

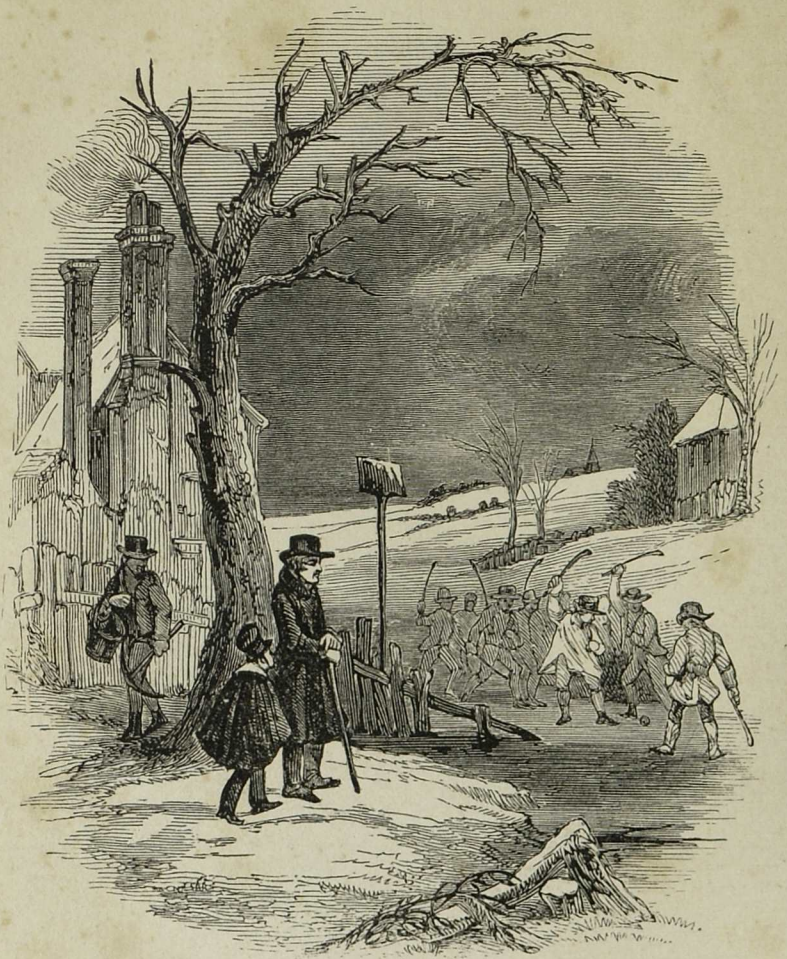


CITY PRESS, 1, LONG LANE,
D. A. DOUDNEY.

THE
JUVENILE NATURALIST.

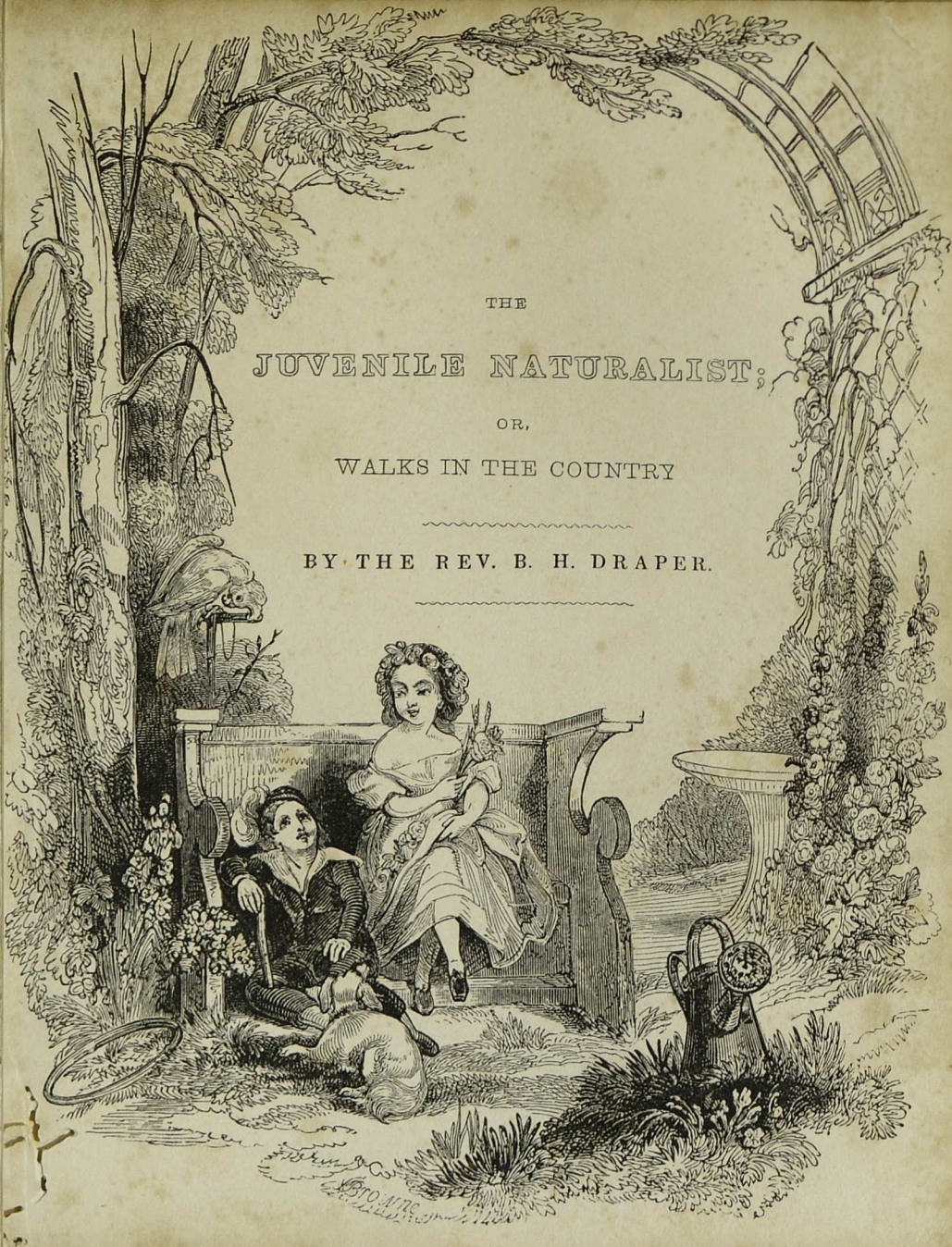
Autumn and Winter.

CITY PRESS, 1. LONG LANE :
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THE
JUVENILE NATURALIST;
OR,
WALKS IN THE COUNTRY

BY THE REV. B. H. DRAPER.





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AUTUMN AND WINTER.

LONDON:

DARTON AND CLARK, HOLBORN HILL.

1839.

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THE
JUVENILE NATURALIST.

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AUTUMN.  
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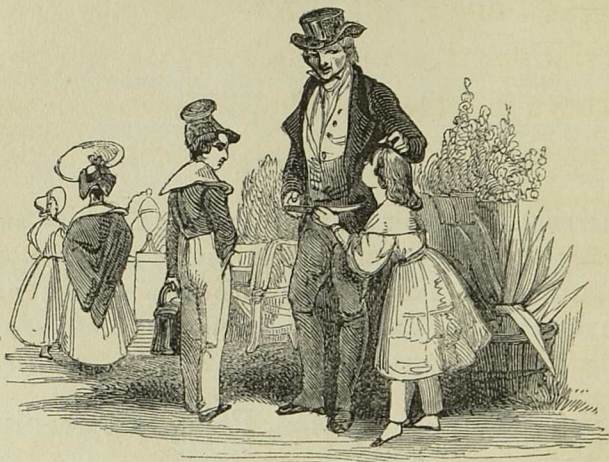
WERE you not much pleased, Papa, last evening, with
cousin Mary Jane?

I am always pleased with her, Edward, she is so
amiable and dutiful. But did you refer to anything
particular?

To her attention to you, Papa.

She is kind to every one.

Yes, but Papa, when we were in the garden, you said, I wish I had a knife! and no one seemed to take any notice of your wish; but Mary Jane soon after, when no one observed her, slipped out of the walk, and went in-doors, and soon brought you what



you wanted. How I wish I had brought you that knife!

It was very attentive and kind. I am glad you

noticed her conduct. This was a specimen of true politeness.

How would you define politeness, Papa?

I scarcely know, without a little reflection; good definitions, as I often tell you, are very difficult; yet they are carefully to be sought after, and remembered, as they are of the first importance to a right understanding of things. "I believe it is to be known best by description; I would, however, venture to call it benevolence in trifles; or the preference of others to ourselves in little daily, hourly, occurrences in the commerce of life. A better place, a more commodious seat, priority in being helped at table, and many other such things; what are they, but giving up ourselves in such trifles to the convenience and pleasure of others? And this constitutes true politeness. It is a perpetual attention, which, by habit, grows easy and natural to us, to the little wants of those we are with, by which we either prevent or remove them. *"

* Lord Chatham's letters to his Nephew.

I thought, Papa, that Uncle John was a model of politeness; for you know, he is almost always bowing, and paying compliments.

I do not think so, Edward; I am glad you have mentioned this circumstance; for I should be very sorry for you to imitate him. Bowing, ceremonious, formal compliments, and stiff civilities, such as his, will never be politeness; this is easy, natural, un-studied, manly, and noble. And what will inspire this but a benevolent mind, perpetually attentive to exert this amiable disposition, even as to trifles, towards all with whom you live, or converse? Benevolence in greater matters takes a higher name, and is of superior worth.

But let us look around and see if there are not some objects that are especially worthy of our notice.

The days are become shorter, Papa; and there are many things which remind us, that the summer is closing.

There are; we meet with but few flowers; and the blossoms are all gone. The pastures have lost their

lively green ; and this is the case with the foliage of the trees. A visible change has taken place in the whole creation. The woods and copses no more resound with the sweet music of the birds. The hedge-row in the valley yonder, which used to be so fragrant with the violets, will yield us no perfume. Some of the grain is taken out of the fields ; and the rest will very shortly be gathered into the garner. As you remarked, Edward, most things intimate to us that the summer has closed, and that the pleasant season of Autumn is drawing around us.

