Come, gentle Spring, ethereal mildness, come;
And from the bosom of yon dropping cloud,
While music wakes around, veil'd in a shower
Of shadowing roses, on our plains descend.

* * * * * *

Be gracious, Heaven! for now laborious man
Has done his part. Ye fostering breezes, blow!
Ye softening dews, ye tender showers, descend!
And temper all, thou world-reviving sun,
Into the perfect year!

THOMSON.

SPRING.

SPRING;

OR,

THE CAUSES, APPEARANCES, AND EFFECTS

OF THE

SEASONAL RENOVATIONS OF NATURE,

IN ALL CLIMATES.

By ROBERT MUDIE,

AUTHOR OF "SUMMER," "AUTUMN," "WINTER," "THE HEAVENS," "THE EARTH," "THE SEA," "THE AIR," &c.

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FIFTH THOUSAND.

LONDON:
JAMES BLACKWOOD, PATERNOSTER ROW.

PREFACE.

THERE are three distinct modes of human knowledge, even when the subject of such knowledge remains the same, each of which is both valuable and necessary, but no one of which is perfect, either for use or for enjoyment, without the others. These three modes, or parts, if the word is preferred, are as follows: First, the knowledge of things and events, in their particular or individual characters and appearances. This is the foundation of the others; and, therefore, it must precede them, in the case of an individual, of a nation, or of the whole human race, as supposed to be in a state of progressive improvement. It is, as one would say, the foundation of all the rest; but, like other foundations, though there can be no structure without it, it is still the lowest part of the structure. The parts of it may be ever so many, or in themselves ever so valuable, but there is not connexion among them, and for this reason they are useless. The rolling pebbles on a shingly beach are, in all probability, composed of exactly the same materials as the solid rocks of the caverned shore,

which breast or are bathed in the deep water. But while these sturdy rocks are fertile in sea-weed, and peopled by innumerable animals, there is not even a sprout of alga, or the smallest rudimental shell, upon the rolling pebbles of the shingly beach. In like manner, the earth of the fertile valley of Egypt,* in as far as it is mere material earth, which has come directly from the rock, without passing through the action of life either vegetable or animal, is in all probability the same as that which forms the great desert of Sahara, and all the deserts in the north of Africa. But Egypt has from the earliest ages been famed for its fertility; and these deserts, wherever the name can be fully applied to them, are utterly barren of vegetation.

Why, where the substantive materials of these places are exactly the same in substance, should there be this exuberance of life and growth in the one, and this perfect and unalterable sterility in the other? The question answers itself; there is no bond of union, no means of connexion between pebble and pebble on the shingly beach, or between particle and particle of the sand on the desert; and therefore it is that the shingly beach and the sandy desert are barren of vegetation, and destitute of life. But, once let there come a connecting matter, a *vinculum*, or tie, of any kind, which shall unite the loose pebbles or the loose particles, and enable the element to which they are exposed

* Earth of the fertile valley of Egypt, chiefly brought down from the mountain tracts by the ceaseless waters of the Nile.

to act upon them as upon one whole, and then the characteristic vegetation and life, which accords with the element, the climate, and the locality, will speedily make their appearance, and attain their perfection.

In the case of that knowledge which applies only to individuals, it is exactly the same. It is barren of usefulness, because there is no vinculum—no connection between the parts; and, therefore, it requires something in addition. This brings us to the other two modes:

Secondly, the relations of the individual subjects of knowledge in their co-existence, or as they are found at any one time, without looking backward for those experiences which, used with judgment, enable us to look forward. This is, in its very nature, indefinite and inexhaustible: indefinite, because the extent of it depends on the number and nature of the subjects of individual knowledge possessed by the party to whom it is intended to be useful; and inexhaustible, because there is really no end to these subjects of knowledge. All, therefore, that can be done, so as to be adapted to the public generally, is really little more than showing the way by means of a few of the more general examples. This I have slightly attempted in the four small volumes on the "Heavens, Earth, Air, and Sea," the sale of which leads me to infer that they have been found not merely readable but useful; and it also encourages me to treat the remaining mode of knowledge in the same general and simple way; which attempt is

embodied in the present volume, and in the other three which I intend shall follow it. This mode of knowledge is:

Thirdly, the relations of the subjects of knowledge in their succession in time, and chiefly as they follow each other as effects from causes. Some metaphysical subtilties have been raised about the relation of Cause and Effect; but they can hardly be regarded in any other light than that of ingenious mental trifling, the time spent on which would have been much more profitably devoted to something else; for the parties entertaining them always acted upon the very same principle of cause and effect as other men, which showed that their doubts and disputations on the subject were neither useful nor real.

In this mode of knowledge, as in that of the relations of co-existence, little more can be done than showing the way. In this respect it is, indeed, more indefinite than the other. We can have testimony of much of the absent, and living testimony of not a little of it; but of the past in succession our living testimony is limited, and of the future we can have none whatever. But all our enjoyment is in the future, the past being irrevocably gone, and the present sliding away from us before we have time to question it. The future is, therefore, the portion of succession, in which all of us have the deepest interest; and to that—in matters of human knowledge, upon which we have no direct revelation given—we have really nothing to guide us but these very relations of succession, which we can obtain from the

experience of the past, and from that only. The third mode of knowledge, therefore, is really the important one—the one especially without which the others can be of no use. It cannot exist without some individual knowledge according to the first mode, and some knowledge of the relations of co-existence according to the second; but still the ready application of a limited portion of knowledge in the way of cause and effect, tends to make man more valuable, both to himself and in society, than a much greater accumulation of knowledge without the capacity of applying it. This is proved by the very generally established fact that men of abundant and ready memory, especially in small matters, are generally weak or wavering, and not unfrequently erroneous, in their judgments.

That some degree of this mode of knowledge is common to all mankind is proved by the fact, that they all proceed upon it, from the very earliest period of life, and the very earliest stage of society. But this, as is the case with all the faculties and aptitudes of man, only shows that it admits of cultivation—not that it does not stand in need of any, but rather the reverse.

Neither of these modes of knowledge, and not that of the relation of succession especially, can be properly brought home to the mind of the reader in a treatise upon any one particular science or branch of knowledge, how important soever that may be in itself, or how ably soever it may be treated; because any attempt to blend two

subjects of equal importance in the work would necessarily confuse both; and besides, this relation of succession is general, and though almost every subject may be brought in illustration of it, it cannot be properly illustrated by any one subject. Succession of some kind or other must always be the means by which it is brought before the mind.

The succession must be one which is recognised by the great body of mankind, if the explanation is intended for general use; and the nature of it must be striking if it is intended for the young, or the otherwise imperfectly informed, who are in search of knowledge by inviting, plain, and easy paths. These are the societies for whom chiefly I write, because there would be no small arrogance, and very small thanks, in attempting to school the learned, even if one had, as one at times will have, a slight conviction that they are not altogether without the need of it. I have accordingly chosen the succession of the year, nominally divided into the *apparent* seasons of Spring, Summer, Autumn, and Winter, as a subject for illustrating the relation of succession, in like manner as I have chosen the allocated departments of material nature, the Heavens, Earth, Air, and Sea, for illustrating the general principles of the relation of co-existence. And, I would have stated this in the preface to "The Heavens"—the first published of the former series, had it not been that I wished to try the effect of one part of my attempt before making any specific declaration of my general object.

In alluding to the four seasons, I have made use of the word "apparent;" and I have done so advisedly: for though this is the conversational mode of speaking on the subject, among those who have their seasons pretty strongly marked, yet it is not descriptive of many parts of the globe, and it is not strictly true of any of them. A season of waxing to maturity and a season of waning to repose, are really the only two seasons which affect the successive states of everything seasonal upon the earth; and they may occupy the whole year, or less, or more, according to circumstances. In some of the insect races, they are probably not a day in length, in some plants they are not a month, in some they are an age; in a continent, they are beyond our calculation; and in a planet they are beyond our imagining; and, to understand any of those, in so far as it is understandable, would require a very different induction of circumstances.

These, and many other successions, are constantly blending themselves with each other in nature, so that it is impossible to be natural, and consequently to be popular, if one of them is taken apart from the connexion. Thus, in treating of SPRING, we must see how it arises from WINTER in the preparations made for it, and also trace its passage into SUMMER in its results; and we must notice also the varied successions of the causes and energies. A systematic appearances of Spring would probably have a much more scientific air; but in this volume, as in former ones, my

object is but a humble one—it is to open the gate, so that all may enter, to assure them that the way is pleasant and profitable; to bid those be of good cheer, and to wish them good speed; well knowing that if I succeed in this, my labour, though unentitled to distinction among the learned, will not be everywhere wholly in vain.

ROBERT MUDIE.

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SPRING.

CHAPTER I.

INTRODUCTORY REMARKS AND REFLECTIONS.

"Thy beams are sweet, beloved Spring!
The winter-shades before thee fly,
The bough smiles green, the young birds sing
The chainless current glistens by
Till countless flowers like stars illume
The deepening vale and forest gloom."

From the Danish of Thaarup.

THERE is not, we believe, in the English language, or in any language now spoken, or ever spoken by the human race, a word which calls up more varied, or more delightful emotions, than the word SPRING. On the present occasion, we are to use it with reference to that season of the year of which it is so beautifully expressive. But when we take a word with us, and attempt to use it as the key of knowledge, it is not only desirable, but necessary, that we should clearly understand the nature and power of this word.

The same season of the year which we call "Spring," is differently named in other languages; and, in several of them, the greenness which comes upon the face of nature during this delightful season, is made the foundation of the

name, and, by necessary consequence, the descriptive attribute of the season. The greenness, however, is a mere consequence; and though the emerald buds upon the hedge and the reviving grass on the meadow, are in themselves delightful, they are not the Spring, they are merely some of its most ordinary effects.

The word Spring is not the name of any one production or appearance of nature, however delightful, instructive, or gratifying that production or appearance may be in itself. It is the name of the *action*—that emanation of almighty power, which, working by laws which God has ordained, and upon variously constituted matter which he has reated, produces all the beauty and all the renovation which are embodied in this little word.

There are few words in the language which have so many and so appropriate applications as this same word Spring; yet it in all its varied uses, there is one general meaning which it always carries along with it. It always means a beginning—something done of which we cannot further trace the cause and nature; and thus it brings us immediately to the footstool of the throne of our God, and shows us where human knowledge ends, and the worship of the Eternal begins.

The "spring" of the air causes that element to bear upon and to support everything on the earth's surface. In the air and in many other substances, this spring or springiness is known by the name of elasticity, which means that which can of itself (*elatio*) rise up, recover its state again, after that state has been changed by external circumstances. Still, however, this is true to the general meaning of the word spring, even as we apply it to the year. The Spring, wherein nature returns to its vigour and its verdure, after the desolation of the Winter, is literally a rising up or uplifting of those principles of life and of growth with

which the Creator has so bountifully endowed his creatures; and though we use the word spring as the general name for the season, yet the peculiar and proper meaning of it is, the exertion of those powers wherewith plants and animals are endowed.*

When we look around us, and give our calm and serious consideration to everything that we see, we cannot fail to discover that spring, or elasticity, is the grand source of all material action; and that our contemplation of it is final as regards created things, and brings us immediately to the acknowledgment and the adoration of our God.

Let us return to the spring or elasticity of the atmospheric air, which air is the breath of life to us while we are in the body, and consider very briefly the part which it performs, under God, in the grand economy of terrestrial nature. So delicate is this spring of the air, that it yields to the gentlest pressure, and returns to its former state the instant that this pressure is removed. Heat makes it vibrate far more sensibly than the most delicate balance which can be constructed by mortal hands; and, as we shall afterwards have occasion to notice, those vibrations are the immediate causes of those changes of seasons which make

* The fine old poet Giles Fletcher has well expressed this in his poem of "Christ's Triumph and Victory," even although we now know that swallows do not hybernate, as in his time they were supposed to do.

"The engladdened Spring, forgetful now to weep,
Began to eblazon from her leafy bed;
The waking swallow broke her half-year's sleep,
And every bush lay deeply purpured
With violets; the woods' late wintry head,
Wide flaming primroses set all on fire,
And his bald trees put on their green attire,
Among whose infant leaves the joyous birds conspire."

the year so delightfully varied. The air presses as a spring, and at the same elevation from the earth's centre, and under the same action of light and heat, it presses equally in all directions, upwards, downwards, and laterally. Its average rate may be estimated at about fifteen pounds of our common avoirdupois weight upon every square inch of surface; so that the body of a man of ordinary size is supported by a spring or pressure of about thirteen tons. This pressure acts so equally upon all sides, that it always ministers to protection. On this account, when a man falls, the spring of the air lets him down gently; and were it not that he is surrounded by this all-yielding, yet all-resisting substance, one tumble to the earth would break him like a potsherd.

Everything else is supported in a similar manner by the spring of the air; and were it not for this spring, the plants, and even the buildings would fall prone upon the earth—no winged creature could make its way through the air—and the world, and all its kingdoms, would be motionless, and, by necessary consequence, dead.

Without this spring of the air, we could have no well-spring of water from the rock; and our pumps, our steam-engines, and our furnaces, by which the stubborn earth is converted into metal, and civilised man turns the contents of the deep-seated mine into the ploughshare, the pruning-hook, and every tool of the artificer, would be in vain; for in all these, and in countless other cases, it is the means which we possess of winding up the spring of the air, and again allowing that spring to recoil and unbend itself, which enables us to carry on our working.

The spring of a watch, a clock, or any other moving instrument, is another remarkable illustration of the use of this extraordinary word. In all such springs, there is a power inherent in the spring itself, capable of performing

its operations without the immediate intervention of man. The two principal springs of the watch are not only curious in themselves, but they are capable of being made the means, or the memorials, of some useful instructions. They are both made of steel, and steel acquires its springiness by being hammered on the anvil, thereby shadowing forth to us that the more the spirit of a man is hammered on the anvil of adversity, the more elastic it should become in returning to the true line of rectitude. God hath been graciously pleased to give us the steel when he "breathed into our nostrils the breath of life," the very emblem of elasticity, or the rebounding or recovering power of a spring. That he hath seen meet to try us in the furnace of worldly affliction, and to beat us on the anvil of worldly care, should only teach us to be grateful to Him for having implanted in us that which can be purified in the fire, and gain strength and elasticity under the hammer.

Of the two springs of the watch or clock—for the principle is the same, whether the instrument is portable or not—the one is called the main-spring. It is a narrow ribbon of steel, coiled up in a little brass box. The axis or arbor of the box is fixed in the frame-work of the watch, so that, though the box turns round upon it, it does not itself turn round. One end of the spring is fastened to this, and the other end is fastened to the circumference of the box. In winding up the watch, the box is turned round by the chain being coiled upon another piece of the machinery, which is called the fusee, and the effect of this is to wind the spring tightly round the arbor, and so treasure up its elasticity to be used as a power during all the interval between the windings of the watch. When the key is withdrawn, the spring reacts, pulls the chain again from the fusee, puts the whole wheelwork of the watch in motion, and would run it down in a little more

time than is occupied in winding, were it not for the counteracting influence of another spring.

This last is the balance-spring, and there is a beautiful, and by no means an uninstructive moral, in the effect which it has in restraining the impetuosity of the other. The balance-spring is usually seen on that side of a watch which is opposite to the dial. It is a small steel wire, very elastic, and coiled round and round the balance with a number of turns, at some distance from each other. In fine watches, it is an exceedingly delicate piece of mechanism, and in order that it may vibrate to an equal extent in the smaller coils as in the larger ones, it has to be fashioned with a degree of nicety which no instrument can measure, but which must depend alone upon the hand of a workman of the utmost skill and experience. There is something worthy of remark in this; the hand is an instrument of God's making; and, worthy of its maker, it can perform operations far more delicate than can be performed by the nicest instruments that man can construct. Hence, as God has bestowed upon us the glorious gift of this hand, a gift which is quite unrivalled among the things of this nether world, surely we ought to employ it, and that with all diligence, in promoting his glory, and the good of his creatures.

This balance-spring does not, like the main-spring of the watch, exert one continued influence. It is acted upon and overcome, and it again reacts and overcomes the power which overcame it; and this is that which regulates the motion of the watch. In a common watch, for we need not fatigue ourselves with those of more elaborate construction, there are two little levers, called pallets, projecting from the arbor of the balance, and forming an angle with each other. These lock into the tooth of the balance-wheel, and were it not that from the form of these teeth they bear more on the one side than on the other, they would hold it

fast. But in consequence of the unequal pressure produced by this means, the tooth of the balance-wheel, urged on by the train of the watch, from the moving power of the main-spring, presses the one pallet, and coils up the balance-spring, so that the tooth escapes from the pallet. The instant this takes place, the balance-spring is free, and it recoils, by the force of its elasticity, and seizes and stops another tooth of the wheel with the opposite pallet; and it is not till the power of the main-spring has accumulated some effort upon the train, that the wheel can pass another tooth, or the watch make another beat, as it is called. Thus, between the constant action of the main-spring, and the alternate bending and unbending of the balance-spring, the watch goes regularly, according as it is constructed and set; and if either of these springs should fail in the performance of its office, the watch would become a useless toy. We have entered somewhat at length into the explanation of the springs which move and regulate this most useful little instrument, because they are not without their moral lesson to us in some points of our conduct as men. We have seen in the watch, that if the main-spring were left to its own action, without control, the watch would run down in little longer time than what is required to wind it up, and thus it would be perfectly useless as a time-keeper. But the balance-spring, duly adjusted and properly applied, prevents this, and distributes regularly over the twenty-four hours that action of the other spring which, but for this regulation, would exhaust itself in a few seconds. The desires and passions of mankind bear some resemblance to the main-spring of the watch: they are wound up by various excitements; and, left to themselves, they would run down in vanity and dissipation, and derange the whole machine. But reason, and still more revelation, is the balance-spring, by the proper application of which, the life of man should

and can be regulated; and under the proper government of religion, it may go regularly, and keep time during the appointed time of human life. It is thus that dumb things admonish us as to what is our duty; and the goodness of the Creator plants a tongue in everything about us, so that if we have wisdom to profit by it, "day unto day uttereth speech, and night unto night proclaimeth knowledge;" and there is no shadow or turning where the willing ear may not hear the voice of instruction.

Such is one simple instance of the application of the word spring; but though we have purposely taken this as purely mechanical, and wholly under the control of man, the word has far more numerous and extended meanings. In all of these it alludes to the origin. When we say a spring of water, we always allude to that primary source which supplies the fountain; and when we would more emphatically describe the purity of a brook or rivulet, we call it "the daughter of springs," thereby implying that its waters are pure and original. The early dawn is the "day-spring;" youth is the spring time of human life; and all growth or increase, whether in corporeal volume or in mental acquirements, is aptly described as a springing.

The day-spring is new to us every morning, and such is its beneficial effect upon the human feelings, that they who are apt to meet it the most frequently, always have the liveliest sense of its freshness. This is a very every-day matter, and, as is apt to be the case with every-day matters, we generally pass it unheeded; but were we wise, and did we take proper heed of what constitutes our real happiness upon earth, we should prize the day-spring above every worldly enjoyment of the day.

Even those who have been travelling, or watching and weary, during the night, find the breaking of the dawn come upon them as a spring-time of life. The head may previously have been heavy, the hands folding for sleep, and the whole body inactive and drowsy, and thought entirely at a stand; but the first pencil of light which the coming sun throws on the upper air, tells upon every nerve of the body, and every feeling of the mind, before it is visible to the eye; and one starts unconsciously into vigour and capacity of action, in the same manner as though roused from a sound and healthful sleep. They who are strangers to the early dawn, and who slumber till the sun has arisen in his strength, do not know how delightful a world God has made for those who are up betimes, and enjoy the morning. There are some situations in which the morning view is very superior; but there is no situation where the cheering influence of the day-spring cannot find out and refresh those who are awake, and alive to its impression. Even in the dungeon where the captive is confined, and on the cold earth without a pallet of straw, or even a stone on which to rest his head, the morning finds him out, and brings a new ray of hope to cheer his drooping spirit.

Unquestionably there is something in this refreshing influence of the day-spring, which human philosophy cannot explain. It is not the light falling on the eye, or anything which produces a specific effect upon any one sense. It is like the Spirit, one cannot tell "whence it cometh;" but its passage is to the heart, and its effect there is most renovating, and most delightful. There is even matter for much philosophical reflection in it, though it refers to points of philosophy all too deep for our common understandings; but which strongly tempts us to inquire into it, as one of the most extraordinary displays of Almighty wisdom and power. Every one in the least conversant with the most

simple principles of natural philosophy, is of course acquainted with the decomposition of the solar beams by means of the well-known instrument, a triangular prism of glass; and the seven primitive colours, reduceable, however, into three, red, yellow, and blue, into which the *spectrum*, or image of a beam of solar light, is divided by that prism. Many must also be aware, that when the coloured spectrum is obtained, there is a different distribution of solar heat over the various colours which compose it. The prism refracts the beam of light, or turns it into a different direction and each part which is differently coloured yields differently to the refractive power of the prism. The red light is the most stubborn, and the others pass away through the orange, the yellow, the blue, the purple, and the violet, until the margin is an indescribable grey, to which no descriptive name can be given. Now at the end of the spectrum, and absolutely without the red colour, the heating power is the greatest, and it diminishes along the spectrum, at the margin of the grey it vanishes, and a power of an opposite character appears to occupy its place. This is too fine for common observation, and too shadowy for being made matter of ordinary philosophy; but there seems no doubt that beyond the purple and the grey there is an energy in the solar beam, which is the very opposite or antagonist of the energy of heat. It is the grey which first comes to us a visible signal of the day-spring; and before this visible sign, there is no doubt a viewless emanation from that chosen instrument of God in the earth's economy, the glorious sun comes down to prepare nature for his appearance—

> "I saw the glorious sun arise
> O'er yonder mountain grey—"

and that, could we so write it in words, and so demonstrate it by experiments, this is that voice of the morning which,

though inaudible to the ear, and untranslatable into the words of ordinary language, brings renovation and refreshment to every living thing.

There is another ground for this belief, which must be familiar to every one that loves the country, (and who is there in nature that knows the country and does not love it?) The night may have been dewless, and the drought of day may have continued upon nature during the hours of darkness; but just at the day-spring, and before visible light has tinged the east, there shall be dew upon every bud, and every blade of grass, as if the earth were anointed in preparation for the appearance of that mighty creature which God has appointed as the regulator of its economy; so that when the sun at last beams forth, and light and shadow give to the morning landscape that power and that beauty which are unknown at noonday, all nature is fresh and sparkling; and he who has the good fortune to be a-field betimes, beholds, reflected from the dew-drops, colours far more radiant and more rich than are to be found in all the cabinets of jewels of all the monarchs upon earth.

A single dew-drop, however small, furnishes in turn gems of all imaginable colours. In one light it is a sapphire; shifting the eye a little, it becomes an emerald; next a topaz; then a ruby; and lastly, when viewed so as to reflect the light without refracting it, it has all the splendence of a diamond. But to obtain this beautiful display of natural colours, it is necessary to take advantage of the morning, when the beams of the newly-risen sun are nearly level with the surface of the earth; and this is the time when the morning birds are in their finest song, when the air and the earth are in their greatest freshness, and when all nature mingles in one common morning song of gratitude.*

* Our poets often allude in their descriptions to the dew at this

There is something peculiarly arousing and strengthening, both to the body and the mind, in this early time of the morning; and were we always wise enough to avail ourselves of it, it is almost incredible with what ease and pleasure the labours of the most diligent life might be performed. It is true that we require sleep to recover the tone of the body, so that it may perform its duty without weariness. But sleep, like everything else, may be indulged in to excess; and, like all excesses, the extra quantity counteracts and destroys the effect of that portion which would in itself be wholesome. But besides this, there is an awakening of the mind in the morning, which cannot be obtained at any other time of the day; and they who miss this go heavily about their employments, and an hour of their drawling day is not equal to half an hour of the energetic day of one who sees the sun rise. When, too, we take the day by the beginning, we can regulate the length of it according to our necessities; and whatever may be our professional avocations we have time to perform them, to cultivate our minds, and to worship our Maker, without the one duty in the least interfering with the other.

Such are a few very simple considerations connected with that day-spring which every individual of the human race may enjoy, and improve by, three hundred and sixty-

time; take for example either Burns, or the Ettrick Shepherd, when singing of the lark—

"Alas it's no thy neebor sweet
The bonnie lark, companion meet!
Bending thee 'mang the dewy weet
Wi' spreckled breast
When upward springing, blythe to meet
The purpling East."

five times in the course of every common year; and no enjoyment is more pure, and no improvement more fertile in the seeds of future improvement. The subject is, however, far better adapted for contemplation than for description, only we should do well to bear in mind, that time once lost is never found, either in itself or in a substitute; and therefore every morning which we neglect is an utter loss to us, and an abridgement of our usefulness and our enjoyment.

The day-spring of the morning leads us, by an easy and very natural transition, to the day-spring of human life, the morning of our sojourn upon earth; and the parallel between the commencement of the life itself, and of those successive days by which it is numbered, is a parallel the most striking. There is a freshness in young life, which no experience can acquire for us at any future time; and there is a newness in every object, which is not felt after years have passed over our heads. Our bodies are light, flexible, easily moved, and not liable to be injured. Our minds, too, never become wearied or listless; and although the occupation and the thought are necessarily different from those of persons of mature age, they are far more energetic, and what is learned or done takes a more permanent hold of the memory.

There are many circumstances which render the morning of life of far more importance than the morning of an individual day. It is a morning to which no to-morrow morning can follow; and therefore, if it is neglected, all is inevitably and utterly lost. We cannot exactly make up the loss of even one morning, though we can repair it a little by our diligence on future mornings. We must bear in mind, however, that the means of doing this is a mercy to us, and not a privilege that we can command as our own. We never "know what a day may bring forth;"

and as there daily occur around us instances in which the young and the strong are at once levelled to the dust, we never can be certain that the demand shall not be made on ourselves—"this night is thy soul required of thee." But if it is thus perilous to neglect one morning out of many, how much more perilous to neglect the one morning of a life—a life granted by a beneficent God, in a world full of the wonders of his power, capable of enjoyment, and doing him service while it lasts, and in the fulness of time entering, through the atonement of the eternal Son, a life of bliss which shall have no end!

If there is peril in human life it is here; if there is warning in the condition of man, it here speaks to the conscience in voices of thunder. But to the individual this morning of life is a time of feebleness and inexperience, so that if left to himself in the early stages of it, the individual would perish of bodily helplessness; and at a more advanced stage of it, mental helplessness would be equally fatal. We find, however, in this, as in everything, that the goodness of the Creator is suited to the weakness of the creature; and that the rearing of the young body, and the education of the young mind, are given in charge to parental affection, which, in well regulated minds, is perhaps the strongest and the most continually operating propensity in human nature. The natural propensity is fortified by the express commandment of God, and that commandment is rendered endearing by the promise with which it is accompanied: "Train up a child in the way that he should go, and when he is old he will not depart from it."

It would be foreign to our purpose to point out any special mode of training, because the training of human beings must always depend on the circumstances in which they are placed, and those circumstances are continually

varying, both with place and with time. There are one or two points, however, which it is impossible entirely to overlook. The training is to be in the way he should *go*, not in the way he should be *led*. Hence the training should be that of an independent being, one who has to find his subsistence in the world, discharge his duties well in society, and seek his own salvation and eternal life through faith in Jesus Christ. Those are the three grand points which lay the foundation of the general character, independently of all education or training for special purposes; and if parents, and they who have the charge of the young, neglect these, or perform them partially or carelessly, they stand before the judgment-seat of an all-seeing and all-searching God, as guilty of perilling the temporal, and the eternal security of his helpless and innocent creatures. There is a short passage in the twelfth chapter of the book of the Ecclesiastes, which gives so urgent a view of the necessity of improving the morning of life, that we shall quote it as a conclusion to our brief remarks on this application of the word Spring: "Remember now thy Creator in the days of thy youth, while the evil days come not, nor the years draw nigh, when thou shalt say, I have no pleasure in them; while the sun, or the light, or the moon, or the stars, be not darkened, nor the clouds return after the rain: In the day when the keepers of the house shall tremble, and the strong men shall bow themselves, and the grinders cease because they are few, and those that look out of the windows be darkened, and the doors shall be shut in the streets when the sound of the grinding is low, and he shall rise up at the voice of the bird, and all the daughters of music shall be brought low; also *when* they shall be afraid of *that which is* high, and fears *shall be* in the way, and the almond-tree shall flourish, and the grasshopper shall be a burden, and desire shall fail'

because man goeth to his long home, and the mourners go about the streets: or ever the silver cord be loosened, or the golden bowl be broken, or the pitcher be broken at the fountain, or the wheel broken at the cistern. Then shall the dust return to the earth as it was; and the spirit shall return unto God who gave it."

There is one other metaphorical sense of the word Spring which it may not be irrelevant to notice previous to our entering upon the appearances peculiar to the spring of the year, and the causes of those appearances. The spring of the morning is for every day individually in itself; the season of Spring comes round every year that a man lives; and though the spring time of youth is single and unrepeated, still it is personal to every individual of the human race. There is, however, a spring more general, more mighty in its application, and more lasting in its nature, than any or than all of these: "THE DAY-SPRING FROM ON HIGH," has visited the nations; and "THE SUN OF RIGHTEOUSNESS has arisen with healing under his wings," shedding a radiance which purifies and warms, and which shall never be extinguished. This is the glorious spring, the dawn of immortality, the triumph over the last enemy of mankind. And as the Spring of the year is welcomed in by flowery garlands, and the songs of the choristers of the grove; so is this Spring celebrated by casting the emblems of cherubic power before the footstool of the Heavenly Throne, and by the quiring songs of the angelic host, and of the saints, washed from their sins in the blood of their Redeemer, in multitudes which no man can number. "And I heard," says St. John, "a voice from heaven, as the voice of many waters, and as the voice of a great thunder: and I heard the voice of many harpers harping with their harps: And they sung as it were a new song before the throne, and before the four beasts and the

elders: and no man could learn that song but the hundred and forty and four thousand which were redeemed from the earth." These are the mysteries of the celestial abodes into which we are unable to look, further than is declared unto us in the words of revelation. But the good tidings did not rest here; for the same inspired apostle proceeds, "And I saw another angel fly in the midst of heaven, having the everlasting gospel to preach unto them that dwell on the earth, and to every nation, and kindred, and tongue, and people, saying with a loud voice, Fear God and give glory to him; for the hour of his judgment is come: and worship him that made heaven and earth, and the sea, and the fountain of waters." And again in another place, "The seventh angel sounded; and there were great voices in heaven, saying, The kingdoms of this world are become the kingdoms of our Lord, and of his Christ; and He shall reign for ever and ever. And the four and twenty elders which sat before God on their seats, fell upon their faces, and worshipped God, saying, We give thee thanks, O Lord God Almighty, which art and wast, and art to come; because Thou hast taken to Thee thy great power, and hast reigned." "And the temple of God was opened in heaven."

Those passages which have been quoted, contain in brief, though figurative description, an embodiment of the three grand epochs or events in the plan and promulgation of the gospel dispensation: First, there is the declaration in heaven delivered to the heavenly host only, and not to be learned by any others, except through the means which God saw meet to appoint. Next comes forth the other angel, flying in the midst of heaven, to preach the everlasting gospel to men of all kindreds, and tongues, and nations. This embodies all the predictions of the prophets from the time of the first promise of Divine grace to fallen

man, that "the seed of the woman shall bruise the head of the serpent." It goes on to the fulness of time, when the Saviour was born in Bethlehem, follows him in all his ministry upon earth, and includes the glorious institution of the Christian Sabbath, on the day-spring of that ever memorable morning, when he rose, triumphant over all the powers of sin and death, leading captivity captive, to the right hand of the Father in the highest heaven, and giving evidence of the finished work of human redemption. Nor does it stop here, for it accompanies the church of Christ in all her vicissitudes, and remains to this day, and will remain to the end of the world, to all those who are saved by grace, through faith, of the gift of God.

The third epoch is, in human contemplation, far from the least delightful of the whole: the voice of the trumpet proclaiming in heaven, that the kingdoms of the world had become the kingdoms of our Lord, and of his Christ; and that he—the Trinity, Father, Son, and Holy Ghost, one mighty and mysterious God—should reign for ever and ever; and every race of men, of whatever clime and whatever colour, should know his law and obey it, and partake in his salvation.

And it is delightful to think, that in these latter times there is not a zone or a climate where the word of salvation has not been proclaimed; and they who aforetime sat in the region and shadow of death, have seen the glorious light, and are rejoicing in it. Yes, everywhere the idol is mouldering within its temple, and the people are journeying, with jubilation and with song, to the heavenly Zion, with their faces thitherward. Nor must we forget to be grateful that the goodness of God has made our little isle of the sea so effective an instrument in the spread of the everlasting gospel; or that wherever the Sabbath sermon, and the morning and evening hymn have been heard, "there have fallen, as it were, scales" from the eyes of the erewhile

blinded nations; and the promise of the Saviour has been gloriously fulfilled: "Seek ye first the kingdom of heaven, and all other things shall be added to it." For whithersoever the light of the gospel has come in its purity, it has been followed by an increase in all the arts, and sober enjoyments of human life, unknown under any other circumstances.

All this is exceedingly delightful, and it is refreshing to the mind, to "stand still and see the salvation of God." Yet, notwithstanding, man is naturally the same fallen and frail creature as ever; and hence it becomes necessary, not only that the hand of diligence in proclaiming the truth should not be slackened, but that it should be exerted more than ever. The field has increased most extensively; so that millions are now thirsting for the bread of life, where only thousands thirsted a few years ago; and it is not only desirable, but it is the bounden duty of every Christian, and must be the labour of love to every one upon whom the truth is come in demonstration of the Spirit and with power, to take his proper share in this good work.

And there is a field for every labourer, however high or however humble; and they who are not called upon to speak the word with their voices, may still administer the written word in such a variety of forms, as to adapt it to the ability and capacity of every one. A volume, a little tract, a single page, nay, even one text of Scripture, may awaken the conscience of some one, and bring them to the truth; and the value of a brand plucked out of the burning, will return and bless the donor, in his person, his household, and all that concerns him.

For the furtherance of this most important and highly desirable end, it were to be wished that every book which addresses itself to the general reader, and aims at contributing its part to the formation of the general character,

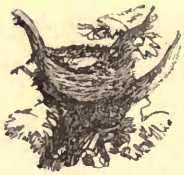
should contain its admixture of religion; not of the mere acknowledgment of a creating God, which is inseparable from a rational view of any of the works or workings of nature, but of the gospel doctrine of salvation through the atonement of Christ, and the impossibility of being saved by any other means. No doubt there are some works upon special subjects, alluding entirely to the civil occupations of mankind, their conduct to each other in civil society, in which this might seem out of place; though, perhaps, even in these it might appear to advantage more frequently than it does. But when the book is intended to speak to man, in his general conditions and relations, as one of God's creatures, it seems very imperfect, and very improper, not to address him as one conversant with the truth of God's revealed word. Christian charity always leads us to desire that every one may feel and conduct himself as impressed in his heart with the knowledge and importance of divine things; and, therefore, any lesson purporting to be given to him, which does not reach this part of his character as well as the rest, is clearly imperfect; and because of the omission, the other parts of it cannot fail to be less palatable and less pleasing to him than they otherwise would be.

There are many other reasons why books for the general reader should address themselves to him, not merely as a rational being, but as immortal; and if there are any subjects upon which this mode of address is more desirable than others, they are the productions and the appearances of nature. All that grows or lives, all that shines in the heavens, and all that occurs in the natural succession of days and years, are not only more open to the observations of people generally, than any other subjects, but they are more inviting. We live in nature, and we are part of nature; for everything connected with our mortal being is dependent upon natural causes. It is, therefore, next to

impossible, for even the most dull and illiterate of the human race, to keep the thoughts of nature entirely absent from his mind. Those, too, who have learned to observe and to think, even though slightly, find much of their meditation and pleasure in natural subjects; and we invariably find that, in favour with the intelligent part of the community, books on such subjects are second only to those which are necessary for pointing out the way of salvation.

Now it is not possible to devote much time to nature, without having the thoughts turned to the God of nature; and under these circumstances, if the student of nature is not informed respecting the character and attributes of the God of revelation, and the doctrine of salvation through the cross of Christ, he stands in much peril of falling into a certain species of idolatry, which is both pernicious and difficult to be got rid of. Sublime and delightful as the study of nature is when pursued aright, it is not in itself capable of furnishing any knowledge of the true God as revealed in his word. It does, however, as has been said, necessarily and strongly impress the mind with feelings of a God; and if there is no guidance of the truth, that God can be thought of only after the manner of men, and is in reality as much an idol of man's making, as if molten in brass, or chiselled in stone.

We have judged it expedient to offer these few remarks as prefatory to a brief notice of the leading appearances of the Spring, with their causes and effects; their influence upon man, and the demonstrations which they afford of the wisdom and goodness of the Creator. We have done so, not with a view of formally explaining the doctrines of the Christian religion, but simply of showing, that one who is ignorant of that religion is in no fit condition for studying nature; and having done so we proceed to the details of our subject.



CHAPTER II.

GENERAL CHARACTERISTICS OF THE SPRING.

THE earth is so extensive, the surface of it so varied, and all the changeable parts of nature in a state of such continual change, that it is impossible to give any general account of a season, that will apply to that season at almost any two places, on any two days, or for any two years. This is a difficulty which meets us in the study of every department of nature. All the parts are so linked together, and each of them receives so much of its character from the others, that we cannot take them apart, study each by itself, and make our knowledge of it a complete and definite treatise, as we can do in the case of human inventions and human works. But this difficulty, so far from being a disappointment, is fraught with encouragement and with wisdom. It is encouraging to feel convinced that any one department of nature will remain as fresh, new, and inviting to us in the fiftieth year of our study as in the first. It is instructive in the highest degree, to feel at every glance and every thought, that creation is one system, the workmanship of one God.

If we look upon natural productions and natural appearances, merely in their individual characters, we can neither feel this encouragement nor profit by this instruction. For this reason, the connexion of substance with substance, and event with event, is the portion of the history of nature which leads to general wisdom, and which is, therefore,

useful to all men, without any reference to their stations or employments in life. If we do not attend to this, it is all in vain, for the purposes of enlightenment, that the lines of our life are cast in even the most pleasant places of the earth. The fairest prospects and the most lovely productions may be constantly before our eyes, and yet we may not see one of them as rational beings, who are accountable to God for all his goodness, ought to see them. It is the same with every other sense of the body; all the wild notes of nature may fall in succession upon the external ear, and yet the ear of the understanding may be perfectly deaf to them. So the sweetest perfumes of nature may be wafted to the nostril on the purest and most refreshing breezes, and yet they may leave no more impression than the wing of a butterfly leaves on the summer air.

That this is the condition of but too many, a very little observation may teach any one; and yet this indifference is so completely destructive of our very best enjoyments, that it should be our constant and our strenuous aim to avoid it. Whenever we have acquired this means of avoidance, so as to be able to make the mind accompany the senses, we have mastered the grand point of education; and to help the young and the ignorant in this, ought to be an object in every book, and every means of instruction. But nature, the creation around us, in its charms and its changes, is the general subject of everybody's observation, and therefore we are especially bound to take good heed, that the mind of the reader should be aroused and carried along in all that is written upon natural subjects. To the more isolated facts, the senses of the most unlettered peasant are as new as those of the most profound philosopher, only the mind of the former takes no hold on them, and their memory perishes like that of the beasts. If, indeed, we could suppose a total stillness of the mind, a state in which there

were no thought produced by the impression on the senses, the party would be reduced to the constitution of a mere animal. It is not merely our temporal pleasure, our rational enjoyment of this wonderful world; for it perils our eternal condition more than the unthinking are aware. "God is a spirit, and they that worship him must worship him in spirit;" but if the spirit is not called forth in all matters in which the body is exercised, we can have no certainty that it is awake and interested in devotion itself; and if this is not done, the mere words of the lip, whatever be their strain or their amount, are but as "a sounding brass, or as a tinkling cymbal."

And we have the highest and holiest example and authority, for blending the study of nature with that of religious knowledge; making "the law," not the moral law, as given from Sinai only, but every law of God as revealed in creation, "a schoolmaster to bring us to Christ." Take up the gospels, read them with that attention which their sacred import demands; and mark if the Saviour himself does not make nature the constant subject to illustrate those divine truths which he taught. The constancy with which this is done, is of itself one of the strongest proofs of the truth of his sacred mission. Well may it be said of him, that he "spake as never man spake." He spoke the whole Godhead—God the Creator, God the Redeemer, and God the Sanctifier, in one unbroken and unbreakable harmony. Man, however God has endowed him, and implanted in his breast desire, and afforded to him opportunity for the acquirement of knowledge, must necessarily fall short of this glorious example, but the commandment to all of us is "that we should follow his steps," how great soever may be the distance.

A very little reflection will show that the language of nature is the only language in which a general address

could be delivered to the human race, in every age, every nation, and possessing every degree of mental acquirement. Addressed to fallen man for the purpose of bringing him to God, it is necessary that the words of invitation should be not only intelligible, but inviting to those who have yet no spiritual discernment. This could not be done by anything merely human; for the habits, the tastes, and the occupations of men are so continually varying, and also so varied at different places, that illustrations drawn from them could have no permanent or general effect; and, consequently, the only subjects of illustration which remain, are the productions of nature, and the laws or general principles, in virtue of which they put on their several appearances.

Bearing these few remarks in mind, and they are necessary to be carried along with us in all our contemplations, we shall turn to the leading phenomena of the Spring, and the substances and agencies engaged in the production of those phenomena.

The phenomena, as we have said, do not admit of general description in such a manner as to be useful; and therefore we must come to the details of them, prepared with some general principles which shall enable us to link them to our memories, and use them for pleasure and for profit. The most general description that we can give of the Spring, is that it is a revival of nature in all those parts of it which have growth or life, or any way minister to one or to both of these. But the revival is so grand, and so different in its results at different stages of it, that it will not describe, but must be observed. This gradual passage from one state to another is found in every movement of nature, whether that movement lasts for a season, a moment, or a long period of years. In every case where it is not too rapid for our observing it as anything like a continuous duration, its individual steps are always too fine for our observing, or

our counting. Some plants will shoot up to the height of several inches in the course of twenty-four hours; but were we to watch them every moment, we should not find the slightest difference between the two consecutive momentary states. It is the same with ourselves. Our mirrors, our friends, and, as life ebbs away, our infirmities, admonish us that we are getting old; but we never have a spontaneous feeling to the same effect; so far from it, we attempt to drive age onward before us, and within ourselves, we question or doubt the truth of the monitors. Life, in short, is our passage from the cradle to the grave, the details of which must be sought in our daily conduct. In like manner Spring finds the world in the gloom of Winter, and conducts it to the full-blown beauty of Summer; but steps of this progress must be observed by everyone for himself in his own locality. This revival of the Spring, shows itself to us only in the result of motion of some description or other, whether the successive steps of that motion, or the actual progress of it, be or be not discernible by our senses or our instruments.

