. Thus while those who go to the observation of nature in the hope of establishing theories which they have framed or fancied in ignorance of the facts, are in most cases disappointed; they who observe in that right and candid manner which seeks only to know what nature actually is, find theories already established, and fit to be made the instruments of knowledge.

In the western part of the eastern continent, the line of greatest heat is certainly on the north side of the equator, though at what distance from it has not been observed. In the same longitude, the line of greatest cold is certainly much farther to the north than it is in America, though whether it extends beyond the pole, has not been, and probably cannot be, ascertained. The probability is that, somewhere about the longitude of Spitzbergen, the line of greatest cold may pass beyond the pole, and be actually thrown upon that in the north of America; and the fact, that the lines of greatest cold and heat, in the only situations in which they have been established, are exactly ninety degrees, or a quadrant, from each other, though they both lie at about fifteen degrees south of the pole and the equator respectively, gives no small probability to the hypothesis. Senegambia, which appears to be about the hottest latitude in Africa, is in about fifteen degrees north, or at the same distance from the equator on the one side, as the hottest parallel of South America is from it on the other.

It is probable that in the eastern parts of Asia, the line of greatest heat is again to the south of the equator,

though the character of the earth's surface there prevents the establishment of it by actual observation. The sea at Torres' Straits, on the north of Australia, is probably the hottest of all seas; and the land to the south of it is also very torrid; but local causes are so much in operation there, that they forbid us from attempting to draw any general conclusion. It is somewhat curious that the direction of greatest cold should point toward the magnetic pole, and that the line of greatest heat, when not obviously disturbed by local causes, should *seem* to be at the distance of a quadrant; and it is not less curious that the magnetic and the electric or heating agencies should also appear to have their lines of action across each other; but the knowledge of these subjects is in its infancy, and it forms no necessary part of our main subject, in the present state of knowledge; though at some future time—of the arrival of which there is no reason to despair—they may be found closely connected, and each of them capable of throwing much valuable light on the other. In matters of this kind, when they are prosecuted in the spirit of true philosophy, and not with a view to the establishment of any of the fancied hypotheses of those quack *doctors*, who are the pests and nuisances of the paths of knowledge, we never have any occasion to despair. A century—a day, before experiment decided the point, and Benjamin Franklin, the printer, sent up his paper kite, and fetched down the lightning of heaven, demonstrating that it is identical with an action excitable in all matter, and retainable in some, *that* lightning was one of the mysteries of nature, generally

believed to be the result of some supernatural working, by means of which the ordinary course of things was broken in upon and disturbed. And, as the heathen of old placed the thunderbolts—by which they really meant the lightning, as the thunder is merely noise, and in itself, like all noises, (would it were the same with noisy persons!) incapable of doing either good or harm—in the hands of Jupiter; so the Christian world, for a long time, continued to place the same bolts immediately in the hands of the Almighty, as though a special interposition of His power had been necessary to accompany the turning of a monsoon, or the fall of a shower of rain in the warm season of the year! The plain man, whose object was truth only in all his investigations, dashed the bolts from the hand of Jove the Thunderer, and did more to vindicate the majesty of God than if he had penned a thousand homilies expressly on the subject. The example, though a splendid, is not a solitary one; and, with the encouraging example of so many, we need not despair of arriving at knowledge, if we seek it in the right path, and with the zeal and single-heartedness of truth.

Thus it appears that it is no very easy matter to find the head quarters either of the polar or the equatorial Winter,—that is, the place at which each of them may be said to have complete sway during its season; and yet this, and much more than this, is necessary before we can be in a condition to have any rational conception of the coming of either of them, far less to give any intelligible account of it.

The tropical Winter (and the summer in both cases

is only the other end of the balance to the Winter,) begins, or has its maximum, at a certain curve which surrounds the earth, not very far from the equator in any case, though sometimes on the one side of it and sometimes on the other; and probably dividing the globe nearly into two equal portions, though not by a plane section, as would be the case if the division were made on the plane of the equator or upon that of a meridian: and from this particular line, wherever it may be situated, the energy of this Winter subsides; and may be understood to reach its minimum in the locality of the greatest cold. Of the region of the maximum of the polar Winter, or that of the greatest cold, we cannot speak with so much certainty. Theoretically, it ought to be a point, and in the pole of the circumference of greatest heat, if that circumference were a circle. But, as told upon the surface of the earth, this circumference appears to be a curve of much irregularity, and therefore, the pole of it cannot, upon any known principle, be a point. According to the theory, which is the only guide that we can have in the matter, though by no means a safe one, the pole of every part of the curve should be a quadrant or ninety degrees distant from the curve itself. Local causes must, of course, disturb this not a little; but still this is the result to which the principle tends. Hence, where the curve of maximum heat is on the equator, its pole, or the point of greatest cold, should be at the pole of the earth's rotation; if the curve is on the opposite side of the equator to the pole referred to, the pole of the curve should be the same distance short of the

pole of the earth, as is found to be the case in America; and if the curve is on the same side of the equator as the pole is, then the pole of the curve should be as far on the opposite side of the pole of the earth as the curve of greatest heat is from the equator—as we have conjectured, from pretty strong probabilities, may be the case in the longitude of the western parts of Africa and Europe.

Thus, though we have not, and are not very likely ever to obtain, data sufficient for enabling us to determine the exact locality, and the form and extent of the place of greatest cold—the home and especial throne of the polar Winter—yet we have some vague means of estimating what it is not, and thence more vaguely guessing at what it is. It is not the pole of the earth's rotation, as the astronomical theory would lead us to conclude, if we rested wholly upon it without taking into account the terrestrial modifications. It does not lie on the circumference of a parallel, as is apt to be supposed by those who, in a manner rather too hasty, suppose that it is connected with a revolution of the magnetic pole round the pole of the earth's rotation; and though the greatest cold hitherto observed has been in the neighbourhood of the present locality of the magnetic pole, there is not sufficient ground for believing that there is any absolute connexion between that pole and the place of greatest cold. About the close of the sixteenth century, the line of no variation lay very nearly in the longitude of Siptzbergen, and of course the longitude of the magnetic pole must have been the same; but the establishments which the Dutch then had on

the shores of Spitzbergen for their whale fishery, shows that the climate of that island could not have been much more rigorous at that period than it is at the present time; and Spitzbergen is in a latitude considerably nearer the pole of the earth than the present locality of the magnetic pole.

Compared with these negatives, there is unfortunately but little of a positive character that can be added. That, in the northern hemisphere, the head quarters of the polar Winter are in the north, is a point which every one will admit; and that it is not a point or pole, but a patch or zone, follows from what has been stated on the irregular position of the circumference of greatest heat. Probably it is very irregular in shape, and far from uniform in cold even at that time when such a region must be under the complete and tranquil domination of uninterrupted frost, so severe as not to have left a single particle of moisture in the atmosphere. Those places of the zone or patch—which must not be confounded with the polar zone of geographers, as the two do not coincide—whereon the greatest number of quadrantal arcs at right-angles to those parts of the circumference of greatest heat, from which we may imagine them to be drawn, fall, should, upon the hypothesis, be the coldest; and those upon which the fewest fall should be the warmest; but how these alternate with each other, and how they differ in their average temperature and their seasons, are matters of observation which it is impossible to explain theoretically.

Such, in brief and very imperfect outline, are the head quarters, or places of maximum influence, in the

two opposing causes which bring about the two kinds of Winter that vary the year in the contrasted regions of the globe. Our next business is to inquire where the coming of either of them is attended with the greatest violence, and in consequence of this needs the greatest preparation; and to ascertain, if possible, the general reason why this should be the case, but without entering into any of the minutiæ, for which, indeed, there are no satisfactory data. The general answer to this inquiry—though a very vague and indefinite one, is, that the contest must be most violent where the one comes upon the other in the greatest strength and with the greatest rapidity; and in order to understand, in a rough and general way, where this may be expected, we must attend to the positions in which the two powers are placed with regard to each other on the surface of the globe. The three circumstances of different latitudes, different lengths of day, and different elevations above the mean level of the earth, are almost the only ones which we can afford room to mention,—the more local ones being very numerous and difficult of explanation.

In latitude, and without taking any notice of variations in other respects, the causes of the two Winters overlay each other, in the whole surface between what we have described as being their respective head quarters; and early diminishes in power as it approaches the head quarters of the other, until it is, upon the mere consideration of latitude alone, hardly capable of producing any effect. If this were the only circumstance upon which the state of things depended, there would

really be no seasons, and very little action, or growth, or life of any kind upon the earth,—no vegetable useful to man could grow in England, no land animal useful to man could be supported; and, a little farther to the north in latitude, and a little higher above the surface than its mean level, would be under the constant and unbroken dominion of ice. There would be no contest of those opposite causes of Winter any where; and no currents, either of the atmospheric air or the oceanic water;—the whole would be in unbroken tranquillity; but it would be a tranquillity of the most melancholy description—the unbroken quietude of death. That the axis of the earth's rotation makes an angle of about sixty-six and a half degrees with the major axis of its orbit the one way, and one hundred and thirteen and a half the other way, seems so very trifling a matter, that the majority even of persons who consider that they have been well educated, and lack nothing in wisdom, would be, and actually are, apt to turn away from the consideration of it, as from a trifle not worthy of attention; and yet, were it not for this trifling circumstance, all their wisdom and all their toil could not find them so much as a single potato to eat; for, were it not for this little circumstance, simple as it is, the greater part of the earth's surface would be utterly barren and unprofitable.

But the change of the sun in apparent declination northward and southward, which is the result of this simple relation between the plane of the orbit of revolution and the position of the axis of rotation, shifts the seasonal action, and brings about those commotions of the elements which, though often both fearful and

formidable at the time, are the real causes of the beauty and the activity which afford us so much pleasure and profit in the kingdoms of growth and of life.

The shifting of the sun in declination, which is the apparent result of this obliquity of the earth's axis, as seen from the surface of the earth, is only over forty-seven degrees of the meridian in the one half-year, and back again over the same in the next. But this, although the same in itself in all latitudes, tells very differently upon the different latitudes of the earth,—the change being a maximum at the equator and a minimum at the poles. The simple element in measuring the influence of the sun upon the earth when at any distance from the zenith, is the cosine of the zenith distance; and the measure of the difference of influence at any two distances from the zenith is the difference of the cosines of those distances,—the cosine of the zenith distance being the same as the sine of the height above the horizon, and expressible by a straight line let fall from the sun perpendicularly to the plane of the horizon, that plane being supposed to be produced as far as may be necessary.

If the sun is in the zenith, the perpendicular will fall exactly upon the place alluded to, and the elementary measure of the influence of the sun will be expressed by the whole distance of that luminary from the earth; and if the sun is exactly in the horizon, the line expressing the measure of its influence is reduced to 0. Near the zenith the differences are very small, so that at sixty degrees from the zenith, or two-thirds of the quadrant, the measure has only decreased one-half;

and as the horizon is approached, the sines become nearly equal to the arcs.

Hence, the nearer that any place is to the pole, and consequently the less the meridian altitude of the sun, the greater is the difference of solar influence with the same change in declination. We shall not state the numerical differences; because there are no results that agree with them; but any one who has access to a table of natural sines, will find numbers expressing the proportions, either in the cosines of the zenith distances or the sines of the altitudes, which are, of course, exactly the same numbers.

The estimate according to the sines, is made on the supposition that the sun is the same number of hours above the horizon at all seasons and in all latitudes; whereas, in the quadrant from the equator to the pole, the length of the summer day and the Winter night is of all variations from twelve hours to six months. By the combination of all these circumstances, the agencies in the high latitudes are brought not only to a difference from each other at the different seasons—to which the slight difference at the equator, as depending on the varying influence of the sun, is really as nothing,—but they bring each up to a terrible power of attack or of resistance, according as the turn of the season is toward summer or toward Winter. They have this power altogether independently of the presence or the absence of humidity; though their influence upon that is productive of many of the most remarkable phenomena which are displayed during those periods of violent action.

There are not in the tropical latitudes any general causes to bring up the small portion of polar action which is there, to a degree capable of producing any thing like a cold Winter, either at the mean level of the earth, or for a considerable height above it. The summits of the lofty mountains, indeed, in every latitude, have a polar character; and upon these the conflicts of the two opposing agencies are perhaps more violent, and certainly more frequent, than they are in the most angry regions near the poles. But furious as are those elemental strifes on the tropical mountains—and in some places they are fearful—they are limited in their range, and brief in their individual duration. The most violent hurricanes of wind, with driving snows, which make the noon-day under an almost vertical sun as black as midnight, armed with the lightning gleams and the thunder volleys, displaying characters very different from the most furious storms of the high latitudes, are often raging in a certain zone of elevation, while the most elevated peaks are still in the cold solemnity of their perennial snows, and the valleys below are basking in the heat of a tropical sun.

This character belongs, in some degree, to the lofty mountains of all latitudes; and as the latitude increases, it comes lower down, is more extensive in the range upon which it is displayed, and more seasonal in the times of its appearance. It is thus a Winter extending into every latitude where there are mountains of sufficient height; and it is a Winter which in some situations is quite perennial; and consequently, though it partakes of the cold of the polar Winter, it is a Winter

of different character. Its plants and its animals have not a long Winter of pause, and a short summer of great activity, as those have which winter and summer in the polar climates. They have a peculiar character, and are not suited for places where there are trains of settled weather of any length. The plants which are found native upon such places, languish and waste away when they are brought down to the valleys or the plains, in spite of the utmost attention of the most skilful cultivator. Flowering plants are but few, and what are met with are not conspicuous either for their beauty or their usefulness. The lichens and the mosses form the characteristic vegetation of those stormy places,—the former on the rocks and the cold and dry heights, and the latter in the humid places and by the runs of water. Of the smaller order of animal life there are few. Birds are not numerous, and they are confined to those genera which can subsist on the coarsest food, or bear hunger the longest, and best brave the violence of the storms. Mammalia are not abundant, at least where the situation is too elevated for the growth of trees or shrubs; and they are, in the more seasonal localities, either such as remain dormant for a time, or fleet-footed ruminantia that can bound among the crags and cliffs, and endure a great deal of labour in searching for their widely-scattered food. Among birds, the more powerful eagles and the long-winged vultures, are the most conspicuous; and they drive about in search of animals that meet with the casualties which are so common in these, the most stormy wilds of nature. The animals appear to be as peculiar in their

nature as the plants: they have little disposition to quit their dwellings in "the munition of rocks," and they do not feel at home or thrive when they are brought into more kindly places.

Altogether, therefore, this mountain zone of what may be termed perpetual Winter, is distinct and apart from the lower places, which have the average climates and seasons of the latitudes in which they are situated; and thus they must be left out when we endeavour to explain the coming of the cold Winter, and the preparations for its coming.

But still, as the latitude increases, and the seasons become more marked and contrasted with each other in their characters, the mountain Winter comes down, and in so far blends with the Winter of the year, in many of its characters. It comes earlier, no doubt, than the Winter on the plains; and it comes with more uncertainty and greater violence. But the time of the tranquillity of its snows is longer; and, contrary to what those who have not observed or studied it, it departs more rapidly and with much less variation and fury of the weather, than on the plains, where it is upon the whole less severe, and of more brief duration. The reason of this latter circumstance is, that, by the time that the mountain snows begin to melt and pass into vapour, the plains and valleys have become comparatively dry and warm; and they draw toward them the mountain air and the evaporated moisture along with it. There is, thus, nothing left upon the mountains by which the serenity of the atmosphere can be very much disturbed. The plains and valleys are at the same time

greatly benefited; and they thus escape those blighting winds, to which allusion has been made, as injurious to the wide plains near the sea, when that is of no great breadth, and the country beyond it cold and humid.

Such are some of the means, as depending on difference of latitude, length of the day, and elevation above the mean level of the earth's surface, by which variations in the coming of Winter are produced. There still, however, remain some circumstances, connected with the more rapid changes of the solar influence, arising from the same absolute changes in declination, and the more rapid alteration of the length of the day in the high latitudes, to which it may not be improper to pay a little attention. The average altitude of the sun, in every latitude, being the compliment of the latitude or the difference between it and ninety degrees; and the variation of influence, and also in the length of the day, being greater in proportion as the altitude is less; it follows that, after the summer solstice is past, the days will cool and shorten more rapidly in proportion as the latitude is higher; and, as what is taken from the warmth and length of the day is added to the cold and length of the night, the night must gain faster upon the day, as the latitudes are higher. The change, or the cause of change, in the heat and length of the day, is most rapid near the time of the equinox, as then the declination varies most rapidly. We need scarcely add, for it is self-evident, that any cause or agency which acquires strength at a more rapid rate, must be sooner able to accomplish its work, whatever that work may be, than one of which the increase is slower. In very

high latitudes, too, there is not, except upon very peculiar surfaces, any thing like a summer pause in nature, or a languor of heat, to be followed by the refreshment of the midsummer rains, and the growth of the midsummer shoot and the after-math, and then by the agreeable serenity of a warm and dry autumn, such as has delighted, renovated, and enriched us in England, in this present year 1837. In high latitudes, the rains do not set in so soon; and they do not come with the lightning and thunder, or any of the other traces—faint ones it is admitted—of the turn of a monsoon, by which the midsummer rains are ushered in in England, especially after a summer that has been very dry and sultry. They are protracted till September, or at all events till August, unless in latitudes so high as that the powers of Winter are not wholly subdued even in the hottest part of the summer.

When those rains do come, the cold is so rapidly getting the better of the heat, that a very little addition produced by evaporation suffices to reduce the temperature to the freezing point; and the moment that this is the case, the Winter may be said to have commenced; for the cold gains rapidly, and, unless by currents of air from a warm sea, or some other local means, the frost does not relent until the Winter solstice is long passed, and the summer influence of a new year comes into operation. In very high latitudes, and also in peculiar situations in latitudes not so high, the cold often gets the mastery before the rain comes on; and in such cases, the fall of humidity from the atmosphere is in snow from the very first. This is most frequently the

case in situations where the difference of temperature in the summer and the Winter is very great; and where, marshy places excepted, the surface of the land is comparatively dry. The moisture which is on the surface is usually frozen before the snow comes; and the shallow waters are also mantled with ice.

This extreme rapidity of the coming of Winter, is not brought about so much by the action of the atmosphere at the place itself, as by the invasion of a cold atmosphere from another. The setting in of the Winter in Canada is perhaps one of the most remarkable examples of this. Labrador comes upon it; and the coming partakes not a little of the sublime. The biting wind first sweeps over the surface, getting absolutely colder by the evaporation which it produces. The surfaces of the shallow waters shoal into fibres of ice as if by magic; and as the effects of the wind increase, its velocity accelerates, until it acquires the violence of a hurricane. As soon as the surface is frozen, the congelation mounts upward, every atom of water in the air is turned into snow, which careers along in serried array, whelming and whirling, turning into ice in the deeper waters and the marshes of the woods; and encasing the whole land in one thick and solid mantle. While it continues, the people are confined to their houses; and the strength of them is put pretty severely to the test, by the combined thumping and thundering of the wind and the snow. But it is too violent for being of long continuance, and too confirmed in its character for admitting of any return of those last remains of summer which it has driven from the land. It is speedily over; and

those parts of the country which were not passable during the summer, become solid paths. The atmosphere is serene and quite dry, so that it is very healthy; and those who take exercise in it soon get warm. Friends whom the pathless marshes had separated from each other during the summer, pay their visits; the woodsman marches forth to his labour in the forest; and life on the snow is really more desirable than in the opposite season of the year, when the temperature equals that of the West Indies; and any one who ventures to try the shade of a tree on the marshy ground, is almost smothered, and stung to distraction by myriads of insects.

But this Winter, violent as it is, is as safe for the ground vegetation as it is sanatory for the people, and favourable for their journeyings by land. The snow comes on before the ground has been cooled to any considerable depth; and after it comes, and settles, there is no more radiation of heat from the earth to the atmosphere; but it continues to be given out by the lower strata of the earth, and thus ascends as far as it can come, reducing the frost which has penetrated into the ground, and cherishing the roots of the plants which are there. This office extends to the roots of trees and shrubs, as well as to those of the herbaceous vegetation, the stems of which have died down. Thus, while the buds are safe in their hybernacula, the deciduous leaves have fallen, those of the coniferæ and other evergreens are protected by the firmness of their epidermis, and all the portion of the tree which is above ground is in a state of safe repose, the rootlets for the coming

year are making progress under the protection of the snow; and Canada, notwithstanding the violence with which its Winter sets in, and the intenseness of the frost while the Winter lasts, is a country peculiarly favourable for timber. This rapid coming on of the Winter is as favourable to many of the humbler species of vegetables; but in the beginning of the season, Labrador is apt to come again, in less wholesome visits, with alternate frosts and fogs, especially in the lower parts of the valley of the St. Lawrence; and these destroy the spring, and are unfavourable both to autumn-sown crops, and to the getting in of the seed of the spring ones.

Further to the north, beyond the limits at which it is of any use to attempt cultivating the ground with any view of obtaining crops of farm or garden produce as substantial food for human beings, and even around the spot which has been understood to have the maximum of cold in these longitudes, and where mercury is a solid metal, capable of being hammered on the anvil, but not touched with impunity by the naked fingers for a considerable portion of the year, there are still some means of enjoyment in the Winter for those human beings who can adapt and reconcile themselves to a climate so different from any that we are accustomed to in the temperate regions of the globe. Over the middle latitudes, the hunter pursues and secures his game, in places which, from their marshy nature, are quite shut out from man when the frost is gone; and the people of warmer latitudes are made gay and comfortable by the furs upon the skins of wild

animals of these apparently inhospitable regions, which are killed by thousands while the snow is upon the ground, and the whole surface is rendered solid by the frost.

Meanwhile, still further to the north, where the land, in this depth of Winter, does not afford even wild animals as game, or any other species of food for human beings, the Esquimaux retires to the ice, constructs his Winter hut of masses of snow cut from its surface covering, spreads his skins upon the snow bench, lights his lamp; and just because the temperature is below the freezing point, he lives as dry and comfortable as many peasants of more temperate, and, in the common acceptation of the term, more civilized countries. He yokes his dogs to the sledge, and travels over the ice wherever he lists, and with no mean velocity; and, whether to secure the little stock of provisions which he has, according to the success of his summer labours, laid up for the Winter, or to supply the place of them when they are exhausted, he resorts to the breathing holes, which the aquatic mammalia, chiefly seals of some species or other, instinctively keep open in the ice; and by skilful management there he contrives to find a supply of fresh provisions for himself and his family in the very intensity of the polar Winter. Thus, to the very extremest verge of the globe, it is fit for the habitation of human beings; and the promise to man is fulfilled; for, in all the varied climates, and their still more varying productions, man may have dominion over the earth, and subdue it.