It is,—for the sun does not pour out his warm beams as he did.

True ; he has entered the constellation of Virgo ; and is descending in his autumnal course, through Virgo, Libra, Scorpio, Sagittarius, to Capricorn.

Yes, this is seen by a glance on your terrestrial globe.

Are there not some spots on the sun ? I could never see any.

No, nor should you attempt to find them with the naked eye. To see them properly, the telescope

must be prepared with coloured glasses. The spots are of various shapes, and often changing, like the clouds on the face of the heavens. Some of these spots have been sufficiently large to cover the whole of Europe, or the continents of Africa, Asia; and even much larger than the surface of the globe. When they continue long in one form, they are seen to enter the sun's disc on the east side; to depart from thence with an increasing velocity half the way over it; then to move slower and slower, till they disappear on the west side. These spots are invisible for about the same time they were in crossing the sun's disc, and are again seen, as at the first, entering on the east side.

What are the spots, Papa?

I know not; it is a probable conjecture of Herschel that the sun has a luminous atmosphere, and that the openings of it create what are called his spots. The motion of these furnishes us with the conclusion, that the sun is a globe, and has a rotation on his own axis.

The sun does not look bigger than our earth; but it is much larger; is it not?

Certainly; it is more than a million of times larger than the earth. The various changes which take place are to be attributed to his beams;—

“ With him hastes the vernal hours,
Breathing sweets and dropping flowers;
Laughing Summer at his side,
Waves her locks in rosy pride;
And Autumn bland, with aspect kind,
Bears his golden sheaf behind.”

The sun is a great and glorious orb; our earth is but as a point when compared with him; and he, and all worlds, and beings, are but as points and shadows compared with the adorable Creator!

The lines you just now quoted, mentioned the “golden sheaves,” Papa, and here they are. What a number of persons are reaping!

The weather is so fine, the farmer is well-disposed to take advantage of it; and very properly, for much rain often injures the corn, and sometimes spoils it, by

causing it to grow in the ear. There are more than



fifteen species of wheat ; four are said to be natives of Britain, the rest are of foreign origin.

What kind is this, Papa? It does not look so pretty as some kinds, it is so covered with spikes.

This is called by botanists, *tritium turgidum*, or cone-wheat; its head readily shows what it is.

Is there any difference in the grain? Yes, a slight difference. It



is shorter, more plump, and more convex on the back, than any other species. But there are several varieties of cone-wheat; I have seen white and red cone, and cone-wheat with several ears. This is the brown cone-wheat.

I think you told me some time since, that wheat belongs to the class of grasses; the blossom we examined about the beginning of the summer, had three stamens, and so must belong to the class triandria; and two pointals, and of course it is of the order of dyginia. I think you said, that wheat will grow in every country.

It will; it is a most gracious appointment of Heaven. And though there are a variety of tastes, every one is fond of bread; and no one ever grows tired of it, however long he may live. From this elevation we can command the whole vale. You see, the reapers are busy everywhere. What a rich display does the country now present of the divine goodness! Who can make a full estimate of it? For our national ingratitude and profaneness, God might have turned

our fruitful fields into barrenness. He might have commissioned his sun to have scorched up the tender blade; or have bade the rains deluge our hopes; or have charged the mildews to have blasted the golden ear. But he has not done so. We have deserved his anger, but he has dealt with us as a people, in mercy. "O that men would praise the Lord for his goodness, and for his wonderful works to the children of men!"

This beautiful ear of wheat was once only a single corn, was it not?

Certainly; the blade, the stem, and all the grains of wheat, with their fine covering, were all wrapt up in that little space.

Why, you know, Papa, if they had not been in it, they could not have come out of it; could they?

Assuredly not; but it was a divine hand which accomplished this wonderful work. Shall we not delight to muse on his infinite skill, and wonder, and adore!

I often think, Papa, of a remark you made the last harvest, that scarcely any one beheld the sign of the

wheat-sheaf, without thinking of the painter; but that many beheld the wheat-sheaf itself, and yet thought not of God; at least, so as to praise and love him.

When we saw this field last winter, how weak and slender the blade was; we should not have thought, if we had not known it would be the case, that it could grow to what it now is.

Yet it was graciously protected by Divine Providence. So the great Shepherd takes care of the weaklings of his flock; he “gathers the lambs in his gracious arms;” nor will he, to use the beautiful expressions of sacred writ, “break the bruised reed, or quench the smoking flax.”

I think, when we saw this field last January, you thought it would be worth very little; but what a fine crop it is.

True, Edward; the great Husbandman has looked on it, and blessed it. He has sent his rains, his dews, and his sunshine, to nourish it. It would never have come to what it is without his kind care; and we, too, need the same care through every day, and hour,

and moment. We owe every breath we draw to his loving-kindness. God is the great Preserver; it is in him every creature lives, and moves, and has its being.

How full the ears are, and how they bend with the weight of the grain.

It is thus that the aged Christian bows in lowliness before the Most High. The patriarch Abraham did so,—he said, “Lo, I who am but dust and ashes have taken upon me to speak to thee.” So Job exclaimed, “I have heard of thee by the hearing of the ear, but now mine eye seeth thee, I repent, and abhor myself, as in dust and ashes!”

Do you see the little gleaners, Papa, yonder, in that part of the field from whence the corn is taken away?

Yes; I love to see them scattered over the field, or going to their cottages with their hands full, or their bundles of corn. God bade the people of Israel think of the widow, the stranger, and the fatherless, when they gathered in their corn, and their fruit. “When ye reap,” said he, “the harvest of your land, thou

shalt not wholly reap the corners of thy field, neither shalt thou gather the gleanings of thy harvest. And



thou shalt not glean thy vineyard; neither shalt thou glean every grape of thy vineyard; thou shalt leave them for the poor and the stranger; I am the Lord your God. When thou cuttest down thy harvest in thy field, and hast forgot a sheaf in thy field, thou shalt not go again to fetch it; when thou beatest thy olive tree, thou shalt not go over the boughs again; it shall

be for the stranger, the fatherless, and the widow ; that the Lord thy God may bless thee in all the works of thy hands.” *

There is another thought suggested by the harvest, most forcibly impressed on our attention by the great Teacher, of the deepest interest ; it is, that, as a separation is made between the tares and the precious grain, so at the great day, a permanent division shall be made between the good and the bad ; between those who have served God, and those who have served him not. We should lay the thought to heart.

* * * * *

The beautiful picture the poet of the “ Seasons ” has drawn, is here living before our eyes,—see, where the farmer walks behind the reapers, and builds up the shocks :—

“ And, conscious, glancing oft on every side,
His sated eye, feels his heart heave with joy.
The gleaners spread around, and here and there,
Spike after spike, their scanty harvest pick.”

* Levit. xix., 9, 10. Deut. xxiv., 12, 21.

Nor should we forget, that all we behold, under the blessing of God, is the produce of industry: and this is the case with all that

“ Exalts, embellishes, and renders life delightful.”

There is much wisdom in the formation of an ear of wheat; look at these dry leaves,—while they were of service to shield, and to cherish the tender grain, they were closely enwrapt about the ear; but as soon as they had performed their office, they withered and fell.

And these knots in the straw, are they of any use?

Certainly; there are four of them. Scarcely an ear would survive the effects of the rain and the wind, if it were not supported and strengthened by these knots. They are full of fine pores, through which the fertilizing juices rise up and nurture the precious grain. Their construction is, indeed, a display of the divine wisdom. But our walk will be a very short one, if we stay here any longer.

There, what a flock of sparrows the boy on the

gate has driven off the corn with his clappers; how much mischief they must do!



They do much good, as well as devour a little grain. From an experiment which has been made, it was found, that a pair of sparrows, with a nest of young ones, devoured three thousand caterpillars in a week.* “A fancy was adopted,” says St. Pierre, “some years

* Bingley’s Animal Biography, i. 20.

since, in Prussia, to exterminate sparrows, as inimical to agriculture. Every peasant was subject to an annual capitation tax of twelve heads of that bird; at the end of the second, or at the farthest, of the third year, it was discovered that insects had devoured their crops; and it was found desirable to invite the sparrows from neighbouring countries, to repeople the kingdom with them."

It is said in the early history of New England, in North America, that the colonists gave a reward of three-pence per dozen for the extirpation of the jack-daws; it was, however, at length discovered, that Providence had not formed even these destructive birds in vain; for, though they devoured the grain, they made ample recompence by clearing the ground of the rapacious insects with which it abounded. When the daws were destroyed, they multiplied so rapidly, that in 1749, there was an entire failure of the crop of grass; and the inhabitants were obliged to procure hay from Pennsylvania, and even from Great Britain.

I did not know that the birds did so much good.

We may be sure that God has made nothing in vain; though our information is often so scanty, that we are unable to discern its utility.

Here is a field of oats just ready to be carried home. To what order does the oat belong?

It belongs to the class Triandria, and has * * *

Three stamens;—

It has two pointals: and, of course, is of the second order, or * * *

Digynia, Papa.

There are thirteen species; six of them are natives of Britain. They are very useful both for man and beast.

And here is a field of barley, almost cut down; why, the harvest will soon be got in.

It will, and happily; God is, indeed, “crowning the year with his goodness.” Barley is of the same class and order with oats; there are eight species, only one of which, the wall-barley-grass, is a native of our country.

See those two butterflies; how beautiful they are; I wish you would tell me more about them.

I have often spoken about them to you, Edward; I know not that I have anything more to say. They pass through four changes. You know the class in which Linnæus has placed them; do you not?

That of Lepidoptera, or scaly-winged.

Yes; their first state, of course, is that of the egg. The eggs, according to their different species, are variously shaped; some are ribbed; some are in the shape of a cone; others round; but most of them beautifully ornamented, out-rivalling the neatest, and, in some cases, the most elegant works of art.

I will try to find some as objects for our microscope.

They will very much gratify you. The butterfly cements her eggs on some plant or shrub, on which the young ones may, as soon as they come forth, readily make a banquet.

How surprising this is.