The leading motions, or more strictly speaking, the leading substances which are moved, for we can observe motion, or the effect of motion, only in a moving or moved substance, form the simplest parts into which we can analyse or separate our very vague and general notion of the revival of the Spring. The doing of this is attended with considerable difficulty; because we hardly know anything of some of the elements, and our knowledge of some of them is partial. There is one fact, however, which limits our consideration to its proper sphere. The appearances and phenomena of the Spring, and of every season of the year, are entirely terrestrial, taking place on the earth itself, and not in any way affecting or influencing the sun, the moon, the planets, the stars, or any other celestial bodies. It is

true that the light and heat of the sun are the grand stimuli to the revival of the Spring, but the sun is not lighted up anew, in order to prank our meadows with flowers, clothe our groves with verdure, delight our ears with songs, and sinew our frames with vernal breezes. The sun is in itself exactly the same at every period of our year; and for aught that we know, it has not undergone any change since the Almighty set a tabernacle for it in the heavens, and will not undergo any change until the same power shall quench it in utter darkness.

How, then, some may ask, is the varying action of the sun the cause of all the vicissitudes of the changing year? The answer is a short one; but as there is some general instruction in it, it may be well to dwell a little upon it, and consider how much of the appearance of things depends on the things themselves, and how much on our position with regard to them. This page, we shall presume, is legible at a moderate distance, varying with the age of the reader, or the natural form of the eye. Lay it close on the nose and forehead, or remove to the distance of a yard or two from it, and not a single word will be made out or a letter seen. But the page is all the while exactly and identically the same, and if you bring it back into the original position it is just as legible as at the first. Hold your finger upright, and as close to your eye as you can distinctly see it, and look towards a tall tree, a high steeple, or even a lofty mountain, and the finger will appear to outmeasure each and all of them, and to outmeasure them the more as they are further distant. Walk up to any of them and apply the finger, and see how different the felt reality is from the visible appearance. Now, the eye, the finger, the tree, the steeple, or the mountain, are exactly the same in the one case as in the other; and the only thing that has shifted is the relative position of the observer.

This faculty of the eye, by means of which it tells us a different story with every change of our position, is a necessary result of the structure of the eye as a material organ, and of the properties of that light which is the medium of vision. This led the late Dr. Edward Young to place in his garden a very striking, though somewhat quaint, lesson. There was an object placed there, painted so skilfully, that, seen from a distance, it appeared an arbour with a most inviting seat; but upon walking up to it, it proved to be nothing but a painted board, inscribed with words to the following effect: "Unseen things never deceive us."

We need not multiply instances, or give any in the case of the other senses, or of the action of any other natural causes, of whatever kind they may be: The effect which any one body or substance in nature produces on another may be changed, either by changing the relative situation of the object, or the power of the actor. Upon this principle the changes of the seasons can be just as readily produced by changes in the situation of the earth, as by changes in the sun; and that they are so produced, may be found demonstrated in any work on astronomy to which the reader pleases to refer.

This, as we have hinted, very much lessens the range of our inquiry into that general action which produces and characterises the Spring. It enables us to regard the sun as a constant power, which not being changed in any seasonal or other changes upon earth, may be left entirely out in our investigation of the causes of those changes.

In what manner this constant power of the sun acts upon the earth, and by what means, in the earth itself, its variations, which cause the Spring and the other revolving seasons, we shall be better able to see afterwards. But we may mention, in the meantime, that there is no action of

the sun, and much less can there be of any other celestial body, except by means of natural causes, which are as completely part of the regular system of laws by which God governs the material creation, as the falling of a raindrop, or the growth of a plant. All these bodies are known to us simply as matter, and not in anywise as mind; and, consequently, all their properties, and all their action, must be material.

Hence, that pretended science known by the name of Judicial Astrology, once one of the most powerful fears and fetters of the human mind, and still not altogether exploded, even by those who have some claims, at least to the appearance, of scientific information, cannot, in the very nature of things, be anything else than a delusion and a cheat.

The foundation of this false science consisted in this, that certain positions of the planets, with regard to each other, and to their apparent places, as seen against the fixed stars at the time of a man's birth, not only contained an exposition of the future character and conduct of the man, but could be read as legibly as a printed book, by adepts in the astrologic mysteries. In the judgment of reason, this is impossible and absurd; but it belongs to a class of absurdities, by means of which the crafty and unprincipled have, in all ages, practised upon the credulity of the weak, for purposes the most disreputable. On this account, it ought to be held up to that scorn which it merits; and exploded by the only means adequate to such a purpose—the careful exposition of the true laws of nature, according to unprejudiced observation, and the revelation of holy writ.

After we clearly understand that the action of the sun upon the earth, and all its productions, is a natural action, and that, in so far as the sun is concerned, it is an

unvarying action, we are in a proper condition for studying the seasons in a useful manner. We have said, that all changes in plants, in animals, or in anything else, within the scope of the material creation, are results of motion of some kind or other; therefore, the revival of the Spring must be the result of motion, as well as the rest are. Thus our inquiry is reduced, in the next step of it, to an answer to the question, "What moves?"

In the first place, the whole earth moves, without any reference to the particular character of the parts of its surface, or of what grows or lives upon them. The motion here is twofold; the one part belonging entirely to the earth, without any regulation of its whole volume by the sun; and the second restrained by, and obedient to, the force and influence of solar gravitation. This is the diurnal or daily rotation, in which the earth turns round upon an imaginary line or axis passing through its centre every twenty-four hours in the direction of from west to east. As this motion depends upon the whole mass of the earth, we have no reason to believe that it is not perfectly uniform, or that every twenty-four hours, as measured by the earth itself, is of exactly the same length. We have, however, no means of ascertaining this, because we dwell upon the earth, and cannot stand apart from it, so as to take note of its motions. We are thus reduced to judge of the length of time from the interval between the sun's, or some other luminary's, appearing successively in a certain direction, say in the south. This is not quite uniform, though in the case of the sun it is nearly so; and we know that the causes of its variation have nothing to do with the rotation of the earth upon its axis, but belong to the earth's other and more complicated motion.

This other is the "annual" motion of the earth, so called from the Latin word, *annulus*, which means a ring which

surrounds, and, metaphorically, the operation or process of sun-rounding. Our word "year," has exactly the same meaning, and yearly is the name of the operation of enclosing.

The daily motion formerly noticed, does not necessarily imply that the earth moves a hair's-breadth from its place, considered as a whole, or alters in the least the earth's general position or situation with regard to the sun; and this is the reason why it has nothing to do in bringing about the revival of the Spring, or any other change of the seasons. But it is very different with the annual motion. This is performed in the direction of from west to east, as well as the other. But it is impossible that one body, of whatsoever dimensions, can move yearly, or round about another, without travelling in space. Ninety-five millions of miles is the average distance of the earth from the sun, as nearly as such a distance can be measured; and this makes the length of its yearly path, taken in round numbers for the sake of easy remembrance, about six hundred millions of miles, or not very much less than two millions of miles in a day. The circumference of the earth, or the measure round it, is about twenty-five thousand miles, which is only about the eightieth part of its average daily travel in space; and yet the latter, taken at the equator of the earth, is more than a thousand miles in the hour, and, consequently, the earth's hour motion in its annual path is at the rate of more than sixty thousand miles.

We speak of twenty, or even ten miles in the hour, as a rapid motion; and if the rate is more than twenty, objects near at hand pass us so rapidly, that we have no clear discernment of them. But if an object, a mile breadth, were to travel past us as rapidly as the earth travels in its annual path, it would pass our field of vision in less than

the sixth part of a second, which is too short a time for giving us any information of it by the same.

It might seem at first sight, that this has nothing to do with a proper understanding of the Spring, or of any other season. Such, however, is not the case. The effect produced by material causes, diminishes as the motion of that which is acted upon increases in rapidity; and all the means of action with which we are acquainted upon earth, would not have the slightest visible effect upon any body or substance whatever, if moving at even a tenth part the rate at which the earth moves. But notwithstanding this astonishing rapidity of motion, the beams of the sun not only tell upon the whole organisation of the minutest thing that grows or lives, but they tell upon every particle of the viewless air, and upon those germs of life, which no eye and no instrument is able to trace. Not only this, but those wonderful beams are obedient to every variation of the surface of the earth, or of its position; and if even one leaf is moist and another dry, the sunbeam will find out the difference and produce the corresponding effect in each. This extraordinary property is briefly but beautifully expressed in the nineteenth Psalm; and this is one instance in which the words of inspiration are in remarkable accordance with the fact in nature. The Psalmist says, "There is nothing hid from the heat thereof;" and this is literally true, as far as observation can be carried; nor is there any doubt that this great influence of the sun strikes through and through the globe of the earth, and influences every particle of its mass, in the performing of that office to which God has appointed it. Thus we have abundant evidence of the immensity of that power which produces the revival of the Spring, and how competent it is to the performance of its great and varied office.

Our next step, therefore, is to consider those peculiarities

of the earth's annual motion which so diversify the action of this immense and constant power, as to cause Spring and the other seasons to come round at their appointed times, and in their appointed degrees in different regions. In doing this, we shall be under the necessity of introducing one or two words of more technical character than we could have wished to use, but we shall be as sparing in their use as possible.

When a body rotates on an axis, as the earth does in its daily motion, and also when it revolves, as the earth does in the course of a year, there is always what is called a "*plane* of motion." The meaning of plane is, a surface perfectly flat or level, not applied as meaning the surface of any material body, but as simply a surface, length and breadth, without any thickness. When we speak of the plane of motion of the earth, or of any celestial body, we never think of the limits of the plane, but regard it as having position in space, and not any boundaries.

This position in the case of a body turning round on an axis, and not necessarily changing its position in space, always has reference to the axis of motion. It is at *right angles* to it, which means that the axis does not lean toward the plane, in one direction more than another, which is but another means of saying that it does not lean to the plane at all. Perhaps it may render the expression a little clearer to those not conversant with such subjects, if we say, that when a body rotates on an axis, no part of it either rises above, or descends below the plane of motion.

There is another circumstance, to which it is desirable to attend here, in order to get a clear view of those simple and beautiful motions of the earth, to which we are indebted for the Spring and the other seasons of the year. We mentioned that, by the very definition, a plane has no

thickness, and therefore it is not fixed to any absolute position in space; but that if we suppose the axis which it crosses to be upward at the one end, and downward at the other, the plane may be understood to be raised in the first of these directions, or lowered in the second, as far as can be named, provided that it is not understood to lean to one side more than another.

This is, perhaps, as simple an explanation as we can give of the earth's daily motion and its plane. But we may further remark, that the earth's axis, though it changes its situation in space, changes its direction very little; so little and so slowly indeed, that it has no traceable effect upon the seasons, and therefore we may pass it by as too nice for our purpose. And we may say, that the earth performs its three hundred and sixty-five and a quarter rotations, with its axis always in the same position, and its plane of motion always the same; and this is the first and simplest branch of those motions of the earth, which we must well understand, taken singly, before we can be prepared for understanding their joint effect. Let us now proceed to the other motion.

The annual motion of the earth is round the sun, at an average distance, as we have said, of about ninety-five millions of miles; but as the sun has no motion corresponding to this, and as none of the other planets move at the same rate as the earth, there is no axis of motion in this case. The path which the earth would describe, if there were anything on which it could leave a trace, is called the *orbit* of the earth, which also simply means that it is round, or nearly so. This orbit of the earth is not a perfect circle, though it does not differ much from one, and the difference in this respect has but a slight influence upon the seasons. With the exception of some disturbances, which are also too slight for requiring us to notice them,

the orbit of the earth lies in one plane; that is, if a perfect level surface were applied to it in any three points of its path, this surface would touch the earth in every other point of the orbit. This is, of course, the plane of the orbit, or the plane of the annual motion; and it is by the difference in position between this plane, and the plane of the daily rotation, that the Spring and all the seasonal changes are produced. If the direction of the major axis or longest diameter of the earth's orbit is taken, then the plane of the annual motion is inclined to that of the daily rotation, at an angle of about twenty-two degrees and twenty-eight minutes of a degree, so that the axis of the earth's rotation is inclined to the plane of the earth's orbit, at an angle of sixty-six degrees and thirty-two minutes, the one way, and at an angle of a hundred and thirteen degrees twenty-eight minutes, the other way.

The influence of the sun comes to the earth in straight lines, and always in the direction of the plane of the orbit; because, as the sun is the centre round which the earth revolves, the sun is necessarily in the plane of the orbit.

The extremities of the major axis, or longest diameter of the orbit, are those in which the earth is situated at midsummer and midwinter; and as there are two of these points, with half of the orbit between them both ways, the fact of the earth's being in them, tells in an exactly opposite manner upon the two hemispheres, or halves of the earth's surface, divided on the plane of its rotation, and of course having a pole or extremity of the axis of rotation in the centre of each. We distinguish these poles as north and south, and each of them is the remotest point from the equator, or circle upon which the hemispheres are supposed to be divided, in its own hemisphere.

The action of the sun, not taking notice of any effect that

may be produced on it by the earth or the atmosphere which surrounds the earth, always falls upon half the earth's surface, and no more. The consequence is, that when the earth is at one extremity of the major axis, the solar influence falls for the twenty-four hours upon twenty-three degrees twenty-eight minutes, in latitude as measured upon the earth, around the pole which is inclined to the sun, or where the axis makes an angle of only sixty-six degrees thirty-two minutes of the orbit.

At this time, however, the opposite hemisphere is very differently situated. Its pole is turned a hundred and thirteen degrees twenty-eight minutes of the earth's latitude from the centre of the solar influence; and as the hemisphere of that influence is only ninety degrees from centre to boundary, twenty-three degrees twenty-eight minutes around that pole must be without the sun's influence for the whole twenty-four hours.

But, as the plane of the orbit, and direction of the axis, remain with little or no change, the pole, which is inclined toward the sun at the beginning of the one half of the revolution, must be inclined from the sun at the beginning of the next half-year; and so on alternately—the midsummer of the one, and the midwinter of the other, happening at the same time.

In order that the explanation may be as plain as possible, let us suppose that we begin our consideration at the point where the pole of the northern hemisphere, or hemisphere in which Britain lies, is directed from the sun; and this will of course be our time of midwinter. This being understood, if we take the earth at the opposite extremity of the axis, it will be midsummer in our northern hemisphere and midwinter in the southern one. As years roll on, these extreme differences of season between the two hemispheres alternate with each other at half-yearly intervals, whether we reckon

from the northern to the southern, or from the southern to the northern.

In passing from the one extreme of twenty-three degrees twenty-eight minutes around either of the poles, having continual day, or presence of the sun, to the same space round the same pole, having continual night, or absence of the sun, all the intermediate states must be gone through; and the mean between them must be a state in which no portion of the earth's surface has either day or night for the whole twenty-four hours, but when these hours are equally divided between the one and the other throughout the whole earth. As we said of all natural changes from one state to an opposite one, this change must pass through intermediate degrees far too delicate for our observation, though there are some circumstances, which can be more effectively explained afterwards, that render the rate of change variable at different stages of its taking place.

What we have stated will, we trust, be sufficient to explain to those who are not conversant with such subjects, that application to each other of the two motions of the earth, which brings about the sun and all the other seasonal changes. At the medium points between the extremes of alternation, which are called *equinoctial* points—from the equality of day and night in every latitude at those times,—the momentary influence of the sun is the same upon both the northern hemisphere and the southern one; and were it not for the continued operation of the former inequality, these would be the times of mean season in both hemispheres.

The equinox which happens on the twenty-first day of March, is called the vernal equinox; and from the time of this to our midsummer the influence of the sun upon the northern hemisphere is increasingly greater than on the southern. This happens about the 21st of June. From

this time the influence of the sun upon the northern hemisphere continues diminishing till the autumnal equinox, about the twenty-third of September; at which time the momentary influence upon both hemispheres is again equal, though the modified influence which results, is affected by the previous state of things.

From the autumnal equinox, the sun's influence becomes greater on the southern hemisphere than on the northern, and continues to do so till our midwinter, which is about the twenty-second of December, and after this it continues to lessen on the southern hemisphere, and to increase on the northern one, until the vernal equinox is again arrived at, and the momentary influence upon the two hemispheres is again equal. These motions, in their regular succession, produce all the seasons, of which our conventional distinction, Spring, Summer, Autumn, and Winter, is more imaginary than real. In as far as the sun is concerned, there is a waxing of solar influence upon the northern hemisphere, and a waning the same upon the southern, during the half-year from December to June; and in the other half of the year the waxing is upon the southern hemisphere, and the waning upon the northern.

Whether the changing position of the earth to the sun, arising from the change of the angle which the plane of the rotation makes with the plane of the orbit, produces a return of solar influence to the one hemisphere or to the other, some time always elapses, not only before the effects of the change begin to be apparent, but before the previous effects have ceased. In like manner the energy upon either hemisphere does not begin to slacken exactly at its midwinter; nor are the mean temperatures at the astronomical times of the equinoxes. These differences between the observed states and the astronomical times, do not depend upon any difference whatever in the solar influence taken

upon the earth as a whole. We have no means of estimating this originally and in itself; for a sunbeam is so exceedingly swift, that it will not linger till the most expert of the human race is able to make a single experiment upon it. We can judge of the action only from the effect produced upon terrestrial substances; and this is so different on substances of different kinds, and there are so very many substances differing from each other in so many ways, that it is impossible to state anything with precision on this part of the subject. We are in consequence reduced to actual observations, in places differently situated and circumstanced; and these are so complicated, that nobody has yet been able, or in all probability will ever be able, to generalise them in a systematic and satisfactory manner.

Still, the real seasons of each hemisphere are reduced to two—a season of increasing action, and one of decreasing. It is when the former has acquired a certain degree of strength, and produced certain effects upon the susceptible parts of nature, that we call it Spring. A greater degree of strength we call Summer. The first marked decrease is Autumn; and the last one Winter. But none of these is distinctly marked from the other; they differ in different latitudes and countries, and even in the same country, during different years, in their various lengths and characters.

Spring is unquestionably the most variable of the whole; and the one most difficult to characterise. It is easy to make calculations as to what should be the character, the time, and the duration of the season in all latitudes, if there were no element in the calculation but the unvarying action of the sun, and those changes of the earth's position with regard to the sun, of which we have given some account. But such calculations are never near the observed truth; though they are a sort of approximation, and serve

as a general framework on which to arrange our observations of particular places.

One reason why Spring is more variable and less manageable in this respect than any other season, arises from those parts of nature, upon which the sun has the chief influence, having most work to do in the Spring. Cultivation must in some measure be put aside, if we would understand the seasons; for a skilful cultivator is always able to work to the weather, at least in some of his labours. Putting this aside, Spring is the season of toil both with wild plants and wild animals; and the more marked the seasons are in any country, this toil is the more severe.

Almost all our natural plants, except the fungi, which are in a great part autumnal, and those plants which keep growing at all seasons, if they have enough of moisture and not too much cold—these excepted, our wild plants make the greater part of their growth in the Spring. They also have the beginning of their annual growing then. In every case it is more difficult to start, than to proceed after starting. There is also more danger to plants at this season than at any other. The young bud is always tender; because the different parts of which it is composed have just come out of their winter hiding-places, and are not inured to the weather. They are not hurt by cold alone, but also by too severe exposure to heat or to drought; and the weather is generally so unsettled at this time, that though its changes are evidently healthful upon the whole, they are severe and even fatal in many instances.

Spring is also the busiest time of the year with the birds; because they have their nests to build and their broods to rear. It is true that the waste left by the winter furnishes the materials of the nests; and that many insects and other small animals are, especially during the advanced part of the Spring, in that condition in which they serve

best for the food of birds. But notwithstanding this, the labours of the winged creatures are exceedingly severe; and many of them fly thousands of miles for the purpose of finding breeding places for their young. It is clearly shown, however, that He, without whose knowledge not even a sparrow can fall to the ground, extends His fatherly care to all his creatures, and strengthens each of them in proportion for every labour they have to perform.

The effects which the Spring produces upon all the tribes of the vegetable and the animal kingdoms, are among the most striking and instructive features of the season. Their dependence on the solar influence is secondary, however, and comes to them through the medium of those more general portions of terrestial nature, upon which the sun produces seasonal changes. They can therefore be more clearly, and also far more briefly noticed, after we have cast a passing glance upon the others. In the mean time let us bear in mind, as the summing up of this chapter, that there is always a hemisphere of the earth acted upon by the sun; and that the solar influence is greatest at the centre of this hemisphere, and vanishes away to nearly nothing at the sides, slowly in the parts near the centre, and more rapidly afterwards; the height of sun above the horizon of every place, being measured by the distance of that place from the nearest point of the boundary of the light. In the daily rotation of the earth eastward, this enlightened hemisphere shifts westward, so as apparently to make a complete revolution every twenty-four hours. It also shifts northward, from our midwinter to our midsummer, over forty-six degrees and fifty-six minutes of latitude—the degree of latitude meaning a distance of about seventy British miles in the direction of north and south. During the other half-year, from midsummer to midwinter, the hemisphere on which the sun acts, moves southward to the same

extent and at the same rate. In this shifting northward and southward, the sun is said to shift in declination; and the rate of this shifting is slowest at the times of turning, whether northward or southward, and quickest midway between them, or at the equinoxes. It will also be recollected, that the time of the greatest northing is the midsummer of the northern hemisphere; and at the time of the greatest southing the midsummer of the southern one; while the equinoxes are the times when the hemispheres are both equally exposed to the solar influence, though the effect upon them is not equal. It thus appears that during the midsummers, when there is continual day over a certain space round the poles, the sun lingers in the respective hemispheres, and thereby exerts its benefical influence for a longer period. On the other hand, the solar influence hurries at the equinoxes; and this is one cause of the greater action of the Spring.

CHAPTER III.

ADAPTATION OF THE EARTH TO THE SOLAR INFLUENCE.

In the preceding chapter we have endeavoured to show how that constant and invariable influence which the beams of the sun exert upon the earth, is seasonably distributed by means of the angle which the planes of the earth's two motions make with each other. This is to be understood as not in any way increasing or diminishing the total action of the sun, at one time more than at another; because, though the earth, and its clothing, its inhabitants, and its accompanying atmosphere, are very powerfully affected by the beams of the sun, the earth exerts no known action back again upon that luminary, having the slightest resemblance to the beams. There is a reciprocal action between the earth and the sun, in the way of gravitation; but this belongs to matter in its general and simple form, and has nothing to do whatever in those changes of matter which are produced by the sunbeams upon the earth. In order to show that this solar action, to which we owe the appearances of the year, and pre-eminently those of the

Spring, is not without power, so vast as to be altogether bewildering to our understanding, we mentioned the rate of the earth's motion; and that of the sunbeams is vastly more rapid, being at the astonishing rate of nearly two hundred thousand miles in one second. The reader who reflects on the immense power and the extreme simplicity of this part of the system of creation, can hardly fail to pause in dumb reverence at the impression which it gives him of the Creator; and if he joins the reflection, that the same Godhead suffered on the cross to redeem mankind from eternal misery, the just and necessary reward of their own offences, he will at once confess that "the love of God passeth all understanding."

If those adaptations of the several parts of the earth and its accompaniments to the sun's influence, which occasion the Spring, and the subsequent succession of the year (for the Spring in the one hemisphere is really the cause of the Autumn in the other), are not so simple and sublime as the adaptation just adverted to, still they are exceedingly beautiful in their way; and when once we understand the most apparently trifling of them, it rises far, not in degree merely, but absolutely in kind, above all the works of the whole human race, and proclaims the glory of its author in terms not to be misunderstood.

This part of the subject is very complicated; and in order to go into anything like an investigation of it, we would have not only to draw largely upon every science of *physics* (that is, of material nature), which man has cultivated, but the whole volume of human knowledge would carry us only a little way. We must therefore content ourselves with hastily pointing to the direction, and bidding the willing traveller "God speed."

The first point in this branch of our inquiry is, "what parts of the earth, that is, what substances and surfaces

presented by it to the sun, are most susceptible to the solar influence?" The next point is the mode in which this influence operates, or, more strictly speaking, the effect which it produces on some of the leading substances. The answers to these questions are, however, all obtained by observation; and therefore they are both obtained at the same time. For this reason it is desirable to take them together, because neither of them is so complete as to amount to useful knowledge without the other. The atmosphere, or air—the one of which names means that it is the place of vapours in an exceedingly minute state of division, and the other means that it is the breath of animal life—is the substance connected with the earth, upon which the sunbeams exert their first and their most powerful influence. It is the latter, for two reasons; first, its great quantity, and secondly, its great susceptibility.

The sunbeams, as we have said, always fall upon half the surface of the earth; and they may also penetrate into and influence its mass to very great depths; but on this point our knowledge is very limited. With the atmosphere it is very different; for the sunbeams always pass through and exert their influence upon a great deal more than half the atmosphere. As this is a point of some interest, we may mention the proportion in a rude way. The earth can at no time prevent the sun's light from reaching any portion of the atmosphere, except a circular portion, directly opposite to the sun, and of the same breadth as the section of the earth. We do not know the height of the atmosphere, and therefore cannot state the quantity; but from the properties of a sphere, the portion of the atmosphere always acted upon by the sun is very considerably more than half of it.

When the sunbeams act as a heat upon the atmosphere, they always expand it, or swell into greater bulk, and make

it lighter. When made lighter, it ascends, for the same reason that warm air escapes with a simmering noise from hot water. Being made lighter, it ascends higher above the earth's surface; but as it ascends, it gets colder. The atmosphere is all over a spring, and therefore, when any cause disturbs its balance, it instantly reacts, and endeavours to return to its former state.

This great susceptibility of change in the atmosphere, by any disturbing cause, however slight, and its equally great tendency to revert back again, in proportion as the disturbing cause slackens, and to assume the same condition as at first, is the first and greatest means of the revival of nature in the Spring. It should therefore be thoroughly understood by every one who endeavours to obtain a rational knowledge of the beautiful operations of nature. If the air of the atmosphere has perfect freedom to obey the action of heat, it exhausts that action in the expansion of its substance, and never becomes sensibly warmer. On the other hand, if the expansion is by any means resisted, the air is sensibly heated, because its own condition does not occupy the whole action of the heat which is applied to it

Atmospheric air is a very light substance as compared with most others with which we are conversant; still its weight is considerable, amounting to about fifteen pounds on every square inch of the earth's surface at the mean level, or supporting on the average a column of about twenty-nine inches of mercury in the common barometer. This weight diminishes at such a rate, that, if heights are taken in the proportion of 1, 2, 3, 4, and so on, the diminution of weight is in the proportion of 1, 4, 9, 16, and so on.

It is the resistance offered by this weight of the atmosphere which is the valuable part of it, and enables it to apply to the earth generally, and to animals and vegetables particularly, that warmth which is the most essential

element of their Spring revival. At the mean level of the earth, which is about the same as the surface of the wide and free oceans, this resistance is greatest; and it diminishes at that rapid rate which we have mentioned, as greater elevations are arrived at. In consequence of this, the places which are lowest are the first to obey the reviving influence of the Spring. As we ascend, the obedience to this influence becomes less and less; and at every point of the earth's surface there is a certain height at which Spring, Summer, and Autumn are never known, but where Winter holds the surface mantled up under a covering of perennial snow.

There is no portion of the British islands where the snow can be said to be perennial, that is, where the average temperature of the hottest day is as low as that at which water freezes. But on the top of Ben Nevis, and that of several other mountains in Scotland, there are very few nights entirely without frost; and in the horseshoe-formed precipices which are very generally found on the north-east or shaded sides of such mountains, snow, and also ice upon the small lakes at the bottom of the snow, are found throughout the year. These are small miniatures of the snow-clad summits, and the glaciers which are found at the foot of them, on a far more splendid scale, on the Alps.

This property of the atmosphere, by means of which its obedience to the action of heat decreases so rapidly, as the elevation above the mean level of the earth increases, is a very important point in the seasonal economy of the earth, and in all those appearances and results to which the seasons give rise. For, in consequence of it, a country under the equator, whose plains or valleys, at the mean level of the sea, are constantly exposed to a high summer temperature, enjoys, if its mountains are high enough, every degree of climate, from the equator to the pole. Equatorial countries, possessing lofty mountain ridges, are

thus a sort of miniatures of the whole globe; and valley and mountain work to one another in the Spring and other seasons, in the same manner, though not of course to the same extent, as the equatorial and polar regions of the whole globe.

What have been now stated are the leading properties of the atmosphere, which are so beautifully the ministers of Almighty goodness in bringing about the Spring, and carrying the action of the Spring forward to the full maturity of the year, so that all the children of nature may be fully supplied with the bounty of their beneficent Creator. There are many minor circumstances, essential to a complete understanding of this most instructive and most extensive subject. They would, however, require more space than we can afford for the whole subject.

The susceptibility of the air to solar action, as we have endeavoured to explain it, consists of two distinct kinds: the one, motion in the air, or a transfer of it from place to place, both upwards and downwards, and laterally; the other, a heating of its substance when the solar action is increased, and a cooling of the same when that action is diminished. The first of these is the modification of the influence which tends to produce that revival of plants and excitement of animals to which their Spring actions are owing. We have seen, that the first of these results from the extreme susceptibility of the air to alter its volume with every variation of temperature; and that the other results from the resistance which the weight, or gravitation, of the air offers to the former property.

The gravitation, though it is the measure of the abstract quantity of matter in the air, cannot be said to be exerted by the air itself. It results from the mass of the earth; and in this way those solid parts of the earth, not only deeper than mines ever dug, but really all the way to the

centre, perform a portion and by no means an unimportant part in the economy of the earth's surface.

In order to show the value of the great mass of matter in the earth as affecting its surface economy, it may be proper to state the relative gravitation, or absolute quantity of matter in a section of the earth, having a base of a square inch at the surface, terminating in a point at the centre, and being in fact a square pyramid, having an inch for its base, and four thousand miles for its length or height. This four thousand is about the mean distance from the surface to the centre. The average weight of the matter of the earth is four and a half times that of water; and a cubic foot of water weighs one thousand ounces. We have thus the elements of a very easy calculation; and the result is, that, making allowance for the fraction which the radius, or distance from the surface to the centre of the earth, is less than four thousand miles, the weight of this section of an inch from the surface to the centre, is thirteen millions of pounds.

We stated already that the pressure of the atmosphere upon an inch of the earth is fifteen pounds, which is only a nine-hundred-thousandth part of the weight of that portion of the earth on which it rests. Nine hundred thousand to one is an immense proportion! and yet this is the power by which the attraction of gravitation in the earth restrains the atmospheric air, by controlling its elasticity. But the air remains elastic, and therefore its elasticity must be more powerful than the earth's attraction, or to its weight in a greater ratio than nine hundred thousand to one.

Thus we see that though the atmospheric air is completely and instantly obedient to those variations of heat upon which the seasons, and to a great extent the weather, depend, yet the air is kept in its place upon the earth, and prevented from being dissipated through space, by a

controlling power nine hundred thousand times greater than its own weight. In this, as in all the other grand adaptations of nature, we find that the powers are absolutely beyond all comprehension by the human mind as matters of ordinary measurement; and yet they are balanced with such perfect nicety, that the slightest imaginable thing will turn the beam the one way or the other. But, in consequence of the immensity of the powers, any change which local action, or indeed any species of action with which we are acquainted, can make in this way, is exceedingly limited. The greatest disturbing cause is soon exhausted; and the effect which it produces upon that part of the balance on which it acts, very much resembles the bending of a spring, which spring at last recoils, and returns not only to its original position, but beyond it in the first instance, in consequence of the momentum, or accumulated power which it acquires during the time of its return.

This is one of the most general principles in nature; though it is one seldom adverted to in common conversation, or in ordinary books upon natural subjects. It is found everywhere; and it is the grand principle of stability, upon which the Almighty Creator has seen meet to support all the systems of created things, in all the variety of their parts, and every appearance and change of appearance which they assume. "He hangeth the earth upon nothing," is the sublimely accurate expression of Holy Writ; but still the earth is in the balance; and though not hung upon anything, it is suspended between the exactly equal forces of the sun's attraction of gravitation, and the momentum which itself acquires by that motion on its orbit, the rate of which we have already noticed.

In the case of everything in the universe there is a similar balance; and wherever there is what we call a principle of action, there is invariably set against it a

principle of resistance. This last principle gives way, and allows the active one to work, to the extent, and for the time which the great Governor has ordained; but when this measure is full, the resisting principle takes its stand, and says in a voice not to be resisted, "Hitherto shalt thou come, and no further."

One of the simplest illustrations of this principle is a pendulum. This instrument, as seen in a common clock, is not a perfect illustration; because, at every beat of the clock, it receives a new impulse, conveyed to it from the weight or the spring through the train of the wheelwork. This is therefore a compound instrument, made up partly of the natural action of the pendulum, and partly also of the action of the machinery. To understand it simply, suspend a bit of string on a nail by a loop at the one end, and let it hang freely; take hold of the lower end of the string, draw it a little to one side, and let it go, and it will swing to the other side, and back again, a few times, but it will very soon stop. Fasten a little weight to the end of it, and draw that to the same distance aside; let it go, and it will continue to swing, or vibrate, much longer than the unloaded string. Increasing the weight, and drawing to the same distance aside, and letting go, will increase the time that the weight keeps swinging. It is the descent of the weight from the one side here which carries it up to the other side; and though the resistance of the atmosphere, the friction of the loop of the string on the nail, and the gravitation of the weight to the earth, all counteract the swinging, and make every swing less than that before it, yet the heavy weight is always the more powerful, and the longer in being overcome.

We might carry this illustration of the pendulum throughout the whole of nature, and make it our interpreter in almost every phenomenon; for, in active nature

there is always an alternation of two principles. That which is begun in Spring and carried to the maturity of Summer in the one hemisphere, brings the Autumnal decay and Winter repose of the other; and when, from the combination of the two motions, to which we alluded in the former chapter, the angle of the axis to the plane of the orbit changes, the decay comes on in that hemisphere which has just completed its Summer, while Spring calls forth the plants and enlivens the animals of the opposite hemisphere.

It is the same everywhere; there is a principle, which, follow it through a series of whatever length we may, leaves us as much in the dark at the thousandth step as at the first one. This principle, acting upon matter in a wonderful but mysterious manner, originates every species of creature. If the species has growth as a vegetable, or growth and life as an animal, the principle of its origin, if no casualty ensue (and we say casualty merely when on account of our ignorance the cause is unknown to us), brings it gradually to the full development of its species. Here, however, there is a limit; the principle, in every known individual case, exhausts itself, and the opposite power against which it worked gets the mastery of it, and brings the fabric which it had elaborated to the common storehouse of mere matter. Some of the small flies which are hatched in the mud by the banks of rivers, and get on the wing during the night or the early dawn, do not live to enjoy one blink of sunshine. Man numbers his threescore and ten years; some other animals, as the eagle, the elephant, and especially those larger cartilaginous fishes which do not die in the bones like hard-boned animals, have a longer duration; and there are some peculiar species of trees which can exist for five hundred years, and probably for a thousand or more; but in every case there is a limit;

and there is not in nature one production, be it magnificent or be it minute, which does not proclaim that it is a mere work, and not the original Worker. Nor is this confined to those temporary productions to which we have alluded, for we have it on the record of eternal truth, that "the earth shall wax old as doth a garment, and the elements shall melt with fervent heat." But it is not said even here that these elements shall return to that original nothing out of which they were called by the voice of creative Power. All is in his keeping, and, visible or invisible, not one atom can perish without the exercise of the same power which originally called it into existence. The heavens may "pass away as a scroll when it is rolled together," and suns and systems, more than mortal tongue can number, may be blotted out from the ken of all created beings; but his eye is upon them, the right hand of his working can find them out; and if he shall say, "RETURN!" they must return in all the freshness of young beauty, and all the vigour of young life, before the quickest eye shall have had half time to twinkle. This, if the words of human speech could do it justice, is the line wherewithal to measure, and the balance wherein to weigh, the glories of creation, so as to feel their effect with improvement of the mind, and with growing veneration for the Creator, and love for the Saviour. Our voices are all too feeble for the mighty task; for who but one inspired of God can declare the counsels of God, as spoken by the voice of universal nature!

Next in importance to the heating influence of the sunbeams, is that influence which the same beams shed as light. The displays of this are equally remarkable for their beauty and their usefulness; but it has not so much effect in bringing about the Spring, and the effect which it has is less easily explained and understood. It in fact belongs

more to the investigation of particular subjects in nature, than to the general phenomena of the seasons. There are some vegetables which grow only in the dark, such as those which are found on the roofs and walls of mines and caves, and it is probable that in its first origin, the first spring of its being as it were, no plant and no animal can bear the light. Afterwards, however, by far the greater number of vegetables require light, otherwise they do not acquire the requisite enjoyment of this influence. A geranium or other plant trained fan-wise in the window of a room which is not very light, turns the whole of its shoots, and even its leaves, away from the room, and toward the window, and if it is turned round, after a time they will all bend over the other way. In the tower of the old cathedral of Dunkeld, in Scotland, now in great part a ruin, we once witnessed a remarkable effort after light in a common potato. This potato had been left among the rubbish on the floor, and the only light which found its way into the tower was through a small window at the height of forty or fifty feet. The potato had found its way to the angle of the tower, and climbed up there until the topmost shoots had reached within a few yards of the window at the time when we observed it. If this potato had been planted in the open fields, the stem of it would not in all probability have exceeded a foot or a foot-and-a-half; but here the effect of the light upon it had been such, that it shot up full twenty-five times as much as it would have done in the open air. How much of this was owing to the potato itself, and how much to the light, is not easily determined; but it shows that in the economy of the vegetable world light is a very important element.

We have said already, that, considered as light, the beams of the sun are much more easily refracted, or turned into a new direction, than the same beams considered as heat.

This quality has not much seasonal effect, but it is exceedingly useful in nature. Were it not for this, every shadow would be absolute darkness, and both the rising and the setting of the sun would be so sudden and so striking, as hardly to be borne; whereas the scattering of light by atmospheric refraction, often renders the shade more agreeable to the sight than the direct sunshine, and makes the day and the night pass gradually into each other, through the evening twilight and the morning dawn. There is, however, as we have said, little seasonal influence in the light; only the twilight of morning or evening is always longest when the sun's apparent daily path makes the smallest angle with the horizon. Consequently it is longer at midsummer and midwinter than at the equinoxes, and longer in high latitudes than in places near the equator.

The waters are, next to the atmosphere, the portion of the earth and its appendages upon which the solar influence has the greatest though not the most palpable effect. The sunbeams have more direct influence in sensibly heating the waters, than in producing the same effect on the air; because water is a body of much greater weight and consistency than air is, and therefore cannot escape so readily from any agent which tends to alter its condition. Water is also much less susceptible of changes of bulk from different degrees of heat than air is, and below a certain temperature, at which it is still liquid, it begins to expand. There is therefore much less transfer of water from place to place, by the returning of the Spring, and the declining of the Autumn, than there is of the air, though the influence of the celestial bodies, the sun, and more especially the moon, does occasion a small motion of the waters, seasonally, monthly, and daily.

When we look at a correct representation of the earth, at an artificial globe or a map, for instance, we perceive,

that, independently altogether of fresh-water lakes, rivers, and marshes, which in some countries occupy a considerable extent, full seven-tenths of the earth's surface is covered by oceans and seas, all connected with each other, and forming one vast expanse of water. From the great extent of this—more than double that of the dry land—we must conclude that water performs a most important part in the economy of the earth: and when we examine the facts, they show us clearly that such is the case; for there is scarcely any operation carried on amid all the varied works and workings of nature, in which water, or one of the elements of water, is not concerned. As it is thus general in its distribution and its use, we would naturally conclude that water must be in some way or other far more obedient to the varying degrees of heat in the different seasons, than it is in mere transfer from one place to another.

When we come to examine the matter with a little care, we find that this action of the solar influence on water is equally essential to the labours of the Spring, and to all the seasonal labours of the year, as the effect of the same influence on the air. The two are, however, very different in their mode of operation. The air, as we have already stated, expands in volume with increase of heat, and diminishes in volume when the heat is diminished, when it does this only to a very limited extent. But the water is dissolvable into very minute portions by the action of heat; and in consequence of this, there is constantly ascending into the air from the surface of the waters, and from that of every moist substance, that supply of vapour, which again descends in showers, liquid or frozen, without which showers the Spring would return in vain. Water is just as essential to growing and living nature as air is, and indeed it is more so; for humidity reaches plants and animals in that very early stage of their being when the

light, and generally speaking the air, is excluded from them, as being inconsistent with the tender state in which they then are.

The air is the vehicle into which this vapour of water is received; and when it is once there, it is of course carried upon the currents of the air, or, as we say, the wings of the wind, in what direction soever those currents may set.

It will be borne in mind, that we stated that the tendency of the currents is from the colder place to the warmer; and thus the air, laden with refreshing moisture, must accompany the sun's apparent declination northward in the Spring, and southward again in the Autumn.

It does not follow, however, that the times when those currents set most strongly either way, are those at which there are the greatest discharges of water from the atmosphere, whether in the liquid or the solid state. It is not the quantity of water which may happen to be in the air at any time which, of itself, determines the quantity of rain or snow. The disposition of the air to part with it forms an element of this; and an element to which it is of the utmost consequence to attend. The warmer that air is, it can retain the more; and it can do the same the rarer that it is, or the less of it that there is in an equal volume.

These are beautiful provisions. The season of springing and growing is the season when watering is most required; and yet long-continued rains, during this season, would defeat the purpose of wild nature, and also that of him who cultivates. Therefore, at this season, the air is more abundantly charged with moisture, and also in the best condition for taking up moisture by evaporation. In this state of things, changes of heat produce more immediate effects, both on the vapour in the atmosphere and on the moist surface of the ground than they do at any other season. Nature is, as one may express it, sooner wetted, and sooner

dried; and this alternating action of wet and dry at comparatively short intervals, is by no means the least important part of nature's action during the Spring.

There is still another beautiful result of this adaptation to each other of atmospheric air and the vapour of water. This enables the atmosphere to deposit the great part of that drink which it brings to all nature, upon those places where it is most serviceable. The upper air—that of the mountain tops—is considerably colder than the air lower down; and, on this account, it has less capacity for moisture. But, as it is pressed by a much shorter column of superincumbent air, its greater expansion makes up, and indeed more than makes up, for its inferior temperature. For this reason, the elements of a shower are always to be met with on a mountain-top, if that mountain-top is not above the range of working or seasonal nature; and, generally speaking, even though it is. Indeed, there is not, in any known portion of the world, a mountain peak so high, as not to carry a load of snow as a store for the supplying of springs and rivers; and at inferior elevations, where there are only winter snows, or hardly any snow at any time of the year, mountains are always showery, and enjoy a sort of Springs weather during a great part of the season of growth; for, when the heat of the season becomes extreme, when all is parched and languishing on the plains, and when not a drop of water can get down to refresh nature there, upon the adjoining mountains there shall be the alternate shining and showering of an April day; and the same vigour and greenness in the plants as appear at the active time of the vernal season.

It is impossible, however, so to frame any general description as to make it tell how, on all places of our globe, that heat, and that moisture, which are essential for the revival of nature in the Spring, are distributed. There are some

general causes and many local ones, without which the estimate is imperfect; and some of these are of so indeterminate and shadowy a nature as to defy all investigation. They may be generally named as the effects of the solar influence upon different kinds of surfaces; and to these we shall now very briefly advert, as the last general branch of terrestrial adaptation to the seasons.