The phenomena of the coming of Winter upon the

Polar Sea have not been so well observed as those upon the land where the character is most decidedly polar. Where the ice on the surface remains unbroken and unthawed during the summer, the coming must be much the same as that on the upper part of a lofty mountain, from which the snow is never cleared. Winds may blow from it to the unfrozen parts where the temperature is higher, and they may sweep along its surface with varied degrees of violence; but there can be no very great commotion of the elements over an icy surface of permanent duration and considerable extent. Where the ice is in detached masses, with unfrozen portions between, the elemental commotion must be much greater. Every detached field or "floe" of ice, gives out a wind from it in all directions to the unfrozen water around it; and thus it may happen that, when the surface is mottled by numerous masses of ice, of considerable size, and at some distance from each other, many winds from all points of the compass may at once be "warring" within the horizon, which is visible from the top of a ship's mast. Those winds are often very violent, working the surface of the unfrozen sea into tumultuous waves, and dashing the smaller pieces of ice against each other, or tilting them up on edge, till they ride many fathoms above the surface of the water, and probably, in some instances, become the *nuclei* of icebergs, though these are understood to be in general formed on the precipitous shores; and, being softened in the under part by the radiating heat from the rocks, which they arrest in its progress and prevent from reaching the air, there to be

diffused, they tumble into the sea with indescribable splash and thundering sound.

When, from causes which we do not understand, the Winter storms of the high latitudes come on earlier and with more fury than usual, they not unfrequently invade countries much further to the south, much in the same way that we have said the storms of Labrador invade Canada. These sometimes invade Scotland, and occasionally, but more rarely, England, as early as the month of September,—not that the snow comes all the way from the polar regions; but cold winds come, and convert the humidity of the atmosphere into snow; and the air, which is much cooled and also loaded with this, drives the warmer before it, at the same time turning its moisture into snow; and thus the invading storm reaches to a greater or a less extent, in proportion to the cause to which its occurrence is owing.

In such a climate as that of Britain, those storms of invasion, when they arrive early in the season, cannot be called Winter storms; but they tend to make the Winter both early and severe; and the mischief which they do to vegetation is greater than if the snow were to lie unthawed till the turn of the year. If it were so to lie, it would afford the same protection to vegetables as the snows do in the more tropical climates; but the cold is not able to hold out; the snow terminates in rain; and the evaporation thence resulting ushers in black frost upon the naked earth, from which vegetation suffers much more severely than it would do from any load of snow upon it, however great. Another snow storm generally follows, indeed, not long after the

black frost, though that frost may alternate with rain and sleet in the interim, and thus make the state of things worse; and in whatever way it terminates, the mischief is in general done before the snow which is to be permanent for the Winter, comes on. Those invasive storms which come only occasionally, do not belong to the common economy of the season; and thus there is no preparation of the vegetables against them. In all these cases of contingency, the cultivated plants suffer first and most severely, because they are, in most of the species, more delicate in their nature than the wild plants; and also because the Winter vegetation, which serves to protect the roots of that of the summer, in situations where there is no snow to protect them, is removed by the cultivator.

To enter into the details of all the varieties of the polar Winter, till so low latitudes are arrived at, as that it and the Winter of drought form nearly equal powers in the vegetation of the year, would far exceed the limits within which we must confine this part of our subject; and so we must take a rapid glance at the preparation which, in the various latitudes which are affected by it, are made for this description of Winter.

## CHAPTER IV.

### PREPARATIONS OF NATURE FOR WINTER.

It is a well-established law of nature, and one which equally agrees with and illustrates the wisdom and goodness of nature's Almighty Author, that, while every power in nature is completely able to perform the work or the office for which it is appointed, and while there is always a surplus capable of meeting those variations of seasons and circumstances, which, as we can neither understand their nature nor their use in the system, we call contingencies, there is still no waste; whatever is not required for one purpose being always applied to another.

In every case, too, the object is just as instrumental in bringing about the result which we observe, as the agent; so that there is, in nature, really no such relationship as that of a workman and materials, unless in so far as we consider simple inorganic matter as obedient to the laws of vegetable and animal life; and this, though a common mode of speaking on the subject, is probably a very incorrect one,—as it is evidently

speaking according to the manner of man's working upon subjects in which man, or any thing that he can conceive or do, has not the smallest concern. It is true that the vegetable or the animal has the power of appropriating and assimilating as part of its own structure, the carbon, the oxygen, the nitrogen, the lime, the silex, and the other elements that we are in the habit of calling simple, of which its structure is composed. But this simplicity is really nothing more than another name for the very limited extent of our knowledge; and, we are at present unable to say into how many elements any one of those substances, which are simple according to our present opinion of them, may be resolved, after we know a little more. But, even granting that any of these elements, as we call them, are all of them now absolutely simple, we cannot regard them as being passive in any one of those combinations into which they enter, even under what seems to us the most powerful of all physical dominions,—the dominion of the life of a warm-blooded animal; for there must be, in the substance which is assimilated, be it what it may, qualities which adapt it to the assimilating organs, and which therefore may be said, not simply to obey these, but to work jointly with them in the producing of the effect. The elementary system, for instance, digests and assimilates food, and makes it fit for the growth, or the repair, according to circumstances, of all the parts of the body. Experience shows that the food must stimulate the digestive organs, in order that these may be enabled to digest the food; and in cases of indolence of the system, a more stimulating quality

must be imparted to the food, in order that it may excite the system to the requisite degree.

In every case it is the same; and our separation of the parts and powers of nature, by means of which any agency is brought about, into agent and subject, is merely in accordance with the limited and imperfect system of our working, and, as such, at variance with the system of nature. Thus, when we, in common parlance, speak of the heart and the circulation of the vital fluid, by means of its pulsations, we are apt to describe the heart as the only active part, and regard the blood which it propels merely as a simple and passive fluid, just as water is when we propel it artificially by means of a forcing pump; nor have there been wanting men of the most profound learning and the most pious intentions, who have put this view of the subject into writing, and laboured, with much apparent self-satisfaction, and no little commendation from the public, to show that the heart of a warm-blooded animal is much superior to any pump which can be constructed by human art; and upon this they have raised a sounding structure to the glory of the Almighty Creator, for being vastly superior to any human engineer in—the art of pump-making! Standing alone, and out of the context of the circumstances, this sounds very like impiety, if not blasphemy; and belongs to the same class with those sincere but mistaken ascriptions of glory to the Almighty, in the poems of Sir Richard Blackmore—one of the best of men and worst of poets—which are turned into ridicule with such happy wickedness, in "Martinus Scriblerus his treatise Περὶ Βάθους." But,

in truth, they are the very opposite of impious in the intention; and it is by the intention only that the individual from which any thing proceeds ought to be judged. Upon the rest of the world the effect is different; and as a world awakened to wisdom is very apt to be somewhat awakened to wickedness at the same time, there is a bane in the putting forth of those well-meant effusions of ignorant piety, which stands more in need of the putting forth of the antidote along with it, than if the same sentiments were given to the public in the pages of a profane author.

There is no further analogy between the heart of an animal and any sort of pump of human construction, than that each of them propels a fluid; and this no more establishes their identity, than the fact of "a river at Monmouth," and the hypothesis of "a river at Macedonia," with "sawmons in them both," established the general resemblance of those places, or the likeness of Harry of Monmouth to Alexander of Macedon. The water which the pump impels neither assists in the working of the pump nor has the slightest tendency to keep that engine in a state of repair. On the contrary, all using is waste and wear; and the natural tendency of the water is to consume the instrument, by rotting if of wood, and by oxidation if of metal.

The relation between the propelling heart and the propelled blood in the living animal is very different from this; for we are unable to say to which of them the fact of circulation is the more owing. Probably it is to the propelled fluid; for we know that if respiration—by means of which the superabundant charcoal

which the blood has taken up as the refuse of the working of the system—is removed, is suspended for a very short time,—or if any gas not fitted for the performance of this purification is inhaled,—the motion of the heart, and all the functions of life in the body, are not again to be excited by the most lively stimuli, after the lapse of a very brief portion of time. We also find that all the functions of life may be carried on for a considerable time, without any derangement indicative of disease in any part; while some topical malady of the heart is making rapid progress, and even converting the valves, and some of the other working structures of that organ, into bone; whereas if the blood is only very slightly diseased, if the disease is not thrown upon some particular part, which it destroys, for a time, the whole functions of the system become deranged, and death ensues.

But though these instances would lead us to conclude that the stimulus is in the circulated fluid, rather than in the organ which puts the circulation in motion, yet it would be inaccurate, as well as unwise, to come to this as a general and ultimate conclusion. A certain condition of the heart, as well as of the blood, is essential to the healthy performance of all the functions of life in the body; and the only just conclusion to which we can come, is, that they act mutually and reciprocally,—that the heart is not prepared as a passive organ, upon which the blood shall act as a stimulating fluid, neither is the blood prepared, as a passive fluid, upon which the heart shall act; for their preparation is mutual as well as their action,—they are made for each

other,—they cooperate in the performance of a certain function;—both are indispensable to that performance; and thus no one of them possesses, or can possess, any portion of the active energy, unless in connexion with the other.

Throughout the whole of nature it is the same; and this is the reason why, when we speak of the preparation of nature or of any part of nature for any season or any occurrence, we must speak with explanation; and, whatever may be our intentions, we are in great danger of being misled ourselves, as well as of misleading others, if we do not. Our first thought of every kind of working is after the manner of men,—as an active worker and passive materials to the performance of every single work; and when we turn our thoughts from our own working, and that of the rest of mankind around us, to the grand working of the system of nature, this narrow, and mistaken, and misleading view of it is apt to cleave to us with very stubborn inveteracy; and the direct and inevitable tendency of it is, not only to give us most false and unworthy notions of nature, but to make us think and judge of the Great Author of nature, as of the same in kind with beings of mortal clay, how much soever our fancy may represent him as elevated above them in degree.

This is exactly the feeling which the heathen had, and have, of the gods of their idolatry. They derive their notions of these from the study of nature, and from studying it after the manner of men,—the only way in which it can be studied by those who have not the light of revelation to guide them. We, how much

soever we may attend on the rites of the Christian religion, and how earnestly and fervently soever we may seek for information on the Christian doctrines and mysteries, are really very much in the same state with the heathen, if we do not carry the notion of the God of Revelation, as made known to us in the words of his own inspiration, along with us when we turn our thoughts to those workings of nature; from which it seems hardly possible that they can be constantly withheld, even by the most ignorant or the most worldly-minded of our race,—from both of which categories we are all most anxious to exclude ourselves.

God is a spirit; and therefore his only direct and immediate act upon material nature is the act of creation—the single fiat which called all the worlds, and all their productions and inhabitants into being, each instinct with every power and faculty requisite for making it continue to act in obedience to the place, the office, and the time, which it pleased him to assign to it. Man, it is true, has what we in common language call a certain "freedom of choice;" that is, he acts upon and even against the ordinary laws of matter in some of his operations. But, even in these, there must be an adaptation of that which he applies, to the purpose to which he applies it; and when he endeavours to work in concert with any natural power,—as he does when he cultivates a plant, or breeds, that is trains, an animal,—he must be content to follow nature, for he cannot and dares not lead. The fact is, that by all his skill in cultivating, either the members of the vegetable kingdom or of the animal, man does nothing

more than find out adaptations of certain parts of nature to each other; and in proof of this we may mention, that in every case the merely theoretic cultivator, however plausible his theories may be, or however useful in the hands of practical men, invariably ruins himself, if he ventures to put his own theories into effect without practical experience. He may prepare his soil, and he may also prepare his plants; and both may be done in the best manner as regards each, considered individually; and yet, when he comes to put them together, he generally finds that there is failure, until he has learned by experience how the adaptation is to be made,—until he has actually seen that the preparations of the two are suited to each other.

The relation between nature generally, as acted on by the season, according to our notions, and the season, as acting upon it according to the same, forms no exception to the general law; and thus, when we speak of the preparation of nature for the Winter, or for any other season, we ought always to understand, though we do not express it, that the season is prepared for nature,—that is, for the vegetable and animal productions of nature,—just as much as these are prepared for the season; only we see the one preparation in individual subjects which we can examine, and the other is general to the whole.

We see different effects upon different productions of nature, but we are not able to say why they should be. In summer, and early autumn, the potato seems a plant of far more power and vigour of growth than the grass upon the meadow; and the moss is a slow and

crawling thing as compared with the mushroom, which "springeth up in a night," and that with such force of growth as to heave stones of considerable weight out of their places. But the potato is blackened by the very earliest frost, even when that frost can scarcely be traced upon any other field-plants, except by those who are up betimes, and see it as a hoar-frost upon the grass; but the grass shakes off this hoar-rime, and is as green and as beautiful, or even more so indeed, in the warmer districts of England, and in all countries which have climates similar to that of England, in the winter months, even when the snow has been just melted from it, than it is in the very heat of summer. The fungus, too, notwithstanding the rapidity and vigour of its growth, scarcely waits the severity of the frosts, but melts away, without leaving any memorial of its existence, in the abundance of those very rains, to a more moderate degree of which its growth is owing; but the little moss, all feeble and slow as it seems, loving the surface and courting the shade, looks rich and gay, and flourishes apace under the rigour of the Winter.

Many instances of a similar nature might be adduced, to show that the different productions of nature receive the Winter in very different ways; and that thus, the preparation of nature for the Winter is a very vague as well as a very varied subject. Still, amid all the variations of appearance at the time of its coming, and of state as to action or repose during the period of its continuance, there is a preparation of the whole of nature for the coming of Winter; and a preparation of Winter for the well-being of nature, whatever may be its

state during the season. Among the vegetables, which from their nature must abide the seasons as they revolve, without power of migrating from one place to another in the individual, some prepare themselves for a state of repose during the season, and others for a state of activity, while there are others still which may be said to remain indifferent to the changes of season, and to have very nearly the same appearance, if not the same growth, all the year round.

Among animals there are similar differences, though the manner in which they are displayed is not quite the same. The fact of most animals being endowed with locomotive power is one cause of this; but there are other causes. Among them, as well as among plants, the adaptations to different seasons, and consequently what we call the preparations for the Winter, are most conspicuous in the land ones. The waters, at least the waters of the sea, have very little change of seasons, unless in particular places where the depth is small, and the natural currents are in consequence interrupted; and, unless in the extent to which it is actually frozen in the cold season, the sea knows no Winter. The scorching Winter of heat is, of course, never known in the sea; and the most powerful action of the summer sun, which produces the dry Winter upon the land, though it strikes downward and stimulates animal and vegetable life to the depth to which they extend, has a tendency to cool the air near the surface, except where the water is so shallow, and the bottom of such a character as that much of the heat is returned from that by radiation and reflection. The reason of the cooling and

refreshing of the air in all situations where the water itself is so deep as to absorb or dissipate most of the solar heat, is an obvious one:—the more directly or perpendicularly the rays of the sun fall upon the surface of the waters, there is the less reflection back again into the air from the surface, and the less refraction by that surface; and consequently, when the depth of the sea is sufficient for the purpose, the solar action is always the more completely absorbed and extinguished by the sea, the more perpendicularly that the rays fall upon the surface. But the rays themselves are hottest when they fall in this direction, and they also act most powerfully upon the water, and consequently have the greatest effect in raising its temperature. Now both the heated water, and the heat constantly applied to the atmosphere, tend to increase the evaporation, and by means of that both the coolness and the moisture of the air over the sea. This is the reason why the sea breezes set in so readily, and are so refreshing, in warm climates and at warm seasons; and why the above countries have a summer of the most delightful growth, when the interior of the country is in all the desolation of the Winter of drought. From these and various other considerations, which will readily occur to every reader who is in the least acquainted with the economy of nature, it is obvious that in noticing the preparations of nature for the Winter, we may leave the sea entirely out of the question, and confine ourselves to the land.

Of the preparations of nature for the Winter, or, more accurately to express it, of the adaptations of nature, that is of the productions of nature, to the condition of

that season, there are three principal branches: First, the preparation or adaptation of the earth itself; secondly, that of the vegetable kingdom; and thirdly, that of the animal.

The seasonal influence of the sun and the atmosphere upon the cold matter of the earth, and without any reference to the influence which that may have on the productions of the earth, is a matter of comparatively minor importance; seasonal action, of whatever kind it may be, penetrates to only a very little depth into the solid mass of the earth: of the effects which it produces, even to this very limited depth, our knowledge is most vague and imperfect. We do know, that, in the course of the warm season, the earth does receive more heat from the direct beams of the sun while that luminary is above the horizon, than it gives out by radiation during the night, when the direct beams cease to act; and in consequence of this there is an accumulation of heat in the soil and other solid matters of the earth, to the depth to which the influence of solar heat penetrates—which is ill-known, and probably very different in different soils; but as to whether this accumulation, or any part of it, remains so as to increase from year to year, we have no data which can assist us in arriving at any thing like a satisfactory conclusion. The question has been mooted by some of those who are anxious to pry into the very dark subject of the progressive history of our planet; and there are some shadowy grounds for conjecturing that there may be a gradual increase from year to year, though at a rate so exceedingly slow that the difference might not be detected by

an instrument in the course of a lifetime. From the tree ferns and other gigantic remains of plants which are found in the strata of temperate countries, especially in the coal measures,—and of which there are not now any living rivals except in tropical, or at all events warm countries as compared with those in which the remains are found,—some have supposed that there has been in the northern parts of the world a very great cooling of the earth, or at all events of the climate, (and the one could not be cooled without cooling the other,) since some early period of the earth's history, of which the date cannot be so much as guessed at, farther than that it must have been very long ago, anterior to the formation of all the strata of aqueous deposit which are nearer the surface than those which contain the remains alluded to, but posterior to the formation of the strata which lie under them.

But, though at first sight this is plausible, a very little reflection shows that it is founded upon false reasoning, inasmuch as there is a discrepancy between the two parts of the comparison. There are tree ferns in the strata of the north, certainly, and there are tree ferns in the tropical forests at the present day, which rival even the palms themselves in the majesty of their appearance. It by no means follows, however, from this similarity of size and general structure, that the fossil tree ferns, and other plants resembling the present living ones of the tropical countries, were of the same species, or required the same high temperature for their growth.

In the general system of vegetable action, large

growth in the individual is not the proper result of high temperature, but rather the reverse—at least within certain limits. Heat is, no doubt, necessary to the large growth of most of the species of vegetables with which we are acquainted; but still, heat is not the element of large growth in the individual. That element is humidity; and thus the only certain conclusion that can be drawn from the presence of those remains of tree ferns in the strata of temperate climates in the northern hemisphere is, that the said climates must have been more moist when clothed with these ferns than they are at the present day.

And there is pretty strong evidence of this fact; and also that we may deceive ourselves if we reason from comparisons of what may have existed in former times in some regions of the world, and what actually exists at present in regions very differently situated. The skeletons of reptiles of vast size, which, from their form, must have been inhabitants of the waters, are met with in the strata of various parts of Europe; and they are especially abundant in those of some parts of England. The strata in which they are found, are of that character which shows that they have been formed by gradual deposits at the bottom of the waters, and not by any violent commotion which agitated the surface of the earth generally, and accumulated the bones of the animals of all latitudes in one common grave. They cannot be results of the flood recorded in the book of Genesis, as the old opinion represented them to be; for, according to the sacred historian, men and land animals were indiscriminately drowned by

that flood; and thus the skeletons of men, which are not more perishable than those of beasts, could not fail to be found, at least in some of those collections of the spoils of the general deluge. But not a single human skeleton has been found in the fossil state. Besides, a flood of water would not destroy and accumulate in masses those animals whose proper and natural element is the water; though by what change of the earth these vast and singularly formed animals became extinct, we cannot so much as conjecture. Indeed, the more we examine the solid strata of the earth with the hope of finding in them a record of the changes which it has undergone, the more we are perplexed; for, to the very lowest depth to which the miner can dig, we find in all things the evidences of revolution and change, which, unless in so far as they come within the period of human history, (and that seems but a moment in duration, and is but as a span in extent, in comparison with the whole,) we are in utter ignorance of the times when, and the means by which, these revolutions were brought about.

The case of the northern elephant, of which there appears to have been no living specimen within the historic period, and its comparison with the living elephants now found only in the south-east of Asia, and the central and southern parts of Africa, forbids us to infer a warmer climate in former times from the existence of the tree ferns in the strata of temperate countries. The bones and the teeth of this northern elephant have been found in many caverns; and the teeth so abundantly in Siberia, that a considerable

traffic in them as ivory has been carried on. The Siberians called it "Mammoth," the animal of the earth, as the bones were never found exposed on the surface, but always at some depth under the accumulations of soil. The learned, too, supposing that it had been the same species as the elephant of the opposite extremity of Asia, were led to the same conjecture about the Siberian climate in former times as that which has been brought forward respecting the tree ferns. But when, about the close of the last century, an elephant was found embedded in a mass of ice, completely preserved, excepting in so far as it had been mutilated by mechanical means as the ice was broken, or torn by the ravages of wild beasts and birds of prey after being so far exposed as that these could reach it, opinion respecting the mammouth was completely changed, and changed upon the most satisfactory and conclusive evidence. Its covering, consisting of thick woolly fur immediately upon the skin, through which long and strong bristles proceeded, forming such a covering as alpine and arctic animals are furnished with for enabling them to endure or throw off rain and snow, showed it to be an animal better fitted for enduring the extremes both of humidity and of cold than any which is now to be met with alive in the same latitudes. All elephants too are vegetable feeders; and though they are partial to the most sweet and delicate vegetables when they can obtain them, yet their common food in their native haunts is of a much coarser texture than the natural food of any of the ruminating animals. They are not absolutely aquatic; but they frequent moist and shady

places only, are fond of the water, and, like the whole of the order to which they belong, they are prone to wallow in the mire. At the time when those elephants inhabited the northern parts of Asia and Europe, we must therefore conclude that those parts must have been much more humid, and have produced herbaceous vegetation of a much larger growth and coarser texture than that which they produce now. Their bones have not hitherto been found at any very great depth below the surface, or embedded in any thing but accumulations of rubbish, or in ice; and therefore they form, as it were, a sort of intermediate link between the epoch of the great aquatic reptiles and that of the present state of things,—though how far removed in time they may have been from either, and whether nearer to the one or the other, we have no means of judging. But, against all this mass of evidence, it is impossible for us to come to any such conclusion as that the high latitudes of the northern hemisphere have become colder in the lapse of years. There is also no astronomical argument for any such occurrence. That the poles of the earth's rotation are absolutely stationary with regard to its own surface, we have every reason to believe,—indeed, we cannot even imagine any physical cause in the earth itself or external of it, by which the position of the axis of rotation with regard to the mass of the earth could possibly be changed. There are some causes which alter the position of the axis with regard to the plane of the orbit; but the surface always moves along with the axis, and keeps its relative position. The change in the obliquity of the ecliptic is a reciprocating

quantity; and when it has diminished for a long period of years, (which it is doing at present, though very slowly,) it will again begin to augment; and the limits within which its changes are confined could not make much variation in the absolute quantity of heat in any latitude; though, if it were much greater than it is at present, the seasons would be more contrasted with each other than they are now. The absolute, or average temperature of any latitude would not be changed by any alteration of the obliquity; because, whatever were added in the one half of the year, would be subtracted in the other. Therefore, in whatever light we view the matter, there is not the slightest reason to suppose that any one latitude upon the surface of the earth has become colder on the average now than it was at the moment of its creation, unless we adopt some wild hypothesis which has not a single fact to support it.