It is; especially as the parent herself does not eat

any leaves. The eggs, in many instances, lie all the winter, where they are deposited, uninjured by the most severe cold; and the warm sun-beams of spring bring them into the second, or caterpillar state. The little creature has sixteen legs, and twelve eyes; and, for some time, eats voraciously; till, at length, it refuses its food, and provides itself a covering, suspending itself in it by a thread, to some leaf, bough, wall, or rafter; this is its third, or pupa state, in which it does not partake of any nourishment. This lasts for a longer or shorter period; when it bursts its case, as soon as the flowers appear to furnish it with honey, on which it feeds. Now, how unlike the caterpillar! It has but six legs, beautiful wings, and two eyes. * * *

Why, Papa, you said the caterpillar had twelve!

True; but the little creature has lost nothing; for the two eyes of the butterfly are composed of at least twenty thousand lenses, each affording a distinct vision!

What eyes!

Well, Edward, you may say, what eyes!

What wonderful changes this little creature passes through.

We must not forget, that these changes are a series of unfoldings, or developments. You have a box, Edward, which has four others in it.

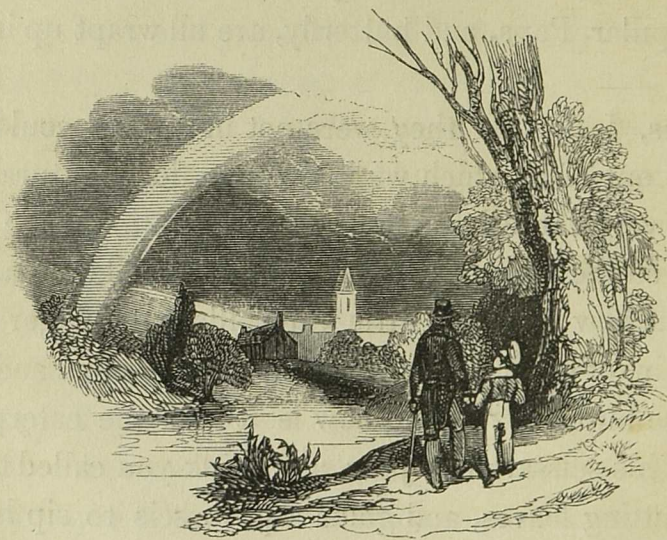
Yes, I have. But do you mean to say, that the caterpillar, Pupa, and butterfly, are all wrapt up in the egg?

Yes, I do. If they were not in it, they could not come out of it, which we know they do. Naturalists, by a very careful and delicate examination, have discovered the eggs of a silk-worm moth in its pupa.

But how can the little caterpillar, no bigger than a grain of sand, include within it the pupa and the future butterfly? And how is it that the caterpillar loses his scissars-like jaws, as I think you called them, for cutting leaves, and gains a proboscis to sip honey from flowers?

I often tell you, Edward, that it is impossible to explain a multitude of things that are constantly before our eyes, and whose existence, therefore, no one

can deny. But we had better hasten home, as the clouds are gathering for rain; it is now falling opposite to us, though at some distance. What a brilliant bow is impressed on that dark part of the heavens. Do you understand how the rainbow is formed?



I think you have explained it to me. Every ray of light has in it all the seven colours,—as your prism proves, Papa.

True ; Sir Isaac Newton first explained the rainbow on philosophical principles. “ Here,” Thomson says,

“ Awful Newton, the dissolving clouds
Form, fronting on the sun, thy showery prism ;
And to the sage-instructed eye, unfold
The various twine of light, by thee disclos’d,
From the white mingling maze.”

You see, our backs are turned, or nearly so, to the sun ; before us are the dark clouds ; between us and the clouds the shower is descending, and the white rays of light are decomposed by the drops of rain ; so that “ the various twine of light,” as Thomson calls it, is unfolded,—as light is by the prism,—and the result is the bow on yonder cloud.

But did not you say, there were but three original colours in the sun-beams, red, yellow, and blue ?

I did ; Sir David Brewster has shown that this is the case.

But how, Papa ?

Why, four out of the seven colours are formed from

a combination of three others. The mixture of red and yellow forms the orange colour; the yellow and blue combined produce green; the union of red and blue presents us with the indigo and the violet. How astonishing, that all the immeasurable shades of colour should arise from only three,—red, yellow, and blue!

All who have described the falls of Niagara, have noticed the beautiful rainbows on the impetuous waters:—

- - - - - “ Waves innumerable,
 Urge on, and overtake the waves before,
 And disappear in thunder and in foam.
 They reach, they leap the barrier; the abyss
 Swallows, insatiable, the sinking waves;
A thousand rainbows arch them; and the woods
 Are deafened with the roar; the violent shock
 Shatters to vapour the descending sheets;
 A cloudy whirlwind fills the gulf, and heaves
 The mighty pyramid of circling mist
 To heav'n.”

WALK XIII.

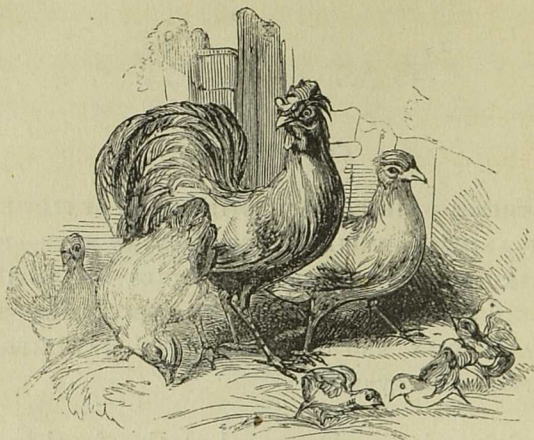
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REMARKABLE THINGS—THE EGG—FRUCTIFICATION OF FLOWERS—GRASS
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SQUIRREL—GOAT—REIN-DEER—CAMEL—LAMBS—FLIES—THE FACUL-
TIES OF MAN—CHIEF END OF MAN—WASPS—PARTRIDGES—MUSH-
ROOMS—PUFF-BALLS—EVENING.

How surprising it is, Papa, that the feathers, bones, beak, and legs, and all the other parts of a chicken, should all be wrapt up in the egg! Who would suppose this, if he had not been made acquainted with the circumstance?

I think no one; few articles, Edward, are more wonderful than an egg, whether we examine its covering,—which is twofold, the hard lime-stone shell, and the soft delicate lining,—or what it contains. Every

object, rightly understood, will furnish us with matter for admiration of the wisdom and goodness displayed in the works of the Most High.



Will you mention some instances which now occur to you, Papa?

I am always pleased to do so, Edward. The fructification of flowers suggests many. For example, when the pointals are longer than the stamina, as in the cowslip, and in many others, the flowers hang down their heads, that the farina or dust which renders them fruitful, may fall on the pointals to perfect the

seed; when this is effected, the cowslip assumes an erect position. Other flowers, at the approach of rain, or the chill of evening, roll up their petals, that the delicate farina, essential to fertility, may not be washed away, or injured. They cease to do so, as soon as the seed is secure.

I think you said, Papa, that grass and wheat will grow in every climate; this also must be a display of the divine wisdom and goodness.

True, Edward; and so is another circumstance in reference to grass; look on this field, and you will see at every step you take, that the cattle eat the grass, but they have left these stalks which contained the seeds. This is a kind arrangement.

It is well, also, Papa, that all the animals do not like just the same thing.

It is, Edward. Some like the leaf, and others the fruit. Plants preferred by some animals are avoided by the rest. The goat will pass by the monkshood, but the horse will eat it; and the horse will not touch the water hemlock, but the goat devours it. The

spurge, which is so noxious to man, is eaten up by caterpillars.

But how do animals know what will do them good, and what will poison them?

That is a difficult question, Edward; I know not what to reply; except, that God has given to them such a correctness of taste and smell, that they readily distinguish the one from the other. We know it is fact, that they do so. Horses will eat the grass which cows will not crop; cows will take some kinds which the horse leaves; and sheep will live on that which is neglected both by the horse and the cow.

You have often remarked, Papa, that God has created things suitable to the different climates.

This is the case in very many instances. Such is the talipot-tree in Ceylon. (See p. 29.) Its leaf is sufficient to shelter eight or ten persons from the heat of the sun in that sultry climate; or from the rain.

You mentioned this one day in our walk, and said it was a sort of great-coat tree!

There is the water-tree in the same island, which

produces bladders in the shape of a cylinder, covered with a lid. These are usually filled with a pure, refreshing, and delicious water; which travellers have



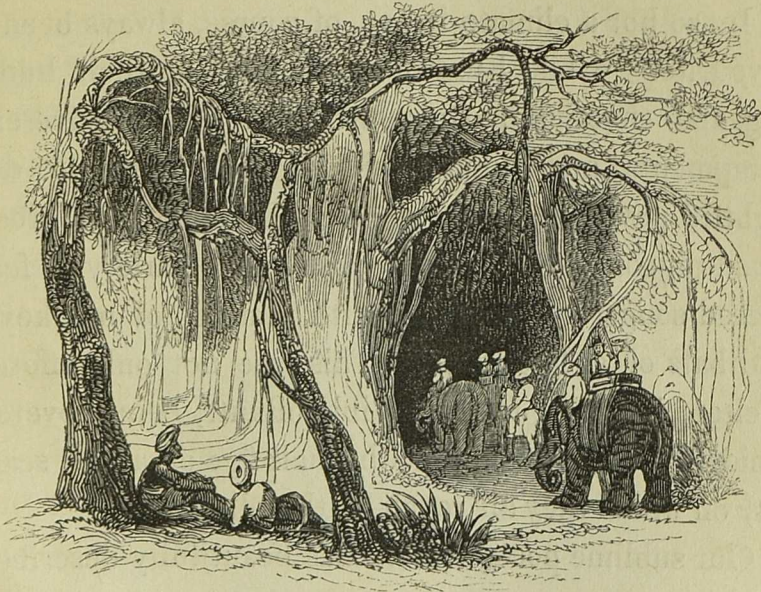
likened to nectar. In New France, there is a kind of cuckoo-pint tree, which will yield, when a single

branch is broken, a full pint of excellent water. In the most desert parts of America, there is a parasitical, or creeping plant, whose leaves are shaped into the form of a pitcher; these collect, and retain the rain, for the use of insects, birds, and beasts; and even men have been benefited by it. The plant is a kind of misseltoe, and is called tillandsia. The abundance of juicy and cooling fruits, which are produced in hot climates, are also evidently among the merciful provisions which God has appointed for their inhabitants.

And is not the banyan-tree, Papa, an article of the same description?