How the beams of the sun, or any other heating cause, shall effect any kind of surface which the land presents to it, is a matter of observation. The several characters of the surface are so many, that it would be impossible to enumerate them all; and therefore all that we can do, is to mention one or two of the leading ones, merely to illustrate the principle.

Evaporation is always a means of cold; for it invariably requires a portion of the action of heat to distribute water through the atmosphere in a state of vapour. From this we get two classes of surfaces, differently affected by the solar influence. Drv places, under the same circumstances of latitude, elevation, and season, are always warmer than moist places; and consequently, a very rainy country is almost invariably a cold country, and the same applies to a rainy season. There is, however, one circumstance connected with this, which must not be overlooked; places easily heated are just as easily cooled; because, that which readily receives the impression of sensible heat, parts with that impression just as readily.

The specific modes of the action of heat, whether of the sun's rays or of any other cause (for all heat appears to be the same in kind, and differs only in degree), belong to the science of chemistry, rather than to such simple description as is meant to be intelligible to every class of readers. We may, however, remark, that, with the exception of very transparent bodies through which the action of heat can

pass, the effect of that action upon any body is in proportion to the readiness with which that body admits the said action of heat into its substance. This depends partly on the surface, and partly on the nature of the substance.

In respect of surface, there are two particulars to be attended to, the colour, and the form of the surface. White is the reflection of the entire light that falls on a surface, and black is the absence of reflection; while the intermediate colours reflect more in proportion as they are light, and absorb more and reflect less in proportion as they are dark. Then as to the form of surfaces, a smooth surface always reflects more light, and a rough one absorbs more, supposing that they are not only of the same colour, but actually belong to the very same substance. Thus, for instance, if there is exposed to the heat of the sun or of a fire a piece of black marble, or a piece of steel, one part of which is highly polished, and another part is left in the rough; if, after a little time, two fingers of the same hand are applied, the one to the polished portion, and the other to the rough one, the first will feel cold and the latter will feel warm. There is a still more striking illustration; if a smooth white glove is drawn on the one hand, and a black one of leather of the same thickness, but having a velvety surface, is drawn on the other, and both hands are held to the fire at an equal distance from it, it will be found that before the hand in the white glove is at all sensible of any increase of heat, that in the black glove will feel painfully hot; and if the experiment were continued long enough, the one hand might be blistered all over, before the other sustained the smallest injury.

These simple experiments can be made by any one who is not a chemist; and those who do understand the principles of that science require no information on that point; they are decisive, and so we need say no more on this

branch of the subject, than to point out one or two of the simplest applications.

A ploughed field, where the surface is composed of loose mould, must feel the influence of the Spring sooner than one which has the surface compact; and such a field of black loam must feel the same influence sooner than one of pale coloured clay. Something must always, however, be allowed for the direction in which the sunbeams fall; because, the more directly or perpendicularly that this takes place, the effect is always the greater. This is the reason why, in our latitudes, the southern slopes of hills are much more early in their vegetation than the northern slopes or levels of the same elevation. There is, however, in this case one of those consequences which invariably follow an increased degree of action. The growing and warm season is most severe upon those sunny sides of the hills. If such a soil is in pasture, it will be burnt up, while the other slope is green; and though a field on such a slope will produce earlier and better crops than a northern slope, it is more expensive in manure. Upon a larger scale these observations apply to countries; and so indeed does every observation which can be made with reference to the action of the sun in stimulating the fertility of the earth; and this is the grand problem of practical usefulness to man, in every inquiry and speculation relating to the season of growth, or the means by which growth may be promoted or regulated.

Surfaces which reflect the heat of the sun, of course, throw it upwards into the air more directly in proportion as the sun is higher above the horizon. This heats the air a little, and consequently makes it ascend; but this heat continues only while the sunbeams continue to fall on the surface. Surfaces which absorb the sunbeams, and become heated by them, also give out a portion of their excess of

heat to the air over them; but they do it by radiation, and this radiation continues after the direct action of the sun has ceased; so that a ploughed field, when it is so dry as not to consume much of the sun's influence by evaporation, is a source of warmth during the Spring nights to its neighbourhood. Anyone who chooses to take notice, will find that the hedges come sooner into bud, and the early flowers open sooner around such a field, than they do around a meadow of grass, or an unploughed stubble field, even though all the three have the same exposure. From moist surfaces there is comparatively little of this radiation of heat; from the surface of water there is less still, and from snow and ice there is very little indeed.

Such are some of the principles of local adaptation, in the surface of the earth, to that solar influence which produces the Spring, and all the beauty and wealth of the year. They do not, however, admit of any rigid application, because the general heat or cold, and the relative duration of Summer and Winter, always produce modifications. If heat is the predominating character of the year, a dark surface is, upon the whole, a source of heat; but if cold is the predominant character of the year, a black surface is as certainly a source of cold. Independently of their being dressed and manured, clean fields and gardens act as hot-beds, in tempting an early Spring in countries which incline to warmth; but in cold countries, the dark upland heaths, and especially the expanses of peat, with scarcely any vegetation upon it, as taken on the average of the whole year, are sources of cold, though, during the long Summer day, the heat upon them is often oppressively great.

There are many other circumstances of a local nature connected with the subsoil—the soil itself, the surrounding places, the nature of the vegetation, and in all probability

the age of the country, or at least the degree to which it has been worn by winds and floods; all of which it is necessary to take into the account, before we can properly explain the time and extent of the Spring revival of the vegetable kingdom. One thing, however, is worthy of remark; early vegetation in the Spring is accompanied by early activity on the part of the resident animals, of whatever class, and early arrival of such as migrate from other climes. In as far as cultivation by man is concerned, at least in the case of corn, which has always been, by way of eminence, the crop, early Spring is followed by early harvest. It is not, however, followed by a corresponding early fall of the wild vegetation, or an early suspension of the activity of animated beings. In such places the season is partially doubled. The farmer gets an Autumnal or Winter crop, many of the trees produce a second shoot, and those birds which rear only one brood in bleak places, rear two in these more favoured spots.

CHAPTER IV.

SPRING IN DIFFERENT HEMISPHERES, LATITUDES, AND LOCALITIES.

THE word Spring, in our understanding of it, as applied to a season of the year, has always the same general meaning; namely, that period at which vegetation, and all that feeds upon vegetation or its consumers, are called into activity from a previous state of repose, more or less profound and prolonged, according to the situation and circumstances of the place.

In order to understand fully this part of the subject, it is necessary to know something of what are called the physical geography and the natural geography of all countries. These include the form and composition of them, considered merely as land; the vegetation with which they are clothed; the prevailing winds that blow across their surfaces; the times and durations of the various periods of broken and settled weather; and, in short, everything which can be learned respecting their natural history, both topographically in its distribution, and historically in the influence of the year upon it, and the effects of that influence.

This, though a most instructive subject, is a very wide and varied one; and therefore the beginner in the study of it must commence with those broad and comprehensive points, of which a general idea can be best obtained, and most easily kept in memory. In doing this practically, it is absolutely necessary to spread out the map of the world,

which, if a good one, is far better than a globe, as it shows the whole surface of the earth at one glance.

This being done, the first point of comparison is that of the two hemispheres—not the two hemispheres displayed in the two circles of the map, and named western and eastern; but the two hemispheres as divided on the equator, marked by a straight line crossing the map from right to left, one half of each of which is contained in the western hemisphere of the map, and the other half in the eastern. In the few words which we can afford to say, it would be impossible to enter into the details, or state any comparative proportions in numbers. This is not necessary, because the general principles ought to be first known, and the details would only perplex our understanding of these.

This being understood, and looking at the hemispheres, no one will fail to observe that the land nearly equals the water in the northern hemisphere, but bears a comparatively small proportion to it in the southern. The land in the northern hemisphere, also, ranges high into the polar latitudes, while, with the exception of the narrow extremity of South America, and a few trifling islands, there is no land in the southern hemisphere beyond its middle latitude, or that which lies half-way in northing and southing between the equator and the pole.

When it is recollected how much more the land is heated by solar action than water is heated by the same, it will be perceived that the difference of seasons in the northern hemispheres must be much greater than in the southern; that the Spring there must act with far greater energy, and have a correspondingly greater resistance to overcome. So much of the polar part of the southern hemisphere is sea; or at all events, if there be any extent of unknown land within it, that land is so near the south pole, and so cut off

from the other lands by the intervening seas, that it can have comparatively little effect upon the seasonal economy of the earth, either one way or another. The vast extent of sea in the south can never be hotter than the sea is with us in the same latitudes; and over great part of it there can be but little difference between the Summer and Winter temperature. The air over any surface does not become much hotter than that surface, speaking generally; and therefore there cannot be, even in the height of the southern summer, any very great ascent of heated air from the surface of this great expanse of water.

A very large portion of the southern hemisphere is thus not in a condition for answering to the stimulating call of the energies of the Spring; and as the surface of the water does not become nearly so cold as that of the land, being always above thirty-two degrees of the common thermometer, until the water begins to curdle into ice, it follows also that the influence of Winter, the antagonist against which Spring has to contend, must be comparatively weak in the southern hemisphere. Here, again, we have an instance of that beautiful balancing of work to be done and agent to do it, which runs through the whole of creation with such perfect economy that there is neither want nor waste in any one part of it. If that which is to be done is of light amount, the strength of the agent is withdrawn, to be employed at some other place; and in like manner, if the severity of the labour is greatly increased, the labourer is girded with a corresponding degree of strength. This displays itself so perfectly and so universally throughout the whole, that we cannot lay our finger, with knowledge, upon a single point of the map, or think with knowledge upon a single event, without feeling in our hearts that there and therein are evidences of the being and the attributes of a Creator, all-wise, all-good, and all-mighty;

"who sitteth on the zone" of this mighty system, and who governs all its movements, great and small, with knowledge and perfection which are beyond our admiration, and far beyond the scope of our most exalted thoughts: so that we can only exclaim with the Psalmist, "How manifold are thy works, O Lord! in wisdom hast thou made them all."

The widely different character of the northern hemisphere, in respect of sea and land, the great breadth of land which occurs in the high latitudes there, and the physical character of those lands, both in the eastern continent and in the western, produce effects of a seasonal nature, far more intense and striking than those in the south. Central Asia is in great part a desert, up to within a short distance of the Arctic Ocean; and though the corresponding part of North America is not absolutely a desert, there are many places where very little rain falls during the Summer months.

In those high latitudes, the Summer sun is above the horizon for the greater part of the twenty-four hours; and even where there is not perpetual day at midsummer, the night is so short that the earth has no time to cool, till the sun again beats upon it in the morning. By this means the Summer temperature on the deserts, and the dry plains, and the rocky hills, is brought up to an intensity fully equal to the average of the warmest tropical climates. This does not continue merely for a day or two, alternating with showers, but for a succession of months, or at all events of many weeks; and during this time the heated atmosphere ascends from the surface of a great extent of land, as if it were vapour rarefied by a great furnace.

At this time, the southern hemisphere has its greatest seasonal cold; but from the extent of unfrozen sea, that cold is not very great. The other effect which the air

produces on water, is therefore carried on to a great extent, and the air is loaded with vapour. Thus loaded, it moves northward, to restore the equilibrium deranged by the rarefication iu the northern atmosphere. At first this is of course slow; and as the motion of the air from the south is the effect of the ascent of it in the north, a considerable time elapses before it assumes its seasonal violence.

The effect which this has upon the season, is much modified by the circumstance of its having to pass over seas or over lands, and also by the character of the latter. The great southern lands are Africa, New Holland, and America. The last of these is narrow and mountainous toward its southern extremity, and of course has its seasons much modified by local action. Southern Africa is the country upon which the south wind tells with the greatest effect. Though not exactly in a tropical latitude, that country gets exceedingly hot and parched during the southern Summer. After the heat has dried up the vegetation (and it has begun to do so before the wind shifts to the south), this wind often blows with excessive violence, and its drying and parching qualities are extreme. It begins with what is really the vernal equinox in that country, namely, in September; but the vernal equinox there, as regulated astronomically, is anything but a spring-time upon the earth. The violence of the wind is often terrific; the waves off the Cape roll in congregated ridges, mountain upon mountain, almost as high as the topmasts of a ship.*

* Dr. Scoresby calculated the waves off the Cape to be occasionally 40 feet from the hollow trough to the summit, so that, as Mrs. Somerville remarks in her "Physical Geography," p. 203, it is the sublimity of the scene, united to threatened danger, which naturally leads to an over-estimate of the magnitude of the waves, and has given rise to the proverbial expression, that they appear to rise "mountains high."

This is the "south-easter off the Cape," so well known to navigators.

It comes from the sea, not at all deficient in moisture; but it comes from over cool water, to sweep along a dry and heated land. The heat is imparted to it; and it speedily dries up all the remaining moisture, withers every herbaceous plant to the ground, and shrivels every leaf. The heat is excessive. and the clouds of dust during the squalls are most annoying; so that the people of Cape Town are obliged to close their doors and windows, and shut up every opening of their houses, until its fury abates. But, notwithstanding the desolation which it spreads over the fields, and the annoyance which it gives to the inhabitants, it is still the healthy wind of that part of the world, and they term the part of the year during which it blows, "the good monsoon." It is not a constant wind, but rather springs up in the forenoon, just as the sea breezes do in some parts of Britain, and many other countries; and the intensity of its drought bears away every species of noxious vapour; so that its effect is healthy.

The Spring in this part of the world really takes place about the middle of the Winter; that is, it is at its greatest action in June or July, varying a little in different years, as the changes of the seasons do in all countries.

The turn of the monsoon from the season of vegetation to that of drought, begins in September; but it does not acquire its full character till near the middle of the astronomical Summer there, which answers to that of our Winter. By this time, the southern waters have acquired the maximum of their Summer temperature; which, however, differs so little from that of the opposite season, that the dry and heated land draws from it a constant current of air. This monsoon, or season (for that is the meaning), continues till March, at which time the opposite one begins; but, like

the other, mildly at the first. It comes with a north-west wind from the Atlantic, which wind is in itself hotter and more charged with vapour when it leaves the ocean, than the opposite monsoon is when it leaves the South Sea. It meets the colder air from the south; a contest ensues, and the lightning and thunder are sublime, while the rain falls in torrents, which are often so heavy as to sweep away, not merely the cattle and the crops, but the very soil itself, on the banks of those water-courses which but just before were dry. This is the real Spring of Southern Africa; and perhaps it is the most violent Spring anywhere to be met with on the surface of the globe. The resistance which it has to overcome is very strong, and the power of this Spring—inverted, in as far as the astronomical year is concerned, is correspondingly great.

It has to contend, not with snow and ice, as in the northerly part of the hemisphere, or with the humidity of Winter, as in our own milder latitudes, but with the very extreme heat and drought. As in every case in nature, however, the very intensity of this heat and drought contains in itself the elements of its own correction, and of a return to the opposite state of things. Whenever the effect of the sun upon the great Antarctic Ocean, during the southern Summer, has, by raising the temperature, caused the tendency of a current of air from that ocean, the parched surface of Southern Africa is at the very maximum of its power of rarefying the air over it, making that air ascend, and thus demanding a supply along the surface.* The state of the Southern Ocean, as just explained, renders it incapable of granting the full amount of this supply; but

* Sir John Herschel, Bart., who spent some years making astronomical researches at the Cape, observed the temperature of the surface-soil there to be as high as 150 deg. Fahrenheit.

the general elasticity of the atmosphere, which pervades its whole mass, and produces an equilibrium around the whole globe, never fails to send from some quarter or other every supply of air that may be necessary. It is this which brings the Atlantic wind, or north-west monsoon, upon the arid karoos, or dry plains, of Southern Africa; and it is because the southern current still comes there in part—and the two currents are of different temperatures, as the south one comes from the direction of the pole, and the north from the direction of the equator—that such torrents of rain are poured down at this season.

The general principle upon which the formation of rain-clouds is simply and satisfactorily explained, is this; when two currents of the air having different temperatures mingle together, both of them fully charged with moisture up to their temperature, which of course is the case with all winds blowing from extensive oceans, the compound which results is not capable of retaining the same quantity of water in vapour as the two component parts separately; and the necessary consequence is, that the difference is formed into clouds, and precipitated to the earth in rain.

The fact of this operation has been established by direct experiments, repeated again and again in the most careful manner. There is thus not the least ground for doubting its truth. It also has the advantage of explaining all the appearances of rain-storms, in a manner more simple and more satisfactory than they can be explained in any other way. It is, therefore, a very necessary portion of the general knowledge of nature; and it is especially necessary for every one who wishes rightly to understand the Spring, enjoy its beauties, and profit by the many lessons of instruction which it is so well calculated to afford—for Spring is in an especial manner the time of showers, alternating with fair weather in rapid succession; and they who

do not understand why this should be the case, cannot but feel a want when they endeavour to make themselves acquainted with the season.

The agencies by which natural appearances are brought about are always best studied through the medium of those cases in which the action is most powerful; because there the attention is most strongly excited, and the working most clearly seen.

This is the reason why we have introduced the present subject, while noticing the very violent and peculiar Spring of Southern Africa, rather than in some other place, where it might have had the appearance of being more systematic. System may be both desirable and necessary for professional students; but to the public generally, with whom study is the sweetener of other labours more than anything else, information ought to be given just when it is wanted, whether it happens to be strictly systematic or not.

It is to be understood, then, that the two currents which meet and mingle over the country of the Cape, at the extreme heat and drought of its surface, come there from two causes. They are drawn by the rapid expansion and ascent of air, from the dry and warm surface; and they are driven, by the more condensed air, over the surface of the oceans. We need hardly explain, that as air which is expanded by heat invariably ascends, that being the direction of least resistance, it takes off part of the pressure from the spring, or elasticity, of the denser air around. We have already hinted, that were it not for an antagonist force, this spring would in all probability act without limit, and scatter the air through space more wide than the distance of the smallest star which the telescope reveals. But notwithstanding this vast power of its spring, and the extreme minuteness of the particles of which the atmosphere is composed, it is still matter, not spirit; and therefore it

is bound in that grand connecting chain wherewith Almighty wisdom has seen meet to link all matter together. The "iron fetter" of the earth's gravitation is upon it; allowing it to perform every work for which it has been ordained, but keeping it to its place, and compelling it to do its duty.

When any such ascent of the air from a heated surface as that of which we are speaking, takes place, the equilibrium on the surface is destroyed, the deficiency at the heated place takes off the lateral restraint on the surrounding air, and it necessarily, by the very constitution of its nature, comes to restore the equilibrium with an energy proportionate to the demand.

There is another circumstance; air in itself is what is called a non-conductor of electric action; that is, if two substances, in different electric states, are separated by a column of dry air beyond a given thickness, they have no tendency to restore the electric equilibrium, but will preserve each body in its particular state. Water, on the other hand, is a conductor of electricity; and so good a conductor, that no two bodies can have different electric states if there is a water communication between them.

While water remains dispersed through the air in invisible vapour, there is no disturbance of its electric state; for electricity, as we understand it, is an action of surfaces, and the particles of water are then so exceedingly minute, that their surfaces are of no expressible dimensions. When, however, two currents of air, having different temperatures, and each fully charged with humidity, rub against each other, and deposit their surplus moisture, not in rain-drops, but in a haze, which is at first barely perceptible, "gumming" the sky, the state of the atmosphere is altered. The air remains as before, an electric, or non-conductor of electricity; but the infant cloud, even in its

very earliest stages, is a conductor, and thus that portion of the atmosphere contains an apparatus similar, with regard to electricity, to that of a common electric machine; and this machine in the air has only to be worked much in the same way as we work the artificial machine, in order to obtain a display of electric action.

It is the friction of the rubber against the non-conducting glass, which excites electric action in the common machine; and it is the insulation of the conductor which enables the action to be treasured up so as to produce a spark, or other electric display. The two currents of air produce the requisite friction, and also supply the conductor in the humidity which they deposit; and hence, if the change from heat and drought to rain is very great, atmospheric electricity, displayed in lightning and thunder, is almost a necessary consequence.

But this electric action of the atmosphere does not take place at the surface of the ground. The air there keeps ascending until the rain comes, and evaporation cools the ground; and of course the greater the heat, and the extent of heated surface, the higher up is the beginning of the electric working, and the greater the display of lightning and thunder when it comes. The comparatively tame character of our thunder-storms is owing to the limited extent of dry surfaces, and the slight degree to which even these are heated. In Southern Africa, in India, and in tropical America, the contending currents of the atmosphere tell another tale, and their lightning blazes, and their thunder peals, until the earth rocks and trembles beneath the majesty of the sky. The Bible is often a wonderfully instructive book in natural history, as on all other subjects, if we would read it with hearts seeking the truth, and eyes of supplication directed to him who alone can open the seals of his own book. It is probable that

this very contest of the winds is alluded to in the seventh chapter of the book of Daniel: "I saw," says the prophet, "and, behold, the four winds of heaven strove upon the great sea;" and though the strife to which we allude is over the land, the one may throw light upon the other.

The ascending current from the dry surface at the Cape does not allow the Antartic and the Atlantic currents to meet each other, until at a great elevation, probably several miles above the surface of the earth; but as the action proceeds, this meeting descends lower and lower, and more and more of the vapour of water accumulates, though still in small drops, and this resistance of the air from the hot surface continues until a canopy of vapour is formed over it. One reason for the prolongation of this resistance, is the drying quality of the air from the parched surface. It dissolves the forming clouds at their lower part, and it resists the passage of electric action. It therefore keeps the powers which are to elaborate the coming rain, in their places in the upper sky, until they have acquired strength to do their work. As they strengthen, it weakens, and the constant formation of visible vapour, and the continued friction of that vapour and the air, increase the electric action, which cannot yet be discharged to the earth. But when the clouds become dense they interrupt the beams of the sun and thus lessen the resistance of the dry surface. When one power continues increasing, and its antagonist diminishing, it is easy to see what must be the result; and that, sooner or later, the contending winds will conquer, and triumph over the parched soil.

It is generally during the night that the onsets of these mighty battles of the elements are made; because naturally the clouds descend lower in the absence of the sun than in its presence. Some mountain peak, or even some tuft of planting on a hill-top, stands up above the general level of

the country; the night is exceedingly dark from the mass of cloud; and the air feels intolerably close and murky. A gleam which illuminates the horizon, and is felt by a thrill in the nerves of the spectator, darts toward the peak, or the turf of trees, and probably shatters the one to pieces, or sets the other on fire. This is the signal of nature, to which speedily follows the note of preparation from the tongue of the thunder, and this is the attack and the beginning of victory; and when once, under such circumstances, the lightning strikes, and the thunder roars, the hope of a Spring revival is as certain to the parched plains, as a continuation of God's protecting providence is to the human race, when they behold the bow of promised mercy in the cloud.

By this single communication between the earth and the upper sky, the clouds are literally rent asunder. The intense heat of such a lightning flash expands a large space of air to almost an absolute vacuity. But as the cause is momentary, so is the effect; and the air, loaded with clouds, instantly closes in, and thereby produces the sound of the thunder. Larger drops of water, and increased electric action, are the results of this violent disturbance and restoration of the equilibrium, and new lightning and thunder are the consequence; and by means of them the rain soon descends, often with that destructive violence to which allusion was formerly made.

The great heat of the surface produces a corresponding evaporation of the moisture, even though the rain continues to fall in torrents. The vegetation is in possession of both elements of Spring revival, in a very high degree of intensity. The ground is watered, while there is a copious supply of heat. Thus all nature springs, and expands, and blooms, with a rapidity which is unknown in temperate places; and when the rain-storm has so far

abated as that the people can venture out, they find luxuriant vegetation where, only a short time before, there was not a green thing.*

The adaptation of the vegetable races to a Spring of so singular and energetical a character as that which is experienced in South America, is a point well worthy of attention; but we shall not enter upon it here, as we purpose to devote a short chapter to the general adaptation and preparing of plants for the Spring, after we have noticed its more remarkable characters in a few more places. We may say, however, that whatever may be the difference between the characters of Spring in one region and in another, we may rest assured, that the native vegetation is equally well adapted in all. In one place, the Spring finds the fields parched to a desert; in another, it finds them covered with a stagnant flood; in a third, they are buried under snow; in a fourth, bound up in ice; and in a fifth, vegetable action has been only partially suspended; but in all, there is the same harmony between what the season has to perform, and the powers with which that season is furnished.

In Southern Africa, the vast evaporation occasioned by the heat of the ground, which sends up the water in a sort of stream, ultimately produces a very considerable degree of cold. The air is then damp and chilly, and exceedingly disagreeable, as well as injurious to the health of the European settlers. On the high grounds the cold is severe, and on some of the mountains, snow falls; and, generally speaking, there is frost almost every night upon elevated

* Travellers, from Burchell to Livingstone, describe the sudden effect of rain on the parched karoo plains as being like magic. The country, which, but a few days before, was apparently an arid waste, is covered with a garniture of the gayest flowers. These flowers are for the most part from bulbiferous plants.

places. This spring of vegetation is really the midwinter in the southern hemisphere, because its height is near the time of our summer solstice. As we proceed northward in Africa, the commencement of the rainy season is later, and corresponds more nearly with our winter half, or their summer half of the year. In Congo, and the other countries eastward of the Gulf of Guinea, for instance, the dry season begins about the end of March, and lasts till the end of October. These countries are very near the equator, and therefore may be said to have very little difference of seasons as depending upon astronomical causes; for there is very little difference in the length of the day or the influence of the sun, all the year round. Accordingly, when Spring begins to exert its heating influence equally on both hemispheres, or, so to express it, when the hold of the one hemisphere on the other, as resulting from solar influence, is the least possible, the dry season sets in in Central Africa. During this time, the winds are from the south and south-east, and they bring no rain; and were it not for the night dews, vegetation would be completely destroyed. These, however, in a great measure, prevent this effect, so that, though the heat is extreme, the low parts of the country do not become parched and desolate. As long as the temperature of the northern hemisphere continues higher than that of the southern, the south winds and the drought continue. But, by the time that our hemisphere has begun to cool, that is in September or October, the south wind begins to abate, the north-west wind to set in, and rains fall in great abundance, accompanied by lightning and thunder. These rains bring an excess of vegetation; but they at the same time render the climate very unhealthy, and they last till about the month of April, after which the country begins again to experience the long-continued heat of the dry season.

As it is not our object to give an account of all the seasons and the weather in the different parts of the earth, but merely to point out the characters of the Spring, and to notice why it should be about the vernal equinox in some countries, and the autumnal equinox in others, we shall not allude particularly to any other country, further than to notice that in Southern Asia the dry season, which is the winter there in respect of vegetation, coincides with the astronomical winter, and not with the summer, as in Southern Africa. In India the south-west monsoon, which is the rainy one, begins to blow in March, April, or May, according to the situation of the place; and the fall of rain, upon some parts of the coasts especially, is very heavy, though there are times at which it does not reach the interior of the country. There, also, the commencement of the rains is really the spring-time of vegetation.

This is the case in all tropical countries, situated so near the equator as to have little variation of solar influence in the course of the year, though the time at which this happens depends upon local circumstances. The drying of the surface of the ground by the action of the sun may always be considered as the cause which puts in motion those currents of air that ultimately bring rains, and renew vegetation. Sometimes these happen only once in the year, and sometimes they happen twice. Thus, for instance, there are some parts of India which have rain at the setting in both of the south-western monsoon and the north-eastern; and there are some of the West India islands also which have two rainy seasons in the course of the year, though generally not of equal duration or severity; and there are others, such as the island of Jamaica, which have the severest rains upon the one side at one season, and upon the other side at the opposite. In all countries which are warm, though not tropical, there is a tendency to this. It

is mentioned under the name of "the former and the latter rain" in the Bible. We can trace it slightly in our own country; only the weather of Britain is so much affected by the Atlantic on the one side, and the continent of Europe upon the other, and also by its own insular situation, and irregular shape and surface, that the general principles which apply to the weather of large and uniform continents will not apply to that of Britain.

The tropical spring, resulting from rain and the subduing of the extreme heat of the surface, as we have attempted to give an outline of it, may be regarded as the one extreme of all the variations of Spring in different places. This forms one point, and that a sort of fixed point, in studying the vernal season in the different latitudes. There is another fixed point, namely, the opposite extreme, where the Spring is produced by the subduing of the greatest degree of cold.

This, of course, must be sought for in the high latitudes, and from the distribution of land and water there, and what has been already stated with regard to the Spring in that hemisphere, it must be evident that we shall not find this other extreme to the southward of the equator. Unless as produced by drought and rain, there is very little variation of seasons in the southern lands, so that, when they are so situated as to have a constant and not excessive supply of humidity, they may be said to be verdant, and vegetation to be in a state of activity, all the year round; so that the cultivator of the soil may choose for his Spring almost any season of the year that he pleases. The little isles which spot the vast expanse of the great Pacific Ocean, to which all the winds that blow are humid winds, as blowing from the sea, have very much of this character. The boughs are never without fruit, for there are three successive crops in progress at the same time; the fields and

the gardens need never be without vegetables, and every day furnishes food for the people. Those little spots are among the gardens of the world; and it must be cheering to every real well-wisher of the best interests of mankind, that, along with this daily supply of the bread which perishes, the natives of those little lovely places are now supplied with the bread of life; that the idol is cast down, the unseemly and the cruel rite abolished, and that, at the very point opposite to this country, from which the means of this divine instruction was sent, the people "Give glory unto the Lord, and declare his praise in the islands."

It is, therefore, in the polar latitudes of the northern hemisphere that we must seek that opposite kind of Spring which is produced by overcoming the extreme of cold. We need hardly remark, that to overcome the extreme of any kind of action, demands the extreme of the opposite, because it is obvious, that in all cases that which overcomes must be the stronger. We have already said that the contest of the two currents of air from the sea meeting over the plains of Southern Africa with the ascending current from those dry and sandy currents, is a long one. It begins in March, but its beginning is not perceptible until some time afterwards. In like manner, when we turn to the regions of the extreme north, we find that no effect worthy of the name of Spring, and, indeed, no visible effect at all, takes place till long after the astronomical turning of the year. This astronomical turning is our winter solstice in the end of December; but even with us, in these comparatively mild latitudes, the Spring cannot be said to be confirmed till between two and three months after this, or even till four in the northern and upland parts of Britain.

With us the winter is comparatively mild, owing to our

insular situation, as well as our latitude; and in the southern parts of the island snows are not very frequent, and of not very long continuance upon low and warm grounds. But if this is the case in a comparatively mild country, both in latitude and in physical situation, we may be sure that the winter is far more protracted in the icy regions of the north; and those who have visited those regions, and have been compelled to winter in them, all bear witness to the length of the winter, and the complete dominion of cold while the rigour of the winter lasts. Even in Canada, which is not in a higher latitude, the cold of the winter, as compared with the heat of the summer, is excessive, and the duration of the cold season is long. The renovating powers of the Spring have to overcome this before they can produce any vernal effect upon the vegetation, or any vernal excitement in the animals; and, therefore, it is necessary that we should know what the Spring has to do before we can have any correct understanding of its character. We never, indeed, can fully appreciate that power and goodness which are displayed in the renovating influence of nature's revival, unless we are fully acquainted with the obstacles against which it has to contend, and also the means of assistance which are prepared for it. The strength of the enemy is a necessary element in estimating the true value of any victory; and while there is little merit in a great victory over a slender foe, there may be much in a small success over one which is powerful.

There is, perhaps, scarcely any part of the world in which the seasons of heat and cold are in greater extremes than they are in the northern parts of the American continent. In Canada, and that not in the hottest parts of it, during the summer season, the thermometer rises to about one hundred and two degrees, which is about six degrees above

the greatest heat in the dry season in Southern Africa. But on the plains in the latter country the temperature rarely sinks below fifty-seven degrees, which is a pleasant state of the atmosphere, not very different from that which we call temperate, and supposed, in dry states of the air, to be the most conducive to health and comfort. In Canada, on the other hand, the thermometer sinks to at least six-and-thirty degrees below zero, or 0 of Fahrenheit's scale, which is sixty-eight degrees below the temperature at which water freezes, and a degree of cold of which the inhabitants of Britain have but little conception. One hundred and thirty-eight degrees, or thereabouts, is the average temperature between the two extremes of the Canadian seasons; and when the difference is so vast, we can readily understand that a considerable time, as well as great power in the agencies, must be requisite in order to pass from the one of them to the other.

The extreme heat of the Summer prevents the Winter from setting in so early as it does in countries where that extreme is much less rigorous; and severe as the Canadian winter is, it does not set in so early as in the northern parts of the British islands, where frosts, and even heavy falls of snow, sometimes occur in the mountain districts as early as September, and produce the most calamitous effects by destroying the grain crops which have not then come to maturity, and also the potato crops, upon which the inhabitants of those districts chiefly depend for their subsistence during the winter. In the year 1836, a snow-storm occurred in part of the valley of the Spey as early as the 20th of September; and in the year 1807 we witnessed a heavy fall of snow in the latter end of that month, which extended down to the level of the sea, at the town of Inverness, near the head of the Moray Firth. The sufferings of the people in the interior of the country, upon

the last-mentioned of these occasions, were dreadful; and the flocks and herds perished in great numbers, partly from lack of food, and partly by the severity of the Winter, which was as long in its duration as it was early in its commencement. It is true that those extreme cases happen but seldom; but when they do happen, their effects are most painfully distressing, and one almost wishes that Winter, in those northern parts of the British islands, had the fervour of a Canadian Summer wherewithal to contend.

In Canada there is seldom any frost till October; and Winter does not assume its government till the following month. November is, however, the terrific portion of the year, in so far as the majesty of Winter is concerned. The Summer heat resists and struggles, until the bud is ripened, and all is prepared for the following Spring; and thus, though the Winter comes with great violence, it comes harmlessly, in so far as the native vegetation is concerned. November is the month which confirms the domination of the Winter's cold. During that month one snow-storm deepens upon another, with furious gusts of wind, and whelming volumes of frozen vapour. The whole surface of the country is speedily mantled up; and at this time it is unsafe to be abroad with any part of the body exposed to the storm, for the sleet and snow adhere, and the cold which they produce would lead to that species of mortification of the parts which is known by the name of frost-bitten; and even in the streets of the cities, the wreaths of snow gathered by the eddyings of the violent winds, form barriers which must be left unassailed till the fury of the time is over.

By the end of November, varying a little of course with the situation, this turbulence of the elements is at an end. The country is sheeted over with snow, the rivers carpeted

with ice, and the cascades hung with icicles of the most fantastic shapes, which, when the sun looks out through the departing clouds, display rainbow tints which no art of man can imitate. So violent is this action of the Winter, and so complete its success, that hardly a particle of water is left in the atmosphere, or anything remains which can in the least disturb the perfect tranquillity of the hoary domination. From the total absence of vapour, the air is beautifully clear, the moon and the stars shine with brilliant lustre, and the aurora borealis sports its varying forms and delicate and delightful colours. The whole earth, too, is firm: those places which were marsh or quagmire during the Summer are consolidated like a pavement, and a general communication is opened up all over the country, without any expense of artificial highways. It is then that distant friends are enabled to visit each other; and, while every labour of the field is suspended, those who, during the Summer, were separated by impassable morasses, are enabled to exchange the civilities of life.

Thus, we must not imagine that the very extreme of Winter is an extreme of misery to the human race. "Subdue the earth, and have dominion over it," was the primal behest to man; and though the circumstances are different, the substance is as true, on the snow-covered earth in the north, as under the shade of the evergreen forests of the tropics, or upon the flowery meadows of the middle latitudes. The bountiful Creator has so formed and endowed man, that he can endure, with safety to his health, a greater range of temperature than any of the other animals; and in order that this power of endurance might not be bestowed in vain, enjoyments have been furnished peculiar to every latitude, from the equator to the vicinity of the pole.

Exercise on foot is not only bearable, but healthful, and

even pleasant, in the very rigour of those winters, after the falling of the snow is over; and the woodman in the Canadian forest gets as warm in girdling or felling his trees, as an ordinary labourer does during our Summer. With riders it is somewhat different, because the body, without actual motion, is subjected to the severity of the cold: even here, however, the country furnishes a remedy. The regions of extreme cold are the regions of furs, where the skins of the wild animals are so abundantly furnished with fine hair, as that no cold of the atmosphere can find its way through them. Wrapt up in these, the inhabitants of those northern countries can drive along the frozen surface in perfect safety, and with far greater ease than in the middle of summer.

The circumstances which we have now mentioned characterise that state of things against which the powers of Spring have to contend in high northern latitudes. They are found with varying intensity along the extreme northern verge of both continents; and in the more northerly parts of America, as well as in some portion of Asia, they are even more striking than we have mentioned. Enough has been said, however, to show that the Spring has no common work to do, no ordinary resistance to overcome, in those northern countries, and therefore we need not wonder that it is protracted till what we consider the Spring season of the year is far advanced, or even over. The whitened snow and the frozen surface throw off not only the light but also the heat of the sun by reflection; and it is not till the sun has acquired what we would consider a summer power, both in the direction of the rays and the length of the day, that the stubborn surface begins to relent. When it does so begin, its progress is rapid in proportion to the power which it has accumulated; and as the evaporation is very great, heavy falls of rain, mingled with the

melting snows, render the clearing of the surface a spectacle of no ordinary grandeur.*

The trees in the forests, which are numerous in these regions of the extreme north, are chiefly evergreens, of the coniferous family—pines, spruces, and larches. Those of the first and second sub-genera receive vast loads of the whelming snow upon their thickly-serried branches in the early parts of the season. Even the strong ones, which are in the vigour of their growth, are often rent and torn by the pressure of these snowy loads, while such as have begun to decay are thrown prone upon the earth. When the snow melts and the rain falls, these, mingled with vast masses of ice and of unthawed snow, are hurried into the swollen water-courses, thence into the rivers, and ultimately to the sea; so that the inhabitants of the extreme north, where no wood grows, and even those who reside on the northern islands between the western and the eastern continents, annually receive a copious supply of timber for domestic purposes, or for fuel, from this annual clearing out of the North American forests.

The labour of the Spring in those wild countries is almost entirely confined to the removal of the winter snow; for by the time that the snow and the snow-water are gone, both the temperature of the season, and the appearances of the wild plants, have a character deserving the name of Summer. This Summer comes on apace, and its productive-

* The natives of the colder and the arctic parts of North America look out eagerly for the arrival of the Canada goose. This bird, with its black head and neck, marked by a white patch on the face behind the eye, is a sure harbinger of Spring. In the Zoological Gardens and in St. James's Park, the bird is a familiar one. To the English about Hudson's Bay, these geese are essential as food. They kill many thousands of them every year, and salt and barrel them for their winter's food.

ness, both in vegetable and animal action, is as remarkable as the stagnation of the energies of life and growth which reigned during the winter. Severe as the Winter is in those extreme latitudes of America, there is, even in its very severity, a means of protection to growing and living nature. It is not the covering of snow or of ice which is fatal to the one or the other of these; it is the frequent application of a small quantity of frozen moisture, and the evaporation of this when thawed. The thawing, indeed, is the injurious part of the process. When water consolidates into ice or snow, that portion of the action of heat which kept it in a fluid state is set free, and given out for the performance of other offices. The melting, however, absorbs a quantity of heat, greater in proportion as it is more rapid. Were it not for this, the casing of even a tender vegetable in ice would be a protection to it; but the difficulty consists in getting the ice removed in the case of one that stands up in the free air. Immersing in cold water will, in a great measure, accomplish it, and the colder the water is, the operation succeeds the better. Now the roots and the young buds of the surface vegetation, in such a country as Canada, are soaked in snow-water, after the snow is melted, until that water is warmed and evaporated by the heat of the sun. This is the grand means of their preservation; for if that powerful action of the sun, which is required for melting the ice and snow, were to beat upon them naked and exposed, they would be shrivelled up and destroyed, as we find the young leaves and tender sprouts of our plants are by a hot sun succeeding to a frosty night.

We have an illustration of this in what is experienced by the human body. If the hands have been exposed to the frost until they are benumbed, and brought near the fire, in order to recover their tone, the sensation is painful;

and if the cold has proceeded so far as to render them insensible, such a means of recovery is fatal. The fluids in the small vessels expand and burst the vessels; the capillaries which join the extremities of veins and arteries are disrupted; the circulation in the part cannot be carried on; and it dies or undergoes the process of mortification, and may, in some instances, extend its deadly influence to other parts. If, however, the hands, when so benumbed, are put into very cold water, and, still more, if they are rubbed with snow, they not only recover their tone with safety, but recover it in a pleasurable manner.

This extends to provisions, whether animal or vegetable, which are accidentally frozen, or intentionally preserved by the action of frost. If frozen vegetables are put into hot water, and boiled for the table, they are tasteless and offensive by the disruption or bursting of the small vessels, and those fluids on which their flavour depends escaping through the openings. If frozen animal food is put into boiling water to be cooked, it not only loses its nutritious flavour, and much of its nutritious quality, but bears some resemblance, odour excepted, to putrid and unwholesome meat. If, however, either vegetable or animal matter, when frozen, is immersed in cold water, and kept there until it is thawed, it is as fresh and as savoury, after being dressed, as though it had never been frozen.

These coincidences between the living subject and the dead, whether animal or vegetable, are by no means uninstructive; and as the law of nature provides that they shall be treated in the same manner, when the Spring, in the average of years, has to call them from the frozen to the active state, this provision of the law proclaims, in terms not to be mistaken, the great wisdom and goodness of the Lawgiver.

Powerful, in its way, as the Spring action is in those

high latitudes of the north, it is not accompanied with those displays of electric action which accompany the same arousing of vegetation in tropical countries. The grand action of the polar Spring is on the surface of the ground, where the sunbeams operate directly upon the snow and ice without any intervention of the atmosphere. Here, therefore, there is no similarity to an electrical machine in the atmosphere; neither is there any necessity for it. Rain formed in the atmosphere, in order to descend on a parched surface, is what is required in a tropical country, because there is no moisture on the ground available for the revival of the vegetable tribes. In the polar country, on the other hand, there is upon the surface of the ground enough of moisture for this purpose, and to spare; and all that is required, in order to render it fit for the purposes of Spring, is to reduce it to that state in which it can be advantageously applied for stimulating the powers of growth in vegetables. Heat is all that is necessary for bringing it to the liquid state, and also for raising it into the air in vapour, whence it may descend again in Spring showers to refresh such places and such plants as require watering. It is highly probable, nay, it is certain, that in those northern countries, the vapour of water never ascends to such a height in the atmosphere as it does in warmer climates. Fogs are, therefore, prevalent in the season of growth; and the rain-drops are never large even in the hottest season, and hail never falls.