Take the opposite hypothesis,—that the earth is getting warmer in consequence of treasuring up in each year a certain quantity, or rather degree of the action of heat, which it receives from the solar influence, and does not again give out by radiation. Even here we cannot be certain of the fact, though we may have our conjectures. There are abundant evidences that the earth is more dry now, in every latitude, than it was in the earlier periods of its history. In Britain, many of the pools and marshes, the effluvia from which used, in former times, to distress the people with ague, are now gone, and their places occupied by fertile meadows or cultivated fields. On a small scale this has been effected by human means—by drainage and other contrivances;

though the results of these are probably only as a drop in the bucket in comparison with what has been done by nature in the ordinary course of change. In the bottoms of many of the hilly parts of the country we find the surface covered with rich meadow grass, below which there is an accumulation of decayed moss, converted into peat or turf, in such quantity that the people cut it for fuel; and in other places we find beds of the same material under corn fields, and even under the beds of sand on the estuaries and by the banks of rivers. Of all species of vegetation, moss is the most retentive of moisture and the worst conductor of heat. On this very account it is one of the means by which nature provides for the safety of some plants during the severity of the Winter; but as it resists the entrance of the action of heat into the earth, as much as the escape of the same action by radiation, we may assume it as a general truth that a moss-clad surface is, under all circumstances, a cold one; and that the diminution of mossy surface is not only a means of warmth, but that when it takes place in the course of nature, it is evidence that there is an increasing heat in that part of the earth to which the action of the sun's rays penetrates. As to heating or cooling from any cause of heat in the earth itself, independently of the action of the sun, we can say nothing with any propriety, as we are in utter ignorance of the state of the interior of the earth, and of all that goes on there. But this, though by no means an irrelevant part of our subject, is only an incidental one,—our main object being the preparation or adaptation of the earth for the Winter.

Now, there is no doubt that, in all countries which have the Winter a cold season, there is an accumulation of the action of solar heat as preparatory for the Winter. The higher the latitude, and consequently the colder the Winter, the greater is this degree of the action of heat which accumulates in the ground toward the close of the summer. The cause of this will be at once understood when it is considered that the increased heat of summer, in the high latitudes, is chiefly owing to the greater length of the day and the corresponding shortness of the night; and that the radiation of heat must bear a much lower proportion to the absorption, when the day is to the night as three or four to one in point of length, than when they have a ratio of equality, or nearly so. It would not be easy to estimate the relative difference, even upon the general principle; and though it were so estimated it would be of very little use, as both the absorption and the radiation at any particular place must be modified by the nature of the surface, and also by that of the soil, as far below the surface as the action of the solar rays penetrates. But as these modifications occasioned by soil and surface have, probably, nearly the same relative effect in all latitudes, the general law must hold upon the average, that in proportion as the latitude increases, there must be a greater accumulation of heat in the earth at the end of the summer, in proportion to the average temperature of the whole year; and, as we shall see afterwards, this accumulation of the action of heat in the earth, is one part of the preparation or adaptation of the earth for the Winter.

There is not only a greater accumulation of heat toward the close of the summer season, in proportion as the latitude increases, but there is also a greater power of retaining it in the earth during the Winter. In lower latitudes, where the snow and frost do not set in until near the winter solstice, or even after it, the earth is greatly cooled by radiation; whereas, when the cold weather sets in, and the snow falls soon after the autumnal equinox, or otherwise early in the season, the surplus heat is retained in the ground, ready to perform its office, when circumstances render the performance of that office necessary.

What has been stated forms the chief preparation of the earth itself for the Winter; and it is both pleasing and instructive to observe how well it works for the benefit of vegetation, of every thing that is committed to the earth or the waters during the Winter, and of all that depends upon these when the season comes round and calls them again into activity. In proportion as the climate is more seasonal, there is more of this surplus action of heat accumulated in the earth during the summer; and as Winter comes the more immediately upon summer the higher the latitude, the accumulated heat is more completely retained there than in places where there is a long and variable autumn.

This accumulated heat, when the frozen surface or the snow comes on early and prevents its escape, not only nourishes the roots of plants, but stimulates them to an early growth; and the roots of all seasonal plants are the parts which act first in the season, and their healthy and vigorous action, as it precedes, so it also

promotes the growth of the stem and all the summer development, and thus is very essential to the general well-being of the plant.

It is matter of common observation that, in places where the autumn is short, the spring is equally so; and that summer follows as closely upon Winter at the one period of the year, as Winter does upon summer at the opposite period. It is not the mere surface action of the sun at the time which renders the progress of vegetation, in the early part of the season, so rapid, and so free from checks and reverses as it is in the high latitudes. The heat in the earth is the principal cause; for though the stems of all the herbaceous plants have died down, the substance of the permanent ones,—of all, indeed, which last throughout the Winter,—is accumulated in the roots; and these roots are kept in such a state of excitement by the confined heat, that the stems are ready to start the instant that the ground is cleared of snow. Even in these high latitudes and elevated situations, where flowering plants are but few, and where the average temperature of the year is low, the benefit of the imprisoned heat is not lost, even before spring has opened the prison doors, and given the exposed portions of the plants to the action of the sun. The lichens, whose hardy nature makes them feel but little the differences of seasons, feel the benefit of this heat, and partially grow under the snow; and that in a much more genial temperature than if they were upon places free of snow in the same climate and locality. The mosses, too, are Winter growers, in less exposed situations than the lichens; and they owe their vigour, in the inclement

season, almost entirely to the retention in the earth of the accumulated action of heat, of which we have been speaking.

But, though there is, as the latitude increases, and the difference between summer and Winter becomes more marked, a tendency to the accumulation and retention in the earth of a greater portion of the summer's heat, yet this does not increase the average temperature of the year, though it renders it more serviceable to vegetation. As the summer becomes warmer in proportion to the Winter, the length of it diminishes; and though, from the retained heat in the ground, the long day, and the short night, the period which vegetables require to come to maturity shortens as the latitude and difference of seasons increase, yet there is a limit, beyond which not a deciduous tree, and no flowering plant, can complete its course so as to bring its fruit to maturity in the course of the year; and therefore at this limit, and beyond it, there can be no such plant. With the exception of some of the dwarf willows, which creep among the moss and lichen, and are secure under the snow of Winter in all situations in which they occur, some of the more stunted and hardy of the coniferæ, which take two years to ripen their seeds, are among the last seeded plants to be met with, before the chief part of the surface is confined to the mosses and the lichens; and there is an ultimate limit of vegetation, beyond which not even one of these last is to be met with, and the earth, when the snow renders any part of it visible, contains not a particle of organic matter, but simply rock, or the dull and barren powder into which that

rock has been divided, by the action of the weather, in alternate freezing and thawing. These last are the regions in which the contrast between the Winter and the summer is the greatest of any; but the summer sun, although constantly above the horizon for many weeks, is so low, and the beams of it fall at so small an angle to the surface, that the greater part of their energy is reflected away into the atmosphere, and produces comparatively little effect upon the earth.

The preparation of the earth for the Winter, as we have now attempted to explain it, really resolves itself into a preparation for the spring, or the spring and the summer blended into one common and brief season, as we find it in the high latitudes. But this is what we might, and, indeed, should expect. All the preparations of nature, whatever they may be, are preparations for the activity of nature; and repose itself, whether it be the mere sleep of the night, or the pause or the hybernation of Winter, forms no exception to the general rule.

The shortening of the time necessary for bringing the annual growth of vegetation to maturity, with the increase of latitude, and of difference between the opposite seasons of the year, may be found in the island of Great Britain. There are many of the long-growthed plants of the south which cannot bring the time of their action within the compass of the short season of the north, and hence they do not find a place there; but in the case of such as can accelerate their maturity, there is a marked shortening as we proceed northward, so that at Cape Rath, the northernest point of Scotland, in any place where a crop of barley can be at all

obtained, there are two or three weeks less between the sowing and the reaping than there are in the south of England; and when we extend our observation to the highest latitude at which the same kind of crop will grow in Norway, the period which it requires in order to come to maturity is still less.

In these adaptations there is something so very beautiful, that they whose admiration escapes it must be dull and callous indeed. The season and the plant work together, and afford the most conclusive proof that they are parts of one system, the workmanship of one Maker, who has endowed them with such delegated powers as that the one works for the other, merely of its own nature, and without the slightest stimulus of any kind from without. At any single place, the adaptation of the parts of nature to each other are such as to excite our admiration; but when we contemplate them in the breadth of their contrasts, they hold us rapt in astonishment that such things should be, and be for us and for our good. Truly, when we look upon that system of nature which is given us for instruction and enjoyment in this world, and reflect that it is given to us as a sure heritage for the whole term of our lives, and secured to us by the very law of our being, if we will but be wise enough to make it our own by knowing it, we can never fail in being more grateful to the Almighty for this, the universal possession of our race, which may and should be enjoyed by all, but can be appreciated by none, than for any or for all of those minor distinctions of merely human origin, which the changes of society, of which we can have no

foreknowledge, may either give or take away, without any merit on our part in the one case, or any demerit in the other.

When we consider this subject aright,—even as men of this world, and without allusion to the volume of inspiration, or the glorious hopes which it opens to the mind that we shall one day, and that not a distant one, be elevated "above this visible diurnal sphere," and know all the workings of systems of worlds far better than we can in the present life know the growth and habits of the most familiar plant,—when we consider it even in this simple and humble point of view, such as might be taken of it by a reflecting man who has no well-grounded hope in the life to come, and who, on that very account, is subject to bondage through fear of death all the days of his life,—we may find grounds of consolation and gratitude—aye, and joyous exultation, that we are what we are, even when the winds of the world's chancings are the most contrary and stormy, and the waters of its adversity are gushing around us in the high-tide swell of their most angry surges. In helpless poverty, in hopeless captivity, in the very extreme of outward privation, if the mind has kept its allegiance to nature and nature's God, sound, full, and without suspicion, all these matters press but lightly; and the beggar on the dunghill may be more rich than the king on the throne, and he who is loaded with fetters may be far more free than the monarch who has a hundred millions of slaves all obedient to his nod.

If we could but bring ourselves to think in this manner

—to prize the heritage which God has given to us upon the certainty of our existence—the very law and constitution of our own nature, and of all the system of nature around us,—above all the trifling heritages which men possess and call their own, the addition which we should thereby make to the serenity and happiness of our lives would be beyond all estimate. Nor would the advantage gained in this way, in the least impede our progress in the acquisition of that property which is essential to our enjoyment of life, and the right discharge of our duties to our brethren of mankind. Care, the care of the world's wealth, is a canker which not only eats into the core of our enjoyment, and withers all our kindly affections, but which blights and stunts the growth of that from which it springs. We cannot, by taking care, in the proper sense of the word, add one farthing to our possessions, any more than we can add one cubit to our stature; for the rack upon which it keeps us narrows all our views, and hinders us from seeing and profiting by circumstances which we could turn to the most profitable account if our minds were at ease, and we could in a calm and dispassionate manner scrutinize the state of things around us.

And what does it all amount to in the end? The practice of getting the mere worldly desires gratified, or rather of following after their gratification, to the exclusion of every thing else, monopolizes the whole man, body and soul; so that when once it is confirmed into a habit, there is pleasure in nothing else, and in that which absorbs all else there is care and pain. The toiling man of business, who drudged and hedged every

day, upon the maxim that "a penny saved is a penny gained," at last retires, full of wealth, and redolent of every comfort which money can purchase. But is he comfortable? See him:—for there are many such in the purlieus of every large city and town—set down in the most trim habitation, and wanting nothing that the wealth of the world can procure. But the beauties of nature, and the luxuries of art, are all lost upon a character of the description to which we are alluding: he totters about for a year or two, and then he is glad to creep into the oblivion of the grave, as a refuge from the dull torment of his own vacant mind.

Some may imagine that this is a case taken from the lowest and most grovelling portion of society; and therefore not adapted to an expression of the majority of the human race. Be it so; and let us take any others—the candidates for fame, for instance, as those who seek distinction on account of what they do, rather than of what they possess;—a worn-out hero tottering on a staff, the man who has been lauded with the wealth of one country for the "most glorious service" of having done his best toward the depopulating of other countries, sinking into sheer inanity, or losing in the cabinet those laurels which he won in the field;—the orator, who in the prime of life carried the public by the ears as easily as a warrener carries rabbits by the same appendages, fallen into the last garrulity of life, to which the sexton will barely listen;—these, and a thousand others which might be mentioned, all tend to show, that if mankind have no mental resource beyond the thought of their wealth or their honours, whatever may be the

extent of the one or the nature of the other, they must inevitably one day become miserable, and the misery to such persons is the sad desolation of utter despair. How much soever they may have shone in their day, and with what loudness soever the tongue of applause may have trumpeted them, a time assuredly comes, when the lustre becomes dim, and the adulation mute —when new idols are produced, a new generation grows up, and, if the kindly grave interpose not in time, they are ejected from the world as antiquated and useless things, before their senses take leave of it for ever, and they are consigned to the clods to moulder there.

To the man whose thoughts have been through life wholly occupied with the affairs of the world, this Winter of life is a season of sad desolation. As long as there is so much of life and health as that hope in this world is not wholly extinct, the new project, or the expectation of the additional gain, may buoy up the fading system; but be the natural health and strength of that system what they may, and the ties by which the soul is bound to the dust of the ground ever so strong, there is a weakening at the last; and when it comes, the unhappy patient feels like Laban: "You have taken away my gods, and what have I left!" Such must be the case with every individual of the human race, whose gods are of such a nature as that they perish or decay with time, or can be taken away by any human means.

Such a man must be prepared for the final repose of the body, the ultimate Winter of life, as well as those whose thoughts have been otherwise occupied; whose

hopes brighten as the external world darkens around them; and who, by the preparation of the spirit for immortality, triumph over the gloom and despair which are inseparable from the margin of the grave, to those who have nothing to support the frailty of the flesh in the day of extremity. Those desolate persons are, to use a homely simile, not unlike a deciduous tree in the last autumn of its existence, after which it is to be green no more, but to stand in the world a blighted and unseemly thing, until it shall be cut down and cast into the fire. The flowers are long over, the fruit is gone, the leaves do not heal off in that kindly manner which they do from a deciduous tree, in which the living principle is to repose during the Winter. They remain till they are torn by the storms and scattered by the winds; there is not a vestige of a bud upon any of the twigs, nor a trace upon the roots of that peculiar cicatrix from which a new rootlet is to spring. All the part of the tree above ground is completely given up to the decomposing influence of the atmosphere, and all the part below to the same influence of the damp earth; while the contest between these opposite powers, at the water line, or mere surface of the earth, very speedily cuts the bole of the tree asunder there, and lays it along the earth to rot. It is much the same with the man whose whole soul is absorbed by the wealth of the world, and the captivations of worldly ambition. In the Winter of life, those airy hopes of the vanities of earth which were so tempting in the spring of life, and so all-engrossing in its summer, are converted into cankers as it draws to a close; and those possessions which were

so endearing as long as fabrics of greatness could be reared upon them by the intoxicated fancy, become chilly and eroding to the feelings; and to those who have made the world their only heritage, the anguish of the death-bed is always in proportion to the glory which is then gone, and the wealth which is then no longer of any avail.

This palling of the joys of the world upon the sense, as life draws to a close, is the signal that the body is in a state of preparation for its Winter; and there is a lesson of admonition in it; that, when the Winter of the body comes, the whole man is not in a condition of desolation. The blunting of the senses, and the inadequacy of the possessions and pleasures of the world to furnish that enjoyment which they do in early life; when the individual still has the course of life to steer, and the duties of life to perform, are hints, as plain and as expressive as can be given, that at this advanced age there is an occupation for the mind, which is its own, and has no reference to worldly gains or worldly honours; and the lessening of the zest for the enjoyments of the world, is evidence that the intuition of nature is, that man should, as the course of this life draws near to its close, turn his thoughts to another. Then, again, there is an appropriate similitude in the deciduous tree, which casts its leaves preparatory to the Winter, but which preserves the buds, the energy of the surface of living action between the wood and the bark, and all the other parts and principles which shall fit it for obeying the stimuli of the spring, when these shall come upon it in the requisite degree of strength:

The principle of vegetable life is not extinct, or lessened, in the tree which is to bud and be green again, while it stands with its bare twigs in the Winter, any more than when it is in the full breadth of its leaves, and the full beauty of its blossoms; it is only concentrated; and the concentration is a means of safety, for it is matter of general observation, that the power of endurance in every kind of life is inversely as the extent of substance through which it is diffused.

Many other grounds of the most valuable instruction might be pointed out, as illustrative of the close analogy which there is between the Winter of the year and that of life; and how, as material nature prepares the natural substance for both, it becomes man to take good heed to the mental preparations. As these last do not come in the course of material nature, or depend upon physical causes, they must be made and kept in readiness for the time at which they are required; and the Winter of each year as it comes round inculcates this, in a manner which should be more impressive than if it were declared in words, however appropriate, or however eloquent. In all seasonal countries—and the more strikingly, the more seasonal that they are—there is a very decided falling off in the gratifications of the senses by natural objects, as compared with what occurs in the summer; but in proportion as the earth becomes less attractive, and is withdrawn from the contemplation for a larger portion of the twenty-four hours, the heavens are more clearly displayed; and their unaltered lustre contrasts strongly and strikingly with the faded condition of the earth; and, in places where the customs of society do not

wholly seduce the minds of men from contemplation and reflection, the nocturnal sky of the Winter forms a most delightful subject for study.

It must not be imagined that the delight arising from the contemplation of the heavens on a clear Winter's night belongs only to the professional astronomer; for truly he may be the one which is least impressed by it. Persons whose *trade*, or profession, is closely connected with the striking in nature, are very rarely they upon whom nature makes the most lively impressions. The fisherman feels not the grandeur of those cliffs under the shelter of which his hut is placed, or the sublimity of that sea upon the produce of which he and his family depend for their daily bread; the shepherd cares not for the graceful swelling of the hills, or the picturesque character of the rocks; and the farmer sees no beauty in the undulations of the golden grain to the breeze, farther than the hope which he has that it will fill his garner with abundance. The case is still the same with those whose pursuits approach nearer to being of an intellectual character, provided that the object of them is a trade; and the converse also holds, for an artist who has a very intense feeling on his art, an author who is similarly affected toward his subject, or any other individual in any of the professions which are generally supposed to have most of mind in them, almost invariably fails of success as a tradement, and is to a certainty eclipsed by those who have not a tithe of his endowments.

One feels a disposition to lament this; and yet it is probably well that it is so—at all events it is in accordance with a general law of nature; and whatever is thus

in accordance cannot be wrong, whatever may be our feelings with regard to it, or our wish that it should be changed. The trade or the profession, whether the reward in the hope of which it is carried on be money or fame, or any of the other means of distinction for which mankind toil, has no reference to any thing but this world, and is not even a happiness to the individual who devotes himself to the pursuit of it.

There is something remarkable in this separation of the trade, or the other pursuit, as a matter of profit, from the love and pleasure of the study of that very subject whence, in the case of a trade, the profit arises; and it points most directly to that separation from the cares, gains, and ambitions of the world, which, as we have hinted, is essential to the right preparation of the intellectual part of man for the Winter of its separation from the body. This cannot be illustrated by the example of a more appropriate case than that of the heavens as they appear on a bright and cloudless Winter night. All that then appears to the eye of a common observer, mighty and majestic as it is in seeming, and more so in reality, is disregarded by the professional astronomer for the sake of something else which is dimly seen, or wholly unheeded by common eyes. Some star seems periodically to wax and wane; there is some nebula, or little luminous cloud, in some part of the heavens, which no artificial aid to the sight can separate into stars, as it does the countless host which compose the broad and curious girdle of the milky way; or there is a cavernous darkness of indescribable depth breaking in upon the light, as is observed in the curious star in

the dagger of Orion—if star it be—which resembles not any other portion of the visible heavens, but is like a dark pit of unfathomable depth, with a margin of snow illuminated by the beams of the sun.

These, and subjects like these, in so far as that they lie out of the ken of ordinary mortals, are the ones about which the professional students of the heavens vex themselves, and very often vex themselves in vain. By the great body of mankind these minor marvels of the astronomer are apt to be overlooked; but it must not be thence inferred that there is in the observation of the heavens no interest for such as are ignorant of, or cannot enter into, these more nice and recondite parts of the wonderful structure which the withdrawal of the beams of the sun reveals to us in the sky of a Winter's night. "The heavens declare the glory of God, and the firmament showeth his handy work," as much to the unlearned as to the learned, though the manner and the object of the two are different.

Upon the countless radiant bodies by which the depth of surrounding space is lighted up, the revolution of our year, and the changes which take place in the lapse of years upon our earth and its productions and inhabitants, have not the smallest effect. Our globe may belong to the system, and must belong to the creation of which they are the grand constituents; but it is so insignificant a portion, that, though it were in one moment to be annihilated, and the whole of its history blotted out from the book of remembrance, the absence of it could be no more missed from the system, than a single grain of sand would be missed from

the great African desert, or one drop of water from the ocean.

The contemplation of this does not bring infinitude to our understandings, because no finite being can form an adequate idea of infinitude. But it gives us the idea of what is intermediate between this and the finite things with which we are conversant in the ordinary affairs of the world. It takes away the limits, as it were, breaks down the fence, within which we are pent up in our common experiences of the things of this life—and opens to us space and duration, to neither of which we can even fancy any limit. When we contemplate the stupendous frame of nature around us, reduced to the semblance of one vast hollow sphere, by the mere incompetency of our eyes to discriminate the different shining specks which mark it on the blue concave, we are lost in utter astonishment, even if we have not the assistance of a single astronomical law for our guidance. It is in vain that we endeavour to bring the largest measures of which we have any knowledge to bear upon this wonderful structure, and give us even a guess at its dimensions: for if we take a boundary, be it ever so remote, and exhausting all the millions, billions, trillions, and so forth, which we name in our arithmetic, but do not and cannot comprehend, we have not, in reality, approached one hair-breadth nearer to the limit of creation. Let us, just for the sake of convincing ourselves of the wonder which every moment in the open air brings to our contemplation, and of which the Winter night gives us the most splendid revelation that we can obtain, while we contemplate it with the eye of the body,—

let us, for this purpose, imagine to ourselves that the optical concave which we know to arise merely from the limited nature of our sight, is a palpable reality—that there is, in truth, a solid firmament of a blue colour, spangled over with stars, in the centre of which the earth that we inhabit is placed. We may suppose it at any distance; and, as great and small are mere differences, not essential parts of the consideration, we may suppose it so remote that the beams of the sun, fleet as is their progress, could not reach it in a thousand ages; and further, we may suppose that the thickness of this firmament is equal to its distance from us, or to any number of times that distance;—nay, we may imagine that distance after distance and firmament after firmament are repeated without end, or till we have strained our fancy to the very last, and the mind begins to be lost in the magnitude of its own conception; we may do this, and we may repeat it and repeat it till the longest life draws to its close in the enumeration,—but are we nearer to the verge and boundary of the creation at the end than we were at the beginning? After we have wearied and wasted all the powers of our minds, are we one single iota nearer the boundary of created space than we were at the point from which we began our imaginary estimate? We are not: it goes on and on,—so that, begin where we may, the termination is at the same distance from us. And this is the creation by our God, considered in the one and simple attribute of the space which it occupies—to us immeasurable and incomprehensible. Yet, of his merciful goodness to us, we are given to feel, though not to understand, or to express

this immensity; and we have reason to believe that, among all the living creatures which people our planet, we alone have this feeling of the works of the Creator. Are we to have this feeling for the mere threescore-and-ten years of our sojourn upon earth, and then go into final nothingness, and know this wonderful creation and its still more wonderful Author, no more? It cannot be; for setting all revelation, and every consideration of a religious nature aside, it would be at variance with every law of nature, as we find those laws manifested in all the parts of the system which come most truly and completely under the range of our plain and every-day observation. Throughout the whole of it, we find not an idle piece of matter, or an unoccupied principle of action. We in no instance find a plant or an animal endowed with a power or faculty for which it has no use, and which it does not use up to the full extent of what is given to it; and it would be passing strange that there should be one anomaly in the system, and that that anomaly should be man, for whose instruction and use so much of the rest is obviously made. The information which he is capable of receiving from the measurable parts of the universe, and the feelings which he has of those parts which are not measurable, especially the latter, are of comparatively little use to him in the ordinary business of the present life; and yet they are more striking—more calculated for making an impression upon the mind, if that mind is in any degree expanded, than those subjects which are essential to his physical welfare; therefore, upon the simple physical consideration of the matter,

and without the slightest allusion to any thing of a religious character, we must either admit that man is destined for something greater, more extensive, and more durable, than the other animated tenants of our globe, or that in him the perfection of design and execution, which are so apparent in the rest of nature, are completely violated and departed from.