It is; this tree is a species of the fig, of the Polygynia class, having male, female, and both sexes in the same species; it is one of the most beautiful and wonderful productions of the east. This tree is constantly increasing, and seems never to decay. The branches throw out shoots from their tops, that grow till they reach the earth, in which they take root, and form other trees in succession, as long as they find

any soil for their sustenance. There is one in the island of Herbedda, in the province of Guzerat, the remains of which,—for much has been carried away by high floods,—is two thousand feet in circumference.



The chief trunks of this tree, which amount to three hundred and fifty, are much larger than our elms and oaks; the smaller stems are more than three thou-

sand. Seven thousand persons have found ample room to repose beneath its shade, which is impervious to the beams of the vertical sun.

What a tree it must be, Papa! How I should like to walk under it.

In so hot a climate it has, of course, always been a favourite. “The English gentlemen, on their hunting and shooting parties, used to form extensive encampments, and spend weeks together under this delightful pavilion, which is generally filled with green wood-pigeons, doves, peacocks, and a variety of feathered songsters; together with families of monkeys, and bats of a large size. This tree not only affords shelter, but food for all its inhabitants, being covered amidst its bright foliage with small figs of a rich scarlet, on which they all regale with delight!”

Our sublime poet, Milton, has beautifully described this tree, as

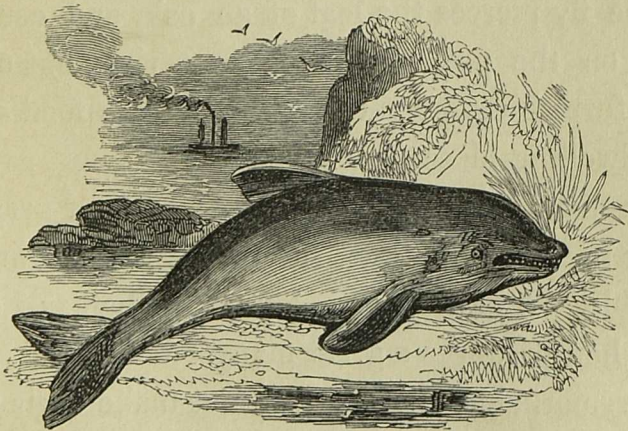
“ Spreading her arms,
Branching so broad and long, that in the ground
The bended twigs take root, and daughters grow

About the mother tree, a pillar'd shade,
High over arch'd, and echoing walks between ;
There oft, the Indian herdsman, shunning heat,
Shelters in cool, and tends his pasturing herds,
At loop-holes cut thro' thickest shades."

This is a surprising tree ; we have not any such in England. But will you mention some more remarkable things ?

Why, Edward, they are common around us ; if we but think, and examine, we shall find them everywhere.

Yes, but I cannot find them so quickly as you do, Papa.



The porpoise you saw, when you sailed down the

river, leaping out of the water, was a remarkable object. That fish has an apparatus by which he can take in a quantity of water in an instant, when it wishes to sink; and it can throw it out and fill the cavity with air, when it would rise, or float on the surface of the stream. How wonderful! All the laws of hydrostatics, and more than all the laws with which we are acquainted, must have been known to its Creator.

It is remarkable, that most insects lay their eggs in places where their young may find nourishment as soon as they are hatched. As I have shown you, when the fly pierces the leaf of an oak, and cements its egg on the puncture, a gall-nut rises out of the wound, furnishing the young fly both with food and a secure dwelling-place.

It is remarkable, that birds and beasts of prey are but few in number, whilst the useful animals are innumerable. A hawk seldom lays more than two eggs, but the hen produces a great many.

It is remarkable, that birds do not make their nests in any place, and at random; they evidently study to

conceal them; or put them at a height but little exposed to danger. And that all the tribes of fowls that live in water, have feathers, beaks, necks, and feet, suited to their mode of living.

It is remarkable, that when birds and fowls are asleep, on the roost, or the perch, that the grasp of their feet does not relax, so that they should fall from their resting-place.

How is it that they do not?

The bones and tendons are so contrived, that the mere weight of the fowl compels the toes to contract, and grasp the branch or pole, without any kind of effort on the part of the bird.

So, the squirrel which lives on nuts and acorns, has feet with claws by which he can climb any tree with the greatest ease.

We have often seen him run up very prettily and nimbly.

We have; and have been not a little amused with his movements. And, I was going to remark, that the goat is another instance of the suitableness of the

faculties of an animal to the place of his residence. He is most at home in mountainous districts; and he has a surprising ability for leaping from one craggy eminence to another.

It is remarkable, that the rein-deer is found in the coldest parts of Lapland, and has a skin so thickly clothed with warm hair, that the chilling breeze cannot penetrate it; and that there, and no where else, in any abundance, the liver-wort grows, which is its chief food. In like manner, on the Lapland mountains, feeding on the seeds of the dwarf birch, the rough-legged partridge dwells; and, happily for it, its legs and even feet are covered with feathers.

It is remarkable, that the camel should be furnished with a number of stomachs, in which he may treasure up a large quantity of water, sufficient for his wants in a long journey over a burning desert, where he cannot obtain any. How suited is this useful creature to the station in which God has placed him.

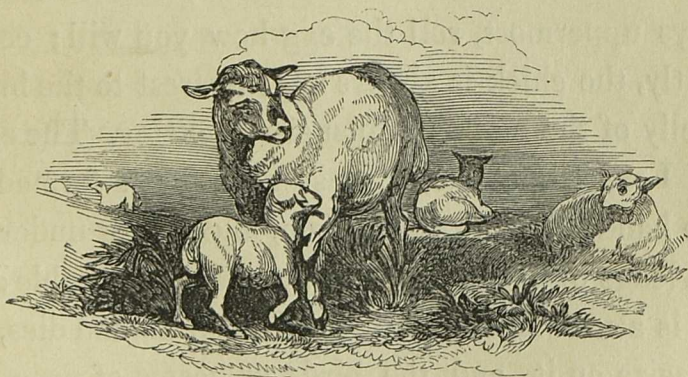
But will he go very fast, Papa?

His average pace is about thirty miles a day. But

couriers have been known to travel, on some species of them, at the rate of one hundred miles a day, for eight or nine days together. Is not this remarkable?

Truly, it is; this wonderful creature may well be called, as it is in one of my books, the ship of the desert. Do you recollect a very remarkable and pretty sight, you bade me notice last spring?

Not immediately, Edward; nor can I readily guess; as there is no end to the wonders of God's power and goodness.



The two lambs, Papa.

I recollect, the ewe with the two lambs; I wished

you to notice, how the mother would not permit the one to suck, though he tried several times, till the other had heard her call, and came for the same purpose. It was, as you say, remarkable, and a very interesting spectacle.

A bird's egg consists of three parts ; "the chick, the yolk in which the chick is placed, and the white in which the yolk swims. The yolk is lighter than the white ; and it is attached to it at two points, joined by a line, or rather plane, *below* the centre of gravity of the yolk. From this arrangement it must follow, that the chick is always uppermost, roll the egg how you will ; consequently, the chick is always kept nearest to the breast or belly of the mother whilst she is sitting. The egg," says Lord Brougham, "must have been formed by some hand skilful in mechanism, and acting under the knowledge of dynamics." Is not this remarkable ?

It is also remarkable, that when an animal dies, the flies seize on it, and the birds or beasts of prey, and they soon remove the nuisance. If my memory does not fail me, St. Pierre calls the large flies "the scaven-

gers of creation." There is a striking propriety in the expression.

And all things, Papa, seem, more or less, made for the service of man.

This is the case, Edward; the Creator formed this beautiful world, and he made it a present,—how magnificent a grant!—to his creature man! Man alone, of all the varied beings which his hand has formed, can render the whole subservient to his use and comfort. And he actually does so. He tames the most fierce of the animals; and seizes, at his pleasure, the swiftest; the fish of the sea, and the fowls of the air, contribute to his sustenance. He multiplies the provision God has given him ten thousand fold. He opens a path into the very bowels of the earth, and brings from the dark abyss innumerable treasures. Even the sun and the moon, no less than the globe on which he dwells, were created for his benefit and gratification.

As it was the design of the Creator that the world and its inhabitants should be for the use of man, what was his end in the creation of man?

A very proper question, Edward; if all other things have a chief end, surely God did not form man without a design worthy of his infinite wisdom. This end can be no other, than to glorify his Creator on earth, to enjoy his presence, and to engage in his worship and service for ever in a better world:

“Not to know him, is not to know ourselves :
Is to know nothing ; nothing worth the care
Of man’s exalted Spirit.”

But you have not noticed anything we have met with in our walk, Papa.

True, Edward; but we have been well employed, since we have been taking rather an extensive view of the wisdom and goodness of God. But was there any object which you noticed in particular?

I wished you to tell me about the wasp’s nest, which is in a hole in the bank by the last gate.

Well, I will do so now. The wasp is of the hymenoptera order of insects. Do you recollect how they are distinguished?

They are insects with a membrane wing, and which are furnished with a sting.

You are right, Edward. Naturalists have numbered one hundred and fifty-nine species of wasps; but only three are natives of Britain. The *Vespa Crabro*, or the hornet; the *Vespa Coarclata*, or the wasp which binds its nest with a band on the bough of a tree; and the *Vespa Vulgaris*, or the common wasp. The nest you have found is of the last species. There are three kinds of wasps, as there are of bees, the queens, or females, the males, and the common labouring wasps, which are neither male nor female. The queens and common wasps have stings, but the males are without them. There are usually two or three hundred males, and as many females, in a nest.

That is quite unlike the bees, Papa; there would be a fine noise, if there were more than one queen bee in a hive.

There would, indeed. When the winter commences, the wasps destroy all the eggs, and young ones. The males and the labouring wasps perish; and nearly all

the females. Perhaps not more than ten or twelve in a nest survive. In the spring a single female finds a hole in a bank, or makes one, and deposits her eggs, which, in about twenty days, become wasps. The first which arrive at perfection, are working wasps; they immediately seek for rotten timber, which they knead with a glutinous fluid into paste, of which they build their city,—or nest. They always begin at the roof, and build downwards.

The nest you have on your shelf in your study, seems made of paper. The combs, or cells, are one tier below another, fastened together by rods.