It is easy to understand why this should be the case. The hailstone or the rain-drop is always large in proportion to the height from which it descends. The height at which water freezes in the polar regions is far less than that at which it does the same in tropical climates. During the Winter, indeed, it comes down to the surface of the earth at a considerable distance from the pole; and even

in Summer it is not very high, as is shown by the comparatively small elevation at which snow remains unmelted upon the mountains in these countries. Hence, when the cold weather sets in, in those tropical countries, scarcely an unfrozen particle of water can remain in the atmosphere, and so the snows fall in impalpable powder. There is another instance of this in the frost-smoke, which appears over the unfrozen water of those countries; and which, though it consists of minute portions of ice, frozen almost at the instant of their evaporation, is light and dry, unless it happens to come in contact with the comparatively warm surface of the skin, and then it bites like an acid. Even in Summer the evaporated water cannot get up to such a height as to form anything like a hailstone, and even during that season fogs are far more constant in the polar seas than rain showers of moderate drops, which are indeed among the rarest Summer occurrences of those regions of comparative desolation.

In such countries as these, there is no need for lightning and thunder; and, accordingly, none of those elements which immediately produce these phenomena are to be found. In this, again, we have an instance of that perfect adaptation of things in nature, which it is impossible to imitate, even in the humblest manner, in human contrivances. If any substance, production, or organisation is wanted to perfect the system at any place, it is sure to be found in the very measure and degree to which it is necessary; but if it would be superfluous, and not necessary to the general working of the system, it is just as sure not to be there.

We should now advert to the mean between the two extremes of the character, appearance, and circumstances of the coming Spring. This does not, however, admit of the same brief and precise explanation as either of these.

Taking the northern hemisphere as our example, because it is the only one in which the polar Spring can be observed, we must remark, that the medium between this and the equatorial Spring is not produced by the operation of any new or peculiar causes, but the blending together of their causes.

At the equator, and for some distance on each side of it, the Spring may be said to partake nothing whatever of the polar character, unless it be over a very little zone, surrounding the perpetual snow upon such mountains as are so lofty as to have snow upon them all the year round. The places where this is the case are but few—they are limited in extent, and they are scarcely habitable by human beings, so that they have not much popular interest. On them, however, the economy of vegetation resembles that in the polar latitudes rather than in the temperate ones, because they are, for part of the year, covered with snow, and for the rest of the year exposed to the sun. Still, however, there is not an exact similarity in the climate or in the Spring between those high grounds within the tropics and the regions of the poles. In the tropical places, especially very near the equator, the solar influence is much the same all the year round, the chief difference being produced by the alternation of rain and drought, the same as it is on the low grounds in these latitudes. The day and night are very nearly of equal length throughout the year, and the sun is so little different from being vertical, even at the tropics, or times of its greatest declination, that the solar influence is always efficient to produce the springing of vegetables, if the germs of seeds are in proper situations, and humidity, the other essential element of the Spring, is supplied.

It may be said, therefore, that on all tropical lands where a vegetable can grow, whatever be their elevation, the

season of rain is the season of Spring, at whatever time of the year this rain may occur.

On lofty mountains, such as the Andes, the summits of many of which are clad with never-melting snow, under the very equator itself, there is a sort of microcosm in respect to climate or seasons. There are some spots in the Andes where the mountains are suddenly cleft into valleys of great depth, where a traveller can stand on the same rock and see the extreme vegetation of India below him, and the sterility of Lapland above.*

When the rains have fallen for some time, the evaporation produced by them lowers the temperature and brings frost and snow upon the mountains; and the snow storms there are terrific, compared with what they are even in the regions of the extreme north. In the northern countries, Winter has to contend with a comparatively feeble enemy; but upon the tropical mountains, the opponents are nearly equal, and so the violence of the contest is the greatest possible. These violent storms are generally very local, and they are so brief in their duration, that the descendants of the Spaniards call them *temporales;* but while they last they are terrific, and bring instant destruction to every human being who happens to be abroad while they rage. Travellers crossing the lofty passes are sometimes overtaken by them; and the flesh of men and mules is given to feed the vultures of heaven, and their bones lie bleaching together in the snow, in sad memorial of their dreadful fate.

"What will not man for sordid lust of gold?"

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* Such scenes may be witnessed on the sides of some of the gigantic volcanoes of this celebrated range, as described by Humboldt, where, close to the snow line, the ground in Spring is a mass of colour from the gay-flowered alpine plants which bloom

Some of the mines are situated in the very summits of these mountains, where the poor labourers, inured to the severest toil, and kept alive by the most scanty supplies, are totally cut off from the habitable country for months, though in direct distance that country may not be a dozen of miles off. These poor slaves to human cupidity are but too often overtaken by the temporales; and so dense is the snow, and so furious the wind, that sight and strength are alike unavailing; and even though the storm does not hurl them over a precipice, their dead bodies are sometimes found within a few yards of their wretched dwelling-places.

Countries in which drought and rain are still the chief and only causes of difference of season, and which are subject to such variations of weather, have many returns of Spring in the course of the year. The temporary snows speedily melt upon those places where snow is not perennial; and as the fall is of sufficient depth entirely to cover the vegetation, the effect of the brief snow-storm, after it is gone, is very similar to that of the winter-snows of the north, when melted by the ardour of the Spring. Vegetation is wonderfully refreshed, and sprouts and blooms with the greatest vigour; so that, though the plants of such places are peculiar in their species, they are equally remarkable for their beauty and the vigour of their growth.

All seasons of the year may be said to be blended together in these singular countries. There are some peculiarities of the native vegetation, or at least of part of it, resulting from this, which are well worthy the attention

there. The next zone contains thickets of coriaceous leaved plants in perpetual bloom and verdure. These are followed by forest trees. At 5,000 feet above the sea coffee and palms begin, while indigo and cocoa cannot be cultivated lower than 2,000 feet.

of man as a cultivator of plants, whether for use or for ornament. Of such plants we may instance the potato and the dahlia, both of which are natives of the Andes, though not of the very extreme regions near the snows. No two plants are more easily grown, more obedient to the hand of the cultivator, or more capable of coming to maturity, in every variety of climate which is the least of a temperate character, than the two which we have mentioned. In all countries, and more especially in countries where corn will not come to maturity, the potato is the most useful of plants; and its general introduction has had far more influence in assisting the improvement of modern times, than they who have not carefully studied the elements of that improvement would be apt to suppose.*

The dahlia, again, is at once the most easily cultivated, and the most ornamental of herbaceous flowers; and there is not a cottager in the British islands, occupying even a square yard of ground, who might not have that ornamented with a dahlia. It is true that both plants are very susceptible of injury from frost, both in their leaves and in their roots; but then, as they are propagated by the roots, and the quality is improved by taking up the roots, and keeping them dry during the winter, a very little labour secures the plants in the greatest perfection for the next season. A small portion of the root serves for planting; and a still smaller portion of the roots produced during one year, supplies an equal number of plants for the next ye ar. Every one knows the benefit of this surplus of the roots or tubers of the potato; and the dahlia, too, is quite wholesome, not badly tasted, might at present make good food for domestic animals, and may, in time, become farinaceous, and as such, form an important part of the food of man.

* Had the author lived to see the effects produced by the dreadful "Potato disease," he would probably have somewhat modified this.

We have the less reason to despair of this result, when we consider that the potato, at its first introduction, was soft and waxy, and not unlike what the dahlia is now, though the natural characters of the two plants are not the same. Let any one consider how much it would add to the autumnal beauty of our farms, after the grain-crops are gathered in, if they were spotted here and there with a few acres of dahlias in full bloom. The Andes, which a narrow-minded jealousy long kept a sealed book to the civilised world, are now open to inquirers of all countries; and it is highly probable that future researches will be crowned with such success as shall enable the cultivators of Europe greatly to increase the riches and the beauty of the earth.

Herein we see a most useful lesson of wisdom, if we would pause and learn it. The most distant spot of earth, and the one least resembling our birth-place in its physical characters, has still something good to give us, if we seek for it in the proper spirit, and with due diligence; and at the present time, our gardens bear beautiful testimony to the return which distant lands have made to us, for carrying thither the blessings of civilisation and religion. And not our gardens merely, but our food, our clothing, our furniture, and every class of our comforts; for, enter any house in which there is only a moderate degree of what we call comfort, and separate those articles which are the productions of other lands from those of our own, and you will find that in every case they amount to a very large proportion.

The lesson goes a little farther than this: man is adapted to more changes of climate and situation than any other living creature; and this verifies the original gift by the Almighty to man, of the whole earth and all its productions for his use. Not only this, but it informs us, in language not to be mistaken, that mankind are one brotherhood;

and that if a nation be in want, or sit in the darkness of ignorance, or in want of the Divine truth, those who possess these blessings, and do not communicate them to such a nation, are as guilty of uncharitableness in the sight of the Father of all, as an individual would be, who withheld the same from a neighbour or a brother.

As we proceed from the equator toward the north pole, the tropical causes, and tropical character of the Spring gradually diminish, and a portion of the polar ones begin to display themselves. The alternation of snow, and its absence upon the lofty mountains, extends over a larger range, and the snow continues for a longer period of the year; so that, when we come to about the latitude of Britain, the Spring on high mountains is polar, and the year consists but of one period of snow, and another of its absence.

This produces a very remarkable difference in the character of the mountain vegetation from that under and near the equator. There, we mentioned that the plants are remarkable for their obedience to the hand of the cultivator, and their improvement under the exercise of his skill. Here, on the other hand, they are remarkable for their stubbornness; for while the mountain-plants of tropical America will grow well, with little attention, if the proper season for them is chosen, the alpine plants of Europe require the most attention; and many of those of our own mountains, none of which can be said to be clad with never-thawing snows, stubbornly resist every effort of the most skilful and laborious gardener. It is the same with polar plants, for they can, with extreme difficulty, be kept alive in good soils and warm situations, and few of them can be so kept alive at all.* The reason is obvious:

* At Kew, they soon lost some growing arctic plants, brought from the shores of Barrow's Straits, by Dr. Sutherland, the surgeon and naturalist, engaged on the Franklin search with Captain Penny.

in the alpine or the polar region the long Winter is but one, and when the snow is melted, the frost is over for the season; whereas, on the low lands of temperate countries, and especially of those which have little or no snow to protect the vegetation during the winter, the tender bud has to endure a long protracted contest of the two great opposing seasons of the year. From the shortness of the polar Summer, and also of the alpine Summer, in consequence of the advanced heat of the season requisite to melt the snow, the bud, in such places, springs at once, and vigorously, and when a frost comes upon it it withers, and the plant is at an end; whereas the native vegetation of such places is tempered to what it has to endure, and as its Spring begins earlier in the year, it can come to maturity with a much slower progress at the beginning.

We have some striking instances of this in the case of the same plant, provided that it is a cultivated one, and has been cultivated so long as to have acquired that artificial character which belongs to all such plants. Barley, for instance, requires two or three weeks or even a month less between the sowing and the reaping, in the very northmost parts of Europe where it will grow, than it does in the south of England. There is a wonderful goodness to man even in this circumstance, trifling as it may seem. If the grain were to require as long time to ripen in the extreme north, as it does in the mild latitudes, the frost, and even the snow, would come upon it and kill it, while the seeds were yet but a milky juice and the straw unripened, and it would be unfit for the food either of man or beast. The same holds, to a certain extent, in the case of every plant which has been long cultivated, though different plants are, of course, susceptible of cultivation in different latitudes, and over different ranges of latitude. The more useful domestic animals possess a similar property of adapting themselves,

by degrees, to great differences of climate; and the whole of living and growing nature is so finely adapted to man, that enough for every necessary purpose of life can be carried along with him, and reared in every part of the world. The polar portion of the Spring increases toward the poles themselves, till, at them, it becomes the general character of the season, as we have already described it.

CHAPTER V.

ADAPTATION AND PREPARING OF THE VEGETABLE KINGDOM FOR THE SPRING.

THE adaptation of the vegetable tribes to their native places on the surface of the earth, and the preparations which are made for their receiving the full benefit of the Spring revival, when it comes and as it comes, are among the most beautiful and the most striking displays of Divine contrivance with which we meet in the whole economy of this delightful season. One can hardly, even in the slightest manner, contemplate these without feeling that verily there is a God that liveth, and that ruleth and judgeth on the earth.

As in every operation of nature there are always two natural parties concerned—an agent and an object—no natural operation could take place unless these were adapted to each other. But every natural object takes place in the very best manner, namely, with perfection and perfect economy. From this consideration alone we are led to conclude, that the adaptation is perfect in every case which

is truly natural; and it is this which renders nature so excellent a pattern to us, in endeavouring to make our small workings as perfect as we can.

Those natural adaptations may be conveniently separated into two departments—accommodations to place, and accommodations to time. It is true that, in nature, these two go together, and co-operate in the production of one perfect working. But nature is complicated and extensive, and our powers of discernment and understanding are feeble and limited; and therefore in this, as in everything else, we must "divide" before we can hope to conquer.

In the former chapters, we have seen to what agencies the Spring revival of nature is owing, and how the operation of those agencies is modified by situation upon the earth, and by mean level above its surface. In this we have, in so far, set before the reader a shadowy outline of the power or agent of the Spring. But, powerful as this agent is, it is a finite and created agent, and as such, it can originate nothing—cannot call forth the most humble plant, or excite the smallest animal, unless there is a germ, prepared and adapted for its working. The returning sun of the Spring (to speak according to the appearance, though not to the reality) would shed his beams in vain, if nature were not prepared for his shining. So, also, the Spring rains would descend, and the Spring breezes would blow, to no purpose, unless there were a previously existing life, whether vegetable or animal, upon which they could exercise their genial influence. The sun shines as brightly on Sahara as it does on the valley of the Nile or the Niger; and beams as brightly upon Chimboraço and Illimani, as it does upon the exuberant fertility of the valleys of the Orinoco and the Amazon. But Sahara is plantless; and the peaks of the two American mountains which we have mentioned rise so

terribly sublime in the chilling desolation of their snows, that they have never been trodden by human foot, and probably not a living thing is to be found upon them. Chimboraço rises as a desert of snow, over a desert of mountain ruins produced by the violence of earthquakes, and, as one would say, it is placed among its kindred. But Illimani, Sorate, and the other giant peaks of the Bolivian Andes, look down upon the affluents of the river Beni, which, continued in the great streams of the Madera and the Amazon, roll through a country rich with forests and exuberant in every kind of vegetation, for nearly three thousand miles, before their mighty current mingles with the Atlantic wave. Nor is there any doubt that, if man had strength for such an effort, he might look from any of the summits upon one of the richest expanses in nature.

It is obvious that the cause of desolation in the one description of places is owing to the want of adaptation to the solar action. In itself that action is exactly the same, whether on the thirsty sand, the snow-clad summit, the luxuriant forest, or the flowery meadow; and we may rest assured, that were the one description of places as well adapted to obey the action of the sun as the others are, the Spring would be just as reviving.

These are cases of extreme difference; but even in the intermediate ones, where the difference is much less, we still find a new vegetation when we come to a new surface, in respect of the earth itself, its moistness or dryness, and its elevation above the earth's surface. Wherever there is a different vegetation, it is in most cases—indeed, we may say in every case—differently acted upon by the Spring; and therefore none can have a perfect understanding of that season, even in this single respect, who has not paid a good deal of attention to the structures and the habits of plants.

To do this completely, would require that it should be the chief business of life; and therefore it can be done only by those who are professional.

There is, however, a much slighter and more general knowledge of the vegetable tribes, which may be possessed by anybody who makes a right use of the spare hours of time, and which, therefore, should be possessed by everybody. In all natural subjects there is, as it were, an adaptation to this kind of knowledge. Man is both invited to study them, and shown the way, by those natural resemblances, in consequence of which one becomes, as it were, an index to a great many others.

The most striking parts of a great majority of plants are their flowers; and as perfect flowering involves in it also the preparation of the seed which, when matured and ripened, is to produce a new plant, the first and broadest distinction of plants is into such as have visible flowers, and such as have not. The first are called *Phenogamous* plants, which is as much as to say, that the parts of them requisite for the forming and fertilising of seeds are seen. The second are called *Cryptogamous* plants, which does not mean that those plants do not produce seeds or germs of some kind or other, but merely that the parts concerned in the first formation of those are invisible to our observation. Flowering plants, and flowerless plants, are the most convenient words for common language.

The flowering plants are by far the most interesting department of the vegetable kingdom. They are largest in size, most beautiful in appearance, firmest in texture, and applicable to the greatest number of useful purposes. All trees in temperate countries—at least now found in the living state—and by far the greater number of trees in the tropical countries, belong to this grand division. It is the same with shrubs; and so also with the greater number of

those herbaceous plants which do not stand up with stems of more than one year's growth, like trees and shrubs, but which, generally speaking, die down in the end of Autumn, to be called up anew in the Spring, from seeds, from the roots of the old plants, or from both.

Flowerless plants are generally found on the surface of the ground, though there are exceptions; and, besides never producing any flowers, few of them have much distinction of stem and leaf. Scarcely any of them can be made to answer any of the ordinary purposes of timber; and there are but a few of them which can be used as human food, either in whole or in part. Ferns and mosses, and all the common sea-weeds, are familiar instances of flowerless plants, though there are some plants in the fresh waters, which remain submerged during the greater part of the year, and yet come to the surface to flower, or at all events to bring one part of their flowers to perfection.

Some plants of this last division are very beautiful, and all are curious and worthy of being studied—as what production of nature is not? But still, the most casual observer must feel, upon comparing them, that the flowering plant is the most elaborate production of nature. This last expression must not be misunderstood; we do not mean to say, that any one work of creation is more elaborate to the Creator than any other. But he has seen meet to work by natural and finite causes in all the operations of nature, and to adapt those causes to the results. Now the flowering plant has organs to elaborate, not only additional to any which the flowerless plant possesses, but of more fine and curious texture than those; and, therefore, those plants require a higher degree of the excitements—chiefly those of heat and light—which produce action in vegetables, than plants which do not flower.

We find the two classes so distributed as to adapt them

differently in this way. The flowering plants are accumulated in the regions of heat and light, especially the former; they are most abundant in tropical climates, and in warm and sheltered situations, which contain moisture enough for the purposes of vegetation, and yet not so much as shall, by being evaporated, reduce the heat below a certain degree. The flowerless plants take, as it were, the opposite end of the scale. They are most numerous in places which are cold and moist; and with considerable difference in different countries, owing to local causes, they diminish in their relative proportion from the pole toward the equator, and from the mountain-top to its base; whereas the flowering plants increase, if we take them in the same order, in latitude or in elevation.

If we attend to what is around us, or observe as we walk over a varied part of the country, we find every day confirmations of this; and we meet with them in the same species of plant on the same kind of soil, in seasons of different character. On the cold heights, and also in the damp hollows, where water stagnates until removed by evaporation, we always find mosses and other flowerless plants; while on the banks and hedges, which have drainage, and on the slopes of hills, we meet with abundance of wild flowers. The fact is, that that portion of the action of heat which brings the flower to maturity in the one place, is consumed in evaporating the water which falls, in the other; and thus only the difference is left to stimulate the vegetation. A damp district may be known in the dryest weather, by the comparatively small number of wild flowers which it presents. On the other hand, though the rain is pouring when we visit it, abundance of such flowers will tell us, with certainty, that the climate of the place is, in general, dry and wholesome. There is something even in the colour of the flowers—red being more prevalent in dry

places, and pale greenish-yellow or white in those that are moist. In the same plants, we find the difference of years, and also of situations, has a remarkable effect upon the flowering. If the place or the season is too moist for the species of plant, it runs up to stem and leaf, produces few or no flowers, and does not bring seed to maturity. In this way we find that oats and barley, though they run much to straw, are very unproductive crops in very moist lands, and the more so the warmer the climate is, if a sufficient supply of moisture is afforded. We accordingly find, that in wild nature, that natural order of plants to which these belong is very limited, and forms but an inconspicuous fraction of the entire vegetation. Some plants of this order, indeed, are naturally marsh plants—such as the rice plant—and they come instead of our grain plants, on the low and damp ground in tropical countries; though in other countries of the same latitude, the people derive these substitutes for bread from stems and roots, rather than from the seeds of any vegetable.

A second mode of distinguishing plants into large divisions is obtained from the way in which the young plant first makes its appearance, when the seed germinates. There are three modes: the plant either puts out no leaf at all, it puts out only one seed-leaf, or it puts out two. There are some nice distinctions upon the borders of the divisions in this case, as well as in that of the flowers; but they are too minute and technical for requiring our notice. The seed-leaf is understood to exist as a distinct part of the seed itself; and no plant which has not leaves properly so called, and even flowers, produces a seed-leaf distinct from the *plumule*, or feather, as it is called, which is the rudiment of the plant itself. These seed-leaves are technically called *cotyledons*, which merely means leaves or lobes. Those without cotyledons are called *acotyledonous;*

those with one are called *monocotyledonous;* and those which have two are called *dicotyledonous.* The first of these, including all the flowerless plants, is most numerous in cold and humid latitudes and situations. The second form a larger portion of the vegetation of temperate countries, though they assume the magnitude of trees only within the tropics, or at least in warm latitudes and places. The third are most numerous in tropical countries, though they are also abundant in temperate ones.

There are some distributions with regard to elevation, which tend farther to show the relative adaptations of these different divisions of plants to peculiar situations on the earth's surface. The numerical statements are not, however, to be regarded as anything more than the approximations; because many of the plants which have no cotyledons are so minute and obscure, that there may be numbers of them which have hitherto escaped observation. Brown,* the first of our botanists, estimates that the flowerless or *acotyledonous* plants in the tropical countries, are to the flowering ones as one to fifteen on the plains, and one to five on the mountains; but both proportions must depend a good deal upon the general character of the country, and the last one upon the height of the mountain. Of flowering plants, those with a single cotyledon increase in proportion to the whole, from the equator toward a pretty high latitude in the northern hemisphere, but they again diminish towards the extreme north. The grasses, bents, and rushes, increase from the equator to the middle of the temperate latitudes, and after

* Robert Brown died in 1858, at his house in Dean-street, Soho. He was styled "Botanicorum facile princeps." The Ray Society have requested Mr. Bennett, his coadjutor, and now his successor at the British Museum, to edit for them a collected edition of his works.

this they fall off toward the extreme north. The falling off, however, is in the grasses; for the rushes and bents are numerous in cold and humid countries; and there is hardly such a thing to be met with in tropical ones.

From this we may infer, that the bents and rushes are hardy plants, adapted to the very coldest situations where flowering plants of any description will grow; that the grasses hold a sort of intermediate character; but that neither is well adapted for the extreme action of tropical climates. Bents and rushes are almost too dry for supporting any vegetable-feeding animal; and as grasses are the prevailing food of those animals, we have the proper native localities of the grazing animals determined by the situation of those plants.

Such is a specimen of the climatal or geographical distribution of a few of the vegetable tribes; and such as wish to understand the subject more fully must be referred to the works of those who have written expressly on it.

A third method of distinguishing plants is the mode of their growth, that is, of their increase in size in the individual plant. As in all plants which last more than a single season, standing in the free air, all parts of the plant feel the influence of the Spring, the distinctions which are founded upon the mode of growth are fully more important for our purpose than the other. If the plant is a true annual,* that is, if it must be reproduced from seed every year, then the only action which Spring can have upon it is making that seed germinate. If, again, the plant has an annual stem in the air, and makes its annual appearance from a stem or root in the ground, or

* In the temperate zones it is estimated that one-sixth of the flowering plants are annuals, in the torrid zone scarcely one in twenty is annual, and in the arctic regions only one plant in thirty is annual.

on its surface, there are only two ways in which the Spring can act upon it—the one by germination of the seed for new plants—and the other by sprouting of the root, or underground stem, for the yearly renewal of old ones. If, however, the stem of the plant summers and winters for several times in the air, and flowers and ripens seeds every year, or during any period longer or shorter, there is, of course, an action of Spring upon all parts of the plant which nature prepares for such action.

We may say, therefore, that plants are so adapted to the Spring, as that some of them present themselves to it only in the shape of seeds; others both as seeds, and as roots from which the annual stems have died down; and others still, in their seeds, and also in their whole structures. The seeds of plants are the most imperishable forms in which the principles of vegetable life can possibly be treasured up; and they appear to be indestructible, very nearly in proportion as they are minute. It is scarcely possible to turn up vegetable mould to any depth, where the very lowest part of it, even though carefully preserved from receiving seeds, shall not speedily be covered with a crop of weeds, if placed in circumstances answering to those of the natural Spring. This is a very beautiful provision in nature, and one which is highly useful to man. New lands are often formed in the sea, by means which would be foreign to our present purpose to explain. Those new lands are often

very remote from any other, and they are of course without any seeds of vegetables. But the winds, probably, waft the extremely minute seeds of flowerless plants, and the currents of the water bring the weightier seeds of flowering ones; so that the young land is clothed with herbs, and ornamented with trees, as soon as it is fit for their reception. To man the advantages are still greater than these, because, by carrying it in the seed, he can distribute a useful plant to every region of the world that will suit its growth. Of our cultivated grain plants and fruit trees very few indeed are originally natives of our country; and the annual ones, especially, could hardly have been introduced in any other form than that of seeds. Besides this, if any place is sown again repeatedly with its own produce, the quality deteriorates; and seed of the same species from a different soil and situation will restore the value. The necessity of this change is well known to every cultivator; and it could be made in no other way than by means of the seed.

The root, or the underground stem, is a more tender form of the vegetable than the seed; but still the fact of its being underground, in a great measure preserves it, and keeps it in such a state as that the Spring may act upon it. Such roots and stems, too, may be preserved for a considerable time out of the earth, and transported to a considerable distance, without losing their power of vegetating. When we come to the third form—that in which the entire plant bears again and again all the changes of the seasons—we have a more complicated structure to deal with, and consequently, one which is more liable to be injured by casualties. Sometimes the whole of such a plant summers and winters; in which state it is called an evergreen, though such plants do shed their leaves after the lapse of some time or other, and all of them mature seeds in some form or other, and drop those seeds upon

the earth. Others, again, shake off their leaves to have them renewed in the Spring; and all plants which do this have a pause between every two producings of seed; whereas many of the evergreens have flowers, and half-grown fruit, and ripe fruit upon them at the same time—exhibiting, as it were, the united effects of three Springs. The shedding of leaves in trees bears a considerable resemblance to the dying down of stems in those plants of which the roots last longer than a year. There is, however, a difference between them in the majority of cases; and the root, of which the stem has died, is not so well prepared for enduring a wintry atmosphere as the tree or the shrub whose leaves have fallen off. The leaves of the tree or shrub are truly *deciduous*, that is, they part and leave no remnant of dead matter; the stem, on the other hand, leaves a dead stump, and often stands or lies in a withered state until the Spring. The fact of their being evergreen, or being deciduous, is therefore an important point, when we come to consider the preparations which are made in perennial plants for the action of the Spring. Before we proceed to that, however, we have to notice the two modes of growth to which we have alluded. The one of these is at the centre of the plant; and the plants are thence called *endogenous*, which means that they grow in the inside. The others grow between the wood and the bark; and they are called *exogenous*, or growing at the outside; which is not quite correct, because the bark is outside the place of growth, and in some plants it contains the larger portion of bulk in the stem, though this is not commonly the case.

It will at once be seen, that in these two several modes of growth there is a wonderful difference as to the susceptibility of the plants to the action of any external cause, and, consequently, to the action of the Spring. If the place of action is in the centre of the trunk of a

tree, it is quite obvious that more of heat or any other stimulating cause will be required to excite that tree to action, than if the excitable part were near the surface; and on the other hand, it will be obvious that an endogenous tree must be capable of enduring a degree of stimulating action which would destroy an exogenous one.

This at once points out the chief locality upon the globe which is best adapted for each species. The endogenous tree is proper for the tropical climates, and the exogenous for temperate ones. This agrees with observation. The palms, and other characteristic trees, which give so much beauty to the tropical forests, are endogenous; the action of them from the root is along the centre; they grow only at the top of the stem, without putting out lateral buds or branches; and the species which branch, by occasionally doubling their terminal buds, are exceedingly few in proportion to the whole.

When we consider perennial plants in respect of their leaves, as being evergreen, or being deciduous, we have another peculiarity of adaptation to Spring action. There is, no doubt, a good deal dependant on the general temperature of the place, and the alternation of its seasons. A tropical tree requires protection from heat, but never from cold, in its native locality; and the leaves of such trees are always covered with a firm and close *epidermis*, or outer skin, which is a very bad conductor of heat. The upper sides of the leaves are also, in general, very smooth, so that they reflect off the heat; and as the same sort of covering is an equal protection against the entrance and the escape of heat, a similar covering will enable a plant to stand the cold. Hence we have many evergreens in the cold latitudes, and in cold and elevated situations. These, however, have their leaves differently formed from the evergreens of warm latitudes, and much better suited for

resisting cold than for resisting heat. The pines and other cone-bearing trees belong to the cold climate evergreens, and they differ, in many of their characters, from many of the evergreens of warm countries.

When the number of species of plants is considered, it will be perceived that it is scarcely possible to give any general sketch of the distribution of individuals. The flowering plants are reckoned at about 78,000, and the *cryptogamous* at about 10,000; and this is a subject upon which the estimate cannot be over the truth, and is very likely under it. This makes in all, as known at the present time, 88,000 species of plants. But every fresh research is rewarded by the discovery of some new ones, and there are vast tracts of country not yet explored; so that it is probably not overrating the total number to set them down at 100,000. Ten pages of description for each plant would certainly not be too much, in order to afford room for even a very brief account of their characters, localities, habits, adaptations, and uses; and this would require the enormous amount of 1,000,000 pages of print, or 2,000 volumes of 500 pages each, which would be sufficient to stock a large library, and more than any individual could profitably read in the course of his life.

But numerous as these plants are, and long as the account of them is, considered as species, the catalogue extends prodigiously when we consider the vast number of some of the species. Including every kind, some of which are absolutely innumerable, a million of each species is certainly much below the real number. If we were to suppose the whole individuals, even at the under estimate that we have taken, to be counted at one each second, or sixty in a minute, and that twelve hours a day, for 313 days every year, were employed in the counting of them, the operation would last between 70,000 and 80,000 years. This does

not include any succession of races, but merely the individual plants which we may suppose, without the least exaggeration, but rather with the reverse, to be alive upon the earth at any one instant of time.

To our comprehension this is altogether stupendous; but those matters which so much startle us are really as nothing in the sight of Him who created all these wonders; and those simple laws which he has established for the government of the vegetable kingdom are exercised with the greatest perfection upon each individual of them at every moment of time; so that, as seasons change and Spring comes round, there is not one of the mighty multitude unprepared for its coming. It is impossible for anyone to reflect upon such a subject as this, without feeling that it is "the doing of the Lord, and wonderful in our eyes."

In taking this simple view of the two extremes, and the medium of climate to which we have before alluded, the summary of the matter is, that lowly flowerless plants, bents, and rushes, and evergreen cone-bearing trees, predominate in the cold latitudes; that palms and evergreen branching trees, together with vigorous herbaceous plants, and many climbing ones remarkable for the beauty of their flowers, predominate in tropical climates; and that, in temperate climates, the leading trees are deciduous, and the grasses compose the greater part of the carpeting of the ground.

To point out the adaptations to the different kinds of soils and exposures in localities of the same geographical climate, is a matter of detail, and would require many words. We may mention, however, that here also, as in the case of different climates, two extremes, and a mean between them, may be made a sort of general index, or skeleton, by the help of which anyone who

chooses to go into the details may preserve them in memory.

The two extremes with regard to locality, without immediate reference to climate, are those of drought and moisture; and the average of these may be considered as the mean. Some attention must be paid to the latitude, or at all events to the temperature; because the character of the vegetation, whether the situation be dry, or moist, or intermediate, depends a great deal upon this. If the place is dry, and at the same time very hot, the surface vegetation consists chiefly of that class of plants which are called *Crassulaceæ*, from the thickness of their leaves. Our common house-leek, which grows on house-tops, heaps of stones, and other dry and warm places, is an example of this. In tropical climates such plants are exceedingly numerous; many of them are singular in their forms, and remarkable for the beauty of their flowers. The fruits are also often pleasing to the taste; and the juices admit of being fermented into liquors, which the people of the hot countries where they grow use as substitutes for those liquors which we of temperate latitudes obtain from our grain plants. Many of these plants, especially the family known by the name of *cacti*, or Indian figs, have often very little of the form of ordinary plants. They consist of what might be regarded as merely thick lumps of vegetable matter, covered with a very tough, and, generally, a shining epidermis, and often beset with prickles, something like those of our gooseberry bushes. The gooseberry, indeed, resembles those curious plants in many of its botanical characters.

It is, however, with the adaptation of those plants to the action of Spring that we are more immediately concerned. Now, their general nature is such, that no solar action, even in the hottest places that are known, can

evaporate the moisture which they contain, and shrivel them up; and the chief cause from which they are liable to suffer is the stagnation of water about them. In consequence of this means of self-preservation which they possess, they are at all times ready for any action that may promote their growth; and thus they are finely adapted to the dry hills, and margins of the deserts in tropical countries, which are the native habitats of the far greater number of them. Other plants, nearly resembling the lilies in their general characters, are adapted to similar places. Of these the *aloes* form well-known examples. They are remarkable for their powerful endurance of heat, the vast quantities of juice which they elaborate even in very dry situations, and the splendour of their flowers, which, in some species, rise to the height of twenty or even thirty feet.

In the opposite extreme of situation—the humid one—the characteristic plants have generally fleshy roots, which run along in the mud, and are there preserved in nearly a uniform condition all the year; so that whenever the air over the marsh or the pool in which they grow is favourable for the production of the leaf, stem, or other part of the plant which is to work in the air, the root of the plant is always ready to obey. The intermediate grounds, which have not the character of prevalent drought or prevalent humidity, are not so susceptible of one general description, because much depends on the shape of the surface and the nature of the sub-soil. If the surface slopes, so as speedily to throw off the rain which falls upon it, or, if the sub-soil is porous, so as to drink it up, then the vegetation approaches more to that of dry and warm places; whereas if the surface is flat, and the sub-soil such as to retain the water, the vegetation approaches more to that of cold and moist places. All these are, however, very much modified

by the general climate, and do not admit of anything but particular description for individual places.

As the equator is left, and one approaches the pole, the dry places begin to be more and more covered with those *lichens* which form almost the only vegetation upon the rocks of the polar mountains. The places which produce these are not, however, so habitually dry as those which produce the succulent plants in warm latitudes; and thus, though the characteristic plants of those upland places of cold regions, which are dry during Summer, remain uninjured by the utmost severity of that season, the chief time of their growth is during the autumnal rains; so that, in the case of many of them, the Autumn of general vegetation answers to Spring, and the Winter to Summer. The plants of humid places fall off in like manner as we approach the poles; and as the plants of the dry places terminate in lichens, so do those of humid ones terminate in mosses.

As we approach the poles, however, the general principle does not apply so well as it does in places near the equator. The equatorial regions are far more under the influence of the sun than regions near the poles; and though drought and moisture are the immediate causes of variations of seasons there, they are both dependant upon the solar action. But as the situations of places are more polar, the mean influence of the sun always becomes less and less, until we at last arrive at the extreme verge, where it is incapable of exciting even the humblest vegetable into life. When we say that the action of the sun lessens on the average, as we advance towards the pole, we do not mean that the sun's action is lessened in itself, but merely that the position of the earth's surface is less adapted to receive it, by being turned away from it at an angle, whereas, the equatorial surface is presented directly toward it. But the

lessening of the adaptation has exactly the same practical effect as if the active cause were lessened; for the same reason that a man who possesses only a vessel holding a quart, can fetch but a quart of water, whether he has to catch that water drop by drop from the rock, or take it at once from the current of a river.

The next point for our consideration is the preparing of the vegetables, whether of different kinds in the same place, or in different places, for the reviving action of the Spring. A few particulars connected with this have been, in part at least, already alluded to; and this will shorten what is necessary to be said here; but still a few general observations may be useful to such readers as have not studied the subject.

In speaking of the preparation of a plant for the action of Spring, we have a preliminary question to settle, by means of which we are enabled to limit the extent to which it is necessary to examine the other, and more complex one. Nature does nothing in vain; and therefore no part of a plant can be expected to be prepared for the Spring action, unless it is to obey that action; that is, to act itself in consequence of the influence of the Spring upon it. Thus our inquiry must first be directed to the parts of plants which are brought into action by the influence of Spring, whatever the character of that Spring may be.

In considering this inquiry, the seeds of plants may be omitted; for the Spring has no action upon seeds, unless they are placed in situations favourable to their germination. If they are so placed, seeds will germinate, whatever be the season of the year; and in a state of nature, and also in cultivation, many seeds germinate in the Autumn; and there are some which germinate indiscriminately at any time of the year; nay, there are not a few which not only germinate, but become plants, before they drop from their parent stems.

This is especially the case with the grasses, when exposed to much humidity after the seeds have been matured. Some of the mountain grasses* exhibit, after the first autumnal rains, the curious spectacle of a light carpet of green, waving and floating a little above the surface of the brown earth; and this consists of young plants which have been produced from the seeds on the tops of those stalks, which are now brown and withered. In cold situations, barley standing in the ear is very liable to do the same; and these are not the only plants which have this peculiarity; for there are some bulbous plants which continue their fructification onward to a bunch of little bulbs, enclosed in a membrane at the top of what was a flowering stem. When all these things are considered, and many others of a similar tendency might be adduced, we cannot include the ripening of seeds among the direct preparation of plants for the action of Spring. They in fact serve a more general and a more important purpose than any which is served by the other parts of plants, by treasuring up and preserving species amid the ruin of the growing portion of the same, by distributing them over places where they did not previously exist, and by maintaining the permanent stability of the vegetable world.

Leaving seeds out of the question, therefore, it remains for us to consider, what parts of a plant which has stood the Winter, act, and how they act when the influence of the Spring operates upon them. In order to understand this, we must revert to the modes of growth by which the

* Such as the *Pea* and *Festuca Vivipara*, common varieties of lowland species, found on the mountains of the British Islands. Some of the Arctic plants are viviparous, and some, such as the "spider plant," a species of Saxifrage, produce little plants from the ends of shoots. This last plant was common on the shores of the Wellington Channel.

several great classes of plants are distinguished from each other; because each of them, as it were, works with a different part of its structure. It is also necessary to attend to another distinction; namely, where the permanent part of the plant which has stood the Winter is situated; because in some plants it is in the earth, or close on its surface, in the form of a root, or an underground stem of some description or other, upon which the stem which bore leaves in the former season has died down, as well as that which bore flowers and fruit. Again, it may exist partly in the air as a stem may or may not have shaken off its leaves, before the Spring exercises any influence upon it, according as it is an evergreen or deciduous.

In attending to this part of the subject, the herbaceous plants which we are in the habit of considering as flowerless, may be left out; as for instance, the common ferns, the mosses, the lichens, and the fungi. The ferns, indeed, are obedient to the Spring, and belong to the plants having seasonal action with underground stems. The mushrooms, too, are a curious sort of seasonal plants; and those parts of them which appear above the surface of the ground, are really flowers; but though a considerable degree of heat is required for the maturing of many of them, they are to be regarded as, upon the whole, Autumnal plants, rather than Spring ones. The action of the early season upon them, too, is so very little known, that it is not a subject for popular discussion; therefore we may leave them entirely out of the question.

Our subject is thus reduced to the consideration of three forms of growth; the growth of arborescent flowerless plants—tree-ferns, for instance; the growth of endogenous flowering plants; and the growth of exogenous ones. Of the first we need say little; the palms are examples of the second; and any of our common forest or fruit trees are

examples of the third. The tree-ferns, and all arborescent plants of the same division, grow at their upper extremities only; they grow round the inner surface of a sort of cylindrical tube, which is sometimes, however, completely filled with solid matter; and when this has obtained all the solidity that it can, it is understood, though not proved, that the plant cannot grow to a greater height, or increase any further in size, but that its decay begins at this stage of its growth. One single seat of vegetable action rises in the centre of a plant of this kind; and in common language we may call this a bud, though it is very unlike the buds of our ordinary trees. This bud is the only part that would require preparation for Spring action: and as the plant is an evergreen, in the strictest sense of the word, and never found native, except in tropical climates, it may be said to be always prepared for action when the necessary stimuli are applied to it.

The palm also rises by a single bud, but its growth is from the central line, and not from the inner surface of a cylinder; and in it the fibres which have been formed successively by the bud, and connect the young leaves with the root of the trees, push the old ones outwards. This also grows in tropical countries; and like the former, it is ready to act whenever it is properly stimulated. What we have chiefly to consider, therefore, as requiring preparation for the Spring, are the plants of temperate countries, having considerable differences of seasons—such as the British islands; and we shall be enabled to get at least a glance of the preparation, by attending to the case of any common tree.

Even in this we need pay little attention to the roots; for the seasonal action of these, as occasioned by the Spring, is probably secondary, and derived from the action of the part above ground. Besides, in many situations, the roots

of trees begin to act almost immediately when the fruit is ripened and the leaves shed, and long before there are any signs of action in the upper parts.

The acting parts of such a tree are the roots, the inner surface of the bark, and the external surface of the wood, where those are applied to each other, and the buds, on whatever part of the tree the last may happen to be situated. When the influence of Spring brings the tree into action, it is highly probable that the buds stimulate all the rest; although in a lofty tree, the buds on the lower branches generally begin to act sooner than those on the upper ones.

Before one can fully understand the importance of the preparation which is made for this action of trees, it is necessary to understand something of the action itself, and of the parts formed by this action, exclusive of those that are immediately connected with the operations of flowering and ripening seeds. These last, no doubt, require preparation for the action of Spring, as well as the others; and if this preparation is not made, Spring and Summer will be without blossoms, and Autumn without fruit. If an unfavourable Autumn renders this preparation imperfect, the action of Spring will be imperfect, however favourable that season may be in itself; and thus, in this, as in all other cases, there is an experience of the past, which if we rightly attend to it, so far guides us as to the future. But to advert briefly to the formation of the tree, in itself as an individual, and without any reference to the flowering and fruiting, the object of which is the multiplication of the species:—

The portion of the tree which we call wood, consists of two distinct kinds of parts, though in most cases these are intimately blended with each other. The one part is formed of what is called cellular tissue or cellular substance, con-

sisting, in the young state of the wood, of little cells or vessels, containing substances more or less fluid, with open spaces between them, which are in general filled with air, not apparently by any peculiar working of the tree, but merely by the power which the atmosphere has of insinuating itself into every open place, however small. These openings containing air are sometimes called cells; and they and also the other cells, every species of which contains substances peculiar to the plant, very greatly in size, not only in different species of trees, but in the same tree under different states of growth, and at different ages of the part of it in which they are situated. If the tree is of a very fast-growing kind, or if it is so situated as to grow faster than trees of its own kind do upon an average, the cells and also the air openings are of larger size than they are under the opposite circumstances.

This is a point of some importance, both practically, and as throwing light upon the mode of growth in trees. Wood which grows fast, is, with very few exceptions, more soft and tender and less durable than that which grows more slowly. The reason is evident: there are larger openings in it at the time of its growth; and though the sides of those openings may be afterwards squeezed together, they never adhere so firmly as to become solid. On the other hand, slow growth may be carried to excess; for if the growth is very much stunted, the longitudinal fibres which unite the wood lengthwise, are constrained and not properly formed; and thus, however hard and solid the wood may be, it is liable to snap across.