This view of the matter is quite as perplexing to the infidel and the atheist as it is to the believer in the word of Divine Revelation; for granting that the whole is the production of chance, and that there is a regular succession of fortuitous causes, if regularity can be predicated of such causes, from the slime-begotten worm, through all the gradations of insect, reptile, and so forth, up to man, why should Chance, the goddess of those who know not God, bungle in the higher part of her work, after being so perfect in all the inferior ones? No reason can be assigned for this; and, therefore, the conclusion to which the unbeliever is inevitably driven, is, that the power to which he assigns the origin and conduct of the creation, is wholly inadequate to the task, and fails at the very point at which its efficiency should be most conspicuously displayed.

Such are some of the most obvious conclusions to which the consideration of the displays of Winter are calculated to lead the mind which has no prejudice to warp it; and though we have alluded to creation in its extent only, the allusion might be made with equal force and conviction to it in the succession of time. In this we have, of our own unassisted perception, not the slightest idea either of a beginning or of an end.

We can imagine that a world, or a system of worlds, may come to an end; that our globe, or that the sun of our system, and all the planets and satellites by which it is attended, may pass away in their present forms, just as a plant or an animal ceases to be in its specific form, and passes through the medium of the dust, to the common mass of created matter; but of the non-existence of the whole universe, or even of the final destruction of any one single particle of the matter of which it is composed, it is utterly impossible for us to form the slightest notion. We cannot imagine a *natural* beginning or end to any thing existent; that is, a beginning or an end produced by physical or secondary causes; because that would be erecting matter into a power superior to itself, the notion of which involves a direct contradiction and palpable absurdity, and therefore cannot be entertained by any one having the slightest claim to the character of a rational being.

But though we are unable to form a definite judgment of this beginning or ending of nature as an entire system, we can trace a feeling of its continuance, time without end, in some state or other; though of that state we can form no adequate conception that can be expressed in words. There are no objects of the senses which can assist us in the expression of this interminable duration, any more than there are to aid us in expressing what we feel with regard to the unbounded extent of creation; and, therefore, neither the one nor the other comes within the range of what may be called our sensal perception and experience, or forms any part of the subject of our intercourse with

our fellow-men, or otherwise with the business of life. Thus it belongs properly to those states of the mind which are temporary withdrawals from the present life and all its cares and concerns, and which are very essential for preparing us to meet that final withdrawal from them, which must once be made, so that we may meet it with the proper degree of resignation and hope, which alone can make the close of life one of the most joyous of its scenes.

Winter is the season of the year during which those contemplations which withdraw the mind from the present life, arise the most naturally, and can be pursued with the least interruption; and, to us, it seems given for the express purpose. When seasonal nature is in a state of activity, its attractions for the senses constrain us to pause before we can reach those lofty considerations. And, no doubt, it is well for our enjoyment, upon the whole, that the changes of the revolving year are calculated to produce, in their succession, such differences upon the mind, because they prevent that fatigue and listlessness which are ever the result of too long and close indulgence in any one train of thought. Thus, though the mind is not, and cannot be, in its own nature, influenced by any of the changes which the year brings about in the material creation, as physical causes can produce no direct effects upon it, yet the trains of our thoughts are differently directed in different seasons; and though external nature does not prepare the mind for the season, yet there is a preparation of the mind itself, which answers the same purpose, and should be carefully attended to.

As, from its very nature, the mind needs no pause or refreshment during the sleep of the night, so neither does it require any annual pause during the Winter. But in deep sleep of the body, the mental actions, or trains of thought, do not return in what we call memory, though they do, more or less, in those disturbed states of slumber in which the trains of thought which pass through the mind are called dreams; and to those same dreams, our waking thoughts often have a much more close resemblance than we should be apt to suppose. We speak not of what is called "absence of mind," but which should properly be called "abstraction;" as the mind is not absent, it is only so completely occupied by the train of thought in which it is engaged, that the communication between it and the senses of the body is for the time suspended. These mental absences are, in some cases, carried to such an extent, that they bear a very close resemblance to the mental trains of thought during profound sleep of the body, of which not one iota is remembered, or can possibly be recalled, so as to be available for any one purpose, either of future thought or of action; and thus, if the expression may be allowed, the mind may be absolutely lost to all usefulness in the depth of its own abstraction, by being rapt away from all connexion with external things, just as is the case when the senses are locked in the oblivion of unbroken sleep. Persons in whom this depth of abstraction becomes a habit, are generally awkward in the ordinary affairs and conduct of life, though they are, without exception, capable of the most clear and profound thinking. There was a re-

markable instance of this philosophic abstraction when carried to "absence," in the case of the late Dr. Robert Hamilton, professor of mathematics in Mareschal College, Aberdeen. The anecdotes which are told of his "absence," are very numerous, and to men who never have their bodily senses overcome by intensity of thought, some of them were of the most ludicrous description, though they were, one and all, highly characteristic of that goodness of heart, and love for the best interests of his fellow-men, by which the whole life of this most excellent man and profound philosopher was characterized. We shall not repeat any of these anecdotes, but content ourselves with saying, that not a few of them were as ludicrously absurd as mental absence could by possibility render them. But the works which Dr. Hamilton published are almost unrivalled for the closeness of their reasoning, and the beautiful clearness and simplicity of their style. If we except "Euler's Elements of Algebra,"—and that is confined to a single subject,—there is probably not, in any language, a school-book at once so plain and so profound as "Hamilton's Introduction to Merchandise." This great man, too, who, upon his walks, could not keep himself out of mires and ditches, or escape without the assistance of others, when he got into them, was the first who exposed the fallacy of the sinking-fund,—the palpable absurdity of paying off debt by money borrowed at interest, when the debtor and borrower do not engage in any manufacture or trade, out of the profits of which they can pay the annual charge upon what they are owing. The analytical sophisms of Dr. Price, whose understanding,

though a clear one in many matters, appears on this particular one to have been entangled in the mere meshes of calculation,—these sophisms, together with the eloquence, and, still more, the political influence of Pitt, found the sinking-fund many advocates; and though there were a few upon the opposition benches of both Houses who doubted, or, at all events, did not go the whole length, yet there was a pretty general floating belief among all parties, that this same sinking-fund worked marvellously, though mysteriously, for the financial good of the nation. But the "absent" philosopher of Aberdeen cleft asunder the nucleus of this arithmetical juggle, with the same ease and certainty as the lightning shivers a rock; and when his little work on "The National Debt" first found its way to the metropolis, the Commons, and even the more solid wisdom of the upper House of Parliament, were astonished, nay, confounded; and although there have been plausible speeches made upon the subject since, as a matter of expediency—such as that by the late Marquis of Londonderry in 1822, when he implored the Commons House not "to lay their suicidal hand upon themselves, by making the sinking-fund *stand* prostrate at the feet of circumstances;" yet no man has ventured to defend it upon principle, or to describe it as much better than a mere "tub to the whale." But with this same Dr. Hamilton, who was so clear and so powerful in written argument, there was a sad falling off when he had to blend argument with external action, or display of any kind; for, though one of the clearest and most successful of teachers in his writings,

his labours in the class-room were all but a perfect failure; and other professors, "by rote," who were to the full as shallow as Dr. Hamilton was profound, were far more successful in the craft and mystery of grinding pedagogues and pill-men than he.

We have mentioned this case, and mentioned it at some length, thereby showing that, in order that the usefulness of man in his day and generation may be a maximum, there is a medium to be observed in matters of thought, especially in those profounder ones which lead us far away from the practical paths of life. And the school of nature, as its progressive lessons present themselves in the course of the year, is finely illustrative of this. Of the seasons, there are three—the spring, the summer, and the autumn—which draw the mind toward the details, by alluring it with the fascinations of the present world; while there is only the Winter left as the appropriate season of abstraction; and thus we have three-fourths of the year more adapted for direct observation and the gratification of the senses, and one-fourth more appropriate for mental exercises. Nature, as it exists, and business, as it is carried on, are not to be neglected in the Winter any more than at other times of the year; and, indeed, for all labours within-doors, more especially for those which require a considerable degree of thought in order to perform them rightly, Winter is preferable to any other of the seasons; and where leisure and other circumstances admit, Winter is also the proper time for enjoying the society of our friends: for though the pleasure, including that of the senses, may be greater in the summer; the

communications of society are more of a home character, and should also be of a more intellectual kind, than they are at any other season of the year; and though many spend their Winter leisure in sociality, and not a few in dissipation, yet nature and reason tell us that the Winter was made for other and nobler purposes. The right improvement of the successive Winters of our years prepares us for the ultimate Winter of life; and if we do not make the preparation, the severity with which that Winter will come upon us will cause itself to be felt.

In as far as the body is concerned, the preparation of man for Winter resembles that of the other animals, only it is slighter in degree, as man has more resource than they; and we find that the provisions of nature for the safety of animals are always less, in proportion as the resources of those animals are greater. In those who are exposed to the weather there is, however, a general increase of the power of endurance in all Winter animals, and in man among the rest, during the Winter months. The preparations of animated nature can, however, be more advantageously treated in another chapter, after we have briefly adverted to those of the vegetable races.

## CHAPTER V.

### PREPARATION OF THE VEGETABLE KINGDOM FOR WINTER.

We have already endeavoured to explain, that when we speak of the preparation of any one portion of the material creation for Winter, or any other season, or for any event to which, in the ordinary course of nature, it may be subject, we are not to understand that this is the work of an external preparer, to the operation of which the production of nature is passive, upon principles similar to those which render materials passive under the hands of a human workman. The natural production is always a cooperator in every change which it displays, whether we call it preparation or any thing else; and in the majority of cases it is the principal operator, or the one which has most influence in determining the character of the result. If it were not for this, all the species of natural productions which are near to each other in locality, and similarly exposed to the sun, the atmosphere, and other natural stimuli, would become like each other, not only in the times of their activity, but in all the particulars of their characters.

If, for instance, the vegetable kingdom were passive to the operation of the sun and the season, in the same way as iron is passive in the hands of the blacksmith, then there would be no natural distinction of spring plants, summer plants, autumn plants, and winter plants; neither would there be any of herb and shrub, of annual and perennial; but the whole would be reduced to one dull uniformity; and the face of nature, which is now so pleasing in its diversity, would be so unbearable on account of its monotony, that no one could endure the *ennui* of drawling out even one year upon it.

It may be argued in opposition to this, that the blacksmith can, out of the same bar of iron, manufacture a very great variety of articles, such as a ploughshare, a reaping-hook, a horseshoe, a nail, a knife, and so on; and we readily admit that he may and dare not refuse to do so; but the maker has a separate forethought purpose in the making of each of those, and he follows up that purpose by a different mode of execution for each of them. But the sun, or the other general agency in the season, which acts upon the vegetable tribes, has no forethought purpose, and no difference in its mode of action. The sun, which withers the grass on the dry common and stimulates that of the carefully irrigated meadow to a more active growth, exerts the very same influence upon both, only they obey that influence differently; just as the labours of the blacksmith would be very different if he went about to make one nail out of a piece of iron, and another out of a brickbat. The different substances upon which it

acts obey its action, or, more correctly speaking, act along with it in very different ways; and the result is the production of all that beautiful variety which we see in nature. The sun, and those general influences of the atmosphere and the earth which the sun calls into activity, are the external causes of every change in the appearance of nature as the seasons perform their revolutions; but the obeying agencies which are in the plants themselves, and which, though they may be very greatly modified both by nature and by art, can never be so far changed as that one species can be turned into another,—are the immediate and specific causes of all the individual productions and appearances; and whether in the grand stimulus of the beams of the sun, in the modifications of that influence by the daily rotation and annual revolution of the earth, or in the minor obediences of the individual things upon the earth, we find that adaptation and cooperation to the performance of every single purpose in nature, which shows that, notwithstanding the vast distance of the celestial and the terrestrial portion, and the endless variety of principles which are called into action in the latter, there is a most perfect nicety pervading the whole.

In consequence of the very great diversity of habit among the vegetable tribes, the preparation of the vegetable kingdom for the Winter, or for any other season, becomes a very vague matter, and no single description can be so framed as to be expressive of any other than some small portion of it. Some plants are prepared for a total renewal of the generation, which

shall take place in the spring of the ensuing year; though in others, which are strictly annual as well as these, the germination of the seeds is autumnal, and the preparation for the Winter is in the young plant. Some again, without passing into seed in the whole plant, seed in part, and produce new plants at the roots, which come into flowering much sooner than those of the same species which are produced from the seed; and there are not a few annuals, which make the Winter the middle of their year, producing nothing but roots and leaves in the part of it which precedes the Winter,—but treasuring up the result of that part of their labour in a bulb or tuber of some kind, which is exhausted by the process of flowering and fruiting in the next year; and the seeds, which are the result of this operation, are ready, against the time that the season comes round, to run the same course; and so on, year after year,—always only annuals, but having one part of the annual growth before the Winter, and the other after.

Plants which have this habit of a pause in the Winter between what may be called an autumnal growth and a spring one, or which are susceptible of being so treated as to acquire it, are very convenient for the cultivator, and very obedient to his art. A very large proportion of them are plants of wholesome and nutritious substance, and form an important part of the food of man and of those animals which he domesticates.

Of these the cabbage tribe, called *Brassicaceæ* (cabbage-like), and also *Cruciferæ* (cross-bearing, from the four petals of the flowers being arranged in the form

of a cross), are among the best known of the plants which have this habit. They are very numerous, and many of them are so well known that they do not need any particular enumeration. We may mention, however, that of the common cabbage, *Brassica oleracea;* there are six distinct varieties or sub-species, none of which appears to pass into any of the others by the ordinary modes of culture, though, when they are treated in different ways, they may be each broken into sub-varieties almost without end. All these are probably originally the produce of the common wild sea cole-wort, *B. sylvestris,* (which is not the sea kale which grows in the sand, and which is so much esteemed in Britain as a culinary vegetable, when forced by artificial heat and blanched),—and they would probably all degenerate back to it if left in the state of nature for a sufficient number of years. Of the wild stock there is only one known species, of which there are no varieties: it is found upon the low grounds near the sea in the middle latitudes, in places where there is a considerable difference of seasons; and we may remark, that, in general, though there are exceptions, the plants of countries with variable seasons are more plastic in the hands of the cultivator than those of countries where the seasons are less marked, or follow each other with less of variable weather between.

The five tribes of the cultivated ones, all of which form their accumulations of nutritious matter in different manners, or upon different parts of the plants, are the following: 1. Kale, *Acephala;* 2. Savoys, *Bullata;* 3. Cabbages, *Capitata;* 4. Turnip-cabbages, *Caulorapa,*

called "Kohls," by the Germans; and 5. Flower-coles, *Botrytis*, called also cauliflowers and broccoli. These five tribes are hardy, or capable of enduring the Winter, very nearly in the order in which they have been stated, though there are very different degrees of hardihood in the different varieties or sub-varieties of all the tribes.

There is one general habit which belongs to the whole of these plants, numerous and varied as they are; and that is, that the accumulation of nutritive matter which they form is always deposited above the collet, or that part of the plant which is, in ordinary language, called the crown of the root, and is the division, or rather the union, between the root properly so called and the stem. This accumulated matter is a sort of *pith*, and in whatever part of the plant it is collected it has in itself very little of an organic structure, and bears the same relation to the vegetable that fat does to the animal. In most, if not all of them, the collet is not confined to the mere upper part of the root, but rises on the stem so as to produce lateral buds in the axillæ of the leaves, if the principal head is lopped off, or very much reduced in its dimensions.

The Kale are called *Acephala*, or headless, because the chief accumulation which they form is in the leaves, and in the centre of the stem within the fibrous part; and they never close and form a compact head. They are the most hardy of the whole, and the ones which, by way of eminence, are called "greens," though, in their young state, any of the others may be used for the same purpose. If the crowns of their roots, at the lower

part, are protected from the severity of the frost, the members of this tribe can endure very severe weather; and when the principal heads are cut at the proper time—which is matter of experience for the particular place—a succession of "sprouts" may be obtained from the lateral heads for a considerable length of time. There are eighteen or twenty named varieties of them, and the local ones are absolutely innumerable.

The Savoys,—so called, as is understood, from the country which supplied them to the rest of Europe, and named *Bulbata*, because the dimples or honey-combings, with which the one side of the leaf is covered over, appear like knobs or studs, little balls, upon the other,—form their accumulation chiefly in the leaves, like the kale, but they have more tendency to accumulate into a close mass in the centre, and form a head, or rather perhaps a heart. They are hardy plants, though not quite so much so as the members of the preceding group. There is no wild plant known which has the peculiar characters of the savoys, or of any of the three groups which remain to be noticed. There are not so many varieties of them as there are of the kale; but still there are about a dozen of named ones beside those that are merely local. Both they and the former are in the best condition during the Winter months.

The Cabbages, termed *Capitata*, because they form into heads or hearts by the close accumulation of the leaves into one mass, have many of the habits of the two preceding groups; only they have the leaves much plainer, and the accumulation in the part of the stem

which is included among the thick leaves. The leaves are blanched in consequence of their closeness, and hence they are more succulent than those of the open ones. Some of them grow to a very large size; but they are coarse, and fit only for the food of domestic animals. They come to maturity at all seasons; but the ones which are in most estimation for the table, are in best condition during the summer. The named varieties of them are about the same in number as those of the savoys.

The Turnip-cabbages (of which *Caulorapa* is merely the Latin translation) have a very different habit from any of the three groups that have been mentioned. Their leaves remain wide apart from each other, have peduncles or footstalks of considerable length, accumulate very little nutritious matter into their own substance, and never collect, or "gather" as it is called, into a head. The accumulation is formed in the stem, and consists of the pith of that part of the plant. It is always above the collet, though some of the varieties form it wholly or partly under ground, and others altogether on the surface; in which latter case, the upper part of the bulb is marked over with the bases of leaves. The varieties of these are comparatively few, not exceeding three or four; and in Britain they are not much esteemed in an economical point of view. They are, however, held in much more estimation in Germany, where all the cabbage tribe enter much more largely into the food of the people than they do in Britain.

The Flower-coles—cauliflowers and broccoli, named

*Botrytis*, because the part of them which is most esteemed for the table, consists of a cluster of small button-shaped buds, having some slight resemblance to a bunch of grapes,—are, so to express it, the nobles of the family. They require the most careful management, and are the most tender in their nature; but they far surpass even the best of the others as articles of food. Their habit in the accumulation of nutritious matter is also very different. They partially, though very partially, form it in the mid-ribs of the leaves toward the basal parts, but the most delicate is in the young flower-buds and the branching stems which carry these. They must be used in the early stage of their flowering, long before any thing like the distinct parts of the individual flowers are in the least developed, otherwise they lose all the delicacy of their flavour. As they are held in much estimation, they are cultivated with assiduity, and a considerable number of varieties have rewarded the skill of the cultivator. These, as usually named, are about as many as those of the cabbage, and they can be brought forward at all seasons; so that, with proper management, there is only a very small part of the year during which one or another of them may not be supplied.

Though the various members of this family of plants, of which we have given a mere outline, are all artificial ones, in those parts of their characters which give them their principal value to man, yet they, perhaps, as well as any others, serve to illustrate the mode in which a provision is made by a plant for the occurrence of a pause in its growth between the production of a root, a

stem, and leaves, and the ultimate and most important of its labours—the production of flowers and seeds. The times of accumulation in these cultivated plants are distributed over the whole or the greater part of the year; and, therefore, they cannot strictly be called preparations of the plants for the Winter. But still, though the resulting effect on the appearance of the plant is changed by the skill of the cultivator, in time, in manner, and in extent, yet the essential habit of the plant can no more be changed for a new one by any labour of man, than one species of plant can be changed to another by the same means; and thus all the varieties to which we have alluded are only modifications of the one habit which the wild plant has when cultivation has not affected it in one way or another. Even when in the natural state, there are differences of habit in them; and these differences sometimes break out when they are cultivated, although we are not, in all cases, able to explain the causes. At some times, and in some situations, the wild plant puts forth its flowering stem and runs to seed, without any marked accumulation of matter in stem or leaf; and the same happens, though less frequently, with the cultivated ones. At other times there is an accumulation in the wild plant, though never to the same extent as in the cultivated one; and when there is an accumulation, there is also a pause, for which that accumulation is preparatory. Of the bulbing, or turnip-rooted cabbages, we may remark, in passing, that the species called the Swedish turnip, and very extensively cultivated in many parts of Britain as food for cattle, is an exceed-

ingly hardy one, very little injured by the severity of Winter, and, therefore, well adapted for the agriculture of the colder districts. It is far more hardy than the common turnip—not nearly so liable to the attacks of insects in the young state, or to be destroyed by the frost in severe Winters. This shows the greater security of a bulb formed above the collet in the stem, and one formed below it in the root; and there is a further difference between the members of the cruciferæ, which form their bulbs on opposite sides of this division of stem and root; those which have the bulb superior, or in the stem, retain their leaves more completely during the pause than those which have it inferior, or in the root; and the leaves which thus remain, as well as the bulb itself, may help to protect the collet from the frosts of Winter. The collet appears to be the most tender part of the stem of every plant, whether herbaceous or ligneous, and therefore attention should be paid to the protection of it by every one who is interested in the health and vigorous growth of all plants which are intended to live through the severity of the Winter, whether they come under the denomination of herbs, of shrubs, or of trees. At the same time, if the collet is a definite one, that is, if it is confined to a limited space, and the part of the plant from which the principal growth proceeds, it is of advantage that it should be freely exposed to the sun and the air during the season of growth.