They are. Each nest contains about sixteen thousand cells. Naturalists calculate, that one Vespiary will produce thirty thousand wasps annually.

What a good thing it is, that so many of them die at the approach of winter. But how did you get your wasp's nest? You did not take it while the wasps were alive, did you?

No; the gardener dug it out of a bank in a garden last spring: for wasps never occupy the same nest

again. As you say, it is indeed a good thing that they nearly all die; if this were not the case, they would soon devour all our fruit, and kill all our bees.

Kill all our bees, Papa!

Yes, Edward; they seize on a bee, as a hawk does on a wren, and tear it open to procure its honey.

How shameful that is; I shall not care about the wasps being killed; nor about killing them. Are they of any use, Papa?

I do not know that they are; unless as food for some species of bird, like many other insects. The paper, however, of which their nests is composed, is a wonderful article. Whilst the most ingenious philosophers, age after age, were writing on leaves, wood, stone, brass, lead, and on the skins of animals, the wasp was reducing rotten wood into a pulp, and forming a strong paper.

Do they eat nothing but fruit?

Yes; sugar, or any thing sweet; they will catch flies, and carry them to their young; and our butcher will tell you how they devour his meat.

Is it not strange that they should kill their young ones?

It appears so, but we must not forget that it is only on the approach of winter, when they would certainly perish, as wasps do not lay up any honey or provision; harsh as it may seem, therefore, it may be in mercy.

Here, Papa, what a large covey of partridges are flying over the field; one, two, three, four, five, six, seven,—why there are seven. Are they not common, all over Europe?

You might affirm, Edward, that they are known almost through the whole world. The partridge is found in every part of the temperate zone, and in the torrid, or where the sun is vertical; and the heat, of course, sometimes overwhelming; and in the frozen regions about the pole. And which is well worthy of notice, it adapts itself, in a singular manner, to the climates in which it resides. The Greenland partridge is brown in summer; but when the wintry season sets in, it is covered with a thick, warm, downy plumage, and is of the colour of the snow, among which it

seeks for its food. Its whiteness is often the means of its safety.

This is remarkable.

Whenever a dog, or any foe, approaches the nest of the partridge, the hen bird very artfully tries to draw him away.



I recollect, Papa, in the summer, when we disturbed one, and she fled out of her nest, she did not fly away from us, but hopped along, fluttering on the ground, as

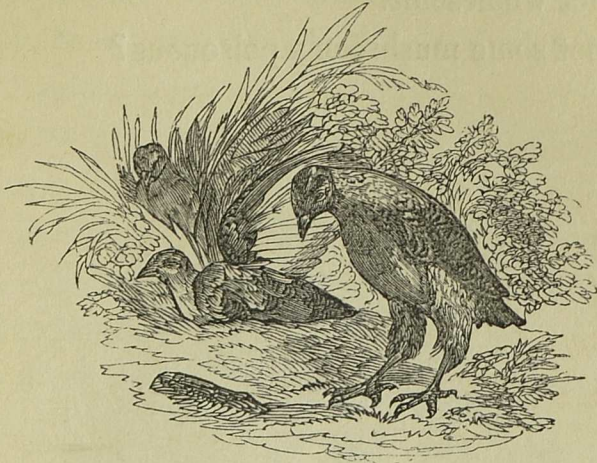
if she had not the use of her wings ; but when I thought I had almost caught her, she fled away, as if nothing were the matter with her

That was, when she had effected her purpose, and got you away from her nest, and her young.

The feathers of the partridge are so beautiful, I should like to have some of the birds themselves among our poultry. Would they not stay, if we were to feed them well ?

I think not ; I have never heard of any one who was able to tame, or domesticate them. There is another remarkable bird of the same order,—gallinæ,—which is found in every country from the Cape of Good Hope, to Iceland ; but which migrates in vast flocks to the north in the spring, and to the south in Autumn ; I refer to the quail. At Capri, an island in the Mediterranean, at the entrance of the gulph of Naples, to which these birds come twice in the year in such immense numbers, that the Bishop derives the greater part of his income from them, and is called, on this account, the quail Bishop. On the western

coast of the kingdom of Naples, a hundred thousand of these birds have been taken in a day, and sent to



Rome, and to different parts of Italy.—But see there are some fine mushrooms; you may take them home with you. Here, put them into this handkerchief.

It is a singular article, Papa; how would you class them in natural history?

It is regarded as a plant of the cryptogamia class, of the order of fungi. As many as fifty-five species have been described. Its botanic name is *Agaricus*. It is of a nature between the animal and the vegetable.

Those from old and dry pastures are the most healthful; the common mushroom gathered from a moist soil is not wholesome.

Are not some mushrooms poisonous?



Yes; the muscarius, or red mushroom, is a deadly poison. In the northern parts of Europe, the people infuse its juice in milk to kill the flies; the instant they taste it, they die. It is uncertain how mush-

rooms are propagated; some have said, that they naturally arise out of putrefaction; but this is not the case. As they are regular, constant, and uniform, they may rather be regarded as true plants, though we cannot fully explain their whole history.

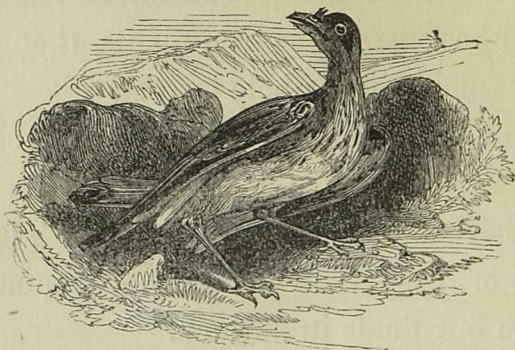
Is the puff ball of the same order and class as the mushroom?

It is; there are ten species of them. The common puff ball,—or *lycoperdon bovista*,—is commonly to be met with in our fields in autumn.

I have often stepped on one, and a great smoke has come out of it.

What you call smoke, Edward, is the seed. Through microscopes which magnify very highly, they appear as minute globules, nearly transparent; “the axis of which is not above the fiftieth part of the diameter of a hair; so that a cube of a hair’s breadth in diameter would be equal to a hundred and twenty-five thousand of them.” Some of the species have hooks, or tails, which, no doubt, are designed the more easily to take root in the ground.—But hark, the stone Cur-

lew* whistles, and intimates, that the evening is drawing on apace. It belongs to the order of Grallœ.



“They sculk,” Mr. White says, “among the stones, which are their best security; for their feathers are so exactly of the colour of our grey-spotted flints, that the most exact observer, unless he catches the eye of the young bird, may be eluded.” It is a singular bird; it makes no nest, but lays two eggs on the bare ground. When it flies, it stretches out its legs straight behind, like a heron. Its noise is often heard at the close of evening.

* Charadius.

There is the evening star; how bright and how beautiful it is.

And not only the evening star, but others are every where peeping through the grey curtain of the atmosphere. How delightful do “the heavens declare the glory of God, and the firmament display his handy work!” Well may we exclaim, when we glance on the wonders of the skies,

“How glorious the day, when the Author of all,
First spake you from nought,—and ye sprung at the call!
Through the regions of space, from his hand ye were hurl’d,
Dark myriads of atoms, each atom a world!
When each sped to his point in the boundless expanse,
And ye caught your first light from the light of his glance!
His power in one moment fix’d each in his spot,
One moment remitted,—ye sink, and are not!
What a point is this earth, ’mid the orbs of the sky!
And compar’d with this earth, what a nothing am I!
Yet I, with my mind’s little plummet would sound,
The MIND that hath known nor creation nor bound;
Would fathom the depths of his wondrous decree.
Can the fly grasp a world,—a shell compass the sea?
No; this to weak man is allow’d, and no more,—
He may wonder and worship,—admire and adore!”

WALK XIV.

CONTENTS.

LIKENESS BETWEEN VEGETABLES AND ANIMALS— FERN— FURZE—
HEATH— VIRGIN'S BOWER— THISTLE— HARVEST BUG— STARLINGS—
THE COW— ROBIN— NUTS— NUT WEEVIL— EVENING.

YOU said, in our last walk, Papa, that the mushroom was an article between the vegetable and the animal. Do not vegetables and animals resemble each other?

They certainly do, in many things. There seems a beautiful gradation in the works of God. They have been compared to a mighty chain. The lowest links, indeed, are very tiny ones; but they grow bigger and bigger, till they are so large that the human mind cannot adequately conceive of their greatness. The animal, mineral, and vegetable kingdoms, are, without doubt, closely allied, and, in not a few respects, resemble each other.

Not in one great point, Papa, that of motion.

It must be allowed, that the motions of animals and vegetables are somewhat different.

But have vegetables any motion but that which the wind gives them?

Certainly; have you not observed how our fine sun-flowers follow the sun in his course? Plants grow, both above and beneath the ground. If they are placed in a room where the light is admitted by only a small chink in a shutter, they will extend their leaves and branches towards this opening. If this be closed and another be made, they will change their course, and travel towards it. Some close up their flowers at the approach of evening, or of rain. Is not all this motion, Edward?

Yes, but they do not run about, as animals do?

It is true; yet the strawberry plants would have extended all over the garden in a little time, if I had not bid the gardener destroy the runners. We have reason to believe that vegetables have a breathing apparatus as well as animals. We are sure that the

irculation of the sap and the juices in the one, is analogous to the circulation of blood in the other. If the current of either be stopped, both the plant and the animal dies. Animals and plants have various organs very similar to each other. One kind of soil, or food, is suited to one species of plants, and a different kind to another. It is so with all the tribes of the animal world. Nothing in the animal or vegetable kingdoms can live without air. When young, they are both weak and delicate, and strong when they become mature; and each, after a certain period, decays. Some plants live much longer than others; and this also is the case with animals.

But all, Papa, die at last.

Yes, the oak, that may brave the blasts of a thousand winters, and the little flower that blooms in the morning, and withers ere evening; the elephant and the ephemeron, each is alike doomed to decay and death. But I want to look over a few pages of the volume I have in my hand; I will sit on this elm, from which the carpenters have so recently taken the

branches and knots; and you may collect what you can to furnish us with conversation afterwards.



* * * *

Well, Edward, I see our resources are not exhausted. We are not likely to be without subjects to employ us this evening.

No, Papa; and I think we should not if we were to walk thousands of evenings.