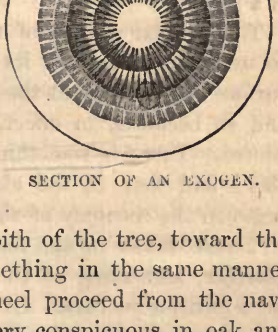
In this there is some instruction to the growers of trees: it being their business to find out the proper medium of growth between too much rapidity and too much tardiness, so as to make the tendency to split lengthwise, and that to break crosswise, each as small as possible. Something

depends, however, upon the purpose for which the wood is required; because there are some purposes where toughness in resisting cross fracture is the essential property; and it will in general be found that timber which has this property in a high degree, is generally more easily split lengthwise than that which is not. Rapid growth of itself always tends to increase this toughness in wood, though when growth is carried to excess, in temperate or cold climates, the growth of one year is not completely matured before Spring returns, and calls forth the growth of another. Thus, a preparation of the wood is required, as well as of the parts more immediately exposed to the air, in order that the tree may be in a fit condition for enjoying the benefits of the Spring.

There are some trees in which the annual growth of wood can hardly be too great; and among the common forest trees of this country, the ash may be cited as an example. On examining the cross section (or cut of the wood of such trees) it will however be found that there is in them a peculiar arrangement of parts: one portion of each year's growth consists of longitudinal fibres very closely packed together, and the other of a loose texture of cells and tubes. The more vigorously that such trees grow, the greater is the proportion of those compact longitudinal fibres, and consequently the wood is the tougher. It does not appear that trees of this habit require the same ripening in the year's wood, as those in which the whole production of the year is more uniform throughout its whole extent. Such trees have accordingly none of what is called sap-wood; or at all events the wood of the year, when perfected, differs less from the wood of former years, than is the case where the whole is of uniform structure. Young plants of trees of this description are also much tougher than those of the opposite one.

This naturally leads us to the consideration of the second kind of structure in the wood of trees, and in part explains to us the mode of its formation. It would be foreign to our purpose to discriminate the different kinds of longitudinal fibres and vessels which occur in the substance of the same plant or of different plants; and so we may give them the general name of longitudinal fibres. These are the wood of a tree properly so called, and they are also the strong or supporting parts of the stems of herbaceous plants. No part of a tree which contains longitudinal fibres is so easily cut across as it is split lengthwise; and when wood is difficult to split, that arises more from the longitudinal fibres being interlaced with each other, like a sort of net-work, than from the cellular tissue, the direction of which is across the substance of the tree.

In most trees, which have stood several years, and obtained some size in wood, the cellular matter is compressed into thin plates, thinner and more conspicuous in proportion as the longitudinal fibres are more firm and vigorous. When the wood of many kinds of trees is cut across, those portions of cellular substance may be observed proceeding from the centre or pith of the tree, toward the external part of the wood, something in the same manner as the spokes of a carriage-wheel proceed from the nave towards the ring. These are very conspicuous in oak and in beech; and in the former, workmen, in cleaving or sawing the tree, often avail themselves of them, so as to procure a finely-mottled colour in the wood. This is



SECTION OF AN EXOGEN.

obtained by dividing the tree in a straight line from the outside to the centre, because then the portions of cellular matter appear as spots of smoother and closer surface than the fibrous portions with which they are intermixed.

Those cellular portions of the wood of a tree are sometimes called medullary rays, the old notion being that the pith, or soft cellular substance in the centre of the tree, performed the same function in its economy that the spinal elongation of the brain (*medulla spinalis*) performs in the animal economy. This, however, is a mistake; for it does not appear that, after any portion of the wood of a tree has ceased to be sap-wood, there is any action whatever in the pith, in the consolidated wood, or in those portions of the cellular substance which are compressed between the longitudinal fibres of the latter. On the other hand, whenever those internal parts of the tree have arrived at their full maturity, they act no more; but in time decay, unless they are embalmed in turpentine, or some other preserving substance, as is the case with the central parts of a pine.

This cellular portion of the tree does however continue to extend or grow, at its outward extremity, toward the surface of the wood, at the same time that it ceases to act, and so becomes, in effect, a dead substance towards the centre. There is something by no means uninstructive in this; and that is, the close resemblance which there is between the economy of this cellular part of a tree whose structure, taken in the longitudinal direction, is fibrous or vascular, and many of those plants which are cellular in their entire structure. Of the latter description of plants, the lichens on a rock, or the mosses on a bog, continue growing at the one extremity, and dying off at the other; so that in time the lichen produces upon the rock a sort of soil adapted to another and more valuable kind of vege-

tation. It is the same with the moss. Begun in stagnant water, it grows at top, and deposits its peat earth at bottom, until it raises the place to such a height, as that a different kind of vegetation will grow upon it. Heath, for instance, and the various heath berries, in places which are cold and elevated; and kindly grass, in such as are warm and sheltered. Of the latter there are many instances in the southern counties of England; where cattle may be observed grazing one part of a bottom as a fine green meadow, and the people cutting turf for fuel in another part of the same.

This coincidence between the cellular parts of the one grand division of plants, and the cellular structure of another division, is not only a very striking proof of the unity of creation, and the oneness of the creative act, but is a great encouragement to us in studying the works of nature, so as to infer with certainty from their structure what their economy must be. And the more minutely and carefully we conduct our observations, the more do we find that this is the case; so that it is impossible for us to acquire the knowledge of any one thing rightly, without thereby getting possession of the means of acquiring the knowledge of many other things. But to revert to the tree.

The cellular part appears to be the first or rudimental one in every plant, whatever is to be its future character; and it exists in the seed, without any direct action of those external agents, which call forth the tree itself, in the spring of successive seasons. It is common to all parts of the tree, and appears to have a power of growth at its external extremity, as long as the tree continues to live, even though the pith and great part of the internal wood are gone, so that the tree contains a hollow cavity many feet in diameter. The vital part of it seems to lie between

the last formed layer of wood, and the last formed layer of bark; but it extends more or less into the substance of both, according to the species of the tree. The bark, indeed, in most trees, consists chiefly of this kind of substance.

It is very different with the vascular or fibrous parts. These never make their appearance until buds and leaves appear, or something which can perform nearly the same office as these. It is therefore reasonable to conclude, that every new bud which is formed upon any twig, branch, or other part of a tree, sends down its complement of fibres to the stem, if it is strong enough to fully obey the action of the Spring. The different modes of growth in trees, and also in the stems of herbaceous plants, to which we have alluded, depend not so much upon any different mode of action in the bud, as upon the way in which it sends down those fibres.

We must here, however, be on our guard against falling into mistakes. The fibres of the bud are not first perfected at the bud, and then sent down by elongation of a completely-formed member, as a root grows downward in the earth, or a stem upward in the air. The action of the root is essential to the perfect action of the bud; for though a lopped branch will bud, and so will a cutting of many kinds of trees, no good is ever done until roots are formed. We must, therefore, consider the first action of the bud merely as action—that is, as a power of exciting, which the influence of the sun communicates to it; and that this is sent all the way down to the root of the tree, not only before the new fibres which connect the bud with the root are actually formed, but before the matter out of which they are to be formed can be rightly prepared.

The action of the root appears to be chiefly upon the cellular substance; and the putting forth of the rootlets,

which are the working parts, before the buds begin to act, shows that that part of the plant which is protected by the earth from the severity of the Winter action, is enabled to prepare for the Spring.

Water, and, probably, carbonic acid — which, being heavier than air, runs into and occupies every crevice of the earth just as water does, and can also mingle pretty largely with water—appear to be the chief substances taken up by the roots of plants. We may expect that water should stimulate the cellular tissue of a tree, because it is the chief stimulant of cellular plants; but how the stimulating is brought about is one of those subjects which are beyond our knowledge. It is done, however; and this may be regarded as one of the actions of the plant, the preparation for which is, the compression of the wood and bark of the former year against each other, and the preservation of the vital power of both by this compression.

The other power of action in the plant, and the one which more immediately obeys the influence of the Spring, is that which slumbers in the bud during the Winter, and does not begin to exert itself until the Spring is more or less advanced, according to the nature and habits of the tree. The parts which this action of the bud have to evolve, are more numerous, and, we may also say, more important, than those elaborated by the root; and therefore the chief preparation of the plant for the Spring is directed to the bud, and those parts which the bud is more immediately to influence.

The bud is accordingly always formed, and not only formed, but brought to a considerable state of forwardness, in the Autumn of the preceding year. Its advance is in proportion to the general size of the plant, or rather of the shoot, at the extremity of which it is formed; and also in proportion to the rapidity with which it is to be developed

in the Spring. The latter circumstance must necessarily depend in part upon the kind of tree, and also upon the nature of the climate—the early tree, and the tree of cold latitudes, requiring the best prepared bud; because to them the action of the Spring is of shortest duration.

Upon actually examining the buds of trees of different sorts, and also in different climates, we find the principle here so completely borne out by the fact, as not to leave the slightest question as to the truth of it. In tropical countries, where there is continual growth if a supply of moisture is afforded, there may be said to be no seasonal bud, the purpose of which can be the production of a twig; and which rests mantled up in its *hybernaculum*, or Winter clothing, between the time of its formation in the Autumn, and its development in the Spring. The extremities of the twigs of branching trees there very much resemble the tree-ferns and the palms, by at all times standing prepared for that action of the sun which is upon them all the year round, whenever it shall be accompanied by the necessary supply of humidity, either sent up from the roots, or absorbed by the leaves. In order that those tropical trees may be prepared for free vapour in the atmosphere, as well as for rain upon the ground, almost the whole of them are evergreens, wearing their leaves continually upon them; so that no part of that bounty of heaven, which created the living tribes, and which causes them to grow and beautify the earth, and be the food and the habitation of so many of the earth's inhabitants, might be bestowed in vain.

We have a slight approximation to this in those of our evergreens which are natives of low and warm situations; such as the holly and the common laurel. In these, however, as in all the native trees of temperate climates, there is only one season of growth, one vegetable Spring; and therefore such trees do not stand prepared for action at

every season, like the evergreens of tropical countries, though they are always ready for the formation of the shoot of the year, earlier or later, according to the character of the particular year. These trees do form buds; but the buds which they form are not nearly so much developed as the buds of those trees which shed their leaves in the Autumn; and this appears to be the chief reason why they retain the old leaves, not only during the Winter, but during the Spring, and often till the Summer is some time advanced. It does not appear that any tree can mature its buds when the leaves are stripped from it, unless such trees as are capable of being propagated by cuttings; and then the cutting must generally be only a short piece of comparatively young wood.

The trees of which we have been speaking, though they are evergreen, yet shed their leaves every year, as well as those which are the latest to obey the Spring, and the first to yield to the Autumn. They may be said to wear their leaves during the whole twelve months, and a little more, though they put them forth at nearly the same season. It should seem, that the comparatively feeble obedience which the firm leaves of the evergreen yield to the early Spring, bears no inconsiderable resemblance to the diminishing action of the fading leaf during the Autumn. Both are sufficient to bring forward the bud to such a stage as that it can be directly acted upon; but the greater sensibility of the young leaves is required for the elaboration of the shoot. The perfect formation and ripening of the longitudinal woody fibres which connect the young shoot upon which the leaves are formed with the root of the tree, appears to be the signal that these are no longer wanted. They then peel off, are cast upon the ground, and, mingling with other matters, contribute to the quantity and fertility of the soil. The process by which this is done is somewhat

of a mystery. While the leaf adheres firmly, and performs its functions, there is a connexion between it and the twig, which extends along the branch, the stem, and the root; but when the leaf is no longer necessary, its longitudinal connexion is cut off, not by fibrous, but by cellular or membranous matter; and that portion of the wood to which the leaf ministered, ceases to increase in growth; and though it continues to bear some part in the action of the tree for one season in all, and for several seasons in some, the moment that it sheds its leaves in a healthy way, it may be said to be little else afterwards than an auxiliary to the more energetic parts of the tree, and on its progress to that gradual suspension of all active or passive use, which is to terminate in its final death and decomposition.

The last act of growth in any one season is the preparation of the bud for the succeeding one,—as if, when the genial influence of one year can do no more for or of itself, it should devote its last fading energies to the making of provision for the next. This beautiful mode of action may be traced a good deal further in the economy of vegetables. For, just as when the plant can do no more to the increase of its own growth for the year, it prepares for another year; even so, when the plant, or any part of the plant, can do no more for the increase of its own volume, it turns the rest of its energy to the formation of a flower-bud, or whatever else may be the form assumed for the continuation of the race. This is not confined to plants which live for several years, but is just as conspicuous in annual ones. As long as the supply of stimulus to a plant consists of that proportion of heat and moisture which is most favourable to its own individual increase in bulk, it shows no tendency to produce flowers. But whenever this proportion is departed from—and the departure generally consists in a lessening of the moisture in proportion to the heat—the

plant immediately prepares for flowering. In annual plants, or those which are grown from the seed every year, there is no particular preparation for the Spring in respect of flowering; for, as we have already said, the maturing of the seed is not necessarily a preparation for the action of Spring, as some seeds germinate before they fall from the parent plant, some immediately after, and some, even under the most favourable circumstances, not until a considerable time has elapsed. The bud, therefore, must be looked upon as that part of the tree which is prepared before the Winter to meet the action of the Spring, in order to produce flowers and seeds. In this respect there are very great differences, depending chiefly upon the time of the year at which the flowers make their appearance. Some plants put forth their flowers before any leaves appear, some along with the leaves, and some not till new twigs have been produced from the leaf-buds of the Spring. There is no doubt that in all of these cases preparation is made for the flower and the seed of the season, as well as for the leaves and the shoot. But people generally can notice only such cases as are open to their observation, without any nice operations in dissecting; and as these do not differ in kind from the others, they answer well enough as illustrative of the whole. A common apple-tree may be taken as a familiar example, because its flower-buds are very conspicuous, and easily distinguished from such as are to produce shoots only. Those buds are of larger size, and apparently wrapt up with greater care in their hybernating scales than the buds which are to produce no fruit. They are often on the ends of the longest twigs, and in the apple always at the end of some twig or other; but whenever they appear, we may rest assured that that particular part of the tree will never increase a hair-breadth as wood. There may be a common bud ever so near it, from which a shoot may spring

and grow to any length during the year; but the moment that a fruit-bud appears, the parts immediately concerned in the production of that bud never do any more in the producing of wood.

This is a much more general truth than one would be led at first to suppose. There are instances of fruit-trees in this country which have certainly yielded fruit regularly for centuries; and it is said that there are vines in Italy still yielding grapes, which were planted more than 2,000 years ago; and it would at first seem strange to consider those aged apple-trees, and still more aged vines, in the light of annuals, or as belonging to exactly the same class with the fleeting plants, which perish entirely as soon as they have matured their seeds for a single season. But still, in as far as flowering and bearing fruit are concerned, the plants have precisely the same duration; and that portion of the most long-lived fruit-tree which has once brought fruit to maturity, never again produces fruit, any more than it produces leaves or wood. What becomes of it is another question, and one for the solution of which we are altogether incompetent. For aught we know it may be absorbed, and no longer exist in the tree as a distinct part; and this is the probable result, inasmuch as it seems to be a general law in trees (for no tree is an annual in its whole structure) that any portion which goes to the permanent wood of the tree, must perform its last operation in forming a bud which shall again produce wood, and not fruit.

These two may be distinct, as they are in the apple, and in all other species which produce their fruit immediately upon the shoot of the former year, without any intervening wood of the same year's growth with the fruit. The two may also be combined in the same bud, as we find in the vine and in all other trees in which the fruit is produced

upon the shoot of the year. They may be even farther separated, as they are in the case of those species which produce their flowers and fruit upon wood more than one year old. In whatever manner they occur, however, we are to consider them as distinct; and whether there is a more permanent part along with the flowering and seeding part or not, this part belongs to the season only. Therefore, a due preparation in the Autumn is fully more essential to the production of flowers and fruit, than to that of the merely vegetable growth which increases the size of the individual plant. Those tropical trees which have several crops upon them at the same time, and also the common juniper, and many other cone-bearing trees, which take at least two years to bring their fruit to full maturity, form no exceptions to this. Every return of the Spring—whether that Spring come only once in the year, as it does in cold and temperate countries, or twice, or oftener, as it does in some tropical ones—always brings more or less of a tendency to flowering along with it. The development of this tendency no doubt depends, in part, upon the preparation of the tree, and in part also upon the state of the weather during which the growth takes place. Some species of fruit-trees with us produce what is called a midsummer shoot: and though in the greater part of them this shoot is usually a mere production of young wood and leaves, yet there are instances of peculiarly dry seasons in which flowers appear with this midsummer shoot, not upon it, though fruit is rarely ripened. The fig is more prone to this double-flowering than most other trees; and when it is so situated as to flower early in the Spring, the second flowering is generally preferred to the first for ripening. The fig is, however, very peculiar; for its flowers do not appear externally, like those of most other fruits, but are formed in the interior of that part which afterwards

becomes the pulp or fleshy portion of the fruit, and encloses the seeds.

What have been now stated, are a few examples of the preparation of the vegetable tribes for the action of the Spring, with the mode in which that preparation is brought about, and the purpose which it is intended to serve. More space has been devoted to them than could have been wished; and yet we fear that what has been said is too sketchy and imperfect for being properly intelligible to ordinary readers, at the same time that it is but little adapted for those who are conversant with the subject. The preparation of the vegetable tribes for the action of the Spring is, however, so beautiful a part of the economy of nature, and calculated to throw so much light upon the splendour, yet simplicity, of those laws by which God governs the material creation, that it is altogether impossible to touch on the subject of the Spring without adverting to it to some extent or other. It may be possible, too, that the few hints we have thrown out may induce some, who have hitherto remained ignorant of the subject, to turn their attention towards it; and we can confidently assure all such, that so far from finding it labour in vain, it will prove to them one of the most delightfully instructive subjects in the whole of the wide and wonderful field of nature. It has the advantage, too, of being a subject upon which the way is not only open, but inviting, to all who have the will. In its subject, it is the knowledge of growth; and those who attend to it ever so little, if they attend to it with willing minds, will not fail to find that it is growing knowledge; and that every step taken in it affords the means of taking two additional steps of the same length.

We have said little or nothing about those herbaceous plants, of which the stems and leaves die down for the

season, either before they have perfected fruit, or after that fruit has been perfected. These are different in their habits from perennial trees, which stand up in the air, and abide the seasons as they come, and some of them differ considerably from others; but still they follow the same general law. In many of these, there is a particular situation in that part of the plant which does not die down previous to the Winter, which determines the general nature of the part upon which matter is prepared for the action of the Spring in the year following. This peculiar portion of the plant may be said to be situated in such a manner as that all above it is upward stem, and all below it downward root; it is called the *collet*, the coronal plate, or simply the crown of the root; and it is in it that the vegetable life of the plant remains to be stimulated by the Spring. All that is above this plate is to be considered as stem or leaves of some form or other; and all that is below it is to be considered as roots. Of the stem accumulating in one season a store to be ready for the action of the ensuing Spring, we have examples in the common onion, and all those roots (as we improperly call them) which are denominated bulbous. The collet is on the bottom of them, nothing is produced below but fibrous roots, proper for the economy of the plant when it is in an active state; and all the leaves and flowering stems are produced on the opposite or upper side of this plate.

In the turnip and the carrot again we have examples of this store of provision for the action of the Spring being collected in the root itself, for the collet is on the upper part of these; and if this collet is removed, or injured by frost, the remainder of the root does not obey the influence of the Spring, but rots like a piece of dead matter. Our cultivated turnips and carrots are to be regarded as forced roots, especially the former; for, in a state of nature,

turnips are strictly annual, growing from the seed in the Spring; putting up their flower stems, flowering, ripening, and shedding their seeds the same year. There are, however, many of the most troublesome weeds which infest our fields and pastures, and render our way-sides unsightly, which do put up leaves the one year, and die down to a fleshy root in the Autumn; and this root contains a store of matter prepared for obeying the ensuing Spring, and flowering and ripening seeds during the Summer. Thistles and rag-weed are examples of this; and their roots generally have the collet so deep in the ground, that they are not injured by the frosts of our severest Winters. The best way of clearing a field of them is to cut them down just when they are coming into flower; because then the roots are so much exhausted, that there is no chance of their sending up a fresh stem from any part of the collet, so as to produce seeds, and thus the roots perish, and the race of the plants perishes along with them. The seeds of such plants are exceedingly abundant, and they have numerous little fibres which act as wings, so that the wind carries them everywhere; and if they are allowed to cover a piece of waste ground on the margin of corn-fields, they regularly invade those fields every year, and sometimes in such numbers as to choke all more useful vegetation. The injury produced by them in Britain, even in those places where they are most abundant, and where cultivation is carried on in the most slovenly manner, are nothing, however, to what they occasion in some other parts of the world. That part of Upper Canada which lies immediately to the northward of Lake Ontario, and which is naturally amongst the richest soil in the whole province, and the best situated for getting the produce to market, has been not merely invaded, but absolutely conquered by the Canadian thistle, so that large portions of ground, which once yielded

an abundant return to the farmer, are now abandoned to the dominion of this most formidable weed. At one time the thinner soils of the province of Moray, in Scotland, suffered an almost equally destructive invasion from the common yellow field marigold, which was supposed to have been introduced by the Danes, in revenge for their inability to conquer the people; but it does not appear that there is much truth in this supposition.

Another mode in which plants prepare for the Spring is by tubers, such as those of the common potato. It is not very easy to know which of the ordinary parts of a plant this same tuber should be referred to. It is not a root; for roots which last the Winter have always the power of putting out rootlets from some part of their own substance, which take up substances from the soil, to assist in the Spring action of the plant. This is never done by the tuber of the potato. It shoots from the eye, much in the same manner that a plant shoots from a seed; and there is really no root, until that root is elaborated by the new plant itself. The tuber of the potato is therefore a kind of stem, though an under-ground one; and cultivators are aware, that by judiciously earthing up a potato plant from time to time, the lateral branches which, if left in the air, would have produced leaves, flowers, and fruit only, can be made to produce tubers. The dahlia is a little different in its economy; and there are crowns upon dahlia roots, from which only new plants can be made to spring. Those crowns are also at the end of the tuber nearest to the stem producing it, whereas the eyes in a potato are most abundant at the opposite end. But still the dahlia makes a much nearer approach to a true tuber than it does to the bulbous roots. The bulbous root is a store of provision only for the second year's growth of the individual plant which produced it; and the stem which the action of the

Spring sends up, comes from the very same bud as the above-ground vegetation of the preceding year. Such a root never multiplies itself, or in any way originates a new plant. But the dahlia, and all that class, produce new tubers in abundance. Their crowns are no doubt connected with the crown of the tuber by which they are produced, otherwise they are abortive, and will not grow; but still there is a multiplication of them, and not only the new tubers, but the shoots which spring from them, become perfect plants. It is the same with bulbs which grow above the collet. They have all a power of multiplication, if placed under favourable circumstances; and therefore they are all to be considered as something more than preparations of a single plant for the action of the Spring. All plants having this habit are adapted to drought during the time that their vegetable action is suspended; and hence, in those climates where the Winter is cold and moist, if they are not taken up and dried, they rot, or at best are greatly deteriorated. If a potato were allowed to be self-sown for a number of years, the tubers would degenerate to those small, waxy, and tasteless ones, which were first found in the American mountains; and if the dahlia were allowed to grow in the same manner, it would soon degenerate into a single flower, of diminutive size, and very little beauty. The tulip, the ranunculus, the anemone, and a vast number of those bulbous and tuberous plants, the flowers of which are so very ornamental, require to be treated in the same manner.

All this shows that every species of accumulation of a plant, whether above ground or below it, that can in any way be considered as related to a stem, bears some analogy to a bud; while the true root, without the crown, which is always a bud or an accumulation of buds, can do nothing—not so much as put out a single fibre. The accumulation

in the stem, whether situated above the earth or under it, is therefore an accumulation specially adapted to the action of the sun and the air of the Spring; whereas an accumulation in a real root contributes more to that species of action in the plant, which we have described as being referrable to the root, and whose stimulus is water. These last suffer in their powers of vegetation, if taken up and dried, just as much as the others suffer by being left in the cold and moist earth.

Those circumstances at once point out the situation for which each kind is adapted. The tuber is adapted to dry places, and so is the bulb standing above the collet; whereas the root which accumulates below the collet is more adapted for cold and humid situations.

Herbaceous plants which die down in the stems every year, but do not perish in the roots, always thus lay up a store for the ensuing Spring. If the air is to be parched with drought, and the earth also dry, the store is deposited in some kind of stem; and the Spring action bears a considerable analogy to the action of a bud; whereas, if the plant is to be soaked with water during the Winter, or mantled up under the snow, the store is placed in a more downward situation, so that it may be protected from that cold which would not fail to destroy it during a long protracted Winter.

Some plants have a curious power of accommodating themselves in this respect; for there are several of the grasses, natives of rather moist situations, which have fibrous roots while they remain there, but if they are transplanted to places which become seasonably dry, the lower part of the stem swells out into a bulb before the upper part withers.

These are a few, and but a few, of the adaptations and preparings of the vegetable tribes for the Spring. We do

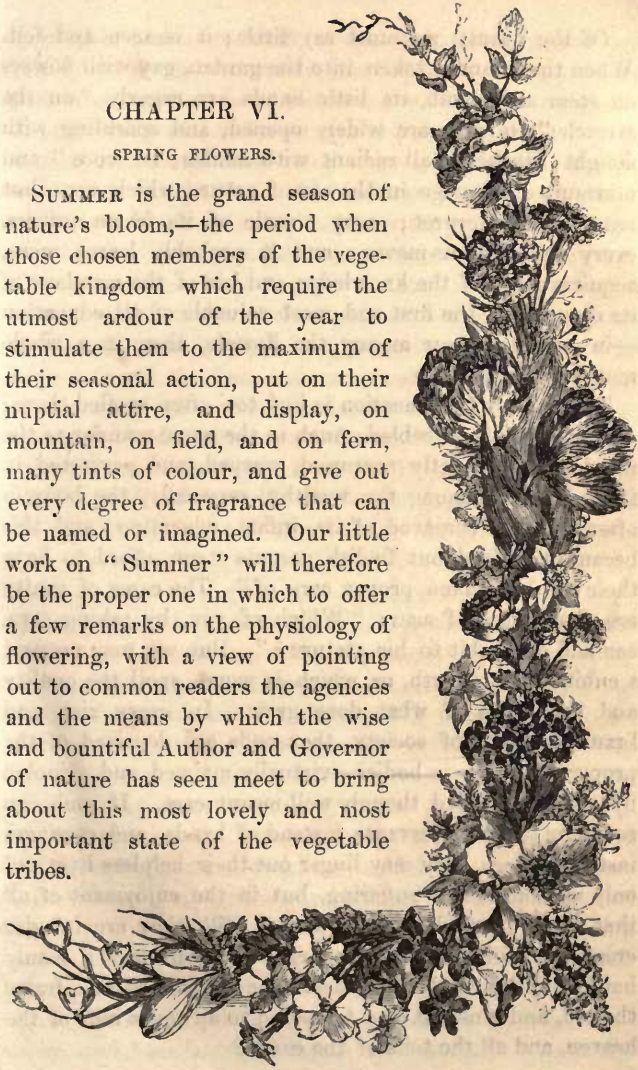
not expect that they will satisfy the inquiring reader, neither do we wish it; for our object is to increase his appetite, and tempt him out into the fields, that he may of his own observation taste and see how good God is, and how bountifully he has provided for every creature that he has made.

"Then spring the living herbs, profusely wild,
O'er all the deep-green earth, beyond the power
Of botanist to number up their tribes:
Whether he steals along the lonely dale,
In silent search; or through the forest, rank
With what the dull incurious weeds account,
Bursts his blind way; or climbs the mountain-rock,
Fir'd by the nodding verdure of its brow.
With such a liberal hand has Nature flung
Their seeds abroad, blown them about in winds,
Innumerous mix'd them with the nursing mould,
The moistening current, and prolific rain."

CHAPTER VI.

SPRING FLOWERS.

SUMMER is the grand season of nature's bloom,—the period when those chosen members of the vegetable kingdom which require the utmost ardour of the year to stimulate them to the maximum of their seasonal action, put on their nuptial attire, and display, on mountain, on field, and on fern, many tints of colour, and give out every degree of fragrance that can be named or imagined. Our little work on "Summer" will therefore be the proper one in which to offer a few remarks on the physiology of flowering, with a view of pointing out to common readers the agencies and the means by which the wise and bountiful Author and Governor of nature has seen meet to bring about this most lovely and most important state of the vegetable tribes.



Of the beauty we must say little; it is seen and felt. When the infant is taken into the garden, gay with flowers on stem and shrub, its little hands are eagerly "on the stretch;" its eyes are widely opened, and sparkling with delight; its face is all radiant with smiles; it "coos" and murmurs a language in the ear of nature, which none but nature can interpret; every muscle of its frame quivers, every articulation moves; and it probably learns more, acquires more of the knowledge and use of the members of its own body—the first and most valuable of all education—in one half hour among the flowers, than in a whole month in the nursery.

The nursery! Education is but too often spoiled there; and the body is enfeebled, much in the same manner as the mind is subsequently narrowed, warped, and perverted, in the schools. Among the wealthy, especially, the body is often cruelly bereaved of its infant education, and this because the fond but foolish parents "can afford to have their children taken proper care of." The cares of vanity are the curses of man: "Which of you, by taking care, can add one cubit to his stature?" But we may prevent a cubit of the growth, or, which is worse, spoil the quality and usefulness of what does grow. In every rich and luxurious state of society, thousands are deprived of the proper use of their bodies—virtually maimed and crippled by this ill-directed though well-meant care. If such can continue to afford servants instead of hands, and carriages instead of legs, they may linger out their helpless lives not only without actual suffering, but in the enjoyment of all that can be bought with money. Still, they are inferior creatures; for where is the price that can buy a manly hand, a well-nerved arm, a fleet foot on the lea, or a frame thewed, and sinewed, and tempered to all the winds of the heaven, and all the toils of the earth?

Yet these are the temporal heritage, specially provided of God for every member of the human race, though the possession is, as we have said, but too often barred by the ill-informed, and therefore injurious, labour of endeavouring to do by art that which can be done by nature only—to accomplish by the hands of hirelings from without, that which can be done only by the living principle within. Adult imbeciles may remain idle as to all ordinary labours, if they can hire others to perform those labours for them; but the wealth of the world could not hire a set of servants who should grow the bones and muscles of a child, and so leave it perfectly free and at leisure to act the infant gentleman or lady. Yet this is the result to which "the nonsense of the rich man's nursery" constantly tends; and we know no better corrective of it than the flowers and the freshness of nature, which will stimulate the little creature to the use, and therefore to the growth and tone of the working structures of its body, in spite of all the efforts that art may make to the contrary.

The constitutional heritage which is thus injured by art, and restored by nature, is the only one which is absolutely secure from the contingencies of society. It is not exempted from disease, for disease, like death, will happen to all human beings; and though both of course have natural causes in every case, yet these causes are very often equally inscrutable. But the well-developed and properly-tempered human body may be said to be excepted from the grief and suffering, the mental anguish of disease. The feeble in body are always ailing, very generally they cannot tell what ails them; and thus, what with being sick of the disease, and sick of the doctor, they pass their time in the most piteous misery.

But the frame which has been allowed to work, and sinew, and season itself, dashes all the minor ails aside;

and if strong disease assails it, it stands up to the contest like a giant. That contest is of course always severe, and it is often fatal, even in the prime of life; but it has none of that mental anguish of the half-real, half-imaginary diseases of the feeble, which is truly the heavy and afflictive part of them. As, in the compound nature of man, the body only can be diseased; so the properly-reared and developed body always takes the burden of the disease upon itself. If this burden is heavy, pressing down to the gates of death, or nearly so, then the body severs the mental connexion, and grapples alone with the grim king, unconscious that anything is the matter; and there have been many instances of such vigour in the final struggle, as that a dozen men have been required to keep one strong man on his death-bed.

To the sorrowing friends, when hope and stay, haply, is thus stricken down in the prime and middle of its days—and, if we may use the expression, bearding death, in order that it may maintain and protect them still—this display is no doubt painful in the extreme. But there is not the least question that is a great blessing to the sufferer. Anguish of which we are unconscious, whatever may be its external display, is really no anguish at all; so that the actual suffering of the strong man may be said to end the moment that the band between bodily sensation and mental perception is loosened. It does far more than this; for a means of recovery is involved in it. Those who feel that they are dying, always in part, and often in great part, die of the feeling. From this, those who have consciousness severed from sensation, are entirely exempted, and the struggle with the disease, and even with death itself, should that be the termination, is wholly physical. Consequently, it is more completely under the command of physical remedies, and, among the rest, the grand healing power of

nature itself, than if it were mixed up with mental apprehensions and alarms. The blood courses like an impetuous torrent, throbbing and thundering on the walls of its containing vessels, and straining the capillaries, with vastly increased force. If these shall give way in any part which is not vital (and it is generally in a part not vital that they do give way), then the excess of tide is poured in that direction; topical inflammation ensues, and the disease lessens, an abscess forms—the disease is subdued, and the patient is speedily restored to health and strength.

These are distinctions of which any one who is observant, may see numerous instances; and no one will refuse to admit that they are distinctions of the utmost importance, and that the securing of a healthy and vigorous constitution is far more valuable, and therefore far more worthy of attention, than the securing of any other earthly possession. It is in the very earliest infancy, almost at the very hour of birth, indeed, that this begins to be lost or won; and if the beginning is in the losing direction, change to the winning one becomes more and more difficult every hour.

Some may consider this a digression, and ask what it has to do with "Spring flowers." We would answer such, by asking them, are not infants "Spring flowers?"—the most lovely, interesting, valuable, and worthy of skilful treatment, that can possibly engage the attention of rational beings? Who can, who dares, answer that question in the negative?

All fruit is in the flower; and it is the fear of injury to the flower which gives most solicitude to the cultivator, whether he cultivates the fields for corn, or the garden and the orchard for fruit. It is true, that every part of a plant has its natural enemies; or rather there are some other productions of nature set over it, in order to keep it

down to the place which it ought to hold in the duly-balanced system of nature. We understand but little of the balance of that system; and therefore the plants which we cultivate artificially are the most subject to these attacks; and they are always the more subject to them the more artificial that our system of culture is, either as regards the plants or the soil.

But the flowers, whose bloom the cultivator thus watches with so much solicitude, are only for one year, or for part of a year in very many instances. The blossoms of the nursery are for a generation – the hope of threescore and ten years to the healthy individual, and about the half of that period for an age of the whole, in a healthy country like Britain. Upon the cold principle of *utilitarianism*, therefore—that heart-sickening and hope-withering abomination of modern times, which has crept in, since cold-blooded selfishness pilfered the name and tried to usurp the chair of philosophy;—upon the principle of this detestable doctrine, which ranks human beings among chattels, and, like "the mother of abominations upon the earth," numbers "slaves, and souls of men," among the articles of mere merchandise—upon this, the most loathsome, revolting, and demoralising doctrine, to which the abused and insulted name of philosophy was ever degraded, the blossom of the nursery is thirty-five times as valuable on the average, and seventy times as valuable to the hope of the individual, as the blossom of the field or the orchard: and, if it is so, according to such a system, what must it be, then, in the estimation of those who possess common sense and human feeling, and are actuated by the spirit of the gospel—who feel, as well as firmly believe, that "children are God's heritage!" Let those who have them, and especially those who have had them, answer the question.

By all means let us go to the fields, and see, and gather the wild flowers, and try if we can find out their uses, in nature and to man. But let us take the infants with us; for assuredly, in spite of all our wise looks and profound researches, they will profit far more in the regions of wild flowers than we. We get health; and if we do not get instruction and enjoyment, it is our own fault; but they get vigorous bodies, and learn how to use them. Walk over the common; if the flowers are few and simple, the air is sweet; and though the birds which are to sing and summer in the thickets may not yet be come, the skylark is over head, and your footing on the sod is cleanly and elastic. At the farther end there is a little and very rude cottage, though without any air of neglect and ruin; and hard by there is a woman, hanging out clothes on the furze bushes; they are few in number, and far from rich in texture, but they are white as the driven snow. Near her on the open sward, which is peculiarly close, smooth, and green, there is a little flaxen-haired girl, with sky-coloured eye and crimson cheeks, busily employed in culling the early daisies. On the sward there is a young baby, tossing about his arms and legs with much delight, and actually wantoning in the use of them in the free air, and under the simple canopy of heaven. His dress is very humble, and externally not over clean; but look at his colour, and mark what limbs he has got! They are not swelled out, like pillows, with cumbrous fat, soft to the touch, and hardly able to move; they are firm and knit; and their action is so vigorous, that if you were to take him by the foot and try to hold it still, he would shake your arm to the shoulder; or if you were to give him a finger of each hand, he could grasp them so firmly as that you could raise him from the ground. All this arises from his food being simply that which nature has provided, improved in quality

by the mother's activity and exposure to the fresh air, and from his being allowed to take his own exercise in every limb and member of his body. At his age there can be no mental training, and no perception of distinction of rank or fashion in him; and therefore, whether his future station is to be that of ploughman or that of peer, he is at this moment under better training than the son of any nobleman at the same age. Now for the vegetable flowers of the seasonal Spring.

Spring flowers depend on the character of the Spring itself, and on the places where they are found. They thus vary with latitude, climate, the general course of the seasons, the nature of the soil, and the character of the particular season in which the observation of them is made. No general account of Spring flowers can therefore be given, which will apply to all countries, all places of the same country, or to the same place in all years.

Generally speaking, the number and the rapid appearance of Spring flowers, are in proportion to the resistance which the Spring has to overcome, but it can stimulate the vegetable tribes into action. They are also modified according as the winter repose out of which the action of Spring has to awaken vegetation, is the percolency of heat and drought, or the chilling influence of a low temperature. When the Spring is a doubtful season, the true Spring flowers are not so numerous; and if the years are very variable, some of the average flowers of Spring may advance upon the Winter, or fall back upon the Summer. Considering the difficulties and uncertainties of the subject, and also the limited space to which our observations must be restricted, we shall confine ourselves to the Spring flowers of Britain—the wild ones which are sown and planted by nature only, without any regard to those which man cultivates, whether native or exotic; and even of the wild

ones shall not pretend to give a full or a formal list, far less anything like a calendar of the times of their appearance. The cultivated flowers are so numerous, so broken into varieties, so obedient to art, and so changed from what they would be were they allowed to go back to a state of nature, that a single genus of them, and even a single species with its varieties, is often sufficient subject for a whole volume.

Thus restricted, the Spring flowers of Britain are not very numerous; and, considered in themselves, they are not possessed of any very high degree of interest. There is a secondary interest about them, however, which perhaps gives them more value than if they were more splendid in their individual appearance. They are the first-born of the year, the earliest promise that the Winter is gone, and that we shall have the bounty and the beauty of another year. What the many-tinted bow of heaven is in the rain cloud, that the little snow-drop under the hedge is on a scowling and sleet-driving day in early Spring. Were it not for the sign given by this plant, which is never given when the storm of the Winter's depth begins to come on, we might suppose that the Winter were to resume its dominion. But the appearance of the flower at this time, and not at the former, tells us that there is a general renovating agency at work now, which was not at work then; and as this agency got the better of the Winter in the depth of the dark days, much more must it get the better of this temporary return.

It is true that we anticipate the return of the seasons, notwithstanding the temporary reverses of our variable climate, upon that general belief in the succession of events, which leads us to conclude that the sun shall rise to-morrow; and that we will be able to rise and follow out the plans which we have in prospect. As applied to

the season and the day, this mode of belief is unobjectionable, and under ordinary circumstances it may do in the case of our own to-morrow. But in our own case it is not universal; for a day will come to which there shall be no to-morrow for us in this world, and when the execution of all our plans will be at an end; nor can we, under any circumstances, tell whether the present day is to be our to-morrowless day or not.

SNOW-DROP.

The breaking in of this uncertainty renders it wise in us to take every case upon its own evidence, just as we take the snow-drop as evidence that the reviving influence of the Spring has begun to operate. The habit of taking the evidence on the circumstances of the particular case, is also the only way we have of dealing rationally with those new cases to which no belief in experience can possibly be applied; and it is because so many rest satisfied with this general belief, that there are so many failures and reverses in the projects of mankind. No school is better, or indeed so well adapted for giving us this most useful habit, than the school of nature, especially

vegetable nature, as obedient to the varying influence of the seasons. The Spring flowers are well adapted for this purpose; for the opening of a flower is the most conspicuous change that takes place in a plant, at least within the same length of time.

There is another advantage in thus turning the flowers, and other simple productions of wild nature, into a book of instruction, which, though very obvious when once mentioned, is sometimes overlooked. The book of Nature requires no scholarship in the perusal; and it is most ready and open to those who have least access to the common technical means of instruction. The people of the country do generally interest themselves much more about the appearances of nature, and the successions and connexions of those appearances, than the people of towns; and a very little more time and thought might enable them to master the whole philosophy of the country; and if they once did this, the whole of their occupations would be a delight to them; their minds would be drawn out and occupied; and, were this once done, their moral and social condition would improve very fast. Under the present system of things, their minds very much resemble neglected and uncropped ground—the weeds are rank in proportion as the soil is valuable.

February cannot be regarded as much of a wild-flower month in any part of the British islands; and in some parts the snow lies undisturbed, or continues to fall at intervals, during the whole month. It is true that in warm places there are a few plants that keep flowering all the Winter over. The common daisy is one of these, though its Winter flowers are few, as compared with its Summer ones. It is therefore not a plant from the flowering of which any prognostic can be drawn, with reward to what is to come. It may be considered as a

remnant of the former year; and, as such, indicative of what has been, rather than of what is in progress. It is not uncommon, in some places, for daisies to bloom under the snow;* and the same may be said of a few other flowers. On dry, sandy plains, the hen-bit dead-nettle may also be found blooming in February; but both place and plant have very little interest. The whole race of the dead-nettles are useless and uninteresting plants, and we are not aware of any animal, wild or tame, that feeds on them. But as they are very common, especially on poor and sandy soils, and keep on flowering for four or six months, they must have some value in the general economy of nature.

All flowers which appear very early in the Spring are to be regarded as to a certain extent the productions of the former year;† and this without any particular reference to the plants on which they appear, whether they be trees, shrubs, or herbaceous plants, and whether they grow from bulbs, from fibrous roots, or from buds upon the twigs and branches. All these are brought forward in so far before the Winter's pause, and they come forward more early, and in greater perfection, in proportion as they have been brought forward then, without absolute reference to the season at the time when they appear.

As typical of the economy of our Spring, the snow-drop

* This is rather doubtful. The *Goldanella alpina*, which grows on the mountains of Switzerland, is said to bloom under the snow.

† Many of the Spring flowers, such as the *Draba verna*, and Wordsworth's Celandine, with the golden glazed petals (*Ficaria Ranunculoides*), never flower but for a few weeks in the early Spring, and cannot be regarded as "the productions of the former year." The daisy *may* be regarded as one, for as the poet James Montgomery wrote, it is "Flora's page," and flowers "in every season."

may be regarded as the prominent flower. It is a bulbous-rooted plant of the narcissus family, never appearing but in the early Spring, and then only in particular places. It is never found on sandy or marshy grounds, and very rarely in places that are much exposed. Little quiet spots, under the shade of a thicket, a copse, or a hedge, or upon the dry bank of a stream, if there is shelter near, is the place to look for this first flower of the year; and as it generally bends its little silvery cup over a grassy sod of rich green, or springs up through the fallen leaves of the former year, there is a pleasing air of innocence about it; and it seems to say that it is satisfied with the very slightest effort of the young year, and leaves the energy of the season to plants of more showy appearance and lofty pretension.