Of the cruciferous plants which form their bulbs, or accumulations of nutritious matter under the collet, and thus have the bulb properly a root and not a stem,

there are very many, some of which are cultivated for their bulbs, others for their leaves, and others, again, for their seeds; but the most typical one, and the only one which it is necessary to mention for the purpose of illustrating the habit, is the turnip. As is the case with the cabbages, and, indeed, with all the bulbing cruciferæ, the accumulation in the turnip is in the central pulp, or pith, within both the integuments and the fibrous portion of that part in which it forms,—though when turnips are grown in situations which are too hot for them, and soils which are too rank or retentive, they are apt to have fibrous matter dispersed through the bulbs, or to be "stringy," as it is called in common language. The bulb of the turnip, if it survives the Winter, and the plant is allowed to run its regular course, answers very nearly the same purpose as the accumulation of matter in the cabbage tribe, in whatever part of these it is found. It serves to nourish the flowering stem, and, by the growth of that, it is exhausted, so that no part of it remains after the seeds begin to ripen, but the shrivelled skin and the fibres.

It would far exceed our limits to detail all the various means by which the herbaceous plants which have a pause in their annual growth, and thus lay up a store, in some way or other, for the Winter, accomplish their purpose; though they all have some resemblance to those which we have noticed, if not in the manner, yet in the principle of their preparation. Even the seasonal trees which are deciduous, or shed their leaves in the autumn, follow nearly the same general law;

only as their annual growth is from a number of points, greater in proportion as the plant is of larger size, and more of a branching habit, there is a separate preparation at each of them, in the form of a bud. Thus buds are always formed previous to, and preparatory for, the Winter, the formation of them being the last action of the tree for the year, and the one which, in the vegetable kingdom, more immediately links the autumn and the Winter together, and also connects with each other the growth of the two consecutive years.

In most trees, the growth and action of the roots are understood to be the portions of the annual action which first give place to seasonal repose; but in herbaceous plants, whose habit is to form regular bulbs, the case is different,—the bulb continuing to swell and consolidate, by drawing nourishment from the root fibres, not only after the leaves above ground have ceased to have any action, but after they are withered and gone. This is more remarkably the case in those plants which form superior bulbs, or bud-bulbs, on the upper side of the collet, as in the onion, the tulip, and the crocus, than in those which have bulbous roots below the collet, as in the turnip, the carrot, and the dahlia. The superior bulb, whatever may be its form, is always of the nature of a bud, of some kind or other; and the chief difference between it and the bud of a tree is, that the bulb combines in its own structure all the three parts of stem, branch, and bud, and nothing originates from it in the season of growth, but leaves and flowering stalks, the rudiments of which, and very often the less developed rudiments of several

successional ones, being contained within the bud or bulb.

From this we can see why bulbs of this description are so much better adapted for dry and warm places, which have their only Winter an arid or tropical one, or have a considerable portion of their summer, according to the calendar, resembling a Winter of this kind. The superior bulb, partaking of the nature of a stem, or, indeed, of the whole upper part of a plant above the collet and roots, continues to receive nourishment, and, therefore, to grow long after the drought has put an end to all surface vegetation. This is the case, in an especial manner, when the whole bulb is lodged in the ground; only, in order that such a bulb may have scope to grow, the ground must not be of too binding a nature—must not consolidate like a brick in the drought; because, against this, when the sun has acted strongly upon it, the power of no vegetable can exert itself so as to produce much increase of volume. But soils—they are chiefly clay soils—which are of this binding nature, absorb moisture during the rains to a much greater extent, and are more intimately incorporated with them than soils which are free; and they hold that moisture with far more pertinacity during the drought. This, by the way, is the reason why they are popularly called retentive soils. Examples of them, as contrasted with soils of a more light and free character, may be found in any country, and in none, perhaps, more strikingly than in the valley of the Thames and its affluents. In some places the soil there is, to a great depth, a very tenacious clay, in others it is gravel

or sand, and in others, again, it is chalk, up to very near the surface. The roads over these are the places where the different states, at some depth, in the dry season, are most easily seen; and the contrasts which they present are abundantly striking. The roads over all these soils are equally dry on the surface; and if the materials used for "pitching," or "metalling" the carriage-way are the same in them all, the chance is that the surface-dust on the road over the clay shall be the most light, loose, and troublesome. When, however, they are broken up, the states of the under parts are found to be very different. The sand, to any depth that may be examined, is comparatively dry, and the gravel and chalk are nearly the same, only with differences arising from the various admixture of clay in the gravel, and the number of perpendicular fissures in the chalk; but the clay is very different; and while the surface is quite dry, the interior, at the depth of only a foot or two, is worked into a sort of mortar or sludgy mire, by the kneading given to it by the carriages, as they alternately press down and release the surface, rendered flexible by its own tenacity, and the yielding nature of the sludgy substratum. Roads upon a bottom of this kind are, by the way, exceedingly deceptive, and there is a great waste of the power of traction upon them, which superficial observers are in nowise aware of. The surface may appear to be smooth and good; but it is flexible, and thus, though the wheels make no rut, the carriage always meets with the same resistance as it would do in being drawn up hill. Now, it will readily be understood that,

though the length of a hill fatigues by its continued opposition, it has nothing to do with the absolute resistance against which the carriage has to be drawn at each individual point. The length of road with which the wheel is "coming" in contact, is all that the wheel has momentarily to contend with, and it alters not the individual effect that may be necessary, whether the length of the steep opposed to it is an inch or a mile. The yielding of the surface of those quagmire roads opposes an ascent to the wheels, so that upon a perfect level, or even upon a declivity, the pull may be all along equal to what is necessary to ascend a comparatively steep hill on a road which does not give way in this manner. The friction, and, consequently, the resistance to be overcome, is even greater than that on a firm road, the ascent of which is all along equal to that which arises from the depression of the elastic surface at the place where the wheels are passing, because a larger portion of the circumference of the wheel is in contact with the ground.

These remarks, it must be admitted, have no very obvious connexion with the preparation of the vegetable tribes for the Winter; but we often obtain more valuable and satisfactory knowledge from those bare analogies than we do from the parts of a subject itself, inasmuch as being more unexpected, they are more striking; and this is very much the case in the instance of which we have given some details. If the water remain so pertinaciously during the heat of summer beneath a dry road, where the evaporation from the surface may be considered a maximum, much more

must it so remain where the surface is covered with vegetation, or with withered leaves, or dry vegetable matters of any kind, which are worse conductors, both of heat and of evaporation, than vegetables in the green and growing state; and as the surface at so small an elevation above the sludgy bottom is so consolidated as that it supports the pressure of a heavy carriage, much more must it resist the expanding of the bulb of a plant. But bulbs on the upper side of the collet, partaking as they do of the nature of stems, do not come to their proper maturity if they are buried so deeply in the ground as that the air, and in some degree the light, have not access to them. Any one may see this in a tulip, or any other bulb which has been left in the ground and buried too deeply there. The bulb and the leaves that spring from it are white and sickly, unable to bear the weather, and rarely capable of producing any flower; or if one is produced, it is of no beauty or value, and not capable of producing its seeds.

Hence, in the clayey and retentive soils of countries which have the Winter of a tropical character, or part of the summer answering to the same, the bulbs are for the most part of the above-ground character, and thus they consolidate and ripen in the atmosphere; while the root-fibres continue to supply them with nourishment from the retentive soil below, long after the loam soils in similar places are completely dried up to the same depth. These above-ground accumulations, which the plants prepare against the ardour of the tropical Winters, are not, however, properly speaking, buds,

they are stem-tubers, and answer nearly the same purpose above ground which the tubers of the potato answer below.

The plants which have this habit of forming large stem-tubers, on or near the surface of the ground, are, for the most part, natives of climates which are very hot and very seasonal; and thus they are good illustrations of the mode in which perennial vegetables with annual stems prepare themselves for the extreme of the tropical Winter: many of them are also very interesting plants in themselves, and highly serviceable as wholesome food for the inhabitants of those countries in which they abound. They are plants of more simple structure than our cabbages, turnips, and potatoes, and in the botanical arrangements they belong to the extensive and splendid division of the vegetable kingdom, which includes the palms, bananas, aloes, lilies, rushes, orchideous plants, and a vast variety of others. In their aspect and in their flowers, they are perhaps the most splendid, and, at the same time, the most singular of all vegetables; and though many of them contain very acrid and even poisonous principles when in the raw state, these can generally be separated by boiling, or sometimes by simple maceration in cold water for a sufficient length of time, and then they yield an alimentary substance, which is of the most placid and light, and also of the most nourishing description. Very many of the people in the dry districts which border on the great deserts in Africa and the west of Asia, subsist, in great part, upon the fruit of the date palm; the banana furnishes more human food, from the same

breadth of ground, than any other known vegetable; and the great American aloe furnishes the people of the table-land of Mexico with the chief part of their vegetable drink, which, like our products of malt, may be made either a wholesome and refreshing beverage for those who labour hard, under exposure to the burning sun, in a country where pure water is not easy to be had, and where the drinking of it is not safe when obtained, or an ardent and intoxicating spirit. Even the roots of our common rush, which flourishes in the coldest parts of the country, contain a considerable quantity of pulpy matter, which is wholesome, and by no means unpalatable. Our orchideous plants, which of course belong to this division of the vegetable kingdom, are not numerous, and they are humble plants as compared with those of the tropical countries; but the tubers of some of them, as of the great or male orchis, when duly prepared, furnish a light and pleasant kind of food. We may add, that as these plants follow next in order of simplicity to the grasses, they are also the next to them in importance as food for the human race; and that they form appropriate substitutes in those places which are too warm for the culture of the ordinary grain plants, and too dry for Indian corn or rice. Our object, however, is not to describe these or any other of the grand divisions of the vegetable kingdom, or to enumerate their uses to man, but merely to take them as illustrative of the preparation of vegetables for the tropical Winter.

In passing, we may, however, remark, that from the great number of these plants, and the diversities of

their aspect and character, one or another of them is, in the climates which are warm enough for them, adapted to almost every variety of situation that can be named, from the marsh and the moist forest of perpetual verdure, to the scenes of extreme drought, upon which the tropical Winter tells with the most withering influence. Their roots are fitted to and found in all situations—in water, in moor, imbedded in ordinary mould, on the surface of the earth, and in the air, without any connexion with the ground, or any medium through which they can be nourished but the atmosphere around them. These last are supported, that is, kept from creeping prone upon the earth by the trees to which they cling; but though they are thus *epiphytal*, or *upon trees*, they are not parasites, deriving their nourishment from their supporters, but wholly dependent for that upon the free air which plays around their elegant foliage, and their most beautiful and fragrant blossoms; for, in both these respects, some of them have no equals in the whole vegetable world.

The plants which are most appropriate for our present purpose, are those which are called *Taccinæ*, from *Tacca*,—a plant of the east of Asia, the Asiatic isles, and those of the South Sea, for which there is not any descriptive English name. In all these countries the grain plants which form the bread of man in Europe, and the other cold and temperate parts of the world, are more difficult of growth than they are with us; and in the isles they were wholly unknown when these isles were first visited by Europeans. But in the different species of Tacca, the people found good substitutes,

growing naturally, and without any more trouble to them than that of gathering them when in the proper state, and preparing them for food. As is the case with the accumulated stores of nutritious matter in all vegetables, in what part soever they may be accumulated,—whether in the root, the stem, the leaves, the buds, or the seed,—the proper season for the taccas is that of the annual pause of their growth, when the faculty of accumulation has done the most that it can do for the year, and before the action of the next season has begun to deteriorate its quality or diminish its quantity. Even when in this state they are bitter and acrid, but when they are reduced to a pulp, and properly washed with water, the farina which remains is very mild, and highly nutritive and easy of digestion, and therefore admirably fitted for the inhabitants of countries, whose system is more feeble and relaxed, by the nature of the climate, than it is with us in the temperate and bracing atmosphere in which we live. The lower leaves of those plants, which are peculiarly succulent, more especially in their footstalks, are capable of being cleared of their bitterness and acridity by boiling, in which state they form very good substitutes for our greens and cabbages, which, being natives of temperate climates, are not found in a state of nature in those warmer regions of the globe.

Closely allied to the taccas in their habits, general adaptation to the seasons, and preparation for the torrid Winter, though differing in some respects, and indicating by their flowers, and also by the reticulation of the veins in their leaves, that they make a partial

approach to those plants, which are called *exogenous*, or growing at the surface, to which class the greater number of our native herbs and all our native trees belong, are the yams, *dioscoraceæ*. One of these, the common black briony, *Tamus communis*, is a native of Europe, growing in hedges, along which it climbs. The roots of this plant grow to a pretty large size, and accumulate a good deal of farinaceous or starchy matter; in their entire state, however, they have an unpleasant taste, and are probably not wholesome. But there seems little doubt that if the value when purified would repay the labour of the purification, the roots of these plants might be prepared as a wholesome article of food, in the same way as are the roots of the taccas, and those of other plants, which the natives of tropical countries use as substitutes for bread. The cereal grasses are, however, so much cultivated with us, and they so much engross the attention of the cultivators of the material of bread, that it would be in vain, and in all probability not very wise, to recommend the culture and preparation of such a root as that of the black briony;—and yet the great success which has attended the culture of the potato, the increase of population and industry which it has facilitated, and the extent to which it has assisted in preventing that famine which, before its introduction, used to be felt in some part of the country almost every year, render attention to those roots or lower stems of plants which collect great quantities of pulpy matter as preparatory for the season of their repose, of more importance than many are apt to suppose.

Our briony is by no means a typical plant in the section to which it belongs; for though it is met with in temperate countries, it is never found in very cold or exposed situations, or in those which are habitually marshy—the character of the tribe to which it belongs is tropical. There are two genera which may be considered as typical—the one, the more abundant and better known, and that from which the name is derived; and the other, more remarkable in its appearance, and more completely a plant of countries which are habitually burnt up and scorched in the dry season: these are the yam, properly so called, and the elephant's foot, or Hottentot's bread.

Of the Yam, there are several species, or varieties, which abound in most of the intertropical countries, where the situation is not too elevated, or too humid or dry; and they are cultivated with nearly the same assiduity as potatoes are with us. They are plants of vigorous growth, with climbing stems, and rather handsome foliage; and the roots grow to a large size, so that a single one often weighs a quarter of a hundred weight, or more. They require a little more labour in dressing than our potatoes, as they contain a juice so very acrid, that it acts unpleasantly on the skin; but this can be easily removed, and then the substance of the roots becomes a very excellent article of food, and, from the productiveness of the plants, a very cheap one. When thoroughly cleared of its acrid juice and properly dried, the root of the yam—which is, indeed, the part to which the name "yam" is given—is more meally than the average of our potatoes; and thus,

while it answers quite as well for eating or substance as the potato does, it is a much better substitute for the meal of grain in making bread, and for other purposes.

The Hottentot's bread is not so widely distributed or so much used as the yam, and we know it chiefly as a wild plant of the dry plains of Southern Africa, which are completely burnt up toward the latter part of the south-east monsoon in that country. The root of this plant is wholly upon the surface of the ground; and, during the dry season, no one who had not seen it at other times would have the slightest idea of its being a vegetable, or any part of a vegetable. What it resembles most nearly is one of the tortoises, which have the different plates of the shell in the form of polygons, with angular grooves between; and even the markings of colour upon it have some resemblance to those upon the tortoise. Hence it is called *Testudinaria*, as the generic name, and *Elephantipes*, or the elephant's foot, as the specific one. There is not a leaf or a bud, or the least vestige either of the one or the other about it, or any point from which such an appendage would be likely to issue. Its external rind is proof against the severest action of the drought, while the under part of it, lying closely upon the surface of the earth as it does, continues to receive the moisture which the action of the heat brings upward, long after the ground upon which it appears to lie, like a piece of stone, is dry and parched. When the rains set in, however, this apparently moist mass very speedily shows that it is instinct with very active life. It soon puts out long and climbing

stems, with very handsome reticulated and slightly three-lobed leaves, and abundance of small flowers; the annual growth having much the appearance of an ornamental climbing plant, standing round the root, as a piece of stone, which merely supported the plant, but did not produce it. This singular plant is not, we believe, admitted into cultivation as an esculent, but when animal food is scarce with the wandering natives of Southern Africa, as it is apt to be during the dry season, when the antelopes, quaggas, and other wild animals are forced to seek food in the upper country, they resort to this as to a meal prepared for them in the desert. The external part of it is hard and woody; but the pulp within is eatable, and might, perhaps, become not an unpalatable dish if it were properly prepared.

The plant now noticed may be regarded as showing the extreme of vegetable preparation in the bulbous or tuberous root for the severity of the tropical Winter. Many of the crassulinæ, or plants, the main body of which consists of thick and succulent leaves or leaf-life productions, have very nearly the same habit. The common houseleek, which flourishes on the tops of walls, or the roofs of houses, among stones, or in any very dry place, but will not thrive in rich and humid soil, is an example with which every body must be familiar.

In the dry places of warm countries, those plants are very numerous, some of them bear fine flowers and pleasant fruit; and though they flower only at particular seasons, and some of them only after very long intervals, drought and heat, which would very soon wholly destroy even the hardiest plants with which we

are familiar in temperate climates, have very little effect on those parts of them which answer to the stems and leaves of our common herbaceous plants.

The general habit of those crassulaceous, or thick and succulent leaved plants, which flourish in the most dry situations, and are but little affected by the utmost ardour of the tropical Winter, is to derive the greatest part of their nourishment from the atmosphere, and to be but little dependent on root or on the earth for any thing farther than a mere resting-place. Their epidermis is remarkably close and tough, and generally, though not always, glossy; they give out very little moisture by evaporation; and they must take in a great deal by absorption at the general surface, as they are almost invariably and at all times very juicy within, and yet do not take up water in substance and give it out again in part in the same way as is done by the common plants, which are unable, in any parts of their structure, to endure the same extremity of drought.

In them we have one extreme of the vegetable creation in its adaptation to climate, and its preparation for the peculiar Winter of that climate. For their own preservation as individuals, they may be said to be always in a state of preparation for the heat and drought, though of course they must grow most rapidly, and come most readily and freely into flower, when the atmosphere is most loaded with those substances which they absorb, and of which we may suppose that water is the chief. As the whole structure and physiology of these plants adapt them for the extreme of drought we might be prepared for the conclusion that muc

humidity settling about them is their greatest enemy, because a plant cannot be adapted to one kind of circumstances, and also to the very opposite kind. The fact completely bears out this conclusion; for if an unskilful cultivator by any chance gets hold of one of these plants, and endeavours to nurse it in what he considers to be a kindly manner, that is, by planting it in rich mould, and supplying it frequently and copiously with water, the plant is sure to canker, and die, and rot; whereas if it is treated with neglect, thrown, for instance, on a dry shelf and left there, the chance is that it will not only live but grow vigorously, and put out its flowers in their full beauty. So necessary is it for us to know the natural habits of the plants of peculiar climates and localities, if we wish to cultivate them successfully by artificial means.

In this manner is the vegetation at the warm extreme of the quadrant adapted to its locality, and prepared for those changes of season which it has to endure; and when we consider that the other, or cold Winter end of the quadrant, is the opposite of the warm one, in respect of the general character of the seasons, and of the Winter in an especial manner, the conclusion almost necessarily is, that the vegetation there must, both in its general nature and in its preparation for the Winter, be adapted to the opposite principle or agency:—that the good and the bad, or the favourable and the unfavourable to the vegetation at the one extremity of the quadrant, must change places at the other extremity, so that the bad at the one may be the good at the other, and the good the bad.

Is it cold—the absence of heat, to which the polar vegetation must be adapted, as the opposite of that to which vegetation is adapted at the equator? No; for though cold is an element of the polar Winter, as heat is an element of the tropical one, neither the one nor the other is the only element. It is not the heat at the equator which makes the warm time of the year the Winter in many situations there; for in those places where the supply of humidity is equal to the degree of heat, the Winter of the dry regions is the very intensity of the summer,—a season of vegetable activity unknown and unequalled under any other circumstances. It is true that the progress of vegetation does not show itself so conspicuously in the humid districts of perpetual growth as it does upon those places which have been parched and naked during the drought, when the rains come upon them; but there are various and obvious reasons why it should not be so apparent. The vegetation on the humid places is abundant at all seasons; and it is of such gigantic character, and so thickly serried, that the addition to it during the hot season cannot be fully estimated, or even seen, except very imperfectly; and the contrast with the dry and barren plains, is one of the most striking that can well be—that between perfect barrenness and abundant vegetation. There is another reason: as the plants on the humid places in the equatorial regions have no Winter of repose, they can have no spring of awakening. Of this, we have illustrative evidence in the spring of the temperate latitudes, where the spring is always marked in its

character, and rapid in its progress, in proportion as the Winter is long, severe, and unbroken in its dominion. Where the Winter is short, and mild, and undivided, the spring comes on so gradually, apparently with such feeble power, and subject to so many checks and reverses, that we cannot notice its progress, except at the end of considerable intervals of time; while, in countries farther to the north, and in them in proportion to the length and confirmed character of the Winter, the spring comes on with such daily strides, that its course is run in a week or two, and that without any reverse.

Another thing—the ever-growing vegetation of the moist places does not need, and, therefore, does not make, those preparations that are regularly made where there is a confirmed Winter and Winter's pause. Buds, bulbs, tubers, and other vegetable stores against a season of vigorous action, consequent upon repose, are not wanted, and, therefore, they are not formed. Man often accumulates what is useless to him, and occasionally what is injurious, from the mere love of accumulating; but nature never makes any accumulation for which there is not a use. In places of continual growth, every germ and growing part of a vegetable, whatever it may be, continues from its first starting, till it has run its appointed course; and so there is not even a bud there but such as are in active growth. The vegetation of such places, in short, has not to prepare either for summer or for Winter, as contrasted seasons; for it feels neither the one nor the other.

Yet, again, the heat is never so intense upon these

places of perpetual verdure as it is upon the dry ones, which feel the burning and parching effects of the tropical Winter. The sunbeams do not reach the ground in any quantity, or with much effect, because of the dense canopy of foliage with which the trees are crowned and tangled; and although the light of the sun is very bright in the open places, a perpetual twilight prevails in the shade of these vast forests. Then, wherever the sunbeams do penetrate, their heat is, in a great measure, exhausted by the evaporating of humidity; whereas, on the dry and naked ground, they tell with great force, of which there is very little evaporation to blunt the intensity; and where moisture comes to be applied to the ground in this greatly heated state, the energy of vegetable action is forced to a degree much exceeding what would be displayed, if the ground were not previously brought to so high a temperature. It is true, that this intense forcing of the vegetation when the rain sets in upon the heated plains, very soon begins to abate; and it is well that it does so, for the strength of no vegetable could bear a continuance of it. In this we have a beautiful example of that beneficent law by means of which the antidote in nature always comes, not only along with, but in the very same power, or instrument, with the bane. The heat of the parched ground, which tends to force the vegetation so much, tends equally to evaporate the rain as it falls, and this, again, tends to reduce the temperature with corresponding rapidity. When plants are furnished with a store, this store enables them to meet the great stimulus to which they are subject

with much less labour than they would do, had they to assimilate directly out of the elements the whole of the matter necessary for the great enlargement of the new parts, which takes place in the early stage of their growth; and, by the time that this store is exhausted, and they are thrown upon their own resources for this additional matter, the stimuli have abated, and the growth has become less rapid.