True; God's works are so manifold, that they are without end. But let us see what you have gleaned. Here is a branch of Fern, or Filix; it is a singular plant.

It is, for I never saw any flowers or seeds on it.

That is, Edward, because you did not look in the right place. They have both flowers and seeds; and they are at the back of the leaf. Here are the seeds, the flowers of course are gone. It is not yet ripe I see; when this is the case, the vessels in which it is produced, fly open with a spring, and disperse the seeds all around. You may see them readily with my glass; they are very numerous.

Who would have thought of looking behind the leaves for flowers and seeds! But of what class is fern?

It belongs to the last class,—Cryptogamia, to which the mosses belong. It is one of the worst weeds for land, and is not easily destroyed. When cut in its prime, and left to rot on the ground, it is useful as a manure. And in the northern parts of our island it is burnt, and balls are made of its ashes, which are used instead of soap. The roots of it have been employed in medicine. In the South Sea Islands, the fern becomes a tree of great beauty; it

is often twenty-five feet high, and has a large plume of leaves on its summit, which is very graceful. But what is your next article?

The blossoms of the furze.

The fine yellow, contrasted with its green spikes, adds much beauty to the landscape. It is the *Ulex Europæus*; it belongs to the class *Diadelphia*; and has two sets, or brotherhoods, as the term imports,



of stamens. It is of the third order, and has ten stamens. Broom, peas, beans, vetches, and clover, are of this class. It is a very useful plant for fences and

fuel; and is said to furnish a nutritious food for cattle in winter, cut small, and mingled with their other food.

I see you have some beautiful bits of heath, or erica, in full blossom. Here, Edward, examine it, and tell me to what class it belongs. You will see the flower readily through my glass.

It has eight stamens, and must belong to the class Octandria; it has one pointal; it must be, therefore, of the first order, or monogynia.

It must; the oak, poplar, hazel, and mezereon, belong to this class. Brooms are made of it among us; but in the Highlands of Scotland they thatch their houses, and make beds of it. Bees gain much honey from its flowers, but it is of a reddish hue. It is an elegant plant. I see you have gathered a branch of the clematis vitalba, or virgin's bower, which, at this season of the year, so prettily whitens the tops of our hedges. It belongs to the Polyandria class; it has many stamens,—

Which the name means, Papa.

It does; and has many pointals, and is of the order Polygynia. There are twelve species; all of them are hardy, climbing plants; the flowers are different, and are red, blue, purple, white, and green. It is easily propagated by layers and cuttings. Why, you have gathered the head of a thistle; it is the *carduus crispus*, and is gone to seed.

There were several goldfinches on it, eating the seed.

They live upon it at this season of the year, and in the winter. The French give this pretty bird a name from this circumstance. Do you recollect what they call it?

Chardonneret.

Yes, from *chardon*, a thistle. This is thought by some a handsome weed; it is of the *Syngenesia* class. How do you describe flowers of this class?

They have their anthers united, so as to form a cylinder, with a single seed placed on the receptacle under each floret.

True; it is of the order *Polygamia Æqualis*, hav-

ing florets of both sexes. Ah! there is a pretty red insect has just crept out of it; do you know what it is, Edward?

I think it is the harvest bug; is it not of the class *Aptera*, for it has no wings?

Yes, it is; it gets under the skin, and burrowing there, occasions much pain. It is the *acarus autumnalis*. To many husbandmen, where they abound, they are very troublesome. They will not attack some individuals. Captain Brown mentions two persons, who had been nutting together all day in the woods, and who afterwards slept in the same bed-chamber; one of them was entirely covered with red blotches by this diminutive bright scarlet insect, whilst the other was quite undisturbed.

Do you hear those starlings, Papa? Only hark, how they are all chattering together. It seems singing and talking, too.

It does; it is not disagreeable. There are several species of them. This is the *sturnus vulgaris*, or the common starling. It is a large congregation of them.

It is said, that in Ireland they assemble in such vast flocks sometimes, as to darken the air. I am of opinion that many arrive here from foreign parts in the autumn; certainly, so many as are seen here at this season, and in the winter, are not bred in our country. The plumage is generally black, but mingled with blue, purple, and copper; and every feather is marked with a pale yellow spot.

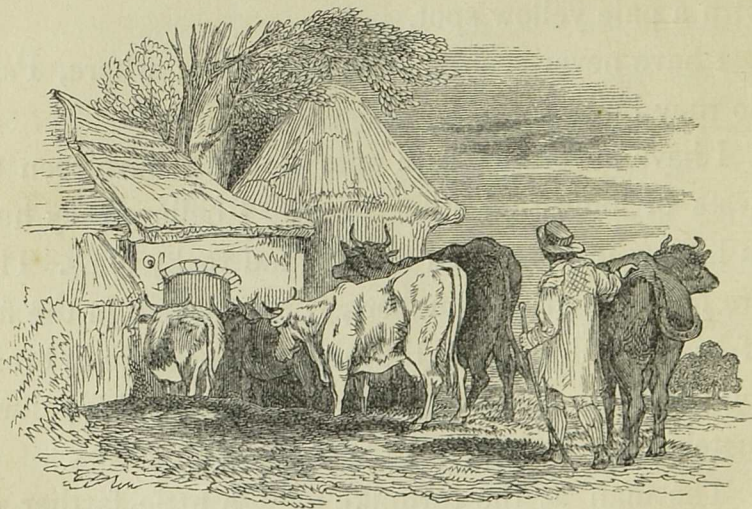
I have never seen a starling's nest; where, Papa, do they build?

I have never met with one, though I have seen the nests of almost all other birds. I believe they build in hollow trees, ruined towers, and rocky cliffs. They are found in great numbers, it is affirmed, in the fens of Lincolnshire, where they do much damage in breaking down the reeds, which are of considerable value in thatching. They are of the order of Passeres.

The man at the turnpike gate, a little farther on, has one in a cage, which says, "Good morrow!" and "How do you do?" I saw many of them at the beginning of the summer come into our cherry-trees,

and eat the cherries, but I did not hear one of them speak a word.

I suppose not; they do not speak unless they are taught. They may be taught to speak almost any thing, and in any language. They are to be met with in almost every part of the world; at least, some species of them.



Here, Papa, are some of the most useful creatures which we have in our country; what a fine herd of cows!

They are; the dairyman is driving them home to be

milked. They do not, however, want much driving; they seem to go very willingly. You are right; they are, indeed, some of the most useful creatures which we possess.

Is not every part useful?

Think, and give me your opinion, Edward.

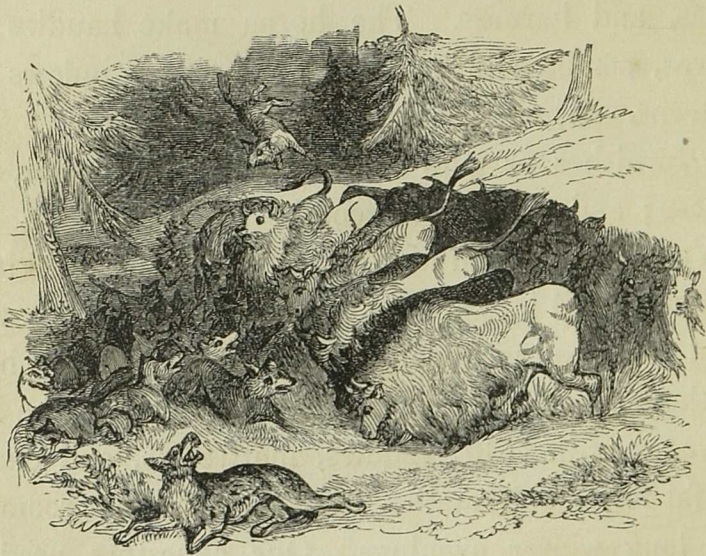
Let me see,—the hide, when tanned, makes boots, shoes, and harness. The horns make handles for knives, combs, and drinking cups, and windows for lanterns. The bones are used instead of ivory. The cow furnishes us with milk, whey, cream, butter, and cheese; and the flesh is good beef.

Yes; and the calf is excellent veal; and its skin is manufactured into vellum. The blood of the cow is used as a good manure for fruit trees, and is the basis of the beautiful colour, the Prussian blue; the hair serves to stuff seats, saddles, mattresses, and chairs. Its fat forms our candles, which light up our rooms in the long winter evenings. Our ancestors used to frame their boats with osiers, and cover them with the hides of bulls.*

* Lucan, lib. iv. 131.

They must have been poor boats, Papa.

Truly, compared with our vessels. The cow is of the class mammalia, of the order pecora. There are immense numbers of this class wild in Mexico, and the interior parts of North America. The people form companies to take them; and in some of their



expeditions, it is affirmed that they have killed from fifteen hundred to two thousand. These wild cattle defend themselves from the wolves in the most admi-

rable manner. When they hear their savage enemies approaching, they form themselves adroitly into the form of a circle. The weakest are left in the middle, whilst the strongest are on the outside, and present to their foes an impenetrable phalanx of horns.

But for what purpose do they kill so many of these wild cattle in America?

Chiefly for their hides, and in some cases for the fat, to be used as tallow.

But, Papa, we have not noticed any birds lately; I suppose it is because they have all done singing.

Not all, Edward; but most of them, as they are changing their feathers, and getting a new and warmer dress for the winter. See, perched on the topmost bough of that ash, the robin—*motacilla rubecula*—or red-breast, pours forth his sweet strain; to tell you, Edward, that all the birds have not done singing. He belongs to the order *passeres*, the same as the red-start and nightingale.

I think I have heard you say that he sings all the year.

Yes, very often through the spring, summer, and autumn; and not unfrequently in the winter. There are but few places where this pretty bird is not to be found. Its general food is insects. How often have I noticed him at the very heels of the gardener, picking up the worms. I love this little bird; he visits us so constantly in winter, and seems to ask an alms. In that cold and dreary season, the red-breast "pays to trusted man his annual visit:"

* * * * * "Half afraid, he first
Against the window beats; then, brisk alights
On the warm hearth; then, hopping o'er the floor,
Eyes all the smiling family askance,
And pecks, and starts, and wonders where he is;
Till, more familiar grown, the table crumbs
Attract his slender feet."