Though March is not a month of flowers in all parts of the British islands, yet in the warmer places it so marks the advance of the season, that the walk of those who love to view nature in the morning of the year, may be considerably diversified.

The wood which gave us only the snow-drop in February, and that only in particular spots, now begins to make some stir in its more lofty and enduring members. Few of the native forest-trees of Britain have flowers that make any gaudy show, though many of them reveal considerable beauty by the use of a microscope. The elms take the lead in flowering: and among them the common field or lowland elm takes the lead. This is not the elm which is found of such large dimensions in the royal parks and other places in the vicinity of London. That one is Dutch, and, as a winter tree, is not at all to be compared with our common elm. The strong gale in the end of 1836 blew down numbers of those great elms, and as they lay prostrate, they showed that they had been wasting away,

root, boll, and branches, by a kind of natural decay, and were worth little or nothing as timber. Our elm, though of smaller dimensions, is a far more sturdy tree, and if placed on a proper soil, which should be rather good but not humid, it will so root itself as to defy the winds; and when wanted, the timber of it is both excellent and beautiful, and well adapted for many household and other domestic purposes.

The cork-barked elm comes into flower about the same time. It is very rarely seen as a tree, but confined to hedges and copses. The bark has the appearance of cork, but not the consistency. The wych-elm, of which there are two kinds, one with the leaves rough, sometimes called wych-hazel, and the other with smooth leaves, also flowers about the same time. In warm districts they are rarely found, except in hedges; but the rough-leaved one is the mountaineer, the elm of the highest glades of the Scotch highlands where an elm will grow; and there it endures the violence of the storm, stands long, and affords excellent timber. The late Sir Walter Scott makes a beautiful allusion to it, in the introduction to the "Lady of the Lake."

> "Harp of the North! that mould'ring long hast hung
> By the *Wych-elm*, that shades St. Filan's spring.

The large Dutch elm closes the catalogue; and it is showy from its size; but when the trees get old, it is best to keep aloof from them in high winds, because though the trees may not fall, there is every chance of a shower of large branches.

The common alder is the next tree in the order of flowering. It prefers moist and marshy places, and is still more hardy than the wych-elm. "The alder by the *barn*, and the beech on the *brae*," is the character of the highest glen in the central Highlands. The tree grows where oak

will not; and this can be turned to ornamental account. The drop of it does not hurt the grass, therefore an alder copse makes excellent wintering for cattle; and the timber, though somewhat soft, is finely coloured.

None of these trees have conspicuous flowers; but these flowers are very numerous, and furnish one of the earliest repasts to the bees.

There are some shrubs and under-shrubs which flower in March, that have got some story to tell.

Among these, the hazel-nut tree occupies a very conspicuous place. It is distributed far and wide over the country, often at considerable elevations; but never unless the soil is valuably good, and very frequently near waterfalls, and also in picturesque situations. It is what Linnæus, in his somewhat fanciful but pleasing style, called a *monœcious* plant, that is, the fertilising and fertilisable parts are "in *one* house," on the same tree, but not in the same flower. The fertilising catkins begin to be formed in the preceding Summer, and gradually increase through the Winter, till they come to maturity in March or April. They are long and pendant; and in a fine Spring morning they may be seen beautifully spangled with dew-drops, displaying rainbow colours in the morning sun, as the catkins wave to the breeze. These dew-drops appear to have something more than their mere beauty: the evaporation of them by the sun produces cold; and then the sun's heat also swells and bursts them, and discharges the *pollen*. The styles which are to produce the nuts are farther down; they are of a beautiful crimson colour, about a dozen in number, and just peeping out of the newly-opened bud which has formed their winter protection; but the whole number on the buds are rarely, if ever, fertilised. This is one of the most interesting of our wild shrubs of tall growth; and not the less so that it

calls the young folks to the copse, a-nutting, in September and October, and when the nuts are seasoned with the somewhat Spartan sauce of the labour of scrambling after them. All these periodical contacts with nature might be made delightfully instructive if a few of elder growth mingled with the young; and if all eyes could be made to see, and all ears to hear, with understanding worthy of the rational children of Him who created all these delightful things for our instruction and use.

SLOE.

The sloe, or black thorn (the flowers are whiter than those of the white thorn), which is a sort of wild plum, begins to flower in March, but continues through April. It is a hardy and crabbed shrub, proverbially acid in the fruit, and hard in the timber; and it is said to conduce in no small degree to the enabling of the people of Britain to drink more port wine than is produced in the whole valley of the Douro.*

The daphnes, both the spurge olive and the spurge

* The author might have added that the leaves of the sloe are said to be used by dishonest grocers to adulterate teas.

laurel, show their bright flowers in March. As wild, they are found in woods and hedges, but not in upland situations. The spurge olive (*mezereon*) especially, is often grown as an ornamental under-shrub. The flowers are showy, and they are rather curious, as coming before the leaves; but the plants are very suspicious. The wood is so acrid as to cause great pain in the throat if it is chewed; and the berries, which are cherry-red, are very dangerous when children are playing about. This plant, as is very generally the case with plants having active principles of any kind, is understood to have medicinal virtues; but the fact is not well made out; and therefore, for medical purposes, it is just as well let alone.

"The willows by the water courses" begin to be attractive in March, from the peculiarity of their flowering, and the beauty of their leaves, their various uses, and the situations in which the greater part of them grow. The most beautiful one in Britain is the weeping-willow (*Salix Babylonica*) which, however, turns out to be a plant by the mountain-pools in the East, and not by the banks of such rivers as the Euphrates at Babylon, or rather at the shapeless and mouldering heaps which now barely mark the site of that great city which was once the mistress of the world. All the willows are hardy plants, and many of them are of very rapid growth. Some of them grow to be tall and stately trees, which, from the form of their leaves and the fineness of their colours, are highly ornamental in wet and marshy places, where hardly any other kind of tree will grow. Others of them creep along the ground, by the sides of mountain bogs. One of these, inaccurately called *Salix herbacea*, the herbaceous willow (though it is not a herbaceous plant, but a ligneous or wooded one), is the smallest of all known trees. Sometimes the height of it when full grown, does not exceed a single inch, and it rarely, if ever,

attains a greater height than three inches; so that the dwarf birch of our cold and bleak mountain-tops in the north is really a giant to it. This diminutive tree, which lives only in a cold and dripping climate, is abundant in Iceland, a country which does not contain anything that can be called a grove or even a thicket; and the people there find it very useful in the dressing of leather.

The white willow (*Salix alba*) is the most valuable as a timber-tree; and, if kept pollarded, the shoots rise long and straight, and are useful for many rural purposes. Those of smaller growth are, perhaps, more useful than the large ones. They are, as everyone may observe, grown in holts in marshy places, with trenches of water between the rows; and as they are both graceful and flexible, and have the upper surface of the leaves green, and the under part silvery, the play of them in a summer breeze is very beautiful. There are many species grown in this way; and as the growth and degree of flexibility and toughness are different in them all, each is adapted for some particular purpose. The purple willow (*S. purpurea*) is the toughest of the whole. It is the *withe*, from the Anglo-Saxon "withan," to bind, or tie. In old times it was used instead of cord, and it is still sometimes used for the same purpose. The preposition *with* is the same word, and ought never to be used unless there is some connexion between one thing and another, though careless writers often confound it with *by*, which merely means together, but without implying any connexion.

Besides the use of their stems as timber, and their shoots in basket-making and other branches of the arts, willows are very valuable trees. Willow-bark is little, if at all, inferior to oak-bark for tanning leather, that is, for so saturating the gelatine of the skin of an animal with *tannin*,

as that it shall resist the decomposing influence of water, and yet remain flexible. Willow-charcoal is very valuable in the manufacture of gunpowder; and, as it contains little or no earthy matter, it is one of the best applications for cleaning the teeth. To enumerate half the uses of willows would require many words. The intelligent reader will not fail, however, to observe in them a remarkable instance of that connexion between abundant quantity and extensive usefulness which runs through the whole of creation, and proves with what admirable perfection of design the whole is adapted to the use of man.

This is a truth which is sure to force itself on our attention whenever we reflect on any one portion of nature around us; and if we carry our contemplation a little farther, we are able to discern that in every country the elements of civilisation for the people of that country are to be found; and that all they want is a beginning. One comfort soon stimulates the desire of winning another; and this principle wants only the proper direction in order to carry mankind on to the very highest degree of civilisation and enjoyment. Nor is it direction, human direction, which is wanted for this purpose, so much as it is the absence of misdirection. The very same bad principle which makes the little hordes of savages murder each other, and exert the whole of their ingenuity in devising and constructing engines of death, applies to mankind in their most civilised state, and keeps them always on the alert to put each other wrong. But we must not suppose that there is any imperfection chargeable against the original creation of man upon this account. A finite creature, acting upon his own experience and judgment, in the midst of a system framed and governed by infinite wisdom, cannot but be fallible—cannot but fall; and, once fallen, there is no restoration to uprightness but through the free grace of God, unmerited on the

part of any one individual of the human race, whatever may be the real or pretended sincerity of his heart and conduct.

All the willows have the fertilising and fertilisable parts on separate flowers, and some have them on separate trees. We believe, for instance, that there is only one of the weeping willows in this country; and thus we can never raise the tree from seed grown at home. This is a matter of no consequence in the case of willows; for almost any part will grow, if it contains a bit of sound wood, and another of bark, in their natural contact with each other. It is of little consequence which end of a cutting of willow is put in the ground, for it will grow the one way just as readily as the other. Nay, if one of the more free-growing species is set like an arch, with both ends in the ground, it will, under favourable circumstances, take root and put out shoots at both. How matters go on at the middle of the bow in these cases, is a question for the physiologists, and one not absolutely settled; but we rather think that the middle of the bow begins to die as soon as the two ends have begun to work; and that the whole of it perishes in a short time, down to the uppermost shoot put out by each of the two ends during the first season of their acting.

The poplars come into flower about the same time as the willows. They are, indeed, very nearly allied to the willows in their character, and neighbours to them in situation. As is the case with the willows, the poplars like a rich and moist soil, though not quite so near the water as the willows. The abele, or white poplar, grows to be the most stately tree; and by the bank of a river, or the shore of a lake or pond, it is a very fine ornament—the white bark contrasts so well with the dark colour of most trees. One of the finest clumps of abele trees, near London, is upon a small projection on the right bank of the Thames, a little below the village of Twickenham; and from the opposite

bank of the river they are a favourite subject with young practitioners in landscape-drawing. The timber of the abele is soft and very light, and not liable to split; so that it is used for many articles which require lightness and not much strength. The Lombardy, or spiry poplar, grows very rapidly, and one here and there makes a good variety in a plantation; but a long line of them looks very stiff and formal. The wood of this species is softer than even that of the abele; but still it is useful for many common purposes, as nails do not split it. Neither of these two species thrives well in the more cold and upland parts of Britain. The aspen, or trembling, or quaking poplar, is the other species most frequently seen in Britain. It is a broad and branching tree, but does not attain the stateliness of the abele. The foot-stalks of the leaves are very thin and flexible, so that the least current in the atmosphere puts the leaves in motion; and one who is not aware of this habit of the tree is often astonished to observe the rapid and general motion of those leaves, while not a breath of wind can be felt. A passing cloud is sufficient to put them in the greatest agitation; and if they are near the bank of a river, and there is a dry shingly or sandy beach between them and the water, they are hardly a moment at rest. These, however, are phenomena of the Summer, not of the Spring.

The abele and the trembling poplar have a mild but very pleasant fragrance in the time of flowering; and they give out a sort of aromatic gum resin, though in so small a quantity as not to be worth collecting as an article of commerce. Some of the foreign ones in warmer countries, yield it more abundantly, but of the same nature. The odours given out by trees in the season of their activity is a subject that has been little studied; and yet it is one well worth attending to, as in many of them it occurs not from the flowers, but from a general exudation of the tree, and sometimes from

the leaves. If the former, it is more perceptible on sunny days; but if the latter, it is most delightful after a shower. With many trees, this is a Summer study; but it is a Spring one with the poplars and the willows.

It is astonishing how superstition works, when it wishes to pervert the noblest of all all subjects, Religion, to the most ignoble of all purposes—the enslavement of the human understanding. The monkish story was, that the cross was made of the timber of the trembling poplar, and that the tree has trembled ever since, in horror at the use to which it was applied! The trembling poplar is the most hardy of the race; as such, a native of cold places, and we doubt if it is to be found in Judea. The wits turned the tree to another account, by alleging that those persons who are always speaking what they should not, and when they should not, have their tongues made of, or infected by, the leaves of the aspen, so that they will not and cannot be still. In northern countries this poplar serves rather an important purpose in nature, as the twigs and bark are the favourite food of that curious animal the beaver, the fine part of whose fur is so valuable in the manufacture of hats. The seeds of both the poplars and the willows are lodged in light and elastic down, which, in a state of nature, contributes to their dispersion; and it is sometimes used in the arts for the packing of elastic cushions. Poplar is unsafe timber where there is danger of fires, being more inflammable than most other kinds of wood; at the same time, it is about the worst fire-wood in the whole forest, as it burns away with no flame, and only a very moderate degree of heat. There are some other poplars not so common in the "home" counties of England, as those which we have noticed. Of these, the grey poplar grows in very elevated and exposed situations; and the black poplar in shaded places near a river, or in the miry part of the water.

There is another forest tree, having a long, and by no means an uninteresting story to tell, which comes into flower at this early season. This is the yew. Blair—not the rhetorician, but *the greater* Blair, the Rev. Robert Blair, of Athelstaneford, who like Gray in England, is one of the greatest poets of Scotland in power, and the smallest in quantity—thus characterises the yew :—

> "Cheerless, unsocial plant, that loves to dwell
> Mid skulls and coffins, epitaphs and worms;
> Where light-heeled ghosts, and visionary shades,
> Beneath the wan cold moon, (so fable feigns,)
> Embodied thick, perform their mystic rounds.—
> No other merriment, dull tree, is thine."

Summer, when the swifts are screaming about the tower, and there are various other little rural attractions, is the proper time for telling the story of the yew; and so we shall content ourselves, in the mean time, with saying that it flowers in March. We cannot help remarking, however, how passing strange it is that the name of *this* Blair does not occur in all the Scottish biographies. This is the more strange from his son being Lord President of the Court of Session, in Scotland, and one of the most able and influential men that ever filled that solemn and important office; and who was selected as the subject of a statue for the court-room, next after the illustrious Duncan Forbes, of Culloden, who was the saviour of his country, insurgents and all, during and after the rebellion in favour of the Stuarts; and the patron—no, the hearty and unshaken friend—of the most amiable and indolent author of "The Seasons." Probably the omission may have been intentional—as a matter of *economy :* and certainly no man stands less in need of this kind of fame than the author of "The

Grave ;" for his memory will long triumph over his subject fatal as that subject is to the posthumous fame of many who make noise enough while they are in the world.

While we are endeavouring to pursue the contemplation of nature, and trace the perfect beautv and consistency that pervades the whole system of the Creator's works, as regulated by His laws, it is both pleasant and profitable occasionally to make a slight digression to the conduct of men, even in those cases which seem to afford no scope for their bad passions. These are bungling and blundering, even at the very best; and thus we gain by contrast, and return to the study of nature with fresh vigour and increased pleasure.

If the season is any way favourable, we can be wrong in a few places in seeking a wild flower in March. The purple spring crocus comes early, but it is rare, and found chiefly on some rich and sheltered meadows in the valley of the Trent. The hare's-tail cotton grass shows its tufts upon the hassocks of vegetation on bogs; and the "least-bent" displays its tender spike on the dry and half barren sandy pastures by the sea. The bents, though proof against most grazing animals, and pointed like spears in some of the larger species, are most useful plants in their localities: they bind the sand together in the same way as willows bind the mud bank of a pond or river; and they thus prevent the sand from invading the fields within. In places where the sea retreats, leaving an expanse of sand behind it, these bents advance forward upon the retiring sea; and the ground which they quit becomes pasture by nature, and may be converted into very early and productive cornfields by art.

The common daffodil, and the two-leaved squill, also usually flower in March. They are not very generally distributed, but they are to be looked for in moist woods,

groves, and thickets, where the soil is good. The common chickweed, so universal on every neglected spot of the rich and cultivated ground, shows its little white stars about this time, and continues to show them till the Winter is considerably advanced. This is one of the plants that fold their leaves together, or sleep, as it is incorrectly called, in certain states of the weather; and it would no doubt be

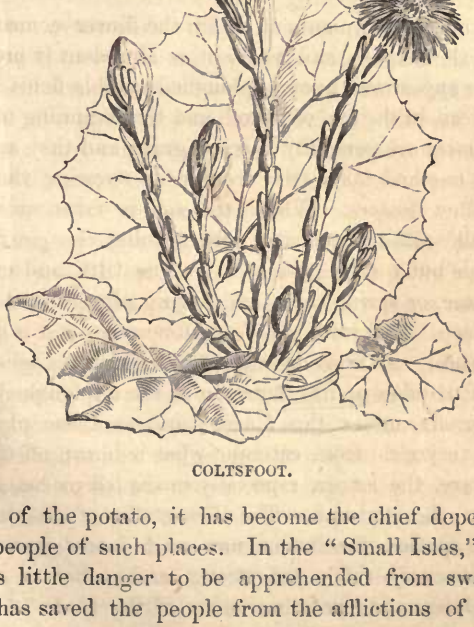
DAFFODIL.

thought a pretty plant, if it were not so common, and did not reprove the sluggard in cultivation so speedily and so sharply. That it is injurious to the ground is very doubtful: and it yields a rich supply to many of the little birds.

The strawberry-leaved cinquefoil flowers on dry sandy pastures, some time in March, if the place and season are not very backward. Both the leaf and the habit of running

in this plant are like those of the strawberry; and on this account Linnæus included it among the strawberries, to which, however, it does not belong, though nearly allied to them in its natural characters, and some of its habits. The strawberries occur in the clefts of rocks, or in the shade of woods; the potentillas are more upon the open places, some on dry and naked ones, and others upon the margin of the peat bog, or even in it if it is not too wet. The bramble, various mulberries, especially of cold, upland, and northern places, the strawberries, the roses, and the potentillas or cinquefoils, and a few others, are all nearly related, according to the natural system of Botany, which endeavours, or *should* endeavour, as much as possible, to class plants according to the average of their natural characters. In a state of nature, all the flowers have five equal petals; and the stamens, though subject to variation, are always numerous. The fruit of all which bear pulpy or succulent fruit is wholesome, very cool and refreshing, and in some very highly flavoured. The flowers are white, or yellow, or various shades of pink or red, but not in any one instance blue. The whole are astringent; and the tormentillas, which are not very unlike the potentillas, are used for this purpose in medicine, and also in the tanning and, in the case of the coloured ones, the dying of leather. Some of them have spindle-shaped roots, resembling miniature parsnips, at least in their shape. These are very sweet and pleasant to the taste; pigs are fond of rooting them up, and are said to be, in part at least, fed upon them in some places in Ireland. The goose-potentilla (*P. anserina*) is the one of which the roots are largest and best. It is not so astringent as some of the others, and on this account it is not so well adapted for tanning leather. Geese are very fond of the leaves, which is the origin of the name. It prefers the soils which are cold and humid to those which are warm and

dry; and thus it is most abundant in places which are not cultivated, and hardly worth cultivating. Where they are abundant, the children seek them with considerable avidity, and eat them raw, or boiled, or roasted; and in some of the remote districts they were used in former times as a sort of substitute for bread; but as the dripping skies which they prefer, though not the half-miry soils, are favourable to the



COLTSFOOT.

growth of the potato, it has become the chief dependence of the people of such places. In the "Small Isles," where there is little danger to be apprehended from swart, the potato has saved the people from the afflictions of famine, to which they were formerly at times subjected; and in many places it has reduced to the class of neglected weeds many little roots which were of value in former times.

Another field-plant, which flowers about the same time, is the common coltsfoot (*Tussilago farfara*). It is called *tussilago*, the cough reliever, from its effect in allaying the irritation of cough, which it is understood to do by sheathing from the action of the air those parts which are slightly inflamed. It is rather curious that, in many parts of the lowlands of Scotland, the country people should call this plant by its scientific name, and not have any other for it. It is a composite flower, something resembling thistles in shape, but not on a rising stem; and its colour is yellow.

It is one of the plants of which the flower comes before any of the leaves; and where it is abundant it presents a singular appearance upon unploughed stubble fields, and the naked leas, in the end of March and the beginning of April. Such places are generally bare of grass, and they appear as if some one had taken the trouble of strewing them over with yellow flowers. Where the soil is favourable, coltsfoot is difficult to eradicate; and nothing can get it out of the fields but working the soil to a fine tilth, and cropping with pease, or spring tares, and turnip after, to be fed off with sheep. The seeds are very numerous; and it does not yield readily to lime dressing. When it is expelled from the field, it takes up its habitation in the unploughed hedges and corners under the fences; and as these places are always very rich, from catching what is blown off the fields when bare, the leaves, especially in shaded places, get very large in the Autumn. The foot-stalks of the leaves of another species of coltsfoot, now made into a genus (*Petasites*), are very thick and strong, and a foot or eighteen inches long, and the dimensions of the blade of the leaf are about the same. In those places of the country where the women take their share in cutting down the corn with the sickle, it is no unusual thing to see a dozen of them

marching back to the beginning side of the field, each shaded, *a-la-parasol*, with a huge leaf of coltsfoot; and if a veritable parasol were to come near the healthy and happy array of these sun-browned damsels, the bearer would stand a chance of being jeered by a few displays of rustic art.

Colts-foot is not altogether a useless plant. The decoction of it is both stimulant and astringent, strengthening and restoring the tone of the parts at the same time. The fumes of it, smoked in the same manner as tobacco, are supposed to have similar effects, but the supposition is doubtful. The young leaves have a good deal of cottony matter on the under surfaces, which can be rubbed off without much difficulty; and when this is saturated with a solution of saltpetre, and allowed to dry, it forms a very ready and excellent tinder. It may also be used for stuffing cushions; but the labour of collecting it is considerable. Even the leaves themselves, properly and thoroughly dried, make no bad stuffing for rural purposes; and a countryman, after a hard day's work, can have a very sound and healthful sleep on a colts-foot pillow.

The corn horse-tail (*Equisetum arvense*), also flowers, such flowering as it may be called, pretty early in the Spring. The equisetums, or jointed ferns as they are sometimes called, are rather pretty plants; they consist of long jointed stems, branching at the joints in some cases, and in others not. They have no proper leaves; and though the germs of the succession plants are produced in scaly heads on the ends of the stems or fronds, these cannot be called flowers. Many of them grow in the water, and all of them in wet places. Some are covered over externally with little sharp tubercles of flinty matter; and they were much used in polishing the finer articles of wood-work,

before the invention of paper covered with a coating of sand or glass; and for some little nice purposes they are preferable to these. The corn-field one, which led us to mention the others, is accounted very injurious to cattle, though, from the roughness of its surface, not from any poisonous effect. Neither they nor their near relatives in the system, the ferns, have any poisonous quality; but, on the contrary, the roots often contain a considerable quantity of farina, or starchy matter, as wholesome and nourishing as the starch of any other plant. The only bread of the aborigines of Australia is from fern roots, for the roasting of which they have ovens of heated stones; and many of the equisetums, the one in question among the rest, form little farinaceous tubers on the roots. Julius Cæsar, who was one of the few conquerors who have had eyes as well as armies, mentions that, when the magazines of corn failed, the Roman soldiers were in the habit of digging from the banks of marshes, and stagnant places of rivers, certain roots, which he calls *charæ*, that served them in place of bread. There is little doubt that these charæ were the tubers of equisetums; for we are not aware that there is the least accumulation of starchy matter in any of the charæ of modern botanists. Gaul, and the other countries overrun by Cæsar, contained many more marshes in his time than they do now; and we may thence conclude that such plants as the equisetums were far more plentiful, and of larger growth.

The equisetums have got a very long and a very old story to tell, if we had time to hear them. Those which at present exist in our parts of the world, and indeed in any parts of it that we are aware of, are a small and feeble remnant. Few of them rise to a greater height than a foot or two, and some are only a few inches; but there have been giants of the race in times now long gone by. Vast

numbers of the remains of these in the fossil state are found in various strata, and at varied depths in the earth; their substance as vegetables gone of course, and earthy matter substituted in its place, but their forms so well preserved as to show in the clearest manner what they have been. These, though simple cellular plants, like the dwarfs of our own times, have rivalled in height the tallest of the vascular trees that now adorn our forests; and suggest a comparison with those lofty and lasting tree-ferns which are still found in the southerly tropical latitudes of our globe. There is little doubt that these mighty plants are aquatic, and it is probable that they lasted for years; whereas the stems or fronds of the present ones are all annual. Along with them there occur the remains of animals, many of them evidently aquatic, and others probably fitted for the land and water, or even for the water and the air. Their situation in the solid strata shows that they were long anterior to the elephants, the rhinoceri, the hyænas, and the other mammalia of warm countries at the present day, all of which appear also to have been extinct before the earliest record of human history commenced. These point to strange and remote changes in the economy of our globe; but they are dark and shadowy, not explainable in a satisfactory manner, even by those who treat expressly of them; and therefore quite unfit subjects for an incidental notice.

The equisetums are plants of humid places, and bring us to the margin of the waters; and there are some Spring flowers in the water itself, or rather blooming over its surface. One of the earliest, and also most showy, is the marsh marigold (*Caltha palustris*), which is really a very gay flower, and the plant bearing it has large and handsome leaves. It is a very common plant on the still parts of brooks, the margins of pools, and other places where the

water is shallow, and not much agitated or disturbed; but the plant is always most healthy, and the flowers most beautiful, when it is over a rivulet of clear spring water. The flower is large, and of a bright yellow colour; and the leaves of the plant are full and abundant. Its similarity in form to the common buttercup of the meadow will prevent any one from mistaking it; and, indeed, there is no plant in the least like it upon the margin of the water. It comes into flower in March, sooner or later, according to the place and the season; and it continues producing a succession of flowers on the same plant for six weeks or two months. The young flower-buds are in the

MARSH-MARIGOLD.

form of little compact buttons, often standing round a full-blown one, on which account the country people, in some places, call them "mother and children." These young

buttons of the flowers are sometimes pickled, and used in the same manner as capers; and when pickled they have very considerable pungency. Indeed, they are abundantly pungent whether they are pickled or not; and we think it would be just as conducive to health to leave them alone as ornaments to the margins of the streams.

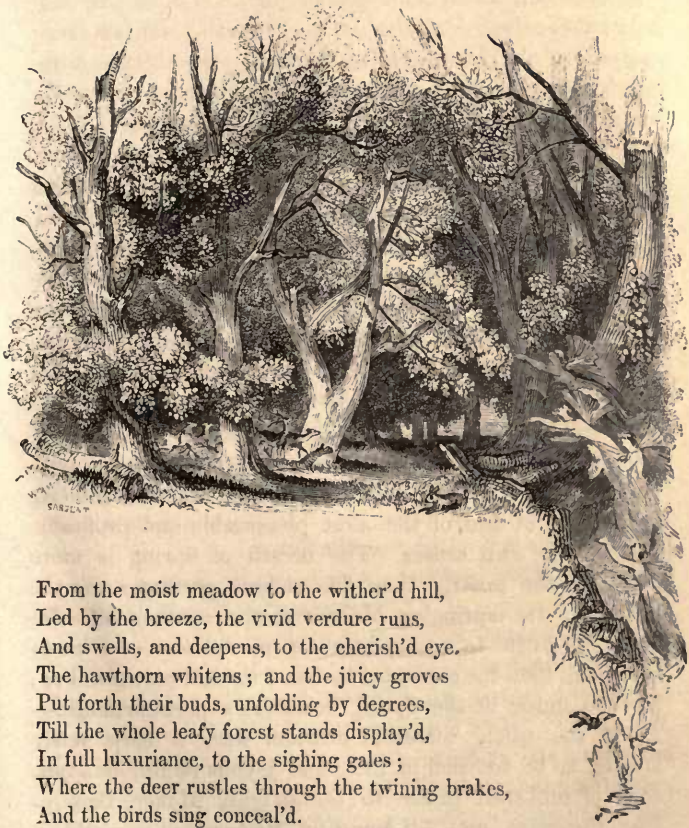
They belong to the *Ranunculaceæ*, a very numerous, and often a very showy race of plants; but under all circumstances a very suspicious one. All of them are acrid, and some are deadly poisons, capable of occasioning death very speedily, and attended by the most afflicting symptoms. One of the most deadly of therace is the common monk's-hood of the gardens, which ought not to be allowed to remain in any place to which children have access, notwithstanding the readiness of its growth, and the whimsical form of its flowers. An instance was mentioned in the public journals not long ago, of a girl who used to resort to this plant in order to bring on a frantic kind of intoxication; but an over-dose either nearly or altogether ended her life, we forget which. We, in concert with a medica man of much skill and experience, and who was a good botanist, and had studied the vegetable poisons, had great trouble in recovering a servant girl from the effects of a very little bit of the root, which had been most inconsiderately, but with no bad intention, given to her by the gardener. When the aged men of Ceas were no longer of any use to the state, the inhuman law enacted that they should drink this same deadly aconite. The hellebores are also very poisonous plants; and even the larkspurs and columbines have mischief in them, and are not to be tampered with by the ignorant.

The whole of the *Ranunculaceæ* lie under the same suspicion; and, contrary to the usual rule among plants, the water ranunculus is one of the least acrid of the whole

The common buttercup, which makes the meadows so gay, and is gathered with so much avidity by children, is very acrid, so much so, that it is sometimes called "wart grass," from a belief, real or unfounded we know not, that the juice of the bruised leaves soon clears the skin of these excrescences. The vulgar notion, that the colour of its beautiful yellow flower is communicated to butter in the season of its bloom, is of course quite unfounded, as it is one of the plants which the cows avoid eating, if they can.

The anemones are also poisonous, and so are the different kinds of clematis; and although the latter are much used in trimming bowers and trellises, it is very doubtful whether they do not, one and all, give an unhealthy character to the air. One species of anemone is a Spring flower, upon high and open chalky pastures. This is the Pasche flower, or Easter flower *(Anemone pulsatilla)*, which is a very acrid one, and blooms about the time of the festival after which it gets its common name. The flowers of most of the tribe, and the roots of some of them, furnish dyes, the mordant for fixing which is the sulphate of alumina, or common alum. In this way the marsh marigold furnishes not a disagreeable yellow.

Such are a few, and but a very few of the Spring flowers; for even among the native plants of Britain, the ones which we have passed unnoticed outnumber what we have noticed a hundred to one. In the noticed ones, we have not been solicitous to select the most interesting ones. We wished to show that common ones have some interest, and so get the reader fairly out into the field, to find and enjoy the fine ones for himself.



From the moist meadow to the wither'd hill,
Led by the breeze, the vivid verdure runs,
And swells, and deepens, to the cherish'd eye.
The hawthorn whitens; and the juicy groves
Put forth their buds, unfolding by degrees,
Till the whole leafy forest stands display'd,
In full luxuriance, to the sighing gales;
Where the deer rustles through the twining brakes,
And the birds sing conceal'd.

CHAPTER VII.

INFLUENCE OF THE SPRING UPON ANIMALS.

THE influence of the Spring upon every creature is great in proportion to the excitability of that creature, that is, to the number and activity of those feelings or perceptions, or whatsoever else they may be called, upon which the genial renovation can produce an effect, wherewithal the Creator has endowed it. We have already considered the adaptation and preparing of the vegetable tribes for this delightful time of the year. It may seem that we ought to have followed this up by a description of the effect of Spring upon them. This, however, could be done only partially; and it would not be fair, for it would be robbing the reader of one of the most pleasurable and profitable uses of his own senses. The breath of Spring is more fresh in the nostril than the richest perfumes of the Summer; the springing blade and the opening bud are more delightful to the eye, and more redolent of hope to the mind, than the expanded leaf and the full-blown flower; and the music of the Spring is nature's peculiar music—as if the whole terrestial creation were a harp newly strung, to be touched in the most joyous strain, in a new song of universal praise to the Mighty Maker, Benevolent Preserver, and All-bountiful Restorer of a world of beauty.

Who that has been endowed with the ordinary senses; who that can smell perfume, behold beauty, hear melody,

or feel that delightful uplifting of the spirit, which fore-promises of eternal life, of the resurrection of the body, of the gathering of bone to his bone, clothing them with sinews and with flesh, calling them up to the kingdom of God and his Christ, there to dwell in unbroken felicity for ever and ever; who that can observe and feel in this manner (and what human being cannot if he will?), can refrain from being present at the annual birth-day of all nature? In the country, the professional labours of the great majority of the people bring them to this; and though they themselves may sometimes not be aware of it, there is a wonderful revival of the strength of man, so as to enable him to go cheerily on with the delightful labours of hope which belong to this beautiful season. But the spirit of the Spring is also a searching spirit. It works its way into the very heart of the city; and the man of business begins to loathe those enjoyments to which he was, it may be, driven by mental vacuity during the Winter; and so, when the toils of the counting-house are over, he takes a drive, a ride, or a walk, according to his circumstances, across the suburban fields, in high enjoyment of what he possibly could not very well explain any further than by saying, "This is a delightful Spring evening! how fresh and promising everything appears!"

Fashion, which is purely a matter of human institution, having no foundation in nature, and therefore never partaking of that endurance which forms part of the system of nature, often keeps pace very differently from nature. At the present time, fashion rules that the very vigour of the Spring shall be the depth of Winter in her dominions; and that while the morning sun shines gloriously, and nature is in her freshest attire, and enlivened by her most delightful music, the *élite* who worship at the footstool of fashion shall hide themselves in the seclusion of the drawing-

room, and view artificial beauties by artificial light, as if they were in the winter hut of an Esquimaux, or the ice palace of a Russian potentate. It may be that they avail themselves of the renovating influence of the Spring, in order that they may the better perform that which is with them the grand labour of the year; but if they will turn Spring into Winter, and Winter into Summer, they must pay the forfeit, by passing their lives without tasting the purest and the sweetest of all the enjoyments of mortal men.

In treating of the influence of the Spring upon animated nature, it is necessary, however, and perhaps desirable, to leave mankind entirely out, and consider only those animals whose whole being forms a part of material nature, and which come from the dust, and return to the dust, without leaving any memorial except their bones. There is, by the way, a very striking natural proof of the existence of an immortal spirit in man, in the fact that man is the only creature upon earth that can or does transmit his memory to his progeny. None of the animals leave any legacy, in name or in knowledge, to those animals which come after; and, on this account, they never become more sagacious in one generation than they were in the generation preceding. It is very different with the human race. There is in them not only a legacy transmittable to all generations, but a capacity for contriving the means of transmission, of which we have a noble example in the art of printing; and we have minor examples in all those accommodations of society and means of enjoyment which have been in a state of improvement from age to age. When we view matters in this light (and it is the true light wherein to view them), we find that all the improvements of civilised society stand up as witnesses for the immortality of the soul, whose evidence can neither be refuted nor rejected, even though

any one were so fool-hardy as to undertake this the most fatal of all suicides.

But, leaving man out of the question in the meantime, let us very briefly attend to the influence of the Spring upon other animated beings; for here the causes and effects are wholly physical, and therefore the whole belongs to the ordinary history and philosophy of material nature.

The difference between animals and plants, chiefly as the latter are in the growing state confined to their several localities, while the animals have the power of ranging about, necessarily occasions great variations, both in preparation for the Spring and in obedience to it. The plant, rooted in the soil, must bear all the seasons as they come; and that goodness of the Creator which is everywhere manifest, tempers it to its locality. The animal, on the other hand, can seek its own shelter, and requires to come abroad only when in so doing it is safe. It is true that there are extreme cases in which multitudes of animals perish during the rigours of the Winter, of kinds which do not so perish in ordinary years. But it is impossible for us to pronounce sentence of good or evil upon these natural occurrences. The probability is, however, that they are upon the whole beneficial; and that a very severe season, which kills off a number of animals, contributes to renewed vigour in those that are left; just as we find that our crops of cultivated plants and garden fruits are far better in the individual, and even upon the whole, when we thin them judiciously, than when we leave them as numerous as they first appear. The fruits starve each other, and the plants do the same, and also choke each other from want of air. That something similar is the case with animals we have abundant proofs, one of which may be mentioned, as affording a striking instance of the fact that nature will not allow her laws to be wantonly broken. Of course, when we speak

of nature as being personified, we merely mean those secondary causes which the great First Cause has seen meet to institute for the preservation and government of the material world; and whenever the word nature is made use of in these pages, as if it were the name of something which is self-acting, it is invariably understood to be nothing more than a general expression for all those laws, by the exercise of which God has seen meet to carry on the economy of material things. This being understood, we may mention our instance. One purpose which those animals that feed upon vegetable matter answer in wild nature, is that of supplying food for flesh-eating animals. The animals which furnish such supplies are endowed with powers of very rapid multiplication; so that, while they are useful to the carnivorous animals, in supplying food, the carnivorous animals are useful to them, by so keeping down their numbers, so that they shall not exceed and exhaust the food which is prepared for them, and so become literally exterminated through want.

It is in this way that all creatures are mutually useful to each other; and there is not an instance that can be adduced in which this mutual usefulness does not hold perfectly good. The sheep, for instance, fatten the pasture as much as the pasture fattens the sheep; and if the grass is thin and wiry upon a dry upland, putting sheep upon it, and gradually increasing their number as it improves, will, in time, bring it to the condition of a rich and valuable pasture. Many districts in the sandy part of Poland, from which the surface vegetation had been almost entirely destroyed by excessive cultivation and scanty manure, are at present in rapid progress toward a renewal of fertility, by the people having laid aside the plough, and turned upon the land Merino sheep, the fleeces and surplus carcases of which prove far more valuable to the people

than the scanty grain crops which they raised a few years ago.

These are simple matters, and matters which every one might observe. But it is doubtful whether they are generally observed; and yet it is impossible even to approach the subject of animals safely without a knowledge of them. When we come to the animal kingdom, without a knowledge of the principle of this mutual support, we see nothing but rapine and destruction. The sheep eat the grass, the wolf and the fox devour the sheep; the caterpillar consumes the bud and the leaf, and the bird eats the caterpillar. All is havoc, in short, and every one appears to be destroying another. When, however, we direct the eye of understanding toward this scene of apparently universal destruction, we find that the whole of it tends as much to the preservation of the destroyed as to that of the destroyer. If, indeed, there is any difference between the two, the destroyer is more important; because his labours, though destructive to the individual, are preservation to the race; whereas the individual destroyer preserves itself only by its destroying. There is no doubt that all this must be done within limits; but the fixing of those limits is safe and sure with Him who, throughout all the kingdoms of nature, in all their departments, saw and sees the end of everything from the beginning.

Our example is a good illustration of this. The hare is among those animals which multiply very rapidly, and consume a great deal of food. The hare is proverbial for the number of its enemies in the smaller beasts of prey, of which those that are not one-fourth its size can master it. This provision of the means of destruction is necessary to regulate the numbers; and if it is interfered with nature performs her necessary work in another way. Some

proprietors of land establish what they call "preserves" for hares, from which they carefully exclude both predatory animals and men; and by this means, and also by the preserve being in a well-chosen spot, hares are often multiplied to a vast extent. But there is a limit to this, even before there is the slightest appearance of a deficiency of food. The law of nature is not to be violated with impunity, or rather not to be violated at all; and thus there falls upon the overstocked preserve an unknown fatality, by means of which the animals perish in vast numbers, without the slightest emaciation of their bodies, or any other appearance of disease. For this reason, those who wish to designate it by a name, call it *epizooty*, or that which falls *epi*, upon, *zoon*, the life; but in what manner it falls they cannot tell by any examination of the individuals which are the victims to it. This is not peculiar to land animals, for it sometimes affects animals, the warm-blooded especially, which inhabit the waters; and instances have occurred of the shores in some countries being literally covered by the bodies of seals, not exhausted by famine, but well-conditioned and fat, upon which this singular visitation had fallen. This excess of every production of nature, in consequence of which each has enough for its own wholesome purpose, and plenty to spare for that which depends upon it, is the beauty of the system, and one of the grand distinctions between the works of God and the works of man. Man's works require to be supported with something from nature which is external of them; neither can man so contrive two engines, or two artificial structures of any kind, as that the one of them can of itself in the least degree repair the other, or keep it in order, any more than the individual machine can repair itself. God's machines (so to call them) are, on the other hand, all self-repairing; and they derive their materials

from each other by means of their own powers, and without any external aid. This applies to every part of nature; but we forbore alluding to it until we came to speak of animals, because in them it is most conspicuous. With this as a general accompaniment—to which we need not refer upon particular occasions, for the purpose of showing that the feeding of one animal upon another is not cruelty, in our sense of the word—we shall proceed to notice a few of the effects of Spring upon the animated world.

These may be, in a great measure, confined to land animals; because the inhabitants of the waters experience comparatively little difference of season. They are also much more conspicuous in certain classes of animals than in others; and of course those in which they are so are best fitted for being subjects of popular description and instruction.

We may mention, for the sake of our readers who have not paid attention to Zoology—the science or knowledge of animals—that animals consist of two grand divisions, the one having back-bones, and other bones which are clothed with flesh and skin; and the other grand division being without bones, and having their external covering so formed as to serve as a sort of substitute. The first grand division contains by far the largest and most interesting animals; and man, considered as body only, is one of the number; but the second grand division is vastly more abundant in numbers, and the part which the numbers of it perform in the economy of nature, especially as it affects the vegetable tribes, is often highly important. The land animals having back-bones consist of three distinct classes, which are accurately discriminated by the popular names of beasts, birds, and reptiles; it being understood that the word "beast" is restricted to such animals as suckle their young with milk. The animals without back-bones, which are smaller individually, but more numerous, are sometimes

popularly denominated by the general name of insects, though that name properly belongs to only one subdivision of them. To avoid a multiplicity of names, we shall, when we have occasion, use the word "insect" in its proper signification, and apply the general name, "small animals," to every back-boneless animal which is not an insect.

All land animals have the power of locomotion, or change of place, to some extent or other; and though this cannot be regarded as the characteristic of animal life, yet it is in this that the influence of Spring is first displayed; for the genial weather puts the whole animated world into a state of activity unknown during the preceding season of the year.