This is a very beautiful part of the system of nature's working, and one which, in itself, if well considered, would be adequate demonstration of the wisdom and goodness of Him by whom the system of nature was begun, and according to the good counsel of whose will it is carried on. But it is as general as it is beautiful; and we find it in operation, although in a more limited degree, at every place on the earth to which we can direct our attention. To revert, in illustration, to the bulbous plants, and also to those which form large buds, or other stores, before the time of their annual pause, may suffice to convince us of this. All the plants which bulb before the Winter are, unless they are kept back by being taken out of the ground, early flowerers, and the trees which form the most perfect buds in the autumn, are the first to come into leaf or flower in the spring; and they are, of course, also the first to run their career, and to prepare for the season which is to follow.

Many useful conclusions might be drawn from these general remarks, if our limits would permit us to draw them; and, among others, that it is not the heat, but the absence of humidity to act along with that heat,

which is the cause of the scorching Winter of the tropical climates. But the polar Winter is the opposite of the tropical one; and therefore the cause of the one must also be the opposite of the cause of the other. In the tropical countries, it is an excess of heat, with a deficiency of humidity; and in the polar latitudes, it is an excess of humidity and a deficiency of heat. The tropical plants are adapted to the excess of heat; and therefore we might reason by analogy—and the fact proves the correctness of the reasoning—that the polar vegetation must be adapted to an excess of humidity.

There is one point of resemblance between a very considerable portion of the native vegetation, both of the equatorial and of the polar countries, though neither can, in strict language, be said to be the most appropriate to the state of things there. The continual vegetation, which knows no Winter, is the appropriate vegetation of tropical countries; and that is adapted to the circumstances of the locality, on the supposition that the supply of heat and that of moisture are always in nearly the same ratio to each other; and, consequently, needs no extraordinary preparation at one time more than at another. The appropriate vegetation of the tropical climates is, therefore, that to which there can, from the ordinary action of the sun, be no excess of heat, if there is the requisite degree of humidity to act along with it.

In like manner, the appropriate vegetation in the regions of the poles, or in those regions as near to them as there can be any thing to which the name of vegetation can with propriety be given, must be that

which never can have too much humidity, if there is an adequate degree of heat along with it—that is, if the temperature is not lower than the freezing point of water, below which the fluids of plants are fixed and consolidated, and, therefore, they cannot grow. In both situations, plants which are not thus adapted to that which is the leading character of each, are really out of their proper element; and the various accumulations of matter, and other preparations for seasons which they make, are really adaptations for one climate, of those species which are, in their general nature, better adapted for another.

The characteristic and appropriate, and also the most prevalent vegetation of these high latitudes, which may be said to occupy the extreme of climate toward the poles, consists chiefly of the lichens and the mosses, —plants which are as little dependent upon the soil or the surface which affords them a resting-place, and therefore as much dependent on the atmosphere in which they grow, as those plants which hold on their way without obvious preparation for seasons, in the tropical climates.

The lichens are plants of the rock, the upland, and the boles of trees and other surfaces; never making their appearance except in situations where the atmosphere is damp, at least for some portion of the year, and more exclusively dependent on the atmosphere for their supply of nourishment than perhaps any other family of plants. They come upon the bare rocks and other surfaces, where there is not previously a single particle of soil; and if the places upon which they come

are different from this, they in no wise diminish the quantity of soil that may be there. In their nature, the lichens are very simple plants, and they appear to be as quiet in their action. That they elaborate vegetable jelly, originally and primarily, out of the atmosphere, or the substances which the atmosphere contains, without any assistance from a previous vegetation, is true; but how and by what means they do this, is another and a more difficult matter. They appear, as has been said, only where the atmosphere is moist, and yet they do not seem to have any very strong attraction for humidity, so as to retain it in the dry time of the year. When the weather is dry upon these mountain tops, and other places which are covered by them, they crackle under the foot, and are easily broken or reduced to powder; while they have more toughness and coherence when they are moist. In many respects, however, they appear to be equally secure, if not equally passive, in all states of the weather; so that, though a moist atmosphere is obviously the most congenial to them, they do not suffer either from the extreme of drought, or from that of frost.

The mosses are different, though they are also plants of the colder climates, but not exclusively confined to them. In all situations they are very retentive of moisture, and in the cold latitudes they hold it in opposition to the utmost influence of the atmosphere. In most of the species they are so exceedingly hardy, that few contingencies are able to destroy their vitality. In the drought they get brown and sickly, but they do not die, like plants of a more highly developed organization; for after a moss has been kept in a perfectly dry state

for some time, it will again recover its greenness, if furnished with a sufficient supply of water.

We cannot, on account of the very limited space to which we are of necessity restricted, enter into any description of the various tribes of the mosses, or the circumstances under which they appear, or the situations in which they flourish the best. We can only spare room to remark, that they are ministers of good or of evil, according to the situations in which they establish themselves. They are bad conductors of heat, and, therefore, whenever they are so abundant as to form an entire covering for the surface, they are calculated alike to mitigate the heat of the long summer day, and the cold of the long Winter night, in the high latitudes. They are but little affected by the vicissitudes of the seasons, themselves, and therefore the roots of other and more valuable plants which are under a covering of them, are not liable to be much injured by seasonal changes. But, on the other hand, the cold damp which the mosses retain, is far from being favourable to the roots or the growth of any very valuable kind of vegetation; and when they come in thick array, they almost uniformly come in the character of spoilers. When the mosses appear in numbers upon a lawn or a meadow, even in the most favourable situation for kindly herbage, they very speedily consume the grass; and when they once have gotten the mastery, the decomposition of them at the bottom, which goes on while they continue growing at the top, in time covers the whole surface with peat-mould; and the retention of moisture is such, that the very climate is altered by them.

They are most prone to establish themselves in situations where water partially or seasonally stagnates to a limited depth; and when they are once established, they go on in converting the place into a perpetual mire. They retain the moisture, from their strong attraction for it, and also from their constant decaying at the roots while they are growing at the surface, until they form a stratum of their own earth, of very considerable thickness—not less than a hundred feet, in some instances; and, as this accumulation of moss or peat-earth is very retentive of moisture, it becomes, in most instances, a means of deteriorating the neighbouring surfaces and soils. If the subsoil is porous, or if there is a natural drainage, from slope or any thing else, so that the moss does not accumulate, but is dried, and its growth arrested, in part of the summer, then the mischief of which it is productive is not so great; and there are then, and, indeed, under most circumstances, some countervailing advantages that result from it. When there is merely a mossy turf on the surface, which becomes green in the autumnal rains, and continues to grow during the Winter, it acts as a preserving mantle, by retaining the heat in the earth; but if there is as much humidity among the roots as will enable it to grow in the summer also —which it will do, as it consists of plants of moisture and cold, which depend not on the sun for their summer—it prevents the summer heat from penetrating the earth; and thus though, under all circumstances, continually-growing mosses tend to equalize the temperature of the seasons, yet, if in large masses, they

reduce the average temperature of the year, and thereby injure the climate. They load the air in their vicinity with humidity; and the result is, the formation of thick dews and fogs, and also white frosts later in the spring, and hoar frosts earlier in the autumn, than would be the case if the moss was not there. The difference of climate which peat-bogs—which are, of course, accumulations of moss—occasion, is much greater than they who have not attended to such matters would be apt to suppose. The author knows of a district, not very far from the sea in longitudinal distance, and not very much above the sea level, where the better varieties of oats could scarcely be ripened before the autumnal frosts; but the peat-bogs have been drained, and in great part cleared; and now wheat is sown and comes to very great perfection, while the quantity of rain and snow in the Winter is very much diminished; and though the summer is probably not so hot as it was then, it is more showery, and favourable for all the more useful kinds of vegetables, and, by consequence, for domestic animals and for man. The place has, in fact, undergone the same kind of change as though it had been lifted to full two or three degrees nearer the equator. This fact, which is one of simple but direct personal observation, speaks volumes on the subject of peat-bogs, and of those mosses of which the substance of the bog is composed. If any country becomes, to a considerable extent, covered by a polar vegetation, we may rest assured that, to the same extent, the climate will assume a polar character. But a character of this kind induced upon lower latitudes, by what means

soever it may be induced, is the least favourable for the cultivator that can well be named. It brings the bad of the polar seasons, without the countervailing good along with it. The moss may bring the fogs, the alternating frosts, and the other unpleasant attributes of the polar climates; but it will not bring the long days of the polar summer, or the settled serenity of the polar Winter.

What the cultivator requires is a greater uniformity of the seasons,—the summers less dry and burning, and the Winters less cold; and, as the necessary consequence of this, both the spring and the autumn less precarious. The humid atmosphere from the bog is equally unfavourable to ripening in the autumn, and to the principle of fertility in flowering plants at all seasons of the year. This is exemplified in the case of the potato in Ireland: the vicinity of the bog, and even the bog itself by a very little management, may be made to yield a good potato-crop for one year; but the tubers of that year, if planted the next, yield a much inferior crop, and sometimes fail altogether. It cannot be said that any change produced on the ground by the first crop is the cause of this; for the failure is the same if the second planting is made in new ground. If those who profess to have the welfare of countries most at heart, shall ever find leisure to ascertain by what means that welfare may most extensively and certainly be promoted, such subjects as the one now hinted at will necessarily occupy no small portion of their attention. But mankind are more occupied in wrangling with each other,—which the experience of ages shows

can be productive of little good, though of much evil—than in studying and labouring to overcome those physical disadvantages, the removal of which would be advantageous to all. It is by doing this that private men, with their own private interest as their chief or only object, enrich the country even more than they enrich themselves; and it seems passing strange that those who take to the improvement of the country as a regular trade will not do the same. In most countries, if one tenth of the eloquence, the ingenuity, the time, and the expense, which have been consumed in settling whether the offices of public trust and emolument should be filled by A or by B,—both of whom are perhaps equally qualified, or disqualified, as may happen, for the discharge of the duties of those offices,—had been bestowed upon subjects of practical usefulness, the world would have been all the richer, the wiser, and the happier. Mankind are somewhat like dogs: they will fight and worry for the bone which one dog possesses, though each might hunt out a bone for himself, in half the time, and without any snarling or bites given or received. Nature prevents this pugnacity of temper among the canine race, for in the wild state they hunt in packs, in concert and amity with each other; and if men were to be guided as much by that reason which nature teaches, as dogs are by their natural instincts in the field, it might probably take off a little of the edge of their pugnacity.—But this is foreign to our main subject.

The mosses are not a primary vegetation like the lichens; they do not come to clothe the bare rocks and

prepare a soil in which other plants may take root and flourish;—they come as destroyers, or to bury or consume that which has been destroyed by other causes. There is a rule,—rather an out-of-the-way one at first sight, it must be admitted,—which is yet better calculated to guide us to the general uses of plants in the economy of nature, than rules which have more of the pomp and circumstance of philosophy in them. It is this: If vegetation is consumed upon the surface of the ground, either by fire or by the rotting influence of humidity, the vegetation which the rains cause to grow upon the embers or the decaying vegetation, are always of a secondary kind—destroyers of an antecedent vegetation, or batteners upon its remains. If the place and the season are warm, fungi are the first vegetation; and if they are cold, the mosses. This is a matter of which any one who chooses to observe can easily convince himself. The site of a gipsy fire in the green lane,—the place where weeds or brushwood have been burnt,—and every other situation where there is a remain of vegetable combustion, always shows fungi of some species or other after the midsummer or earlier autumnal rains. It is the same with a fallen tree which has been allowed to lie till the under part begins to rot,—with the lower part of a stack of wood similarly situated,—and even with a dead limb upon a living tree. So also in more cold and upland situations, burnt surfaces are very speedily covered with mosses; and some of those mosses present beautiful miniatures of forests. Upon fallen trees in similar situations the mosses are also sure to come, and that in much greater abundance than on the

situations of former fires; and the mosses there may or may not be preceded by fungi, according to circumstances.

There is thus a correspondence of office in the fungus and the moss, though the plants are otherwise as different as the places where, and the degrees of temperature under which, they appear. The fungi are things of a day, and their remains very speedily perish, so that they cannot be traced. The mosses are perennial in their duration, and the deposits which their remains form can with difficulty be destroyed by any known species of natural action. When a peat bog rises so high as to have a surface-drainage sufficient to prevent the stagnation of the rain upon it, very few plants make their appearance; and the few that do come slowly appear to catch the soil from what is swept over the surface by the winds, until they have become so abundant as to produce by their annual decomposition a new soil for themselves. In warm situations where the surrounding surface is rich, this may proceed with considerable rapidity, so that in sheltered valleys there are often meadows of rich grass over the peat; but in high, cold, and damp places, the moss assumes much of the character of a final vegetation, for it leaves the surface in black sterility after itself has ceased to grow.

The mosses do not appear to have, even in the decay of their under portions, any power of actually decomposing the ligneous parts of any trees or shrubs, though they disintegrate all the mild-juiced ones,—as may be seen in the birches, alders, and hazels which are embedded in the bogs. But although they reduce the

wood of the hazel to a pulpy substance, they do not alter the shell of the nut any farther than by blackening it. They however reduce the kernel to a pulp; and of all plants and trees whereof they conserve the remains, they never leave a part which under any circumstances could germinate. They are thus final destroyers of all the other vegetation upon which they come in the abundance of their array, though they in some instances embalm the dead. In the great bogs of the British islands, those embalmings are most conspicuous in the oak and the pine. The former appears to be preserved by means of the tannin and the astringent principle which it contains, and the latter by means of its resin; for the sap-wood and also the young twigs of both are reduced to pulp, and the heart-wood of the oak which remains is nearly as black as ebony. The destruction, from the accumulation of moss, and the long continuance of the peat into which it passes, is complete in so far as the herbaceous vegetation and even the vegetable mould are concerned. The hard testa of some of the smaller seeds, indeed, resist its action, much in the same way as the shells of the hazel nuts. In peat-bogs which we have seen cut through to the bottom, for a depth of at least forty feet, the substratum immediately under the peat consisted of pure white silicious sand, in a state of very minute division, and under that another of equally pure clay, quite impervious to water in the greater part of its extent. The same, we believe, is the case with the great turf bogs in Ireland: the substratum immediately under the bogs often consists of gravel, not water-rounded, as

though it had been rolled for a time in every sort of flood before it was deposited there, but in angular fragments, such as we may suppose to have been produced by the fracture of larger masses of stone by the frosts of many Winters. But whether the stratum immediately under the peat or turf consists of this kind of gravel, or of sand in a state of more minute division, there is always a portion of clay under it; and the remains of pine trees and other substances which there has not been the means of decomposing, do not rest immediately upon the sand or gravel, but have always some of the peat or bog-earth under them. This clearly shows that the mosses, of which this bog-earth is composed, ate up, in some way or other, the richer soil which had existed prior to them, and which nourished the trees of which they contain the remains; and not only this, but that in the conversion of the vegetable soil, as we may call it, into moss, all the vegetable part of it has been appropriated by the mosses, and assimilated into their substance; while the silicious and argillaceous earths mixed with it have been precipitated; the argil, or clay, taking the lowest situation,—as it invariably does when clay and silicious sand, both in a state of minute division, are left to arrange themselves according to their own natural tendencies.

The coating of fine and pure clay, which in most instances forms the very lowest of what may be called the accumulated strata of these bogs, contributes not a little to their growth and permanence, by forming a water-proof lining to the place on which the bog rests. In this way it divides the waters, that is, it prevents

the rain which falls upon the bog above it from percolating into the earth; and it also prevents the water which may come into the lower portion of the earth, by other channels, from finding its exit in springs at the place which the bog occupies. The pressure of the bog itself contributes to the producing of the latter of these effects; and hence, though the surface of one of these bogs may be at all seasons so much charged with humidity as to be a quagmire or a marsh, there is never much water discharged from it by springs and rivulets, as compared with an equal extent of surface, lying in a similar manner, upon which there is no accumulation of decayed mosses; and the small quantity of water which is discharged in this way, is so impregnated with mossy particles, that it is equally unfavourable for kindly vegetation on the banks of the rivulets which it forms, and for the health and wholesome quality of fish in their waters. This last is well exemplified in the common trout, which are always few in number, dark in hue, and inferior in flesh and flavour, in these mossy streams, to what they are in those whose courses do not lie through moss of any kind.

The effect of this is a wintry state of the climate at all seasons of the year; for the rain which falls, not having the usual exit through the earth which it finds in countries where there are springs, is constantly either ascending or descending through the atmosphere; and both operations are sources of cold. When this accumulation of moss-earth is broken, and especially when it is removed to a considerable extent, the clay stratum, no longer strengthened by the pressure of the moss

over it, gives way; springs of the purest water make their appearance, and the climate and vegetation are both greatly improved. But these mossy accumulations, though they are both unsightly and unprofitable in temperate countries, are highly valuable in many places of those near and within the polar circle. The accumulation of moss which goes on there, from its growth under the snow of Winter, is a preparation for the fertility of the summer, as important as any which takes place in climates more advantageously situated upon the globe. In the summer, when the sun is constantly above the horizon, or only below it for a very short time, the inland places of these polar regions, which are not in the immediate vicinity of many mountains, would be as completely parched as the plains under the equator are in the dry season; and the parching would be a far more serious matter in the polar climate than it is in the tropical one; for as the Winter there is a time of total stagnation to every species of vegetable upon which either men or animals can subsist, if the summer were one of burning drought, the whole year would be one season of complete barrenness; but the moss, which arrests the water, and gives it out only by evaporation, and that gradually, prevents the burning up of the surface by the action of the summer sun, unremitting though it be; and this, the Winter growth of those cold, and at that time snow-clad countries, enables them not only to support those children of wild nature which are permanently resident in them, but, during the summer, countless thousands which winter in warmer climates.

Thus when we come to take a minute and careful examination of them, we find that all the seasons of the year, even in the utmost of their extremes, work for the good of the system; and that the physical properties are so adapted to each other, as that there is a mutual advantage reciprocating from the equator to the pole, in the distribution of which the atmosphere is the principal agent. The zone which happens to be parched with drought for the time is the means of a constant ascent of the atmosphere there; and that zone or portion which has the depth of the cold Winter is equally efficient in causing a descent of the atmosphere toward the surface of the earth. But the state of things upon the globe is—either from astronomical causes, in respect of the position of the earth's axis of rotation with respect to a line supposed to be drawn from the centre of the earth to that of the sun, or from local causes arising from the character of the earth's surface—always such, that there is the extreme of the hot Winter in one region and that of the cold in another; and thus the circulation is always carried on by the atmosphere, from the opposite action of these impelling it in different directions, and thus effecting a constant circulation, which tells upon every part of the earth in proportion to its character.

If we took nothing into the account but the simple astronomical positions, we should be apt to suppose that the times of the equinoxes would be periods of equilibrium and pause. To a certain extent this is the case, in so far as the general currents of the atmosphere are concerned; but the extent of it is far more limited than

we should be apt to suppose; and the physical times of its occurrence, as dependent on the obedience of the earth and the atmosphere to the action of the sun, do not coincide with the astronomical ones as resulting from the position of the earth's axis with regard to that luminary. The character of summer influence in that hemisphere which the sun has apparently quitted, by means of the apparent motion in declination, has by no means ceased at the time of the equinox; and neither has the Winter influence, in that hemisphere from which the sun has been apparently absent, and is about again to return. This retardation of the maximum of the effect produced beyond the producing cause, both in respect of heat and of cold, is different in its length in the different latitudes, and also in different places, according to their physical structure and local situation; and in consequence of this, all the four seasons of the year, as we understand them in their effects, are in continual occurrence every day throughout the year, though each is of course in a different place:—the season opening at one, in its full at another, and closing at a third, are of constant occurrence; and they call and answer to each other, through the medium of the atmosphere, in such a manner, that their very diversity is the cause of the activity, the life, and the value of the whole.

Thus, while in every season we view the system of nature, we find such mutual dependence and assistance to each other in all the parts of it, that there is no single work of man which shows with half the force and truth that it is the production of one author; and yet when

we take the several parts in their details, we find that each of them is so admirably fitted for its purpose, that less than infinite wisdom and power could not have originated even the most local and the most minute.

The minor adaptations, such as that of the individual plant to its soil and its climate, and the complete perfection with which each of them works in concert with all else in its locality, are themes upon which we can dwell with pleasure: but when we come to discover that the burning sand of the equatorial desert, and the unthawed ice of the pole, work in concert for the advantage of every intermediate region of the earth; and that, if either of these extremes were to cease, the beauty and the usefulness of all that is intermediate would cease along with it; and also that, in countries which have extremes of seasons, if the one were to fail, so would the other,—we catch a shadowy glimpse of an extent of knowledge, and a power of working, at which all our feelings give way to the most adoring astonishment, and to the feeling that "we also are His offspring;" and that He has not endowed us with the power of knowing thus far, without making the principle of knowledge in our nature one of eternal growth, whose extent and pleasure shall know no end.

## CHAPTER VI.

### PREPARATION OF ANIMATED NATURE FOR WINTER.

ANIMATED nature works less to the seasons, or, which in observation amounts nearly to the same thing, the seasonal influences tell less generally upon it, than they do upon vegetable nature. The reasons why this should be the case, may be readily and at once understood, by any one who reflects but for a moment on the physiological difference between animals and vegetables; though their differences must be estimated on the averages of the two kingdoms, and not on the confines, where, as both seem to approach the nature of dead matter, they also seem to approach each other.

Taken on the average, the animals have resources against the vicissitudes of the seasons which no vegetable possesses. They can, for instance, betake themselves to places of shelter and safety when the state of the atmosphere is unfavourable to them; and where the seasons are strongly marked, there are some of them that can change their habitations, even to a full quadrant of the earth's circumference, or more than six thousand

miles, when the country which they quit is no longer able to afford them that kind of protection and nourishment which their nature requires. Vegetables, on the other hand, must remain in their places, and abide all the changes of the year, as those come round, without any means of preparation, except such as can be exerted without any change of place.

When we speak of adaptation, or preparation, in any animal or any plant, in reference to all the varying characters of the year in a seasonal country, we must be understood as making allusion only to such as are in the developed state throughout the whole year; for the egg of the animal, and the seed of the plant, may be, in all the annual ones, regarded as in nearly the same passive state during the season of repose; though even among those seasonal ones there is a wonderful difference between the resource of the parent animal in the depositing of the egg, and that of the plant in discharging its seeds. There are, no doubt, very curious structures and adaptations of seeds, by means of which they are carried to those places which are proper for their germination; but in all of them the winds, the waters, or something else than the parent plant, is always the agent by which the change of place is effected. Not so with the annuals among the animal races; for among insects, which, if not the only annual animals with which we are familiar in these latitudes, are the ones which are the most conspicuously so, we find more curious instances of resource displayed by the females in finding proper places for their eggs, and depositing them there, than are displayed in any other part of the living

world. Very many of them appear to have no other purpose, while in their last or winged state, than this securing of a future generation. That it shall eat, is the chief, we may indeed say, the only use of an individual animal in wild nature; for animals having no knowledge to acquire, and no mental desires to gratify, have no speculation or contemplation. The pachydermatous animal which wallows in the foulest mire, has just as much enjoyment of that, as the sheep has of the flowery meadow, or the wild deer of the wind-charmed hill; and the butterfly which hovers over the fairest and sweetest flowers of the parterre, has not more enjoyment of them than the mud-flies have of the most putrid and loathsome ditch.