A naturalist* mentions a singular proof of the robin's love for its young ones. "A gentleman," says he, "in my neighbourhood, had directed one of his

* Mr. Jesse.

wagons to be packed with sundry hampers and boxes, intending to send it to Worthing, whither he was going himself. For some time his going was delayed, and he directed that the wagon should be placed in a shed in his yard, packed as it was, till it should be convenient to him to send it off. In the meantime, a pair of robins built their nest among the straw in the wagon, and had hatched their young before it was sent away. One of the old birds, instead of being frightened away by the motion of the wagon, only left its nest occasionally, for the purpose of flying to the nearest hedge for food for its young; and thus, alternately affording warmth and nourishment to them, it arrived at Worthing. The affection of this bird having been observed by the wagoner, he took care, in unloading, not to disturb the robin's nest; so that the robin and its young returned in safety to Walton Heath, the place from whence they were taken. The distance the wagon went, in going and returning, could not have been less than one hundred miles."

This is a delightful little history.

It is, and much to the credit of the wagoner. The poet Langhorne has written a pretty address to the red-breast, in which he facetiously advises him not to visit a neighbour of his, an old miser, lest he should catch him, and eat him for his dinner :—

“ Little bird, with bosom red,
Welcome to my humble shed ;
Courtly domes, of high degree,
Have no room for thee and me.

Daily near my table steal,
Whilst I pick my scanty meal ;
Doubt not, little tho' there be,
But I'll cast a crumb to thee ;
Well rewarded, if I spy
Pleasure in thy glancing eye ;
See thee, when thou'st eat thy fill,
Plume thy breast, and wipe thy bill.

Come, my feather'd friend, again,
Well thou know'st the broken pane :
Ask of me thy daily store ;
Go not near Avaro's door ;
Once within his iron hall,
Woeful end shall thee befall.

Savage! he would soon divest
Of its rosy plumes thy breast ;
Then, with solitary joy,
Eat thee, bones and all, my boy ! ”

These are pretty lines ; I hope Bob took his advice, and did not go near old Avaro.

But stay a little ; before we go home, let us gather a few of these fine nuts which hang over the path.

I saw them whilst I was repeating the lines, and meant to gather some. Will you tell me all about the nuts, Papa ?

I think it belongs to the class pentandria. The nut, of course, is the fruit of the tree ; and which, deposited in the earth, will produce other trees.

Here is one, Papa, with a large maggot in it ; how could it get into the nut ?

In the same way that one gets into the oak-gall. I think you know how that is ; do you not ?

Yes ; a fly pierces the leaf, and lays an egg in the wound, and then the ball grows around it, which furnishes it with food, till it is transformed into a fly.

The fly which produces the maggot in the nut is of the coleoptera, or sheath-winged class. It is called the nut-weevil, or the *curculio nucum*. The genus includes nearly three hundred species. Some of them make great havoc in granaries among the corn. The insect that gives birth to the little creature in the nut “appears early in the month of August, and may be found creeping about hazel-trees. The female, when ready to deposit her eggs, singles out a nut, which she pierces with her proboscis, and then deposits an egg in the cavity; she then passes on to another nut, which she pierces in like manner; and so on till she has deposited her whole stock.”

Is it not surprising that the nut does not die after this?

It does not, but “continues to grow, and the kernel to ripen; when the egg is hatched, the larva has its proper food on which to subsist. By the time it has arrived at its full growth, and has nearly consumed the whole kernel, the nut falls, and the maggot creeps out of the hole which it has made, and gets under the

surface of the ground, where it passes several months in a dormant state; then, casting its skin, it commences the pupa state, after which it becomes a fly, like its parent, and is an inhabitant of the air."

But, Edward, the time admonishes us to quicken our pace homewards;

"For 'tis the close of day,
 And evening's hues array
 The western sky in all their radiant lustre;
 And round the setting sun,
 His goal of glory won,
 Resplendent clouds in silent beauty muster.

Ere yet those charms grow dim,
 Creation's vesper hymn,
 Grateful and lonely, is from earth ascending;
 Till, with that song of praise,
 The hearts of those who gaze,
 With solemn feelings of delight are blending.

Thus should the sun-set hour,
 With soul-absorbing power,
 Nurse by its glories the immortal spirit,
 And plume its wings for flight
 To realms of cloudless light,
 Regions its God hath form'd it to inherit.

Fair, bright, and sweet is morn,
When daylight, newly born,
In all its beauty is to sense appealing ;
Yet eve to me is fraught
With more unearthly thought,
And purer touches of immortal feeling !” *

* Bernard Barton.



WALK XV.

CONTENTS.

GOOD HABITS—EARLY RISING—SIR W. JONES—EYES OF ANIMALS—OF MAN—OF THE HORSE AND COW—OF THE CAT AND TIGER—OF FISH—OF GNATS AND FLIES—OF SPIDERS—OF BIRDS—HEARING OF INSECTS—ANTS—MIGRATION OF BIRDS—LINES ON, BY MRS. HEMANS—THE STORK—POETRY.

As I have been so long accustomed to rise at six o'clock, Papa, I now wake as readily as I used to do at seven. I got through all my lessons before breakfast this morning.

I am glad, Edward, that this is the case. Good habits are of unspeakable importance; and nothing is more to be dreaded than bad ones. Every one might rise early, if he would attempt it gradually, and thus he would live longer than others. Whilst we are asleep we do not really live. Good habits make a good man, and bad ones a bad man.

You know I used to lie in bed till William or you called me; so I never thought of rising till I heard the summons.

This was very wrong. We should all think of our respective duties, and diligently employ our thoughts as to the best manner of discharging them. I should be ashamed to be dependent on any one to call me in the morning; as if I could not wake, if I pleased, as well as they can. A young man ought to aim at independence; of doing all he can for himself, of providing for himself, and so on. Such a line of conduct is rational, and noble; it is our duty, and a source of continual pleasure. I would have you, Edward, and every young man, possess a spirit similar to that of Sir William Jones, when he was a youth, like yourself. "Jones," said Dr. Thackeray, one of his tutors, "is a boy of so active a mind, that if he were left naked and friendless on Salisbury Plain, he would, nevertheless, find the road to fame and fortune."

And so he did, Papa; but every one cannot expect to be like Sir W. Jones, or so successful as he was.

Perhaps not; yet every one can do more than he imagines, if he would try. Always, Edward, remember this little word, TRY. I have come through life, with the thought ever uppermost in my mind, that what man has done, man may do. There is nothing in learning, or science, or in the mechanical arts, which I would not attempt, if I regarded it as my duty; or if I could accomplish any very valuable ends by such an application.

But you told me, Papa, that you would give me some account of the eyes of animals.

Well, I will do so; the subject is very curious and interesting. There is a general likeness in eyes; and yet, it will be found, that, on examination, they very much differ. Human beings have six muscles to each eye, that they may move it on either side; but horses, cows, sheep, and other quadrupeds, which habitually incline their heads to the earth in search of food, have a muscle by which the eye-balls are suspended and supported, and which we do not need. This is a wonderful adaptation to the circumstances in which

the creature is placed. For example, the eyes of amphibious animals partly agree with those of the fish and the quadruped. The cat, and the tiger, which prowl by night, have a peculiar power of expanding the pupil. The eyes of fish have no apparatus to moisten them, as it would be obviously unnecessary. The eye is formed with consummate skill; it is adapted by Him who formed it to the properties of light. Every eye refracts the light, and brings it to a focus on the retina. Our best, and most perfect glasses, those of Dollond, are by no means equal to the human eye.

Gnats, and flies, have a great number of eyes; they can see on every side, without any movement of the organs of vision. Fish have a chrystalline, almost round, to fit the eyes to the strong refraction of light in the element in which they live; and though they have no eyelids, their cornea is horny, to defend their sight.

I think you told me that the mole has two very small eyes, hid under its velvet coat; and how suited

these are to his mode of living, chiefly under ground.

They are; the adaptation of the faculties of animals to their mode of life is wonderful, and strikingly displays the wisdom of the Creator. Spiders have four, six, or even eight eyes; they are transparent, like so many gems. They can readily see on all sides. The lizard, called the cameleon, can move one eye whilst the other is still; he can fix one on the sky, and the other on the ground. He can glance at all that is behind and before him at once. How manifold, and how surprising, are the works of God!

You have said nothing about the eyes of birds.

True; nor of those of many other creatures. It is impossible we should notice, as they deserve, all the works of the Most High. Lord Brougham remarks of the eyes of birds, that “they require to have them sometimes as flat as possible for protection; and, at other times, as round as possible, that they may see the small objects, flies, and other insects, which they are chasing through the air, and which they pursue

with the most unerring certainty. This could only be accomplished by giving them a power of suddenly changing the form of their eyes. Accordingly, there is a set of hard scales placed on the outer coat of their eye, round the place where the light enters; and over these scales are drawn the muscles, or fibres, by which motion is communicated; so that, by acting with these muscles, the bird can press the scales, and squeeze the natural magnifier of the eye into a round shape when it wishes to follow an insect through the air; and can relax the scales, in order to flatten the eye again when it would see a distant object, or move safely through leaves and twigs. This power of altering the shape of the eye is possessed by birds of prey in a very remarkable degree. They can see the smallest objects close to them, and can yet discern larger bodies at vast distances; as a carcase stretched upon the plain, or a dying fish afloat upon the water."

Is not the eyelid designed to moisten the eye, and to keep it clean?

Certainly. “ And a singular provision is made for keeping the surface of the bird’s eye clean, for wiping, as it were, the glass of the instrument, and also for protecting it, while rapidly flying through the air, and through thickets, without hindering the sight. Birds are, for these purposes, furnished with a third eyelid; a fine membrane, or skin, which is constantly moved very rapidly over the eye-ball, by two muscles placed in the back of the eye. One of the muscles ends in a loop, the other in a string, which goes through the loop, and is fixed in the corner of the membrane, to pull it backwards and forwards. If you wish to draw anything towards any place with the least force, you must pull directly in the line between the thing and the place; but if you wish to draw it as quickly as possible, and do not regard the loss of force, you must pull it obliquely, by drawing it in two directions at once. Tie a string to a stone, and draw it straight towards you with one hand; then make a loop on another string, and running the first through it, draw one string in each hand, not towards you, but side-

ways, till both strings are stretched in a straight line; you will see how much swifter the stone moves than it did before, when pulled straight forward. Now this is proved, by mathematical reasoning, to be the necessary consequence of force applied obliquely; there is a loss of power, but a great increase of velocity. The velocity is the thing required to be gained in the third eyelid; and the contrivance is exactly that of a string and a loop, moved each by a muscle, as the two strings are by the hands in the case we have been supposing."