Beasts, taking them generally, have no motion, except that of walking on the earth, or swimming a short way across the waters; and therefore the influence of the Spring, and of all the seasons, must, generally speaking, be met by them in the same localities. It follows, as a necessary consequence of this, that they must require some seasonal preparation, greater in proportion as the seasons of their native places differ more from each other. In tropical countries they resemble the trees, in being in nearly the same state of preparation all the year round; and, as they can seek shelter, they do not so soon begin to require adaptation to variable seasons as vegetables do.* When we come to very cold latitudes, and cold mountain regions near the snow, we find, however, that there is an adaptation of the beasts to their place on the earth. In polar latitudes, and also in Alpine ones, some species wax exceedingly fat previous to the Winter; and then retire to artificial dens, or holes dug by themselves, in which

* It is found that some of the tropical mammalia, such as the Tenree of Madagascar, passes the Summer in a sleep very similar to the state called hybernation.

they pass the severity of the Winter, not only without eating, but with all the animal functions nearly suspended; the little waste of their bodies which occurs in this inactive state being supplied by the fat which accumulated upon them previous to their falling into their Winter repose. This mode of passing the Winter is usually called *hybernation*, which simply means wintering. It is habitual in some species of animals, for they pass into this state every Winter. It is probable, however, that every animal can partially pass into it; for there have been instances of sheep, and also of human beings, that have remained alive under the snow much longer than they would have done in the open air, without a supply of food. The first influence of Spring upon those hybernating animals is, to rouse them from their slumbers, and prepare them for the grand labour of the year, the production of a new generation, which shall supply their place when they are gone. As the places which such animals inhabit are usually remote from the dwellings of men, and their early habits are obscure, the influence of the Spring upon them is not very easily observed. In those cold latitudes the animals which do not hybernate (and they are by far the greater number), have their vigour secured against the Spring by an addition to the quantity, and by the change in colour, of the hair or fur, which is the general clothing of such animals. It gets much closer, and becomes paler in the colour, often changing entirely to white, as it does in the Alpine hare, which is found near the summits of our loftiest mountains; and does not descend thence in the Winter, but remains amid the snows without hybernating. Where the difference of seasons is less extreme, and the animals are exposed to the weather, their protection consists in the old coat of the year remaining uncast, while the young coat grows among the roots; whereas, if the

same animals are kept under shelter during the Winter, there is little difference in the texture of their coats all the year round. The influence of the Spring upon this class of animals is, however, more worthy of being studied as a portion of the scenes which they inhabit, than in themselves considered apart. These animals are found in every latitude, from the equator to the extreme north; and from the mean level of the earth's surface, to the margins of the snows upon the loftiest mountains. This general distribution proves how useful they must be in wild nature; and we need not point out the usefulness of the domesticated species to man, for, in the early stages of society they form his only wealth; and we can imagine no state of civilisation in which they could be dispensed with. They supply far more human food and clothing, than all the other classes of animals put together; and they are the only animals that assist man in the performance of his labours.

The animals which we designate by the general name of reptiles, are cold-blooded; and though they can exert themselves powerfully when occasion requires, their animal powers are not nearly so vigorous as those of the classes which have the blood warm. Generally speaking, they are impatient alike of the heat of the sun, and of chilling cold. There are however, exceptions; for several of them sport in the warm sunshine only. Their head-quarters are in the tropical countries in the thick forests, and generally by the margin of the waters. In polar latitudes they are hardly known; they are but few in any temperate country; and with us there is but a single one which can be said to bear any conspicuous part in the labours of the Spring. This is the common frog, which reposes in a state of hybernation under water during the Winter, and which may be both seen and heard at its spring labours, in ditches and small

ponds of stagnant water. The character which it gives to the season is, however, but a slight one; and the song which it utters to cheer its labours is far from being the most musical in nature's grand vernal chorus.

THE FROG.

The few other reptiles which this country contains do not come abroad until the season is so far advanced that Spring may be said to be over; and even then their manners and mode of life are so obscure, that, instead of obtruding themselves upon the observer, they are apt to elude his observation altogether. They consist of the common toad, and animals somewhat intermediate between that and the frog; two or three small snakes of the harmless class; and a single poisonous serpent, the common viper,

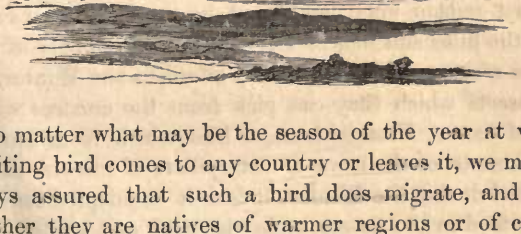
whose bite, or rather whose venom, is not very deadly under our mild sun and mild atmosphere. These are all obscure and quiet creatures, living in retirement, hurting nobody; and so far as is known, doing neither good nor harm to anything that concerns man.

There only remains to be noticed one other class of land animals having back-bones, namely, the birds. As the greater number of these can make their way through the air, they are not hemmed in by the same boundaries which necessarily confine the three former classes, but can range from climate to climate, and from country to country; and therefore it is in them which we are to seek for the grand displays of vernal action upon animated nature.

This power of mobility in the birds, and the comparatively small fatigue with which those that are properly winged for the purpose proceed through the thin element in which their pathway lies, enable them to be at every spot where their presence is more especially necessary, to reach every article of food which is appointed for their consumption, and to regulate the numbers of those creatures, whether animal or vegetable, over which they are immediately set. Besides being travellers in the air, the birds are in an especial manner children of the sun, and follow that luminary in its apparent declinations. What the impulse is which guides them in their seasonal movements, is beyond the scope of our knowledge; and therefore we need make no inquiry concerning it, any more than we need inquire why the sun illuminates and warms by its own direct light, while the moon illuminates only by reflecting a portion of the light of the sun, and does not warm at all, or at least very slightly.

But though we cannot assign the reason, or even guess at it, the fact is certain; and there is no bird which periodically disappears from one region of the world, in numbers,

which does not proceed to another. There is no bird which is hatched in any one part of the world, and afterwards leaves that part for another, but which returns to spend the breeding season, and hatch its own brood in the place of its nativity. There are also cases quite well authenticated of this being done with a nicety which human reason could not exceed or hardly reach; for if a pair of birds have once built a nest in any spot, and escaped casualty so as to return again, they come directly to the same spot; and do it so nicely that the same pair of house-martens will, for a series of years, return and repair the same identical nest in the same corner of the same window; or if any accident has rendered that unfit for their purpose, they will build a new nest as near to the place of the old one as ever they can.



No matter what may be the season of the year at which a visiting bird comes to any country or leaves it, we may be always assured that such a bird does migrate, and that, whether they are natives of warmer regions or of colder, no bird ever hybernates. Specimens have, indeed, been found benumbed, under hedges, and in other hiding-places, after the rest of their fellows had quitted the country; but such birds are always exceptions to the rule, and not observances of it. They are either sickly birds, or those members of very late broods which were unable to accompany the rest when the voice of the season warned them to be gone.

We are but little acquainted with the migrations of birds in the southern hemisphere; and as the character of that hemisphere is more or less tropical throughout its whole extent, it is highly probable that such birds are regulated entirely by the alternations of rain and drought, without any regard to the seasons of the year, as dependent upon the apparent declinations of the sun. In the northern hemisphere the case is very different. From the diversity of seasons which that hemisphere enjoys in its various latitudes, the supply of bird's food is equally variable, more especially in the case of those birds which feed upon insects and other small animals. After the snows of Winter have fallen, and the frosts of Winter have sealed up the rivers and the lakes, there remains not one of these small animals accessible to a bird; and therefore all birds whose habit it is to feed upon animal matters, on the land, in the marshes, or by the margins of the stream, must either quit, or they would perish during the rigours of the long Winter. The few that remain upon land must be capable of subsisting upon the buds and tops of trees, the scanty supply of wild berries which countries so dreary afford in the Winter, and the insects which they can pick from the crevices of the bark of trees. Even with us, a bird which feeds entirely upon insects, or the larvæ or caterpillars of insects, cannot find food during the Winter, unless it be adapted for seeking its food in the waters, or in the mud and sludge upon their margins. We have therefore no winter pasture for such birds; and as our insular situation renders our Winter less severe than that of the same latitudes on the continent, the insect feeding birds must, during the Winter, find their way farther to the south than they do from us. Those insect-feeders are our sweetest songsters; and as, in consequence of their winter's absence, they are new to us every Spring, we feel an interest in them, which we do not feel in

those birds which spend the whole year within our country, though many of the latter are endeared to us by the familiarity which they display, and the protection which their helpless condition, and confiding advances, appear to seek of us during the inclement season.

As our summer birds retire during the Winter to more southerly habitations, where food for them is abundant, so those which, if they remained in the extreme north, would be liable to perish there, pay us their annual visits at the time when our summer songsters are gone. These are chiefly water birds and marsh birds; for though some land birds come, and come in abundance in particular years, that takes place chiefly when the storms in the north are more than usually early and severe. These movements do not affect the birds which remain far at sea, except during their nesting times, so much as they affect those which frequent the fresh waters, and the beaches and shallows along the margin of the sea. The reason of this is obvious; fresh waters and shallows freeze much sooner than water which is deeper, and more impregnated with salt; and thus the shore bird is frozen out, and compelled to take its departure, while the sea-bird, which finds its food by fishing on the broad waters, meets with no inconvenience.

This southward movement of the birds before the Winter's frost, is that which has to be reversed by the operation of the Spring. On the average of years the reversal is complete, and no more. That which is done while the heat retreats southward is undone while it advances northward; and during those portions both of the Winter and the Summer, when there is comparatively but little variations for several weeks, there are resting places for the wanderers, while their habits and their powers of motion are such, that those which summer in the temperate countries find a

second summer during the time of their sojourn in places further to the south.

The proper breeding season—the grand time of activity with all migrant birds—is, however, at the greatest distance to which they range from the equator. That is the place of their nativity; and it is there that they ply their labours with the greatest assiduity, and pour forth their songs with the most apparent delight.

But in addition to those migrant birds, the one set of which begin to arrive and the other set to depart at the opening of the Spring, there are many which reside for the whole year in the same locality. Birds of this latter class are most numerous at the equator; and as the seasons become more marked, their numbers diminish, until, in the high latitudes, they are, as has been said, comparatively few.

With us, these last-mentioned are generally vegetable feeders, or indiscriminate feeders upon animal or vegetable matters; and, instead of dispersing themselves over the country in the Winter, as one would be apt to suppose, they congregate in vast flocks, which often consist of many different kinds of birds. While the corn-fields remain clear of snow, they find abundance of food in these; and it is in this way that they acquire strength to be able to undergo the labours of the Spring, when that season comes round; for, where the seasons are strongly marked, all birds and all animals in a state of nature are strictly seasonal; and the Spring is the grand time of action with them. Nor are they slow in their obedience to the indications of this their favourite season; for instead of showing any backwardness to the performance of their labours, they obviously feel more delight in them than in anything else. Those which are on the spot feel even the slightest and most transitory foretaste of the season. One day the redbreast shall have

been crouching on the snow, or tapping at the window for his accustomed alms; but if the frost relents, and the sun of next day shines out warm and kindly, this interesting bird will be perched on the tree, carolling his farewell song of thankfulness, as if he were about to take his departure for the copse, build his nest, and rear his tender young. The little wren, too, which, during the severity of the storm, merely hops from under the firewood heap by the cottage door, to see what its little daring bill can capture, gets on the top of the same heap in the warm sun, and begins its sweet little warble.

If the morning is fine, the sun beats warm, and the sunny sides of the furrows begin to take the "colour of promise," the lark is speedily at the top of the sky, making the fields shiver to his delightfully enlivening melody. Notwithstanding the general attention which this early voice of the Spring, both of the year and of the morning, has received, and notwithstanding all that has been written concerning it in prose or in verse, there is something so exhilarating in the song of the lark, and it is so completely identified with the important labours of the fields, and the happy homes of rustic life, that one never tires of hearing it. The earliest note which charms the ear of the infant, when it is old enough to observe, and taken out to inhale strength from the fresh air of the morning, is the song of the lark; and the worn-out rustic, who is unable to contend longer with the variable weather of the Spring, takes

his last farewell of nature in the song of this interesting bird. Its soaring aloft, till it seems but a little brown speck against the blue dome of the sky, or its total disappearance in that magnificent expanse, while the notes of its song of invitation continue to thrill sweetly on the ear, impart a train of thought which it is not easy to commit to writing. The slow and solemn Sabbath-morning walk, which a man of right mind often takes, in order to commune with his own heart, and prepare him for drawing near to his God in the place appointed for solemn worship, is certainly improved by the song of this bird, which though it differs not on one day in itself from what it is on another, yet brings home to the mind the particular subject on which it is bent at the time. It has often been remarked that those sounds and sights in nature—such as this matin song—which, upon the working days of the week, cheer man on to the hearty and successful performance of his labour, conduce as much to the tuning of the mind to an accordance with the solemn services of the sacred day. It is reported of a certain martyr, that when he was bound to the stake, and the faggots were collecting around him, a skylark mounted on high, and sung over his head; at which he clasped his hands together, and returned thanks that "there was still one free creature which could pour forth its gratitude to the Giver of all good according to the dictates of its own heart."

As a herald of the Spring, there is a certainty about the lark, which can hardly be predicated of any other songster of the early season; for, though there may be an occasional song of this bird from a small height, upon one of those fine days wherewith a lingering Winter is not unfrequently spotted; yet, when the lark mounts to the top of his flight, and swells his song to the full power of his voice, one may rest assured that the Spring has indeed

arrived; and that any relapses into Winter which occur after this, will not be either severe, or of long duration.

Another of the early heralds of the Spring is the missel-thrush, the largest and one of the most mellow-toned of our wild songsters. This is the largest of the thrush tribe, soft in its appearance, mellow in its song, local in its distribution, and hid in the deepest covert of the groves. But still it is one of those birds which are most on the alert for the coming of the Spring, and most ready to greet with a song even a very slight promise of the vernal sea-season. It is true that the Winter is never very severe in places where this bird is to be found; and as it remains in the shelter of the sprays, it does not feel the Winter so much as those birds which are buffeted by the angry winds upon the open plains; but still this thrush is a delightful bird of the early season, because so little of the seasonal influence excites it to the delivery of its soft melody; and even if it is overtaken by one of those short but boisterous snow showers, which so frequently occur in the end of January and the beginning of February, it sings away as if to keep in remembrance that, notwithstanding the little temporary reverse, the Spring will certainly come. It is thus that various members of the animal kingdom forcibly admonish us to trust in the goodness of God, and patiently await his time, if we would but translate their voices to our own proper edification.

SONG-THRUSH.

It has often been customary to assign particular days

for the commencement of the songs of birds for the year, and also for their beginning the construction or repair of their nests. This, however, like many other matters on which we attempt to apply numerical precision to natural occurrences, is calculated only to mislead. The time at which the native bird shall be excited to song, or to seasonal labour, or that which the Spring visitant shall arrive, is not fixed by the calendar, but depends both upon the place and upon the season.* If there is a low and warm district, bounded southwards by the sea, and sheltered from the north and north-east by a swelling bank some four or five hundred feet in height, and if beyond this latter an upland stretches, then the native birds may be in full activity, and many of the visitants may have arrived upon the warm lowland, while upon the upland all is mute.

ROOK.

The rook is a most characteristic bird of the vernal

* The observations and records of naturalists at many different localities in the British Islands, show, that the arrivals and departures of migratory birds are extremely regular. See White's "Selborne," Knapp's "Journal of a Naturalist," and such periodicals as "The Zoologist," for numerous instances In the tropics and the warmer parts of the world, the migrations of different animals, such as of the land-crab of Jamaica from the sea to the mountains, and *vice versa,* are wonderfully regular. There is great force and beauty in the Scriptural assertion "the stork knoweth the time of her coming." The arrival of these and other migratory birds is regularly looked for by the inhabitants.

season, and one to which considerable interest attaches. The family of birds to which the rook belongs are, generally speaking, plunderers of the nests of other birds; and though this may, indeed must, excite rather a feeling against them with many persons, yet it no doubt has its use in nature, and contributes to the general good of the feathered race. If rooks are not altogether without this propensity, they have it in an exceedingly slight degree; and the good which they do in other respects is more than a compensation. They are social birds among themselves; they appear to prefer building their rookeries near human habitations, rather than in remote places; and they hesitate not to alight in the fields, and follow the ploughs, performing their part in the labours of the husbandman wit unwearie d assiduity. Those larvæ of earth beetles and flies, or, more strictly speaking, those beetles which pass their larva state under the ground, feed upon the roots of vegetables, and are often very destructive to young corn in fields, and grass in meadows, by completely consuming the roots, and leaving the upper parts of the plants to perish, are the chief subjects for which the rooks search the earth so diligently as it is turned up by the plough. These underground destroyers are, individually, of small size, but they are exceedingly voracious; and their numbers, in some places and seasons, are altogether incredible, so that they resemble, in their destructive ravages, a species of underground locusts. Against such enemies man himself can do nothing; because a hundred times the produce of the richest field would not repay the expense of clearing it by human labour, even though practicable. But the rooks do this in a very effectual manner; so that, where rooks are abundant, the kind of larvæ which have been noticed do comparatively little damage. They are exceedingly keen-eyed birds, sturdy walkers, and powerful

on the wing; and thus they are able to undergo a great deal of fatigue in the performance of those duties which are so serviceable to the farmer. While they walk about on the ploughed fields, there is a strut of importance about them. We do not mean to say that they are in the least conscious of doing good; far otherwise, for the only inducement which they have to the performance of their field labour is the desire of feeding themselves and their young. Still, some one has remarked, and the remark does not appear to be altogether destitute of truth, that whenever there is familiarity with man, and a strut of importance in the bearing of any animal, that animal always does man service in some way or other, whether man himself has discernment enough for appreciating the service or not. On the other hand, an animal which sneaks into concealment, and approaches the abode of man stealthily, or under cover of the night, always comes for a mischievous purpose; and, however, useful it may be in wild nature, where man has no dominion, it may invariably be looked upon as a creature which can, and which should be removed, after his dominion is fully established.

We must not wonder at, or be in any doubt or hesitation concerning this change which takes place in the relative value of many animals, after man takes full possession of that kingdom which his Maker gave him. He introduces the exercise of a power altogether new, and to which there is nothing approaching in the rest of the earth's inhabitants. He brings, or, at all events, he ought to bring, understanding and judgment into the system of nature; and as his wants are both numerous and urgent, and he is, in a great measure, left to his own judgment in the satisfying of them, it is delegated to him to determine which other animals are to make room for him. This, we are ready to admit, is a matter which cannot be decided

without much knowledge of the nature of animals, and the total absence of all prejudice; but still it is a point which the Almighty has left for human decision. It is true that the good man is "merciful to his beast," but that means the beast which he finds useful to him; and though man ought not to torture any living creature with wanton cruelty, yet there is no doubt that he is justified in destroying, and even in attempting to extirpate, that which experience has shown to be contrary to his best interests.

The experience must be well founded, however; and to get a proper foundation of experience, for judging rightly upon this point, is one of the many uses of the study of natural history. This does not mean the mere distinction of one animal, or natural production of any kind, from another; but an accurate knowledge of the part which each acts in nature, and a full understanding of in what manner, and in how far that is conducive to the advantage or the disadvantage of man. There have been errors in this respect in the case of the rooks; and instances could be mentioned in which the people of a district, after no small expense and labour in the destruction of these birds, found their crops so much more seriously injured by those small animals which the rooks destroy, that they were glad to get them back again at far more labour and cost than had been necessary for the previous destruction.

That rooks do sometimes pull tufts of grass, and young plants of corn, of potatoes, or of other cultivated vegetables, is no doubt true; but it will in general, if not in every case, be found that there has been a worm at the root which would have more effectually destroyed the plant than the rook does. That at certain seasons of the year, they levy contributions on the produce of the fields, we do not mean to deny; and as little do we mean to deny that those insectivorous birds of song which clear the fruit-trees of

caterpillars in the early season, and so prevent the total failure of the fruit-crop, do return to the garden, after the supply of caterpillars fails, and take a portion of the berries. But if the depredations which they commit in this respect are fairly weighed against the services which they perform, it will be found that the former are really but slight in comparison.

Besides the usefulness of their services, rooks are very interesting birds in their economy. The assiduity with which they build their nests, the severe chastisement which they inflict upon such members of the community as are dishonest in the procuring of sticks for this purpose, the attachment of the pair to each other, their diligence in feeding their young, and the perfect harmony which subsists among all the families of a community so numerous as that of a rookery often is, not only offer very pleasing subjects for rational contemplation, but furnish lessons of instruction and reproof which ought not to be slighted.

It is a common saying in many parts of the country, that these interesting and well-known birds lay the first stick of their nests, or begin the repairs of their old ones, on the first day of March. There is, however, no fixed day for this. In very open winters, in the warmer districts of the country, they sometimes begin their labours early in January, if not at the very beginning of that month; while in the late seasons, in the cold districts, their labours sometimes do not begin till April. The fact is, that there is no fixed time for any labour of animals. They are stimulated by a particular character of the season; and whether that arrives sooner or later, they obey it as a matter of course. It often happens that they begin their labours before the Winter sets in; if the Winter happens to be late, they have again to suspend them; but if they once have begun and once have paired, the pair keep together through good weather and through

bad, until a temperature arrives which shall suit them for the grand labour of the year; and then they double their diligence in nest-building in proportion as the commencement has been made.

The same circumstances which tempt the early resident songsters to tune their notes, and the rooks to begin to repair their habitations, often bring from the shores of the sea those running birds which winter there, but breed in the upland moors, such as lapwings, plovers, and other species. These birds often coming too early, are overtaken by a renewal of the storm; and when the snow-flakes beat around them, the whistling of the plover, and the wailing of the lapwing upon the wild moors, have something in them which is singularly plaintive. On such occasions the plover generally keeps the ground, and runs from bush to bush until it finds one fit for its shelter; but the lapwing dares the storm, and tumbles about amid the driving flakes, in its very peculiar style of flight, and uttering its very peculiar cry. It has been remarked, however, that there is never any severe weather of long duration after the appearance of the lapwing inland upon the moors.

It is just as impossible to lay down any fixed date for the first appearance upon their summer grounds of those birds which are seasonally migrant within the country, as it is to determine the precise day on which a bird permanently resident in the same place shall begin its song, or that on which a stranger from a far country shall arrive. One thing is certain, namely, that those birds which remain permanently within the country, whether they remain all the year in the same place, or shift from place to place with the seasons, are regulated as to the time of their Spring activity by circumstances which occur in the country; and therefore we have a sort of guide to the time at which we may expect them to be called into activity.

The case of those which come to us from distant countries is a good deal more difficult; because, though we know very little about the matter, we have reason to believe that they are impelled by the state of the regions which they leave, instead of attracted by that of those to which they come. The latter can have no influence upon them till their arrival.

After they do arrive, however, in the south of our island, the state of the weather has a considerable influence upon their progress northwards, and also upon their pairing, commencing their labours, and beginning their songs. The males of most of the species come first. The cause of this is not exactly known. It is possible, however, that the season sooner takes effect upon male birds than upon females. In external appearance, especially in the colours of the plumage and the naked skin, where these are subject to change in the breeding season, the males always undergo greater changes than the females; and those changes are invariably an increase of brightness and beauty. Whether these changes of colour are produced directly by the influence of the season, or indirectly by the general stimulus given to the system of the birds, it is not easy to determine; nor is it of much importance whether it is the one or the other, but it is certain that many of those pleasing little creatures assume a gayer livery in the vernal season, and are inspired with a corresponding degree of additional spirit and energy.*

These preparations, whether in the resident bird or in that which comes from a distance, appear to be highly

* Alfred Tennyson, the poet laureate, in his "Locksley Hall," alludes to this.

"In the Spring, a fuller crimson comes upon the robin's breast;
In the Spring, the wanton lapwing gets himself another crest;
In the Spring, a livelier iris changes on the burnished dove."

necessary for the purpose of carrying them through the labours which they have to perform at this season of the year. Nor is it unworthy of remark, that, while birds are at this season the most laborious of all creatures, they are the most cheerful and sprightly. At other seasons they sit moping and solitary upon the twigs, or crouch down upon the ground, as if they were lifeless. At this time, on the other hand, they are all bustle and activity, and the harder they labour they appear to require the less rest. In this we have a beautiful instance of the benevolent kindness of the Creator to his creatures, in not only fitting each for the general station that it fills in nature, but in so varying the adaptation as that its vigour is always exactly in proportion to the demand that there is upon it. If little is required for the time, correspondingly little is imparted; but if great energy is needed on a particular occasion, and for a particular purpose, the measure of that energy is always brought up to that of the necessity there is for it.

Besides their great beauty and variety, and the vast interest which they impart to the activity of the vernal season, there is something peculiarly worthy of our notice in the songs of the feathered tribes. Birds are the only animals which have song; for though bees hum, beetles drone, crickets chirp, and various other insects emit sounds, not one of these sounds can be considered voice. None of them is produced by the mouth of the animal, or any part of the breathing apparatus acting upon the breath. They are all the results of the striking of external parts, either against the atmosphere, or rapidly against each other; and they are as inseparable from the motion of the creatures as the sound of the wings of some birds is from the style of their flight. We have mentioned the lapwing, and there is no bird which has more peculiarly sounding wings than it has. In its nesting-time upon the moors, when it is

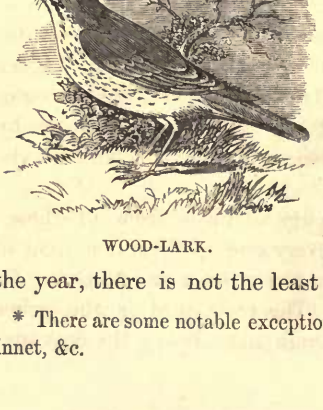
excited in an extraordinary manner, as it always is by the passing of a dog near its nest, it tumbles about in the air with apparently frantic motions; and ever and anon it twitches down to within a very short distance of the invader, and on the turn, its wings give a report as if it had discharged a small pistol at him. Nor is it at all uncommon to see a cur sneak off, crouching and whining, from this demonstration of the bird, as if he were apprehensive of being shot.

Those sounds of wings and external parts, whether they occur in birds or smaller animals, have however no relation to voice, and none of them has any modulation, or bears even the slightest resemblance to song. The songs of the birds, on the other hand, are distinct vocal sounds; and there is a very peculiar provision made for the power and compass of their musical instrument, to which there is nothing equal or even resembling in any other class of animals. The beasts, or mammalia (sucklers of their young), as they are technically called, all have voice to some extent or other, but that voice is never musical; and what is remarkable, it is incapable of improvement by artificial teaching. Many birds can be taught to pipe with the greatest accuracy musical airs, even though they contain semi-tones and trills, which are of very difficult execution by the human voice, or upon a musical instrument. Not a few, also, can be taught to articulate words, and sing songs, equally true to the sense and the music. When we find, in birds, which have little external resemblance to human beings, those perfect imitations of what may be regarded as the most pleasing sounds of the human voice, analogy would lead us to conclude that we should have the same imitations in greater perfection from the mammalia, and especially from those mammalia which, externally and internally, have the nearer resemblance to

human beings, the monkey, and still more the apes. Those creatures, more especially the monkeys, are certainly noisy enough; but whether the sounds which they utter happen to express pleasure or pain, satisfaction or anger, they are invariably disagreeable; and in some of the tropical forests, where the loudest tongued species are numerous, their howlings are terrific to one unacquainted with them. If we were to muster the whole list of this class of animals, we should not be able to find a single approximation to music, or anything which could be called a spirit-awakening cry. There are no doubt many of the voices of those animals which are agreeable to us. The baying of the watch-dog, for instance; the bleating of the ewe, and the little voice of her own lamb, which alone answers to her out of the hundred which may be sporting together on the green sward. But in these, and in all cases in which the voices of beasts are pleasurable to us, the pleasure is not in the voice itself, but in something we associate with it. When we are weary and worn with wandering in an unknown and thinly-inhabited country, the barking of a dog is always pleasant to the ear; but it is so because it gives us hope that we are near a human dwelling; we love the deep sound of the watch-dog wafted on the still air of a dark night, because it announces to us that the faithful creature is on the alert, and at his post, while his master sleeps in perfect security. In like manner the bleating of the ewe, and the response of the lamb, give us pleasure by the example they afford of tender attachment between the mother and the offspring.

How different are the songs of birds from all these! They are all musical, and every one of them is a song of joy and excitement, both to the utterer and to those for whose sake it is uttered. The male bird is the prime songster; and generally, though not always, the only one.

This song, too, is given immediately before, and during the severest labours of the birds; and therefore it in some way contributes to spirit them on to those labours, and bear them up under their pressure. The fact is not universal; but it is pretty general that those birds which build elaborate nests, are much more vocal than those which form rude ones, or no nests at all. The gallinaceons birds of rich plains, such as partridges and pheasants, have cries, which are often shrill and piercing, and have much tone in them, but they never upon any occasion amount to anything that deserves the name of music. Resident birds have also, generally speaking,* less song than migrant ones, and birds which frequent the open downs and the bleak moors have less than those which nestle in the groves and thickets. The sky-lark may seem an exception to this, but it is not one in reality; for, though the sky-lark does not frequent the woods, it is a comparatively concealed bird upon the ground, among the brown clods during the early part of the season, and among the tall herbage after the season is farther advanced. Sufficient attention has not, however, been paid to this curious subject for enabling us to say what the specific effect of song generally, or of any one song in particular, has upon the birds which utter it. That it is connected with the grand labour of the year, there is not the least doubt; for if the female or

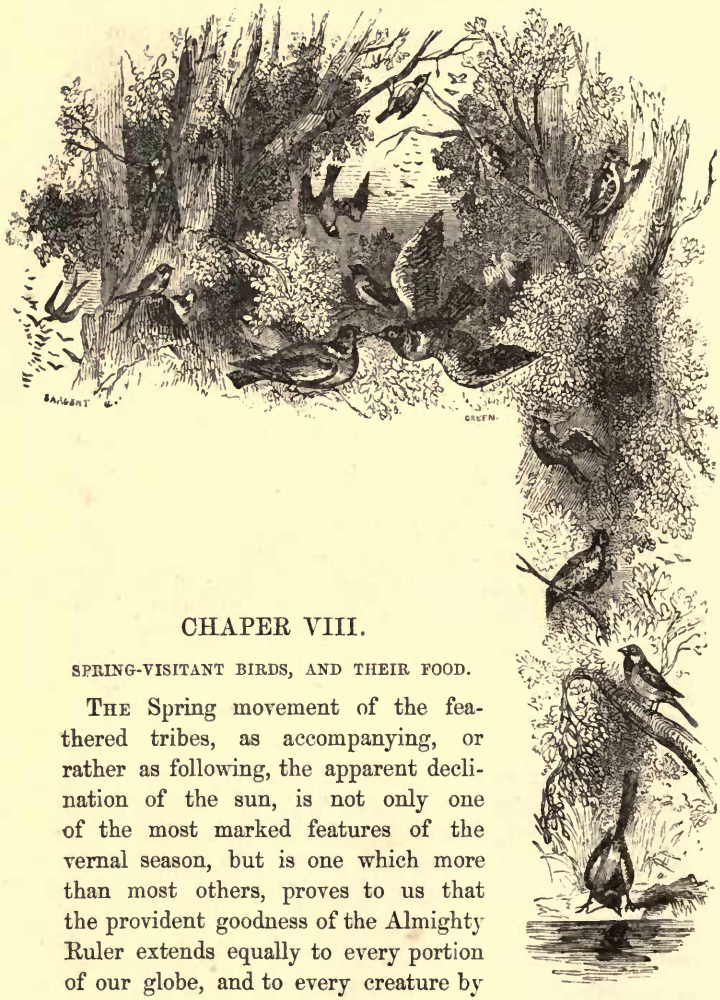


WOOD-LARK.

* There are some notable exceptions, such as the thrush, blackbird, linnet, &c.

the nest is destroyed, before the brood are brought to maturity, the male bird sings anew; an unpaired male sings throughout the whole season; and a male kept in captivity, and removed from the natural influence of the seasons, sings at all times of the year. These songs, especially the last mentioned, are unnatural ones, however; and though we admire them because we can hear them at times, and in places where their wild song cannot be heard, they want the natural freshness and hearty glee with which the free denizen of the air pours forth his notes, when the Spring is young, and all is full of hope. The confined bird may be taught to imitate human music, and that it can be so taught is curious; but the wild note in free nature is that which is most pleasing to a rightly-constituted ear.

Our resident birds, the Spring bleatings of our flocks, and other sounds produced by creatures which summer and winter with us, give us the beginning of the Spring; and there are some of the very remote and elevated parts of Britain in which the season has scarcely any other music than is afforded by these. In the richer districts, however, the case is different; and the wanderers from afar come thronging in, one after another, as the Spring advances. No two of these have exactly the same note; and no two of them adopt exactly the same locality as a nursing-place for the year. Not a few of them also resort only to particular districts; and as they must do so, because those districts are best adapted for feeding them, their distribution becomes a key to some other parts of the history of nature. They and their food require a little more notice than we have already given them; but as this chapter is long, we shall make them the subject of the next.



CHAPER VIII.

SPRING-VISITANT BIRDS, AND THEIR FOOD.

THE Spring movement of the feathered tribes, as accompanying, or rather as following, the apparent declination of the sun, is not only one of the most marked features of the vernal season, but is one which more than most others, proves to us that the provident goodness of the Almighty Ruler extends equally to every portion of our globe, and to every creature by which any one portion of it is inhabited.

At the time when the birds begin their northward movement, food for them has failed in the extreme south, in consequence of the long-continued heat and drought of the antarctic summer. They therefore begin to move northward, guided no doubt by the supply of food, just as sheep are guided along the more verdant parts of an extensive hill pasture, where they shun those places that afford them no subsistence, and follow the lines of the fertile ones, however crooked these may be. These birds proceed by stages; and though the movement extends a considerable way southward of the equator, it has, in different species of birds, its beginning over a very extensive range of latitude. When driven southward by the severity of the Winter, the bird makes no voluntary journey: it is impelled by natural circumstances, and it moves not an inch farther than those circumstances impel it.

In the winter movement southward, the birds are, generally speaking, congregated into flocks; and those flocks always alight at the first place which can furnish them with a supply of food; and there they remain until that supply is exhausted, or until it is cut off from them by the weather. When either of these happens, they make another stage southward, and so continue till they reach a place where they can find a supply even in the depth of Winter. The line of distinction between birds which migrate from country to country, in the direction of north and south, and those that migrate between the warm and the cold latitudes, in the same country, without any particular reference to north or south, or any other direction, is not however so well defined as that we can distinctly separate the one from the other. We might expect this, because the birds follow their food; and as some of them will naturally follow it in one direction, and some in another, we can easily see that the flock which originally

moves from a high northern latitude, by being frozen out, must naturally leave a portion in the favourable grounds of each country over which it passes. This must hold true, whatever be the latitude of the most northerly or Summer station of the birds; and thus during the Winter they are distributed over all places where a supply of food for them is to be found, so that nothing is lost. There is a considerable difference of this southward movement in different seasons. If the Winter is comparatively open and mild in the north, the migrants are fewer; and they do not extend their excursion so far toward the south. If, on the other hand, the Winter is uncommonly early and severe, they migrate in greater numbers, and extend farther. Those Winter excursions necessarily have very considerable influence upon the opposite migration in the Spring, especially as to the time at which the Spring birds arrive. Consequently, some general knowledge of it is essential to a right understanding of the other.

The high latitudes are the centre and capital of Winter's empire—the place where cold displays the greatest of its strength. Accordingly, it is from these regions that the character of Winter throughout the empire is taken. The year 1836 afforded at least some illustration of this. The polar winter probably set in early and with great turbulence; and the consequence was a considerable fall of snow, accompanied by keen frost, even in the valley of the Thames, as early as the latter part of October,—a circumstance of rare occurrence in that part of England. Such a season must *tend* to drive the birds southward more early, and in greater numbers, than if, as happens in the majority of years, there had been no frost of any consequence until January. How far southward the rigour of such a season may extend, depends on the power which the south has of resisting the invading storm. This, again, depends upon

the dryness of the preceding period; and the early snow-storm of 1836 was owing to the heavy rains in the preceding months, and the consequent cooling both of the earth and the air by evaporation. As cold air, from its greater density, always invades the warmer place, our cold atmosphere must invade the countries to the south of us; and thus no state of the south can entirely prevent the advance of an early and severe winter from the northern regions.

We need not say that if the severity of the weather drives the birds farther to the south in one winter than in another, they must be later in returning northward in the Spring; and this is one of the reasons why calendars stating the particular day of the arrival of any bird can never be accurately applied.

When the Winter is very severe, heavy snows fall, and continue in much more southerly places than when the Winter is milder. But though the early setting-in of those storms may injure the late crops, which are not then gathered in, it must not be thence inferred that they bring nothing but desolation and ruin. The most bitter cup which the bountiful Father of all presents to his creatures, is always sweetened with mercy; and there is no one season, however disagreeable it may be to us, however destructive to our artificial labours, which does not only bring an ultimate good along with it, but also an antidote in part, at least, to its own severity during the time. The early Winter comes with its chilling frost, which alone would destroy the more tender vegetation; but along with the frost there comes the mantle of snow to be thrown in merciful protection over the suffering earth. It may thus happen, and it certainly often does happen, that a severe Winter is followed by a season of extraordinary plenty both for man and animals. Among others, the birds

are often driven far and long from the regions of the north, in order that the feast which nature provides for them there may be more abundant on their return.

In considering the movements of the feathered tribes, we must not lose sight of these circumstances; and we must also bear in mind, that while they are driven southwards by the cold, they are invited northwards by the returning heat, which brings a supply of food northward while the southward supply is diminishing.

By far the greater number of migrant birds, whether they come to us in Summer or in Winter, feed chiefly upon animal matters, in great part insects, and small animals. The Winter, even with us, cuts off the land supply of these to a very great extent. Very many of them die off entirely at the end of the season, and exist during the Winter only as eggs, which the parent insects have deposited in the places best adapted for being hatched by the returning season. A vast number of these are deposited on plants; but they are, generally speaking, too dimunitive for being seen by birds, or of affording any considerable supply of food, even though they were seen. Others exist in the earth, the waters, and the mud at the bottom of the waters, in the state of larvæ, or, as we call them in common language, grubs or caterpillars. It is for the purpose of feeding upon those larvæ, that many water-birds quit the north in the Winter, and resort to the fens, the pools, the streams, and the oozy banks of the estuaries of rivers in this country. Several individuals hide themselves, in the mature state, in holes and crevices, where they hybernate, or remain inactive, without feeding or motion, during the Winter. In short, we can hardly name a situation in which the rudiment or the means of life, in insects and other small animals, is not treasured up during the Winter, in order to be ready for the renovating in-

fluence of the Spring. In severe weather they are all dormant, however, and not to be found by the birds. This is the more complete the higher the latitude, and consequently the colder the Winter: and the display of insect life is long in proportion to the duration of the Summer. The number of insects, independently of other small animals, which are in concealment during the Winter, is immense. Britain, as compared with other countries, has an under rather than an over supply; and yet the species which have been discovered in the British islands amount to at least ten thousand; and it is impossible to say how many additional species may be yet discovered. The rapidity with which some of these multiply is beyond all imagination; and were the facts not well-authenticated one would not believe them. Of these insects, it is often the very small ones which are most destructive of vegetation; and the destruction is perpetrated, not when they are in the perfect or last stage of their being, but chiefly when they are larvæ, or in the first stage from the egg. There are no doubt exceptions to this, but it is the general rule; and the time when the Spring-visiting birds are with us is the great time for those larvæ.

Of creatures so numerous in species, and so utterly countless in individuals, it is not possible to convey any adequate notion, except in a work expressly on the subject. We may mention, however, the Spring exertions of a single female of some of the species. The extent of those exertions shows that they must commence their labours betimes in the season. Very many of the colonies of wild bees, which make their nests in holes of the earth, or collections of moss, and which construct waxen cells, and collect honey with so much assiduity during the Summer, die away, with the exception of a few females, which creep into hiding-places, and remain dormant there till the warmth of the

new season calls them forth. These females are, however, left by nature in such a condition that each of them can found a colony and rear a brood. The little creature has to find her own food, to make her nest, to construct cells fit for the hatching of her eggs; and all this in a very short time, and without the slightest assistance. Generally speaking, however, she succeeds; and her first care is to rear a working family, which shall farther assist in the labours; and it is not till the season be somewhat advanced that matured males and females are produced in the nest. The labours of many other insects are as severe as these; and some of their structures are highly curious, far surpassing anything which occurs among the larger animals.

One of the most singular races are the *aphides*, which, of different colours, and under different names, infest various species of plants, such as the rose, the cherry, the common bean, and a variety of others. The colonies of these, like those of the last-mentioned, generally proceed from a single female, or from an egg which produces a single female in the Spring. Some idea of the numbers of these little creatures may be formed when we consider that several species consist of at least twenty successive generations in the course of the Summer; and that the number of even the fifth generation of these twenty has been ascertained to amount to very nearly six thousand millions.

Indeed, when we consider that the rudiments of insect life, and of that of other small animals, are scattered everywhere, over the land, throughout the waters, and upon everything which the land produces, we are constrained to think that this is the portion of nature which is prepared and fitted for the action of the Spring. The individuals in all these cases, are of comparatively small size; but this is made up by the amazing fertility and the rapid succession in which the power of this fertility is exercised. Upon a

subject so much above even our comprehension, it is impossible to state with numerical precision what would be the result of this production if insects were not restrained, by their being made to support other departments of nature. It is not, however, too much to say, that if all the eggs of insects which are deposited upon the leaves and other parts of plants, in this country, were to come to maturity, they would not leave a single green leaf upon a tree. If those which are deposited in the earth were in like manner to come to maturity, they would not leave a single herb upon its surface; while if those which are deposited in the water, and remain there, were all to come to maturity, and continue their increase, they would thicken every pool and stream to the consistency of mire. Even this is a very slight and imperfect view of the amazing energy of life which is possessed by these little creatures; for it is no exaggeration to say, that, were their powers to be exerted to the full extent for only a very few years, and were such a result possible from the nature of its substance, they would, in those few years, convert the whole matter of the earth itself into insects.

It is true that this tremendous power is never worked to the full measure; but that is no argument against its existence. The powers wherewith the Almighty has endowed matter, in order that it may accomplish the purposes of his will, are not subjects which we can measure with a line, weigh in a balance, or sum up by our imperfect and limited arithmetic. They are ordained by him to control matter, to work it into those combinations, and mould it into those shapes which he has ordained. As he has appointed them, so has he given them strength for the perfect accomplishment of their labours. This strength no resistance of merely inactive matter can successfully oppose; and therefore he has wisely set the one of them to regulate and

control the other, and preserve them in those bounds which are conducive to the greatest good of the whole. When we reflect on these matters, we cannot but feel that there is a natural as well as a religious truth in the declaration of Holy Writ—" God hath chosen the weak things of the world to confound the things that are strong."