Many of the insects, the annual ones especially, have eaten all that they require, and thus performed their duty to the rest of nature, before they are transformed into the winged state; so that, in that state, they have nothing to do, but to sport, to make a succession sure, and to die. This perfect absolvement of the winged insect from labour and dependence on the earth, together with the fact that it passes through a death-like repose before it comes to this state, was probably the reason why they, who were prone to clothe every thought in a poetic dress, gave the same name to a butterfly and to the soul—both implying "of the wind," or "a breath,"—and breathing being the only vital function which many insects perform in their winged state. When the male insects, which are in many instances feeble compared to the female, have performed their part of this labour, they almost instantly die,

just as the anthers and petals of a flower are cast off when the fertility of the seed is secured; and they do this even in species of which the females live through the Winter, and do not deposit their eggs and found their colonies till the spring; which is the case with many of the wild bees. These females have a very laborious task to perform, as they have to prepare cells, deposit eggs, and nurse the young to activity, before they can have any assistance in their labours. The repose of the Winter is of course necessary to prepare these most industrious insects for the labours of the spring; and their repose during that time may be well allowed them, as their services are required in the general economy of nature, only during the flowery time of the year.

The labours of those females which merely deposit their eggs,—commit them to the keeping of nature,—and die, are not so severe as those of the races which survive the Winter, and nurse and feed their offspring in the early part of the year; but still they are considerable, and they are often highly curious, and done with a precision in the work, and a perfection in the performance of it, to which there is nothing at all comparable in the most ingenious labours of the most dexterous and persevering of the human race. There is probably no living creature which casts its offspring wholly upon the world, in the same manner that the majority of plants do their seeds. The oviparous cartilaginous fishes—the sharks and rays, indeed, do not fasten their eggs to any fixed substance, but the eggs are furnished with tendrils or claspers, by means of which they can

attach themselves to plants, and other moorings; and the animals always come into the vicinity of such objects, there to deposit their eggs. The ostrich in the dry desert leaves her eggs to the action of the sun during the day, and so, in great part, do many of the swift-footed birds which breed on our sandy banks and downs near the sea; but when cold or rain comes, the female returns to her charge. The greater number of the oviparous reptiles bury their eggs in the earth, or deposit them in the waters; but whether this is done in the one or in the other, a fit place is chosen; and, in several instances, the mother remains near the place, and watches.

The insects which are strictly annual perish soon after the eggs are deposited; but still these are deposited with as much attention to the fitness of the place, as they are in the cases of those which form nests or cells, and feed the young while they are in the larva state. Some species, and those very minute ones, place their eggs upon the roots of vegetables, in such a manner as that the head of the young one, when it comes into life and activity, is placed in such a situation as that it shall, without previous motion, be able to begin eating that part of the young plant which is its most appropriate food. In not a few instances, those eggs are deposited in the bodies of living animals; and many of the insect mothers capture a number of other insects, and deposit them in holes, as a store of provision for the young; but those which have artificial larders of animal food prepared for them in this manner, rarely pass the Winter in the places where the eggs and stores

are deposited. Annual ones without number are attached to the twigs of trees, or deposited in the buds or the bark, though we are not aware that any annual insect deposits its eggs in or upon a deciduous leaf, which is to fall to the ground in the autumn. Of such plants as have leaves of this kind, the insects select the permanent parts, as the young when hatched in the ensuing season are then ready to feed upon the leaves. Instances of the placing of the egg where it shall be secure, and the young one can obtain a supply of food the instant that food becomes necessary, are so many, that the mere catalogue of them would fill a large volume; but the slight allusions which have been made, will serve to show that there is, in the case of those animals which perish previous to the Winter, with the exception of the egg, a degree of what we are in the habit of calling care for the safety and welfare of the future progeny, to which there is nothing at all comparable in the vegetable world; and if this is found to hold as a universal or general practice among those animals which are annual, in the securing of their offspring, we may be prepared to expect some care, at least, displayed by every perennial animal for its own personal protection during the Winter.

But here we must be careful not to fall into those errors with which this part of the subject is beset—the more so that they are deceiving, curious, and wear not a little of the semblance of truth. The preparations of the animal for the Winter, or for any other season of repose, whether they consist in the depositing of the egg in an advantageous situation, or in any thing else,

such as the migration of the animal, its hybernation, the acquiring of a Winter covering different from what it has in the summer, are no more the result of any thing like knowledge or forethought on the part of the animal, than the shedding of leaves, the hybernating of buds, or the retreat of herbaceous plants into their bulbs or other roots; though, according to our common way of viewing matters, and speaking of them, the actions and preparations of the animal are said to be voluntary, and those of the plant wholly the results of external causes acting upon it.

This, however, is merely the result of our erroneous way of viewing these different parts of nature, and speaking of them. The animals have locomotion, circulation, breathing, and various other functions of animal life analogous to our own; and as we are very often not capable of drawing the line of distinction between those senses which bring us our information with regard to the external world, and that immaterial and immortal principle within us, which alone can reason from experience, and form forethought plans, anticipating certain results, we are very apt to suppose that the animals proceed upon the same principles as we do; and this is the grand error which we commit with reference both to ourselves and to them.

Now, a very little reflection, if we would give ourselves the trouble of it, would suffice to set us right in this matter: the animals never require any teaching, even in the school of experience, in order to enable them to perform in the most perfect manner, and without the slightest mistake or blunder, the very most of

these observations, which, according to our ordinary modes of speaking, show such wisdom of purpose. The annual insect, which deposits her eggs in the most appropriate nidus, with such care and attention, can have no schooling in the matter from her parent, because long before she quickens in the egg, that parent is dead and dissolved, leaving not a trace of her individual existence. As little can she profit by her own experience, for the act is a single one, never performed a second time; and thus, even conceding to her all the reason and understanding that the wisest of the human race could possess, there are really no means by which she could bring them to bear upon the operations in question. They are simply the results of a natural law, in the operation of which the insect has no more plan or purpose than water has plan or purpose when it is congealed into ice in the Winter, or melted into a liquid in the summer; and what is true of the insect in these her most curious operations, is also true of every operation which is, or which can be, performed by any being not endowed with an immortal spirit, and the faculty of receiving instruction, and proceeding by experience, which that spirit alone can impart.

Hence, how much soever the preparation of animals for the Winter may differ from that of vegetables in appearance and degree, and how apt soever we may be to regard the one as active and voluntary, and the other as passive, and wholly the result of external circumstances, they are, in truth, both exactly the same in kind and in principle. In none of them is there any thing which can be called voluntary, either in the

creature which is adapted to the season, or in the season which is adapted to the creature. If we will call the one the changed, and the other the changer, still the action is reciprocal; and there must be a disposition or faculty to be changed, on the one hand, before there can be any exercise of the faculty which we say changes it, on the other. Accordingly, there are some species which will be so adapted as that they will live at all seasons, and in almost any situation, while there are others that can hardly bear the slightest change. These differences of natural rapacity are found as much among animals as among plants, if not more; and it is a pleasing consideration to us, that those which have the greatest range of adaptation, are the most valuable to us, in an economical point of view, whether they are animals or vegetables. The ox, the sheep, and the horse can, in one or another of these varieties, adapt themselves to every climate which human beings can, with any thing like comfort, inhabit; while the elephant and the camel are confined within, comparatively, narrow limits, and even within these they are not relatively so useful as the others.

The fallacy—and it is a fallacy into which many, even of those who are well-meaning and far from ignorant, are apt to be betrayed—that animals of any class or any character, have, in and of themselves, a power of making their own adaptations to the Winter, or to any other season, or any circumstance—how perfectly soever they may be adapted to any or to all of these, really explains itself when we come to scrutinize it closely; for there are results arrived at by these

animals, at which not one of them could possibly arrive by the exercise of reason, even if we were to concede to them wisdom far exceeding the wisdom of Solomon; and some of these are very closely connected with their adaptations to the seasons. Of these we may select two well authenticated ones, which, together, may be held as conclusive of the fact. In the first place, several of those migrant birds, which come to the northern latitudes in the summer, and quit them in the Winter for warmer latitudes, have two broods of young during the time of their residence in their northern haunts. The young of the second brood are not always so far advanced as to be able to depart at the time of the general migration; but, though some of the very late ones remain and perish if the Winter is more than usually severe, there are others which find their way to the southern countries, as far as the equator and beyond it, even after all the old ones are gone; and we know of no exercise of reason by which such a result could be brought about. Again, it is well ascertained that some birds, though they may take an aërial journey of four thousand miles in the interior, and which cannot possibly have landmarks to guide them, return to the very same nesting places year after year, without the least deviation or error: as, for instance, the same house martens have been ascertained to resort to the same identical window for many successive years; and there is no doubt that the case is the same with many other birds.

These long migrations of the feathered race may be reckoned among the most extraordinary adaptations of

animals to the seasons; and if they are not only not performed according to any plan or purpose on the part of the birds themselves, but are such that no plan or purpose, even of man, could perform them, much more must we allow that the simpler ones come under the same law, and that the creatures for whose benefit they occur, have no project of their own in the originating of them.

The experience of no finite being can be perfect; as there is no possibility of a finite being knowing of how many of the circumstances of any one case it may be ignorant, and whether these of which it is ignorant, may not be the very ones upon which the whole case turns. Many successes, and no failures, give a presumption or probability that the most important elements of the case are known; but no number of instances short of absolute infinity, which cannot of course be arrived at in measured time, however long, can amount to an absolute certainty; as, for instance, though we regard the rising of the sun as an event of which we have not the slightest doubt, yet it would be too much for any human being to assume that the sun shall rise a million of years hence in the same way that it does now. Yet this rising of the sun is a matter which depends wholly upon those physical laws which have been given to nations by the great Author of nature; and therefore our uncertainty with regard to it depends not upon those motions of the earth, which are the immediate causes of the event, but upon the imperfect conception which we have of them, and which throws the uncertainty as much on the one side as on the other,

and renders the negative just as indeterminate to us as the positive.

In the adaptation of the animal to the season, there is never any failure; and hence we must conclude that it is regulated upon principles far more stable and certain than any which can have their foundation in finite reason; that, in truth, they must be part of that holy and immutable law by which the whole of physical nature is so obviously regulated. It is true that we cannot analyze the occurrence, so as to point out what is due to the prepared or adapted animal, and what to the preparing or adapting season. We know them only in the effects of their joint working; and as both are indispensable to that which appears to us, we have no possible means of dividing the result between them, so as to be able to say, that the one is more eminently the object, and the other the agent.

With these considerations to keep us in the right path, we are, in so far, prepared to consider the preparations of the animated races for the Winter. The Winter is varied, and so are the creatures which are prepared for it; and therefore the subject is one of details much more than of general principles. The scorching Winter of the tropical countries is the very opposite of the cold Winter of the polar ones; and, therefore, they require adaptations of an opposite character; and in the case of those animals which have the power of seasonally passing from the one region to the other, they act much in the same way as they do in the case of the transferable atmosphere, of which the two keep up a regular circulation.

But the varieties of animals, in their adaptations to

places and to circumstances, are so many, that it is quite impossible to bring them within the scope of any one general principle. The seasons in the waters and upon the land are very different in the strength of the contrast which they form with each other. In the waters, unless when they are frozen, the seasonal differences are very limited, and their inhabitants require very little preparation for Winter or for any other season. The migrations of the fishes are never, to any considerable extent, climatal or seasonal ones, they are always physiological, and connected with the breeding of the animals—not with the weather. Many of them resort to the streams, the estuaries, and the rivers, in the fall, and some as late as mid-winter, for the purpose of depositing their spawn; so that the Winter is the season when many of them are to be had in greatest abundance, and in the best condition. The different races do, indeed, alternate with each other, and by this means there are always young or fry upon the coasts and banks, which furnish an abundant supply of food for such more advanced ones as come there for the purpose of nature; as the fishes, in very many of their species, depend on the young of other species for their principal supply of food. Thus the most characteristic inhabitants of the sea, those which range in the extent of its waters, go on, season after season, and year after year, very much in the same manner; and at the depth of a very few fathoms below the surface, it is probable that the water has the same temperature all the year round, and summer and Winter are altogether unknown.

In the waters near the shores, and especially in those

which alternately ebb and flow upon the beaches, the case is different, being seasonal to some extent, varying with the latitude and the set of the tides and currents; but even there the seasonal influence is small, compared with what it is upon the land; and as this lessened seasonal influence does not depend upon the action of the sea, which is in itself perfectly equal upon land and sea, but upon the resistance of the water, the seasons of the sun happen later, according to the calendar, than those on the land, and thus the real harvest of the sea is thrown back into the Winter months; and if the latitude is not very high, and the Winter long, the influence of the one year begins to be felt in the sea, before that of the preceding year has ceased.

This fact of a table being spread in the sea and along its shores, for the support of no inconsiderable portion of the land animals, especially those in the high latitudes, at that time of the year when the land is not only barren of food, but when it is so mantled up in the snow of the Winter as to be inaccessible, is one of the most striking adaptations in nature; and, like all the others, it depends upon the most simple causes,—the different obedience which the water yields to the action of the sun, compared with that of the land.

Before the different action of the atmosphere upon the land and the water was so well understood as it is now, there was not a little perplexity in accounting for some phenomena, which now appear to be very simple. We say the action of the *atmosphere*, though that is only the medium, the sun being the agent; but still the modifying influence of the atmosphere is so great,

that the resulting influence upon the earth or the waters, whether it be that the atmosphere has the higher temperature, and the influence is what we call a heating one, or that the atmosphere is the colder, and the influence a cooling one; in either case, the atmosphere conduces so much to the result, that we are strictly correct when we say that the seasonal influence, whether of Winter, of summer, or of any thing intermediate, is atmospheric. We can form no adequate conception of what would be the effect of the rays of the sun, if they came directly to the earth, without that division and deflection into different directions, which they receive in the atmosphere, to a degree of minuteness, bordering almost upon infinitude. But were it not for the extreme dilatation and deflection, and diminution of velocity, which the solar action undergoes in passing through this medium, it is by no means improbable that not a plant could grow or an animal live on any part of the earth's surface. The moon is an example of an atmosphereless planet; and in so far as we can judge of the moon, from its appearance, as seen through the best telescopes, there is not a single growing or living thing upon the surface of that luminary. For these reasons, we may regard solar action and atmospheric action, in as far as heat and light are concerned, as being one and the same in their influence, whether upon the solid earth or the waters, upon both of which, when the state and temperature of the air are the same, the joint influence of the sun and the atmosphere must come with the same intensity.

But the land and the water receive and obey this influence very differently; and this is the cause why their seasons are different, and also why the seasons upon the coast lands are different from those upon inland places. Those differences are general, or belong to those agencies by which every thing that grows or lives is affected, and therefore the consideration of them is essential to the right understanding of every part of the working of the system of nature down to the most minute individual being.

In their obedience to the general action, the land and the water have some analogy to the vegetable and the animal kingdoms in their obedience to the seasons of the year. The vegetable abides the season in its place, and so does the solid earth abide the atmospheric influence. The animal is put in motion by the seasons, and the atmosphere has a similar effect upon the waters.

The motion immediately imparted to water by the influence of the atmosphere, supposing that water to be at rest, or not impelled literally by any current, is a motion in the direction of the perpendicular; and it is occasioned by the volume and consequently the weight of the water, changing with changes of temperature. These changes are of but limited extent, and they are brought about very slowly; but their progress is powerful beyond almost any mechanical resistance which we can assign, and they are productive of some very important results, more especially in the economy of the Winter. The absolute quantity of the water is, of course, not altered by those changes of volume and temperature, for these merely reciprocate,

the increase of the one being within certain limits, proportional to the decrease of the other.

But water has a peculiar property in the relation of the changes of its density by temperature, and it is this which is the foundation of those results to which we have alluded as being of considerable importance in the economy of Winter. Water has a maximum, or greatest density, at the temperature of about thirty-nine degrees of the common thermometer, under the mean pressure of the atmosphere, which is about seven degrees above the freezing point under the same pressure. In cooling water from a higher temperature its bulk diminishes, and the weight of an equal bulk increases, till the thermometer descends to 39°, or more correctly in our latitudes to 39° 2′; but as the temperature shown by a thermometer is merely relative, not absolute, the fraction of a degree may for common purposes be disregarded. After this temperature of maximum density is arrived at, the water again begins to expand, and continues to do so as the temperature is lowered; and when it reaches the point of congelation and crystallizes into ice, there is a momentary change of temperature, effected with great and irresistible force.

It is this power of expansion, after the temperature is below 39°, which makes the water of so much efficiency and value as a Winter agent. Its expansion is very limited, and very slow, excepting at the time when it shoots into crystals of ice. It is like a finely tapering wedge inserted between the particles of the soil, and into the fissures of the rocks, but, like all

wedges that are finely tapering, it is a most powerful one. Even though the cold does not descend so low as the freezing point, the expanding water breaks the clods, not in that rough way which would be done by the stroke of a hammer or any other mechanical instrument, but by acting through the mass and separating it particle from particle. If frost should come and penetrate to any considerable depth, the work of disintegration—one which is peculiarly favourable to the future growth of plants—is of course more completely performed, and the result is correspondingly advantageous; but, whether there is actual frost or not, a temperature below 39° continued for such a length of time as that it shall penetrate the earth to the full depth to which the soil is available for the purposes of cultivation, is of great service in promoting the fertility of the land. Therefore, where the soil is stiff, and apt to harden into clods, the best preparation which the cultivator can make for the Winter, is to ridge up, or rough-plough, or dig the land so as to give it the greatest exposure possible both to the rain and to the action of the atmosphere.

The same loosening takes place by cold in the wild and uncultivated districts as in the arable lands; and where the soil is of a mossy nature, and, as such, takes in a great deal of humidity, the effect is so considerable, that after a frost the soil retains the height to which it has been raised; while the stones—those of such small size as to have been raised by the expansion—sink down again in the thaw, and each appears as if lodged in a pit; and in some parts of the country where the soil is

poor, the climate cold, and the stones often seen in this way when the frost goes off, the stones are accused of raising up the soil,—a species of depredation which they certainly do not commit, whatever effect their own disintegration may have upon it. This may seem a very simple operation; but it really has a great deal of influence in the growth of that vegetation with which countries that have the summer and the Winter in nearly equal balance, are so much more perennially clothed than those which have more of the extreme of either.

The effect of the expansion of water when freezing, in cleaving the rocks, and sometimes entire mountains, are far more striking; and in elevated places which have the Winter severe, we seldom see a bold precipice without the accompaniment of a mass of its own ruins at its base. This happens especially in the case of the clay-stone porphyries, of which great part of the summits, even of very lofty mountains, is formed. Ben Nevis, in the heart of the Scottish highlands, is a remarkable instance of this. Its summit is so lofty that there is scarcely a lichen upon it, and there are comparatively few nights in the course of the year in which the temperature does not sink as low as the freezing point. But from its situation, the current of the Atlantic, which is our warmest current of air, comes upon it with unabated influence; and consequently there is perhaps more freezing and thawing upon the top of Ben Nevis than there is upon that of any other mountain in the British islands, or probably in any part of Europe. The result is, that a vast quantity of the rock has been

broken into angular fragments, which occupy a surface of acres on some parts of the upper slopes, and having a thickness of a good many feet; and those beds of broken stone are so loose, and lie so much on the slope, that any one attempting to walk on them is carried down-hill, to the imminent danger both of his flesh and his bones. The exposed parts undergo new divisions and are reduced into smaller masses in the course of every season. Nor is there any doubt that, in the lapse of years, the portion at the surface will be reduced to a powder, which, washed into the interstices of that below, will form a soil analogous to what we meet with in the angular gravels, of which there are such beds in most mountainous countries, and also in the angular breccias, which are merely such beds hardened into stone; and for the formation of which one could not account by the action of water, or motion, whether of waves and tides as in the sea, of river-currents, or of the more violent action of inundations and floods. In this way the peculiar adaptation of water to the Winter operates in converting the mountain rocks into a soil fit for vegetation, and sending the fragments down to places where a vegetation of some species or other will grow, and yet farther ameliorating the soil, by what it absorbs from the atmosphere in its growth, and deposits upon the earth in its decay.

If the operation were to go on to the full power of the Winter cold, upon the lofty summits and in the high latitudes, the process of division and disintegration would be so rapid that no species of vegetation could work up to it; and the result would be the conversion

of the whole surface into sand as barren as that of the burning deserts of the tropical climates, and far more unsightly and dismal. But here the water interposes in one state to check and restrain the power of destruction which it exerts in another. The cap of snow remains perennial on the lofty summit; and the snowy mantle is thrown over the shoulders of the mountain and the face of the polar land, very soon after the Winter's cold begins to set in. This is another, and very striking instance, of that power of compensation in nature which brings the antidote in the very same agent as the bane.

But this, though a very important work of the Winter, and one which in so far makes the earth its own cultivator in those places which man cannot conveniently or profitably cultivate, is not the one which makes the principal contrast between the times of the seasons in the water and on the land, and so renders the shores and their vicinity prepared places for many of the animals during the severity of the season. It has been said, and we believe that there is *some* truth in the saying, that the more powerful of the ravenous beasts do not attack sleeping prey, just as the cat springs only upon the "stirring mouse;" and in like manner, those animals which have the requisite power of locomotion are drawn away from that nature which Winters and summers on the same spot, during the time that it is enjoying its repose. On the shores of the sea this depth of repose is never felt; and the time of the year at which there is the nearest approach to it is the latter part of the spring and the very early part of the

summer, when the Winter hoards of the sea begin to withdraw into the deeper water, in which most of the finny tribes acquire their chief tone and vigour, and before the breeds of the season have barely made their appearance; and that this approximation to Winter in the sea should occur after the spring has returned and food begins to be plentiful on the land, is another instance of the admirable working of the parts of the system of nature for each other. The slow effect of the seasonal influence upon the sea, compared with what it is on the land, is the chief cause of that difference of seasonal period which makes them reciprocate so advantageously; and therefore the cause and manner of the delay are well worthy of observation.

The chief cause of this difference is the motion upward or downward, which changes of temperature occasion in the water. Of the causes of such changes, as they may operate at the bottom of the sea, or in the body of its waters, we know little or nothing, and therefore we must confine our remarks to the action of the atmosphere, which, though it extends to some depth downward into the volume of the water, may yet be, for the sake of simplicity, considered as a surface action.