Such are the germs of provision, which lie ready to be called forth in such abundance, as not only to continue their own species to the full amount which nature requires, but to furnish an ample store for many resident animals of a larger growth, and also for those migrants which come from distant lands. The fresh water fishes, many of the small mammalia, as well as many of our resident birds, are supported during the season of their greatest activity upon this provision of insects and other small animals; for those birds which, during the Winter season, collect seeds in the fields, or wild berries and other little fruits from the hedges and bushes, feed their young almost exclusively, and themselves in great part, upon insects and small animals, during the nesting time, when their labours are most severe. But notwithstanding the abundant portion which is thus afforded to the larger inhabitants of the earth, the waters, and the air, the numbers of insects and small animals that is left is great everywhere; and it is so immense in some places, that they literally encumber the atmosphere, and darken the sun, as if they were thick clouds of driven snow. Over some of the marshes in Canada, when the heat of the Summer sun beats strongly upon that country of extreme seasons, woe to the man who takes shelter under a marsh tree, from the fervour of the burning sun. Gnats and musquitos are congregated there in myriads; so that, before he can effect a retreat, every naked part of his skin is tingling and smarting, and his clothes are so loaded with the little pests, that it is not without great difficulty he can

shake them off. In the marshes of polar Europe, the numbers are not quite so great; but still one who visits those marshes when they are bound up in the ice and snow of Winter, and again after the heat of the sun has awakened the germs of life which then lay dormant, would be quite astonished at the transition.

In the case of Winter, there is not a living thing—not one little wing in the air. The sun has set for the long night of Winter; and the dominion of that season is complete and tranquil. There is not even a perceptible particle of moist in the atmosphere; for as the sun, which is the grand agent in its ascent, has totally withdrawn his beams for the time, Winter has congealed every atom of water, and added it to the snowy mantle wherewithal those lands are protected, to be ready for the powerful action of their brief but vigorous Spring. In Summer, again, the sun which awakens those germs of insect life is constantly present for some time, and nearly present the whole day for much longer; therefore, the powers of life in the waters are worked to their full extent, and the mighty swarms to which we have alluded are the result.

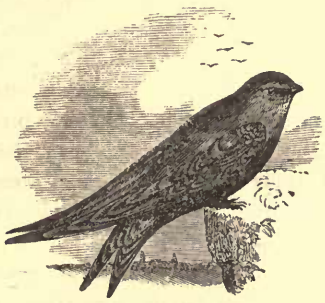
In such places it is the waters chiefly which bring forth this seasonal life. Trees are but few there; and the soft bud and tender leaf which support the caterpillars of butterflies and moths in such a country as Britain, are hardly known. Hence the abundance of such countries for the supply of birds is by the margins of the morasses, the pools, and the other waters; and therefore the birds which move northwards, to breed there, are mostly either water birds or birds of the margins of the waters.

This abundant supply in the polar lands draws such birds northwards in vast flocks; and they leave the more southerly places as a provison for others.

If such latitudes as our own are considered, the water or

shore birds which migrate to us in the Spring, are exceedingly few, though those which feed upon land insects and their larvæ, in the trees, on the ground, or in the air, are numerous.

The air visitants which feed upon insects are among the most characteristic, or at all events the best marked of the whole. They are of smaller size, and their prey is different, but still there is some resemblance between them and the birds of prey, properly so called. Like those, they are divided into day-feeders, and feeders during the night, or at all events, during the twilight. The former are the swallow tribe. The swifts are at the top of the sky, incessantly on the wing during the season of their labour, seldom alighting on the ground, and quite incapable of walking upon it. They generally build their nests in the most lofty situations, such as towers, steeples, and the crevices of lofty cliffs. The fleetness of their wings is such that they have little to fear in their proper element, the sky, while they do not interfere with what is going on at the earth's surface. The swallow, known from the rest by the deep fork of its tail, even when it is on the wing, occupies the next highest position. It builds in chimneys and other lofty places, though not so high as the swift. The house martin is one of those birds which claim the closest neighbourhood with the human race. The corner of the window, the projecting eaves of the roof, and such situations, are those in which it builds its curious clay castle; and it is under-



SWIFT.

stood that this interesting little favourite returns again and again, for many successive years, to the same spot. The other is the sand martin, which excavates holes in the banks, in which its nest is lodged with great safety. The surfaces of pools and streams are the places where the martins and the swallows find the greater part of their food, though the house-martin rids those with whom it lodges of great numbers of house-flies; and for this, as well as for the familiarity of its manners, the ingenuity of its architecture, and its personal neatness and beauty, it is a bird which nobody molests.

HOUSE MARTIN.

The only night or twilight bird at all allied to these, is that which in common language is very improperly called the goat-sucker. It is improperly so called, because, instead of sucking goats, its bill is so constructed that it cannot suck at all. This bird, in its plumage and its whole structure, only that it has no weapons that could injure another bird, resembles the owls. It feeds on night insects, which it catches in the air, not at a very great

THE GOAT-SUCKER.

height. The prey consists of course chiefly of moths and twilight beetles.

Though this division of our birds is brought to us by the Spring migration, no one of them comes to us in the Spring as it stands in the calendar, unless it be in the very warmest districts in the south. The martins are generally the first to arrive, then the swallows, and lastly the swifts and the goat-suckers, which very rarely make their appearance in any part of Britain before the middle or even toward the end of the month of May. Our true Spring months are March, April, and May; and in the northern and upland parts of the country, Spring may be said to extend into June; for among the mountains it is not uncommon to meet, in the beginning of that month, with those brief snow showers and sunny gleams between, which characterise April in more southern parts, and indicate that the contest between the two great seasons of the year is at its height.

The birds of which we have spoken delay their coming until there shall be food for them on the wing. The insects which are bred in the water, and spend the greatest part of their brief existence in sporting over its surface are the first to make their appearance; and as the martins and swallows feed chiefly in such places, they come before the swifts and goat-suckers, the former of which hawk in the upper air, and the latter near the surface, but still over the land rather than over the water.

None of these birds utter anything which bears the least resemblance to a song. In some states of the atmosphere the swifts screech in a harsh and piercing key; and the goat-suckers utter a booming or jarring sound as they fly along; but none of these is very agreeable. Still this family of birds is of great service to vegetation; for they eat full-grown insects, just when they are in a condition for

depositing their eggs: and thus they tend more to keep down the numbers, than those birds which feed upon caterpillars. The goat-sucker, in particular, is highly useful; for its chief food, at least at one season of the year, consists of those large beetles known by the name of *chafers*, because the full-grown insects injure the leaves of trees and other plants; and the larvæ of the chafers are among the most destructive to the roots of grass and corn.

Our other summer birds which come to capture indiscriminately insects and their larvæ, upon trees, upon the ground, or in the air, are far more numerous; and the services which they render are of course far more important. They come earlier than the birds which hawk in the air; because the caterpillars are hatched before perfect insects appear. Some come earlier and some later, according to the nature of their food; and they also divide the land among them, one taking one locality, and another another.

They are our song birds by way of eminence; for, though many of our native birds sing pleasantly, there are none that are equal to these; and, besides, the songs of our native birds have rather begun to abate before these little strangers arrive, and they are not resumed till the strangers have departed, though some of our native birds, the males of the year's breed especially, sing in the Autumn, and occasionally even in the Winter. The bold and familiar redbreast, for example, often sings sweetly from a tree close by the window, at times when there is not another

THE REDBREAST.

song uttered by any individual of the feathered race. Those birds which are so very characteristic of the maturity of the vernal season, are very differently distributed in different parts of our country. Being all birds which retire to more southerly latitudes, when the supply of insects begins to be over, they are of course more numerous in species, as much as in individuals of the same species, in the southern parts of the country than in the northern. Some, and those the sweetest songsters of the whole, never reach the north or even farther than the middle of the country, and where they do come they are not found in the hilly parts. This is the case with the sweetest, and probably least seen of all our songsters, the nightingale, which has been so often described that we need repeat no part of the description, and whose cheerful song of encouragement and joy has been so ridiculously fabled as a voice of lamentation, for bereavement, uttered by the widowed female. The female of this species does happen to sing a little sometimes, though but seldom, and not very well; but the male is the grand songster, and his is anything but a song of sorrow.

To those who visit the fields and the groves during the Spring, for the purpose of breathing the healthful breeze, studying the beauties of nature, and admiring the wisdom and goodness of Nature's Author, those visitant birds which come to us in the very blush of the blooming season, and give voice to nature when decked out in the choicest ornaments of the year, are among the most delightful subjects connected with the time.

But the study of them goes much farther than this; and when we examine them aright, we do not fail to perceive that their usefulness is far greater than the pleasure which we derive in listening to their songs. This, indeed, is a general truth in nature; and clearly proves to us that

there is nothing there which merely serves to feast our eyes with an unmeaning spectacle, and our ears with an unavailing sound. In what man produces by art, the beauty and the utility are sometimes separated; but this is never the case in nature. There is not a substance or a creature which God has made, or an event brought about by those natural causes which he has appointed, that entices us by its beauty, without involving something which will repay in usefulness the attention we bestow upon it. No doubt there are many cases in which we remain ignorant of this usefulness, but in every such case the fault is in ourselves and not in nature; and the connection between the fair and the valuable has been so clearly established in so many cases, that it holds out the strongest inducement for us to follow up, by the most diligent inquiry, every natural subject which presses itself strongly upon our attention. The Book of Nature is fair and ample; it is spread wide before us; we are endowed with the capacity of reading it if we will but learn; and therefore we stand not only inexcusable, but self-condemned, if we go down to our graves in ignorance of the many enjoyments which God has thronged around our temporal condition, to humble our vanity, to alleviate our suffering, and to bring us back to the knowledge of how insignificant we, and all our boasted doings are, in comparison with the smallest work of Him who created the heavens and the earth, and endowed us with discernment and understanding, so that, if we will, we may appreciate the goodness of our God, and reverence and serve him accordingly, by obedience to his moral laws, and true faith in the mysteries of that glorious redemption which is so clearly revealed in his word.

In the case of these summer birds, the discovery of their usefulness is a matter of no difficulty. We see with our own eyes the ravages which many species of caterpillars

commit where there are no birds to consume their numbers, where they are not accessible to birds, or where they breed so rapidly, owing to particular states of the weather, as that the birds are unable to keep them within due bounds. How often do our turnips, our hops, and numerous other cultivated plants, nearly or totally fail, in consequence of the ravages of some minute insect, which cultivators popularly know by the name of "the fly." How often are whole orchards left not only without a fruit to ripen, but without a leaf, and with the twigs wrapt up in the nets of caterpillars which have feasted for their time, and undergone their transformation; and how often do the larvæ of insects invade our dwelling-houses, and spoil our provisions, our clothes, our books, and many other articles! Now if only a slight stagnation of vegetable growth, occasioned by a bleak dry wind from the east, or any other cause, can produce effects so disastrous wherever that cause operates; if this happens (and that it does to some extent or other, every season bears witness), let us just consider what would be the condition of us and all our possessions, if the whole of these insect plagues were let loose upon us, without any controlling power to regulate their numbers. Were such to become the case, all that would remain for us would be, to be wretched for a part of one summer, and never to behold another. To save us from this, the birds have, among other instruments, been appointed by Him who guides us in all matters wherein we cannot guide ourselves. Therefore, when we pursue this branch of the subject in a rational manner, and as far as the proper use of our reason will lead us, we find that it terminates as every such inquiry terminates, namely, in the heart-felt conviction, that if we were not preserved by the ever-watchful providence of a merciful God, we could not

keep the means of life, or the life itself, even for a single day. To him, therefore, be the gratitude and the praise, for sending his protecting messengers from afar, and teaching them so to watch over the springing of the earth, as that the year may be crowned with his bounty, and all may be fed, and worship and revere the Almighty Giver!

But how stands it with the insects, from whose ravages these birds come to protect us? Are they destroyers, and nothing but destroyers? It cannot be, for they are part of the creation by the same God as we ourselves; and we have it upon a record which cannot lie, that when the work of creation was finished, by the sixth mysterious day of the great work coming to a close, "God saw everything that he had made, and behold, it was very good."

Now, in the case of these insects, and of all the little animals which we are apt to consider as noxious to us, there is as much evidence of his goodness as there is in any other created thing. The quantity of matter, cast off by the living world, and passing into a state of corruption, is very great at all times; and in the warm season especially it is so abundant, that if there were not some means of changing its form, and making it wholesome for the time, the living world would be buried in its own rubbish. To prevent this, is the general purpose of those insects and small animals; and it will invariably be found that they congregate in the greatest multitudes where their labours are most necessary. Even when they attack and destroy a crop, they act in the manner which is best for the passing time, how short soever the duration of that time may be; and it is only when they interfere with man's artificial arrangements that he can consider them as hurtful. The whole system of nature is a system of mutual support;

and every portion of it is conducive to the perfection of the whole.

In this matter of the summer birds and the summer insects, there is an accommodation of one part of nature to another, which is equally worthy of our study and our admiration—our study, for the instruction which it affords; and our admiration, as a specimen of that unity and harmony which run through the whole system of nature.

The latter part of the Spring and the early part of the Summer, according as the months run in the calendar—though the real Spring, in as far as its effect upon nature is concerned—is the busy time with the birds, a time at which their labours are proportionably greater than those of any other animals at any one season of the year. The mammalia have little else to do than to find their own food. A few, no doubt, dig burrows, and form beds of withered vegetables for their young. But their labours in this respect bear no proportion whatever to those of the birds in the construction of their nests, many of which are so elaborately made, that human art cannot imitate them. The incubation, too, is a severer task than the mammalia are called upon to perform; and nature provides food for their young in the early stage, not only without effort on the part of the parent animal, but absolutely with pain to her, if it is not consumed. The bird, on the other hand, must feed its young on the produce of its labour; and as that produce is in very small quantities, and often difficult to be procured, while the young are in general exceedingly voracious, and require a vast deal of feeding, the labour is very severe; such, indeed, as nothing but a winged creature would be able to endure, unless some preparation were made expressly for it.*

* As an example of the labour of a bird during the season of incubation, the case of the house-swallow *(Hirundo urbica)* may be

The insects and other small animals of the season are exactly such a preparation. With the exception of those which establish colonies, construct nests, and build cells, the insects and other small animals have no labour to perform at this season, except the finding of their own food; and the juicy bud, the soft leaf, and the readily-flowing sap of plants, supply them with abundance, easily accessible, and of the most nutritious quality. It is true that many of those caterpillars make nests for themselves, by spinning webs, rolling up leaves, and various other operations; but these are trifling labours compared with the labours of the birds; and while they are in the state of caterpillars, the state in which birds feed most abundantly upon them, they have no labour to perform but such as tends to the maintenance of the individual. The labour, if labour it can be called, which is the mere depositing of their eggs, is, in the annual ones, performed in the previous Autumn; so that one may say, that those eggs have no more self-exertion in coming to maturity than a seed has in sprouting or a fruit in ripening.

The more abundant that insects and small animals are during the breeding season of birds, as compared with what they are at other times of the year, the more completely are they seasonal, and the less labour is required of any one single species for the production of their myriads. They are the children of the season, called forth by the general warmth of the sun; and if that warmth did not come upon them and excite them, they would lie dormant for centuries, indeed for ever. It is true that every germ is from a parent, for without this there can be no production of even the smallest animal; but still the germ

quoted. An observer, in Scotland, closely watched a pair of these birds for a day, when they had four young ones. The parents visited the nest 307 times.

would be nothing availing without the excitement of the season. We must not, therefore, be too severe upon the ancients, ignorant as they were of the true nature of God, and his attributes and superintending providence, for having conjectured that the actual production of these creatures was equivocal or spontaneous, resulting from the influence of the sun upon the mud as its first origin—for this is what is seen; and without the knowledge of the truth, that there can be no species of creature without creation by God, there was nothing to induce or guide men to the previous and obscure part of the insects' history, until God had revealed himself in his word.

CHAPTER IX.

INFLUENCE OF THE SPRING UPON MAN AND HIS LABOURS.

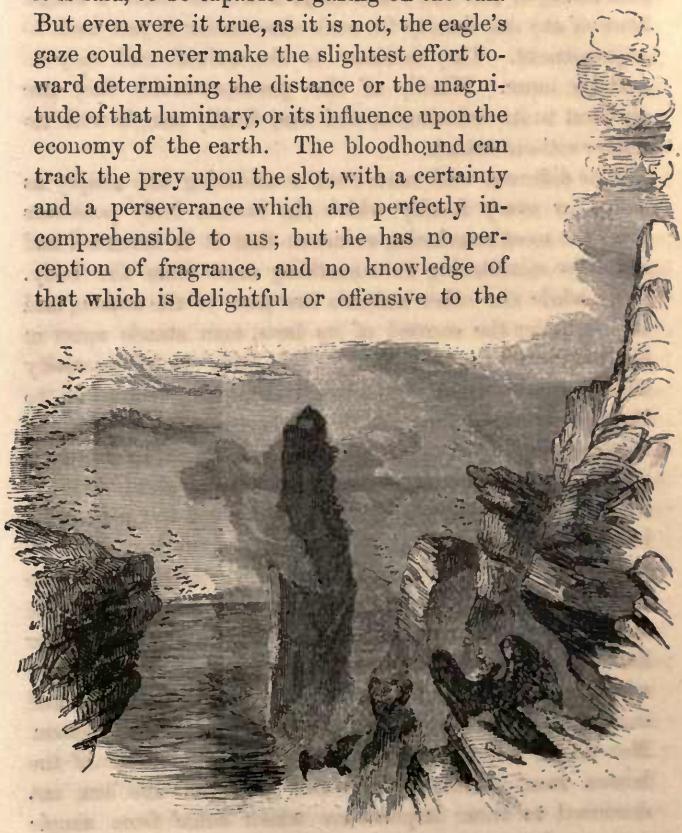
THE reviving energy of the Spring has a different influence upon man from what it has upon any other member of the terrestrial creation. This follows from the compound nature of man. As possessing a material and mortal body, he is as much under the influence of the sun, and of every other natural cause and agent of the seasons, as any other creature formed of flesh and blood. But as possessing an immortal spirit, which is not matter, nor subject to any of the laws of matter, he is beyond or above the influence of natural causes. It is true that the mind sympathises in every sensation of the body, whether pleasurable or painful, constantly, though in a manner so mysterious, that we cannot understand it any more than we can understand the connection between the two parts of our compound nature. The mind seems to mourn under the anguish of the body, and to be uplifted in the body's enjoyments. But, notwithstanding this, we cannot believe that the mind in itself undergoes the slightest change; for, being simple and immortal, and beyond the action of every physical agency, however great, we know of nothing that can change it, but the power of that Almighty One to whom it owes its being. Consequently, it must be in the connection between the two, that this apparent sympathy of the mind with the body lies. When we say that the mind is energetic and happy, all that we can mean is, that he impressions of the body are imparted to it, freely and

fully. When we say that the mind desponds, or sinks down under the pressure of any bodily state, all that we can mean is, that some physical derangement of the body, or some distraction of the senses from their proper objects and mode of working, prevents it from conveying to the mind those clear and forcible perceptions which it conveys when healthy and composed. In like manner, when, in the extreme decrepitude of human life, or under the pressure of severe and long protracted disease, we say that the mind is enfeebled, or that it is gone, all that we can mean is, that the frail body is so exhausted that it can no longer act the part of that ready and obedient servant to the mind, which it did in the days of health and vigour.

These are distinctions which we must constantly bear in mind, when we would examine the influence which any season, state, or change of the physical world has upon man; because, if we omit the distinction, we necessarily judge of man as of the beasts that perish, and consequently our judgment is erroneous.

In this compound nature, man has an advantage over every other terrestrial creature, which is immeasurably great; for it does not differ in degree merely, it differs in kind. The human body, taking it in all its organisation, is the most perfect body in animated nature. Of other living creatures, some excel it in one particular faculty or capacity, and some in another; but there is none which, throughout the whole frame, is furnished with such general sensibility, or of which the senses, whether seated in particular organs, or partaken in by all parts of the system, are capable of bringing in so much and so varied information. The eye of the eagle, for instance, is more keen than the eye of man, and it discerns a little animal down in the valley, from a height above the mountain-top, from which man could with difficulty discern any but large

objects. But the eye of the eagle, notwithstanding all its keenness, has no perception of the beauty of that landscape which it commands from its lofty post in the sky. The eagle is said, incorrcetly no doubt, but still it is said, to be capable of gazing on the sun. But even were it true, as it is not, the eagle's gaze could never make the slightest effort toward determining the distance or the magnitude of that luminary, or its influence upon the economy of the earth. The bloodhound can track the prey upon the slot, with a certainty and a perseverance which are perfectly incomprehensible to us; but he has no perception of fragrance, and no knowledge of that which is delightful or offensive to the



smell; for he will pass the sweetest flowers with the most perfect indifference, to proceed eagerly upon the scent of tainted carrion. It is the same in the case of every animal; all their senses and faculties contribute merely to the preservation of the individual, and the continuing of the race; and there is not in them a single trace of any one faculty for such observation as can lead to improvement. They minister to the animal, and they do nothing more. Wholly of the present world, they are obedient to its vicissitudes, and they finally mingle with its dust—without return.

It is different with man, even considering him simply as body, for every faculty which the human body possesses gives the most convincing evidence that it is intended and made for ministering to something more than the body. Thus, while the other animals are part of the season, and wholly under the control of its laws, man stands apart in his immortality; and though the body is of necessity obedient to seasonal influences, the mind remains free, to exercise its grand function of observing what goes on, and learning wisdom from it. The irrational animals are thus wholly occupied by the season, and carried along with it, whithersoever it lists, while man is enabled to turn it to a lesson of instruction.

But we have said that the mind sympathises with the body, and that the body of man, viewing it in all its faculties, has far more sensibility than that of any other living creature. Therefore, independently of the lesson of wisdom, man is fitted for deriving greater direct and immediate pleasure from the return of a pleasurable season. Nor do we fail to observe this, in every member of the human race, whom an artificial mode of life has not deadened to those impressions which come from simple nature. In remote villages, where pomp and luxury are

unknown, and where the thoughts are regulated by the vicissitudes of the year, and not by those of courts, fashionable parties, or mercantile adventures, it is delightful to observe the awakening energy which is inspired by the Spring.

To see this in its perfection, we must take our place of observation, not where the Winter is a doubtful season, freezing and thawing, or showering and shining, in alternate days or weeks, but where it is confirmed and decided Winter, lasting for a considerable time. This is necessary, because, in order to see a proper display of the effect of Spring, Spring must have something to contend with, both in the habit of the people, and in the condition of the country around them.

Let us suppose, then, that we are to observe the coming of the Spring, in some district where the Winter has been decided, but neither alpine nor polar; a district where all the immediate fields are under cultivation or pasturage, spotted over with substantial farm homesteads, and happy and healthy villages; where the wants of the human race are not inordinately multiplied by luxury, but where every necessary and comfort of frugal country life is readily accessible, and abundantly supplied to all;—a district, in short, where there is will to be industrious, intelligence to be observant, and the enlightenment of the spirit to breathe religion. For all these elements, in the place and in the people, are requisite, in order that the Spring may come in the fulness of its beauty, and be turned to account as the bountiful kindness communicated in such a season deserves.

The confirmed winter storm, we shall suppose, has fallen early in January, as it frequently does in such places, and has not fallen after long-continued rains, which always make an unsettled and disagreeable winter, but when the

ground is comparatively dry; and up to the time of the storm's coming, the autumn-sown crops looked promising, and the labour of the fields in preparation for the Spring was well advanced. We are farther to suppose that the snow-storm is not the result of any temporary disturbance of the mere local atmosphere; but that it is occasioned by the steady setting-in of the north winds. The mountains, which we are to suppose to be situated some distance to the northward, and occupying a considerable space, have been in great part clad with snow since October; and latterly the snow has been creeping downward and downward, the snow clouds being seen forming and descending upon the mountain valleys, but without reaching the country with which we are more immediately concerned. The south wind has still kept its hold over the cultivated land, and the frosts have been only occasional, and by no means severe. One evening, after a day of unwonted tranquillity, dense clouds appear like great snowy mountains in the northern part of the horizon, while the few clouds which lie in streaks across the setting sun, are intensely deep in their shadows, and equally bright in their lights. As the evening closes in, the clouds disappear, the stars are unusually brilliant, and there is not a breath of air stirring. The old experienced farmer goes out to take his wonted nocturnal survey of the heavens, from which long observation at the same spot has enabled him to form a tolerably correct judgment of what will be the state of the weather in the morning. Two or three meteors, brilliant, but of brief duration, shoot along a quadrant of the sky, as if they were so many bright lights of the firmament dropping from their orbits. He returns, and directs his young men to prepare for what may happen, as there will certainly be a change of the weather.

The air is perfectly tranquil when the family retire to

their early pillows, to find that repose which healthful labour sweetens and never misses. But, just at the turn of the night, the south gives way, the north triumphs, and the whirlwind, herald of the victory, lays hold of the four corners of the house, and shakes it with the shaking of an earthquake. But the house, like its inhabitants, is made for the storm, and so stands secure and harmless, while the wind thunders in the fields around, every gust louder than another. In a little, its sound is muffled without being lessened; and the snow is heard battering at the windows for an entrance, but battering in vain. Morning dawns; but every lee and eddy is wreathed up, the snow still darkens the air, and reeks along the curling wreaths, as if each were a furnace. The first care is to provide for the safety and support of the domestic animals; and this being done, as there is health and plenty in the abode, the family ply their in-door labours with their wonted cheerfulness. For two days and two nights the storm rages with unabated violence; but on the third day the wind has veered more easterly, blows rather gently, and though the snow falls as thickly, it falls uniformly over the whole surface. This continues for two or three days more; and on the evening of the last of these days, the sun, which has not been visible for nearly a week, looks out just before setting, as if promising a morning visit. The night remains clear, with keen frost, and the wind steady at north, and blowing very gently. The sun rises bright in the morning, the storm is over, and the weather remains unbroken for four or five weeks.

The air is so completely clear of humidity, that out-door labours and out-door sports become pleasant; and as there are many labours, especially those of carriage, which can be performed in such weather, these, with the healthful recreations of the country, render the time a time of

industry and glee; and they who experience such winters as this, and are rightly provided for them, are more healthy and more vigorous, and therefore more happy, than those who are subjected to the variable weather of open winters.

When the appointed days of the snow-storm are numbered, a disturbance again takes place in the atmosphere, but it is of a different kind from the former. There are little sheets of lightning, playing momentarily in the lower atmosphere, and the lustre of the stars is diminished, but still there is no cloud; the wind, however, dies away to a dead calm toward evening, and all is ready for the breaking of the storm. That operation is the first performed by the Spring; and we shall borrow the words of the "British Naturalist," wherein to describe it:—"As the Spring air gets the mastery, which is aided by the condensation which takes place during the night, it rises to a wind, the sound of which cannot be mistaken. The rigidity of trees, window-frames, and other wooden fabrics, through which it passes, is relaxed; the withered grass and reeds, where these are exposed, moisten, and the rattling and thumping are succeeded by murmuring harmony, in which, compared with the others, there is a good deal of music; and as the morning advances, and the animals come abroad, and man begins to be active, the hard metallic sound is gone, and there is a softness about nature. There is also a delightful transparency in the atmosphere, because the little *spiculæ* of ice is gone; and the heat of the air is too much occupied in converting the snow and ice into water for changing much of that into vapour. When the change is accompanied by rain, it is far more pleasant at the time, and there is a danger, almost a certain one, that the Spring will be treacherous; and that, in consequence of the great heat required for melting the snow, and the evaporation of the rain together, frost will return long before the process

of thawing, so comparatively slow, is completed. The slow melting of snow by rain, compared with that by a warm atmosphere, which is constantly shifting by the wind, can be easily understood, when it is remembered that the water which falls, even if it had the temperature of the greatest summer heat, would be cooled down to the freezing point in melting half its weight in snow. But, as the temperature can only be a little above freezing, the water will have the temperature of 32 deg. before it has cooled perhaps one-tenth of its weight; and as the water is a bad conductor of heat, and great part of the action of the oblique rays of the sun reflected away from its surface, a rainy breaking of a storm is almost sure to be followed by frost, if it do not happen when the season is far advanced. The dry thaw is the one which ushers in the Spring most pleasantly and most certainly, and it is so far fortunate that it is most common in those regions where, from the length of the Winter, vegetation requires to be called soonest into action."—Vol. ii. pp. 102—104.

In such a situation, and under such circumstances, as those which we have attempted to describe, the storm not unfrequently passes away in what is emphatically termed a gentle thaw; and when this is the case, the Spring comes under the most favourable circumstances. The snow is dissolved by atmospheric influence alone, without any rain from the clouds; although there are generally light clouds hovering about, ready to produce rain, if returning frosts should render a contest of the elements necessary. Besides its mere pleasantness, the gentle thaw is attended with several beneficial consequences. In the first place, there is no flooding of the low grounds, and no washing of the soil from the elevated ones; but the snow forms a trough for the discharge of the water into which it is melted, and thus the coldest of the snow-water does not reach the surface of

the land. In the second place, the water produced by the melting of the snow, sinks gradually into the earth; and the earth has been opened to receive a greater store than if it had been pelted by rains during the Winter. This is occasioned by the radiation of the heat from the lower strata of the earth, which is confined by the snow, and turned back again to act upon the earth. In the third place, this last circumstance produces a beginning of the Spring under the shelter of the snow, which could not have taken place with free exposure to the atmosphere. The blade of the plant is protected; and the roots have heat and moisture, and the air is excluded from them. They are thus placed under the most favourable circumstances, and they are stimulated accordingly. The difference in this respect is very considerable; for if, owing to the action of the wind during the fall, or to any other cause, one portion of a field has been exposed to the air while the frost continued, and another covered by the snow, it will be found that vegetation upon the part which the snow covered will be fresh, green, and vigorous, long before that upon the exposed part shows any decided signs of action. This, by the way, is the real cause why Spring is so rapid, and meets with so few reverses where the Winter is firm and decided, but of moderate length, than it does where the Winter is variable.

In such a place as we are alluding to, the Spring wind usually freshens as the snow disappears; and this both quickens the melting of the snow, and dries the surface of the ground. By the time that there are only a few little patches of snow remaining in nooks, and under the shelter of thick hedges, the skylark is on the furrow or the stubble, and the pastures are soon fit both for sheep and cattle. Already the children can gather snow-drops under the hedge, and daisies on the green, which is new to them after

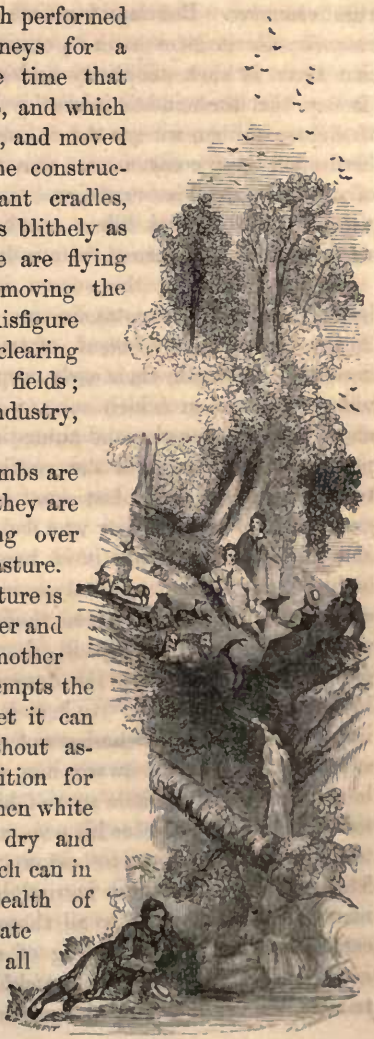
its winter concealment. When the clods begin to dry, the lark soars aloft at the streak of dawn, calling the ploughmen to their labours. Nor are they backward to obey; for they and their teams have been rested during the storm, and thus return to their labour with fresh vigour. Not many days will elapse from the time that a field was snow-clad, until a dozen shares be cleaving, and a dozen ploughboards turning the surface; and such portions of the surface as were not ploughed in the Autumn will soon be ready for receiving the seed of the expected crop. Ploughing is easy under such circumstances; because the snow, with the action of the heat under it, have rendered it mellow and easily divided; and a more kindly tilth may be obtained by one ploughing after a snow-storm which departs gently, than by two, or indeed by any number of ploughings, when the naked surface has been battered by winter rains, and there has been no natural action to break the clods.

During the continuance of the snow, the wild birds are sorely pinched, and they throng to the stackyard and farm-court, acquiring a degree of boldness and confidence almost equalling that of domestic animals. The magpie, notwithstanding the habitual wariness of his character, comes close to the farm-house or the cottage, watching for a share of whatever he may find. The rooks fly far and near with weary wing, and seek the margins of streams, or the shores of the sea, if these happen to be within the range of their flight. All the resident birds, indeed, approach the abodes of men; and the hares, and the deer, where the latter exist, leave the cover of the woods, and levy nightly contributions on the cottage gardens. All wild nature, indeed, in countries where man inhabits, acknowledge his dominion during those times of severity, in the most pleasing way in which dominion can be acknowledged, that is, by claiming

his protection. This approach of the animals to seek the bounty of man, when wild nature fails them, is a tribute on their part to his superior resources; and, rightly improved, it ought to teach man kindness to them at all times, and charity with no stinted hand in those times of sore distress. That they are for his rational use, we do not deny; but the bond of nature is never single. There is a reciprocity, the violation of which is a crime; and because man has recourse to those wild creatures in his necessities, the bond of heaven is upon him to do his best to succour them in theirs; and if he heeds it not, he is an undutiful son, and justly forfeits his Father's love. When the storm has relented, and the governing Spring leads the young year on apace, all those wild creatures are in motion, and repaying, to the best of their abilities, the small pittance which subsisted them during the storm. While every bud was cased in snow, or bound in frost, the little tits, and birds of that class, resorted to the corn-ricks, and with curious dexterity drew straws, in order to satisfy their hunger with the few grains which the straw brought along with it. Where are they now, and what are they doing? They are in the orchard; and no sailors among the ropes, or monkeys among the branches, ever moved so quickly and so adroitly as they are moving from twig to twig and from bud to bud. What are they doing? "Stripping the trees of their fruit-buds; fetch me the gun," says the ill-informed gardener. Stay, rash spoiler, and first *learn*, before you *do*. Wherever one of these pretty little birds is plying its bill with so much assiduity, there is "a worm in the bud"—a nascent caterpillar is there; so that every bud which that little bill searches, will bring you an additional apple in the Autumn. Therefore, let the birds alone; go to your work with diligence during the day, and to your book at night, and you will be a happier, wiser and better man.

The rooks, too, which performed long and weary journeys for a scanty meal during the time that the earth was sealed up, and which then uttered not a voice, and moved not a stick towards the construction of their air-pendant cradles, are now cawing away as blithely as larks; and whilst some are flying hither and thither, removing the broken sprays which disfigure the lawn, others are clearing the meadows and the fields; and all is activity, industry, and delight.

In brief space the lambs are dropped; and ere long they are frisking and gambolling over the now renovated pasture. The grass upon that pasture is still short, but it is tender and sweet; it supports the mother in her weakness, and tempts the young to nibble ere yet it can reach the ground, without assuming a strained position for that purpose. Sheep, when white and clean, and on a dry and wholesome pasture, which can in no wise affect the health of creatures of such delicate constitution, are at all times among the most delightful sights in



rural economy. But lambing time is one of peculiar interest, because it gives a sure promise of future abundance; and there is such simplicity and such tenderness in the display, that the mind is insensibly led to higher and holier thoughts. When we see the attention of a judicious shepherd upon these occasions, we cannot refrain from thinking of the unspeakable condescension and kindness of Him who "feeds his flock like a shepherd, gathers the lambs with his arms, and carries them in his bosom."

By the time that the season is fairly confirmed, the leisure-hours of the cottagers are spent in the pleasing labour, or rather amusement, of trimming their little gardens, and getting in their early crops. There is no sort of village occupation which men, women, and children set about with greater glee and animation than this; for, independently of the hope of the produce, there is a pleasure to the simple and unsophisticated heart in "seeing things grow," which perhaps they who feel the most are the least able to explain. Certain it is, however, that it would be highly desirable, that not only every country labourer, but every artizan in towns, where these are not so large as to prevent the possibility of it, should have a little bit of garden, and should fulfil the duty which devolved on man in a state of innocence, "to keep it and to dress it." It is impossible for anyone who has not carefully attended to the subject, to be at all aware how strong the tie is which binds man even to a little spot of his native earth, if so be that he can consider it as his own, and that he himself, and those on whom he loves to bestow it, are to enjoy the fruit. This is the very strongest natural hold which binds a poor man to his country, and to all those institutions which are established for the well-being of society. Show me the cottage, the roses and honeysuckles on which are neatly trimmed and trained, and the garden behind is well stocked

with culinary herbs and a few choice flowers, and I will speedily find you a cottager who never wastes his time or his money, or debases his mind, and learns "the broad road which leadeth to destruction," in the contamination of an alehouse. If the garden is neat, one may rest assured that the cottage, however humble it is, is the abode of contentment and happiness; and that, however simple the fare may be, it is wealth and luxury in full store to the inmates, because they are satisfied with it, and grateful for the possession of it.

It is not easy to point out all the advantages which flow from such a state of things, both to those who enjoy it, and those who observe it. People of cultivated minds and refined taste are often fond of vegetables; and if they find that one in humbler life possesses the same taste, a brotherhood of the heart is instantly established, which brings them near to each other as men, and children of the same common Father, whatever may be the difference of their stations in society. Upon the humble cultivator himself, the effect is still more. Attached to his rural home, his little bit of ground, and his favourite plants, his mind has always a resting-place, and therefore he is not subject to be tossed about by the same gales of passion as they who have no home, because they will not make a home of that place where they remain for the night, in growling and discontent at the weight and irksomeness of those labours which sit light as a feather on our happy cottager.

As the Spring advances, the days lengthen, and the fields become dry, the labours of husbandman and cottager increase in number and activity—the Spring wheat and the oats are got into the ground, and harrowed down, and all the other labours of the farm proceed with increased energy. The evenings, to the labourer, after the stipulated toil for the master is over, are now so encouraging, that he

can cultivate his garden with equal pleasure and success; the beans, the early French beans, and all those little crops in which productiveness and beauty are united; and if a child claims its square yard of the garden, it plants and sows its tiny crop, with as much hope and exultation as the man who cultivates hundreds of acres. The elder children, who had diligently attended school in the Winter, heedless of the snow, now suspend their education, in order to tend the flocks and herds, or do such little offices about the farm or the cottage as are not too great for their strength. They are active and healthy, and their labours are duly prized and praised—the sweetest reward which youthful exertions can receive; and so they work away willingly to the full bent of their strength. The younger children, whose legs were too short for the snow, now replace the elder at school; and as there is still an hour of artificial light after the fast fading twilight has obliged the father to give over the dressing of the garden, each is more ready than another to show him how perfectly it has conned over its little lesson. Delighted with the approbation of a kind father, the little things go happy to bed, sleep soundly till the morning, and are eager for school next day, in order to win the double approbation of the teacher in school, and the parent at home.

There is another very happy effect of this pleasure of domestication, so to express it, which ought not to be overlooked. Kind-heartedness and affection in the family, and with the neighbourhood, produce an attachment to the worship of God, and to the house wherein the assembled people sing his praise, and breathe the sincere prayers of devout hearts to his eternal throne. We shall not stop to inquire how it happens; but no one, who has been in the habit of observing, can deny the fact, that the homeless man and the churchless man are names applicable to the

same individual; while he who loves his home and his family, never fails to love the temple of his God; and as his desire during the six days of the week is to the former, so his desire on the sacred day of rest, the sabbath of the new covenant, the weekly commemoration of the rising of our blessed Lord from the dead, is toward the house of prayer, where men assemble together to encourage each other in the performance of those sacred duties which the God of all goodness has appointed, as the easy means by which favour and acceptance in his sight, through the blood of the Mediator, may be obtained.

By the time that the sowing of the seed commences, the hedges are sprinkled with green buds, the trees begin to expand their leaves, and the fruit-trees to come into the full blow of their petals. This is a second signal for the birds to come to their labours; because an immense number of caterpillars are now brought to light, which were previously hidden from the keenest glance of these sharp-eyed little watchers. On their former visits they came in comparative silence; but now the influence of the season is strong upon them, and they come with songs, filling the air with sweet sounds, and every sound more gladsome than another. The early flowers have now also expanded their blooms, and collected in their nectaries that honey which is to regale the early bees. Nor are the winged emblems of industry ungrateful for the rich banquet which they receive when the store which they laid up in Autumn begins to be exhausted; for the honey is most abundant in the nectary, just at the time when the anthers of the flower are in the best condition for shedding that fertilising dust, which is essential to the maturity of the seeds, and consequently to the race of the plant. Here, again, we have a beautiful instance of reciprocal benefit. Without the flowers, no bee or other insect which feeds on honey could possibly exist;

and without the bee or other insect, the flower would in many instances bloom in vain.* Thus we find throughout the whole compass of widely extended and indescribably diversified nature, there is a mutual dependence, and a reciprocal advantage, which in all cases binds the one part of it to the other. It would be impossible to express in words the numerous cases of this which occur at any one place during any one Spring. Indeed, it is not desirable that they could be so expressed; because, though anyone should be so endowed with knowledge, and with the faculty of expressing that knowledge, as to be able distinctly to describe the whole, he would be merely robbing his readers of a pleasure which they can enjoy to the full extent, only as the reward of their own personal labours. We are unequal to the task of thus describing; yet, were we conscious of full power for that purpose, we would refrain from using them in mercy to the reader, and use our every exertion in persuading him to go and enjoy the pleasure for himself. The chosen draught of which every lover of nature may drink, can be had, in its freshness and purity, only at the living fountain of nature; and if we attempt to fetch it away in the clay pitchers of human description, it loses all its spirit, becomes insipid, and acquires an earthy taste from the clay. Therefore, he who would enjoy nature must go directly to nature, and take nothing at second-hand, excepting a simple hint as to the way in which he should go, the giving of which is all our ambition and all our desire.

As the Spring still farther advances, the gratifications of the Spring multiply in even a higher proportion. The lambs grow apace; the fleece of the sheep gives promise of

* Darwin, in his lately published work on "Natural Selection," has shewn that most of the Leguminous plants require the visits of insects, such as bees, to render them capable of producing seeds.

abundant clothing; the cattle throw off their winter coats, and appear sleek and fat; the working horses, released from part of their toil, gambol lightly in the enclosures; our native birds come into the full power of their song; the strangers arrive, in numbers and at times according to the situation of the place; not a leafless spray is to be seen in wood or copse; not a naked clod on the corn-field; the meadows are enamelled with flowers; the uplands are scented with blossoms; insect life is on the wing; the cuckoo has sung again and again; the hay-fields wave gracefully in the breeze, and begin to tempt the scythe of the mower—yet one little week, and, lo, it will be Summer.

Such are the leading causes, and the more remarkable characters of the Spring, which is the grand time of promise for the year, and upon which the Summer and the Autumn in a great measure depend. "As men sow, so shall they reap," is a natural truth, as applied to the year, and to the improvement man makes of the advantages of the year. In the seasons of the life of man, it is of still greater importance. The days which are appointed us here upon earth, are the spring time of a year which will never end. If we "sow the wind" in the present life, we may lay our account with "reaping the whirlwind" eternally. But if, in humble dependence upon God, and earnest prayer to him for the sanctifying influence of the Holy Spirit, we sow true faith in Jesus Christ, we shall reap eternal life.

THE END.

INDEX.

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