Now, the surface of the sea is open to our observation, so that we can ascertain its temperature, and compare it with that of the superincumbent air on the adjoining land. The temperature of the unfrozen sea is never much lower than the freezing point, and not in many places lower than 39°, or the point of maximum density; and generally speaking it is more than this, the average of the whole sea throughout the year being

estimated at more than 50₀, about 52° indeed; but as this estimate does not take in the temperature at the south pole, which must be lower than at the north one, because the polar Winter is longer and more shut up in the south than in the north, it is too high. At every temperature above 39°, cold applied to the surface of the sea causes the upper film to sink down and expose a new surface. It moves downward the instant that the cold affects it; and being in very small quantity it moves very slowly; and as the pressure increases with the depth, it meets with an increasing resistance as it descends. Thus it must stop altogether at some depth; but what that depth is, is not a general problem, but one depending chiefly upon the circumstances of the particular case, and therefore it does not belong to popular description. In very shallow waters, the whole is very speedily cooled down to 39°; and as all further cooling tends to render the water more buoyant, the surface is very soon frozen, as we find it to be in the foot-prints and shallow pools, with only a few hours of frost. But when the depth is considerable, and the surface considerably above 39° when the cold sets in, the process of bringing the water to a stationary condition, so that the cold may reduce it below 39°, is very slow, as the portions in which it descends are so thin, that there are probably thousands, or even millions of them in the inch. Thus, unless where the water is both shallow and stagnant, where the surface is always below 39°, or where there is a nucleus of former ice to begin the foundation, the sea never freezes. It is much the same with very deep lakes, even those which are situated

in rather high latitudes; and there are examples of the same, even in the artificial ponds and ditches to which people resort in frosty weather for the exercise of skating. If there is a spring in the bottom of the pond, especially one which has a deep-seated source, that spring sends up warmer water to the surface, and keeps an opening after the rest of the surface is covered with ice; and if this is also covered at last, and especially if snow falls upon and conceals it, it becomes highly dangerous. A deep pit in the bottom produces the same kind of effect, though not to the same degree; but upon this account it is only the more dangerous, as it is sooner frozen over, and thus it is deceptive when the whole ice is more thin and elastic, and therefore more apt to give way where weakest. Care should be taken that those ponds to which city skaters, who seldom have much information upon natural subjects, are admitted, have the bottom level and without holes, and if the depth of water were six inches instead of six feet, skaiting might be had more frequently and with perfect safety.

Such is the cause of that delay in the Winter on the sea and its shores, which makes it continue to be a source of plenty to many land animals when the supply upon the land fails; and the next point is to inquire which animals are adapted to profit by this supply. Generally speaking they must be animal feeders, or capable of subsisting, in part at least, upon animal substances; for there are not many of the vegetable productions of the sea upon which land animals are fond of feeding, even when they are famished by hunger.

In some parts of the north, however, the sea weeds are cut and gathered as food for pigs, and the cows are driven as regularly to the shores in the Winter as they are to the meadows in summer. Generally speaking, however, the herbivorous mammalia do not resort absolutely to the beach in Winter, unless for the purpose of collecting those remains of land vegetation which the tide may have left deposited there.

The birds, and especially the running birds, which feed upon small invertebrated animals, such as mollusca, worms, and the larvæ of ground insects, are the chief resorters to the shores of the sea during the severity of the Winter; while the different species of ducks collect on the waters, though in the estuaries of the rivers, and especially where the adjoining land is fenny, and the bottom composed of mud, rather than the open seas or the high shores. We cannot say that the Winter absolutely draws the birds to those places, or that the birds come to them because they *know* that there is food to be obtained there. Their general movement is in the direction of the warmer air, just as their retreat from the shores appears to be in the direction of that which is colder. The circumstances which cooperate with this instinct of the birds to move toward the warm air in the Winter, and toward the cold air in the summer, differ with the nature of their immediate haunts, and that of the food on which they subsist; and the physiological causes of the two movements are different. In Winter, or autumn, or whatever season the birds move to the south, their sole occupation till the Winter is over is the finding of their food, and otherwise taking

care of themselves individually. But in the early part of the season, when they move toward the north, they are impelled by the pairing impulse, which heats and excites their system, and, as it were, drives them toward the colder locality for relief. This additional excitement of the system in birds, preparatory to the grand seasonal labour of rearing their broods, is very essential for enabling them to endure that labour, which is great in many species, and absolutely extreme in some. It is, indeed, a store of vigour through the year, and sustains them until the time of the great autumnal moult, when they are again reduced to their individual characters, and have nothing but their personal wants to supply, until more genial climates, or the renovating influence of a new season, shall again arouse them to a repetition of the same labour.

This seasonal preparation of the birds is one of the most interesting subjects in the whole economy of living nature. There are many circumstances which vary it, arising both from the birds themselves, and from climatal and other local causes, so that no general description can be expressive of every particular case; but the nature and object of the impulse are the same in all, and the differences are only in degree. Some birds do not move from the same haunt summer or Winter, except to seek food in one part of their range when that in another part is exhausted; and others dash along upon rapid wing, almost from the equator to the pole; and between these there is every variety. Some birds pair for life, and appear to have what we call an attachment to each other, independently of all reference to

pairing and rearing a brood; in others, the male is totally indifferent to the female during the time of her incubation, and instead of taking any share in the rearing of the young, he is apt to destroy them if they come in his way; and between these two limits again the gradations are very many.

In general, there is least excitement and disposition to range, or make any kind of display previous to the rearing of the broods, in those birds which are attached to each other for life; and those males which are the most indifferent to the young, make usually the greatest display, though they are not necessarily the ones which range to the greatest distances; for, the distance to which a bird ranges on its migrations, appears to depend fully as much on the nature of its food as on any other circumstance. Indeed, before we can arrive at any very clear and satisfactory conclusions upon this interesting subject, there are many elements to be taken into account—far too many for entering into an incidental notice.

The impulse which the birds receive preparatory for their grand seasonal labour, leaves, in most instances, a considerable surplus above what that labour naturally requires. In the early part of the season, this impulse is most conspicuous in the male birds; and it is to it that we are indebted for those varied songs which make the fields and groves so sonorous in the vernal season and during part of the summer, and which in some of the species are partially renewed in the autumn. Birds which pair for life have little or none of this seasonal voice; and the voices of such as inhabit the extensive and deep forests have, in general, but little music in

them; and if they are not harsh and screaming, they are melancholy and monotonous.

But the surplus energy arising from the vernal impulse extends till the year is far gone, and probably it is not wholly exhausted when the new impulse is given. In this latter part of the season it appears to be about equally strong in the male and the female. It carries them through the moult; and strengthens them for their journey, if migrants, or fortifies them against the Winter, if they are not. Even the Winter migrants, unless when they appear to be driven by the violence of storms, contrary to their natural impulse, are in better condition than at any other time; and if they are exhausted by a forced flight of considerable length, they very speedily regain their flesh when they come to a locality where they can procure food at an ordinary expenditure of their energy.

There is something resembling this observable among the mammalia, although their seasonal affections, either one way or another, are by no means so remarkable as those of the birds. This is most conspicuous in the vegetable feeders; though it is no doubt aided by the more substantial nature of their autumnal and Winter food, as long as the Winter keeps open, to that which they have in the summer. Completely ripened stems, even when they have the appearance of being withered, contain much more of substantial nourishment than the green matter upon which those animals chiefly subsist during the summer months. This in part, no doubt, occasions that superior condition in which the herbivorous mammalia are found during the latter part of

the autumn and the early Winter. But there is also a diminished waste of the vital energy of the animals at this season; and there is also that portion of the physiological impulse to which allusion has already been made. In those species which have a long gestation, and in which the pairing is over before the Winter sets in, the impulse given by the remainder of the energy is chiefly in the males, and it is more decidedly in them in proportion as the pairing time is later in the season,—as for instance, it is more decided in deer than in the ox tribe. In the animals of short gestation, which pair in the spring, such as the common hare, the strengthening for the Winter is more equal to the male and the female; but even in them there is a predominance on the part of the former.

In the mammalia, and also in those birds which seek the same situations in the Winter as in the summer, there is a preparation in the covering as well as in the condition of the animal. The succession fur or hair, and the succession feathers, come on earlier according as the animal is more exposed; and the old covering grows to a greater length and remains longer. Mammalia are susceptible of much more change in this way than birds, because they have not the same facilities of changing their residences; and it is probable that the two kinds of hair which appear upon many of the alpine and cold-climate animals, are really caused by a continuation of the same influence of cold which alters the covering of those which are removed from warmer climates to winter in those colder ones. In extreme cases both mammalia and birds change their colours as

preparatory for the Winter, and some of them become entirely white, except a speck or two which remain true to the summer colour, as if in evidence of the identity of the species. Some hybernate, or pass the Winter in a dormant state; though, in temperate latitudes, the mammalia which do this are but few, and of peculiar characters; and there are naturally no hybernating birds. Of reptiles, by far the greater number pass the Winter in a dormant state; and in the case of some, such as the common toad, dormancy is the rule of life, and activity only the exception. In proportion as this dormancy is more congenial to the character of the animal, less preparation seems necessary for entering upon it; and all action, and consequently all waste of the system, are more completely suspended during its continuance. Where it is less continued and complete, the animal is prepared for it by the waste of the system diminishing sooner than the disposition to feed, in consequence of which the animals get very fat before they become inactive; and this fat serves them with what nourishment their system may require, until they are again able to come abroad and find food for themselves. The predatory mammalia, as they are subjected to nearly the same vicissitudes as those animals which constitute their prey, follow nearly the same law in their preparations for the Winter. The chief difference is, that they have proportionally warmer and lighter coverings, which they receive, as their living food requires more labour in procuring than the vegetable food of the others, which of course needs neither stratagem nor chase in its capture.

To return to the birds.—The insectivorous birds are the first to depart from the colder latitudes and the colder climates. They obviously retire chiefly on account of the failure of their food, as they take their departure pretty much in the same order that their favourite food fails. The first to be gone are those which are most exclusively insectivorous, and prefer the soft caterpillars of lepidopterous insects, which are chiefly found on the leaves of deciduous trees, and disappear as those leaves become hard. Among these are to be found the sweetest of our seasonal songsters, the chief part of which are mute or gone soon after the midsummer rains; so that their Winter with us is the very beginning of autumn. Those which feed upon the winged insects of the year, come later and tarry longer than such of the former ones as come in numbers and spread themselves extensively over the country. Their winged food comes later than the caterpillars; and the winged insects have to make provision for the continuance of their race after the caterpillars have disappeared. But they are generally gone before the harvest is over, especially in the late districts. The birds which feed upon small animals in the marshy places, and disperse themselves over the lowland fens and the humid wastes of the uplands, remain still later on their then summer pastures, because their food is not so seasonal as that which is found on the leaves of the trees or upon the wing in the air. They appear to be more influenced in the time of their departure by the severity of the weather, which sends much of their food to such a depth in the ground as that they cannot

reach it, than by its actual destruction for the season. Some of them linger till they are driven by the storms; and in this they are followed or accompanied by the swimming birds of the fresh waters or the estuaries. All of them have upon the average a more polar locality than the insectivorous birds of the summer; and though they swarm in the north in the breeding season, there are many of them that never come so far south as Britain, except as very rare stragglers.

The omnivorous birds, and those which feed much or chiefly upon the seeds of vegetables, are not so migratory as any of the others; but the greater number of them flock in the Winter, and occupy a much smaller breadth of the country than they do in the summer. They come to the corn-fields and other open places, which are then strewed pretty thickly with the seeds both of cultivated and wild plants; and when the weather is severe, or the snow lies thick upon the ground, they approach the habitations of man, the banks of the open streams, and the shores of the sea. Unless the weather is more than usually severe, they remain in good condition all this time, and are ready to begin their songs with the opening of the spring, or even in the Winter, when the days are warm and sunny.

## CONCLUSION.

We have now brought our labours on the four seasons of the year to a close; and when we reflect on the wonderful revealments made in the causes of the succession of each revolution in them, we feel that, with some love of the subject, and a very firm conviction of the usefulness and pleasure of the study of it, we have by no means done justice, either to the principles or the details. It is a subject, indeed, of which no one book—not all the books that could be written, could give an adequate account. It is not even desirable that there should be such a book; and thus the utter impossibility of producing one is really an advantage, instead of being the reverse. "The Book of the Seasons," how irreverently or arrogantly some, in the plenitude of the many folds of "mantle-muffled pride," may appropriate the title, is not a volume to be written by human hand. It is "graven with an iron pen and lead in the rock for ever." The lines thereof have gone forth to all lands, in language intelligible to people of every tongue and language, and in every age of the world; and round the mighty globe of the earth, those lines will be apparent and impressive, until the

command shall go forth to the air, the earth, and the sea, and all that in them is, that for them "Time is no longer," and they must go into the utter darkness of that oblivion from which there is no natural return.

For any one human being to attempt, or even to profess, to furnish an interpretation of the great book of nature,—to translate into the puny language of a child of the dust, a thing "crushed before the moth,"—that which stands written by the finger and in the character of the Almighty himself, would be surpassing arrogance. It would be this in its coexistence, and even in the least active state and the most narrow view of that coexistence, for one day, one hour, or even one moment. It is in every department of nature, and in every tenant of all those departments; and it needs no aid of human speech. As well might man attempt to set forth the power of the lightning in the touch of his hand, or illustrate the hurricane in the breath of his nostrils, as to unfold the system and explain the operations of nature, in any thing that he could say or write: for, the countless millions of tints, and tones, and tastes, and odours, and touches, and indescribable influences to which no man can give names, but whose impression every man feels, wherein nature addresses itself to every sense and mode of sensation, and to each of them singly, and all of them jointly, in the lapse of every moment, and throughout all the moments of unnumbered ages, are far beyond human powers.

The shortest walk—the mere circumstance of coming into the open air, at any time or in any situation, is sufficient to afford to every mind which is imbued

with any thing like a true feeling of contemplation, ample store whereon to meditate for months—for a life-time, however long. Away, then, with the pretence of those who proffer to school us in the knowledge of nature, and let us resort to the fountain-head.

When Alexander of Macedon, who, in many respects, deserved his cognomen of "the Great" more than almost any human invader and conqueror to whom allusion could be made, visited the Cynic Diogenes, and proffered to give him whatever he might ask or desire, "Stand from between me and the sun, and do not take from me that which you cannot restore," said the Sage; and much in the same terms may we address those who, in the slender pretence of their small philosophy, and still smaller taste, would stand between us and the inspiring radiance and cheering warmth which beam upon us from all nature around.

In these four volumes on the seasons, as well as in the four preceding ones on the Heavens, Air, Earth, and Sea, which relate to the coexistent states of nature much in the same way that the present ones relate to its annual successions, my object has not been so much to furnish a guide as to give an invitation; and to express the pleasure which I should feel to be the way-faring companion of every one, who goes forth with willing heart and well-prepared frame, to traverse the lovely realms of nature, and take note of the many sources and subjects of delight which are to be met with there. The highways of nature are ready prepared, open and inviting, and easy withal; and all that seems to be wanting is the setting-up of a few finger-

posts, to wile the unwary away from the by-paths which lead to nothing of interest, and to beacon them to those in which instruction and enjoyment can be found, far more than adequate to the compensating of so easy and so pleasant a labour.

To those who are entering upon the observation and study of nature, not as a trade, but as a source of refreshment in the time of active occupation, and as a retreat to which they may retire and recover their tone when the current of the world sets against them, the chief danger is,—that they may be betrayed into some of the narrow considerations by which mere merchandise is made of that which is fitted and intended for the general enlargement of the mind; and the glorious system of nature, in the freshness and vigour of its own activity, is neglected for the sake of gathering a few cast-off trifles which may be arranged in drawers, and the museum which God himself has founded and furnished with such ample stores, and such certain means of maintaining the whole, is mimicked in the paltry contents of a cabinet.

In this, as in most matters,—and the danger that it may be the case in this is greater than in most others,—the desire of mere possession very generally destroys the whole of the pleasure which would be otherwise obtained, and obtained without money and without price. Even in those matters which, according to law and the usage of society, are, or can be made property, and secured, as the cant phrase has it, "while grass grows or water runs," by *entail*—notching to prevent sliding off, or any other of those exquisitely ludicrous

means, by which mankind, finding that they cannot convert three score and ten years into an immortality, attempt to secure countless generations against the consequences of those aches which grieve their own bones, —even in them the legal proprietor does not hold the title of the pleasure and enjoyment. Cares and anxieties beset him on every side, so that the little tent of a gipsy, with the light-heartedness of that singular and unhousable Nommade, would often be paradise compared to what is felt in his gilded chamber, and under his canopy of the most costly stuffs—the down all too hard for his dainty bones—by the encumbered legal possessor of wealth which he never could have won.

But if this is true in those cases in which there are all the rights of legitimacy, and all the sanctions of law, so that no vulgar step shall intrude, how much more must it be the case in the wide and glorious field of nature, which is free alike to every man. The most successful conqueror,—he who spoils the greatest number of his fellow-men of their goods, and bereaves them of their lives, and for so doing has his likeness in most appropriate stone set up within the church, and his blood-stained banner displayed over the altar,—even he cannot extend his subjugating arms to the more exalted glories of nature, or the more mighty laws which the system obeys. The mightiest monarch that ever trod the earth, and in so doing trampled on the dust of his fathers, was never able to forbid the fall of a single raindrop, or command the seasons to alter one iota of their course; and all the laws of nature are immeasurably above his edicts. He is also drawn away from these

things; and, if the veil could be removed, the probability is, that the most envied of the human race would be found to be the most wretched. There is no savour to their pottage, no raciness in their cup. They can command all that they know; and, in consequence of this, desire sickens, hope withers, life becomes extinct, the successor is the idol, and their very memory is blotted out.

These circumstances are mentioned, from no desire to lessen the esteem in which the parties alluded to are held by the majority of the world; for they have their uses—and no unimportant ones, in society,—and therefore they are more worthy of the consideration and support of generous and right feeling men, than of contumely of any other description, for if they have their peculiar honours they pay for them at a rate, of the extent of which they are, in all probability, but little aware. And it may be well for them that they are not, for if they were to know it to its full extent, their condition would be altogether insupportable.

The chief object which we have had in view is the illustration of the fact, that the world of possession, and the world of knowledge and consequent enjoyment, are very different matters. The first belongs to a comparatively limited portion of mankind—at least as forming their distinctive and most valuable, or at all events, most valued characteristic, upon which their status in the world mainly depends. The second is free to all, so that all may enjoy the pleasure of it, without money and without price, if they will only prepare themselves for so doing, or to speak more correctly, will not spoil

the preparation which is natural to them. It has this farther recommendation to the great body of mankind, that it is much better suited to the industrious than to the idle—to those who labour than to those who have nothing to do. By the one class it can be enjoyed at *any* time; and therefore, according to a very general law, or at least practice, of human nature, it is enjoyed at no time: to the other class it is always new, in those little snatches of time which they can devote to it; and, as there is but little in very many of the pursuits of man, to give the mind a fair share of occupation along with the body, and farther, as the unoccupied mind is always in danger of wandering into vanity or vice, and reaching upon the body and paralyzing the hand of labour, it is desirable that every one should have some mental resource to keep the mind in order and the body in tone, even when the wheels of routine business are trundling most swiftly.

But in order to render the great system of things a constant pleasure and ever ready retreat for us, as its whole structure, as well as our own, shows to have been the beneficent purpose of the great Author of both, it is necessary that our attention should be directed to it as a living and a working structure, and not merely as a collection of individual parts. Active nature is the proper study for active men, and the details of its still life are fitter for the dull and the idle. Aware of this fact, I have endeavoured so to frame the hints in this volume and its three co-annuals, as to draw the attention of the reader far more to agencies and modes of action than to the details of the materials which form the instru-

ments in the action, or description of the phenomena or the productions which form the result.

Throughout the whole of the series, I have never omitted to point the attention to the grand truth of what is incorrectly called Natural Theology—the feeling of an ever-present, all-wise, and Almighty God, to whom, as the maker and governor of the system, every part of it has a strong and obvious tendency to draw us near. But I have endeavoured to express those hints in terms so very general, as to avoid all clashing with any of those points of dispute, upon which men come so sturdily to issue in religious matters, and in which they cannot be all in the right, and probably the far greater number are in the wrong. In such parts of the volumes, my province and my endeavour have been, to show that the sincere in heart and the willing in mind may receive the advantages—the theological as well as the physical advantages, which result from a knowledge of the great principles of nature, with actual profit, whatever may be their differences in the details of their creeds—details which, *possibly*, some of their own number do not very clearly understand. This may not flatter any party; but it appeared to me as the best that could be adopted for offending none; and besides, as the one which is really the most useful in itself.

To prefer either of the two modes of studying the works and the workings of nature,—that is, studying them in their coexistence in space and in their succession in time, would not be easy, and it is not necessary, as both of them are highly desirable, well calculated for promoting activity, virtue, and intelli-

gence, and for preventing or restraining indolence, vice, and ignorance. To a certain extent, too, they come equally within the scope of every body's observation, although in this respect the advantage appears to lie on the side of the successional view of the matter. The localities of observation are much confined to many of the human race; and the productions of nature as co-existent in any one state as on the average of their characters without reference to time, are soon either exhausted, or they become so familiar as to cease to be objects of excitement; and if the party wishes to pursue the subject farther, this can be done only through the medium of books, the connexion between what is stated in which and real nature in any one limited place, is neither so close nor so inviting as might be desirable.

But, by means of the seasonal changes which, at most times and in most situations, go on regularly, or at all events progressively from day to day, the face of nature is new to us every morning, not only when we are in the country and have a wide and varied horizon, but even when we are in the heart of a city, and must confine our notice of terrestrial nature to the cage-bird in the room and the flower-pot in the window, with the cat on the hearth-rug for our barometer,—the electric sparks from her back answering to "set fair," and "set frost," and the ablution of her countenance with her paw, to "much rain" and "very stormy," with perhaps nearly as much accuracy as the marks on the scale of the instrument; for very often that philosophy which is held in such wondering esteem by the world, does not consist

so much in knowing more of matters than other people do, as in having a more incomprehensible way of speaking about them ;—any puddle looks deep, if muddy.

When we add the consideration of locality on the surface of the earth to that of succession in time, and also bear in mind how the hemispheres reciprocate with each other in the different seasons, our field for contemplation becomes greatly extended and varied; but as these variations all depend on one set of causes, or rather upon a single compound cause—the position of the earth's surface with relation to the sun, the explanation of the one of them suggests, and in so far supplies, that of the other; and thus, although the seasons are, upon any one day of the year which we can name or select as a standard, very much diversified in any one locality, still they are parts of one great whole; and the one cannot be fully understood without a reference to the other.

It is farther to be borne in mind, that although we are in the habit of speaking of the beginning and the end of the year, and calling the first of January its first day, and the thirty-first of December its last, yet that, in so doing, we speak according to an artificial calendar of our own establishing, and not according to any thing in nature, either celestial or terrestrial, which answers to these two days; the year is a constant circle, always beginning in some of its phenomena, and ending in others, but never coming to a pause, or being without all the varieties of the alternating seasons, at one place upon the globe, or another. Thus, though, in our gratitude for the stores with which the season

rewards our labours, we say that the year, at a particular season, is crowned with the bounty of God; yet, in truth, it wears that all-radiant and joy-dispensing crown at all seasons and in every clime.


THE END.

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