As we are speaking of birds, I will mention a circumstance not generally known, that, unlike all other animals, there is a communication between the air-vessels of their lungs, and the hollow parts of their bodies; by this means, they can dilate their bodies, as we do a bladder, and thus make themselves lighter when they would either make their flight towards the grounds lower, or rise more swiftly, or float more easily in the air.

Mr. White says, Papa, that philosophers are agreed

that insects have no organs of hearing; and, as a proof of it, he blew a large speaking trumpet among the hives in his garden, and the insects, though the sound might have been heard a mile off, did not take the least notice of it.

That was certainly very remarkable. The subject of the hearing of insects is still enwrapt in much obscurity. I am, however, inclined to think that they do hear in different degrees. It is affirmed by some good naturalists, that they hear by means of their antennæ. This may be the case, but I do not think it has been proved. They do not appear to have any ears; and to hear without ears, sounds very strangely, to say the least. The other day I saw a boy, not far from a hive, striking at a few bees, who, I thought, altered their tone, and a number soon came to the aid of their



fellows; and, if I had not got him off as soon as possible, he would have been sadly injured. Surely, as he was not in sight of the hive, the bees who came to the aid of their brethren must have heard their call. I think that some insects have a degree of hearing.

See, how the ground is covered with ants! Are not these very wonderful insects? Here are some of them with a membrane wing; and I am sure they sting, for one stung me the other day. They must, therefore, be of the order hymenoptera; that is, insects membrane-winged, with a sting.

They are; and they are, as you say, very singular insects. As there are so many in the path, their nest is not far distant. They are now emigrating. They somewhat resemble bees; and keep, like bees, together in communities. There are three classes of them; the females, and neuters, or working ants, both of which have a sting. The males and females have wings. There are eighteen species, distinguished by their colour.

Do they not lay eggs?

Yes; on opening a small ant-hill, the eggs are scattered like fine white sugar, or salt. On examining these with a microscope, they appear in distinct membranes, as clear as a fish's bladder; yet prettily figured all over like the eggs of the smaller birds. When these are hatched, the old ones bring out the young to bask in the sunshine; but they carefully take them back at the approach of rain, or of evening. The eggs of the larger ant are many times bigger; are very visible to the naked eye, and are of a dirty white colour.

I picked up a large slate one day, and under it there was an ant's nest; and it was divided into different apartments; but the little creatures were in great trouble, eagerly picked up the white eggs, and ran away with them in every direction. So I put the tile over them again.

Could they have known your kindness they would have been greatly obliged to you. I have sometimes been much amused to see several of these little creatures tugging at a dead beetle, cock-chafer, or piece

of fruit, to get it home to their nest. They, as well as flies, are a sort of scavengers, who pick up and devour any dead or rotten substance; and, in this respect, they are of some use. Like the bees, they help their companions whenever they are heavily loaded. It has been said of them, that they do not run about at random; some are sent abroad to make discoveries, and if they bring back news that they have met with a pear, or a sugar loaf, or a pot of sweetmeats, they will run from the bottom of the garden, as high as the third story of a house, to come at it. They follow each other in the same path, without turning to the right or left; and are very fond of the honey dew, made by the green blight insect, called the aphis; but they do not injure the insect.

Don't they lay up corn in the summer, as provision for the winter?

Some naturalists have affirmed this to be the case; and they have even said, that to prevent its sprouting in their moist subterraneous cells, they bite off the end which would produce the blade. Much has been

written, and generally believed, about the granaries of corn which they lay up for winter; but as they pass the winter chiefly in a torpid state, this does not appear probable. Indeed, it is certain that the ant does not eat corn, or hoard up anything.

But Solomon says, Papa, "Go to the ant, thou sluggard, consider her ways, and be wise; which provideth her meat in the summer, and gathereth her food in the harvest." Does not this imply that the ant lays up for winter?

The wise man, I think, avails himself of a commonly-received opinion to give a lesson of moral instruction; that is, to recommend industry. And every one will acknowledge that the ant is one of the most busy of the insect tribe. From the coldness of our climate it is, as I said, torpid with us in the winter; but it has been remarked that they are awake and busy in a hot-house; so that it seems probable that ants do not sleep in those parts of the world where the heat is greater.

Horace mentions the ant as an example of industry,

and of prudent foresight as to futurity;* and very properly. A nest of ants is an industrious, well-regulated republic; their harmony, and assistance of each other, are indeed well worthy of observation. An instructor of mankind as to their best interests, both here and hereafter, may, with the utmost propriety, send the negligent and slothful to learn of this little creature. He may well say, Go to the ant, and awake to industry and foresight like her's. Think, when thou seest this insect so industrious about its tiny concerns, how much it becomes thee, a rational and an immortal creature, to secure, with the utmost energy, the great blessings which are essential to thy usefulness and happiness here, and thy felicity hereafter.

But I have a few more remarks to make about the ant. About August, or early in September, all the winged ants, male and female, leave their habitations under ground, and occupy the airy regions, where

* Sat. I.

they propagate their race. Here multitudes on multitudes are eaten by the swallow tribe. It is probable that all the males die; but the females which escape the devourers begin to form new colonies. There is a large species of black ant in America, which builds its nest in a tree, larger than a bushel measure; and what is remarkable, it makes a covered way on the lee side of the tree, to add to the comfort and security of their departure from home, or their return.

Really, Papa, this looks as if they knew what they were about.

No doubt they do. The ants called termes, which are found in Africa, and the east, are very different from our's. They erect buildings of eight, ten, or twelve feet high. It has been asserted that the female will lay eighty thousand eggs in twenty-four hours! I will lend you a volume, in which you shall read a larger account of these formidable creatures.

But I wanted to ask you, Papa, about the migration of birds. This morning I saw a multitude of martins and swallows sitting on the thatch of our large

barn ; and, after chattering some time, they fled round, and round, and round, and then they settled again ; and they did so for some time, till I was obliged to leave them. It was a very pretty sight.

It is, Edward, as you say, a very pretty spectacle ; but there are few subjects which have more difficulties. I confess I know not how fully to explain it. Have you met with anything on the subject in your reading, Edward ?

Only a poem in a little volume I have in my pocket, by Mrs. Hemans.

Read it by all means. There is a delicacy in the expression, and an animation in the very structure of Mrs. Heman's poetry which greatly pleases me.

Here it is, Papa :—

“ Birds, joyous birds of the wandering wing,
Whence is it ye come with the flowers of spring ?
We come from the shores of the green old Nile,
From the land where the roses of Sharon smile,
From the palms that wave through the Indian sky,
From the myrrh trees of glowing Araby.

“ We have crept o’er cities in song renown’d ;
Silent they lie, with the deserts round !
We have crossed proud rivers, whose tide hath roll’d
All dark with the warrior’s blood of old ;
And each worn wing hath regain’d its home
Under the peasant’s roof-tree, or monarch’s dome.

“ And what have ye found in the monarch’s dome,
Since last ye traversed the blue sea’s foam ?
We have found a change, we have found a pall,
And a gloom o’ershadowing the banquet’s hall ;
And a mark on the floor, as of life-drops spilt,
Nought looks the same, save the nest we built !

“ Oh joyous birds, it hath still been so,
Thro’ the halls of kings doth the tempest go !
But the huts of the hamlet lie still and deep ;
And the hills o’er their quiet a vigil keep.
Say, what have ye found in the peasant’s cot ;
Since last ye parted from that sweet spot ?

“ A change we have found there, and many a change !
Faces, and footsteps, and all things strange !
Gone are the heads of the silvery hair ;
And the young that were, have a brow of care ;
And the place is hush’d where the children play’d ;
Nought looks the same, but the nest we made !

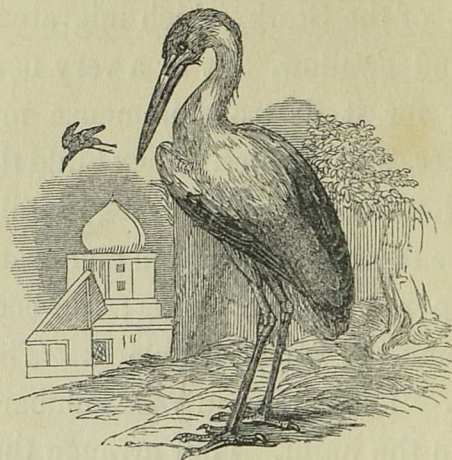
“ Sad is your tale of the beautiful earth,
Birds that o’ersweep it in power and mirth !
Yet, thro’ the wastes of the trackless air,
Ye have a guide, and shall *we* despair ?
Ye over desert and deep have passed,
So shall *we* reach our bright home at last !”

Thank you, Edward; the last verse contains a most encouraging sentiment. But it has been questioned, and with some plausibility, whether birds do really migrate? I think it is certain that many of them do; or we should be sure to see them in winter; but I do not think so many leave our shores, as some naturalists imagine. As they lose their song, they are not so readily noticed, perhaps, as in the spring, when they make the woodlands resound with their melody. It seems certain that almost all our water-fowl breed in the woods and mountains of Lapland and Sweden; and when winter reigns in severity in the north, they disperse themselves over the whole of Europe. Linnæus speaks of myriads of water-fowl which migrated with him out of Lapland; he tells us

they were so numerous, that they covered the whole of the river Calix, for eight days and nights.

I lately read, in Macgill's travels in Turkey, a pleasing account of the Stork, which migrates, as well as the martin and swallow. It is a very useful bird in the country, for it destroys immense multitudes of locusts, snakes, and reptiles. They build their nests in the roofs of houses, or in high trees in villages, where they are quite tame, and free from molestation. Its legs and beak are red, and very long; the body and neck pure white, and the wings jet black. They annually visit Turkey. They arrive in vast numbers in March, and always in the night. They arrange their progress very systematically; a few make their appearance before the grand army, and then return to give their report; after which the whole body advances, during the night, leaving some of their number to garrison the towns and villages in their course. Early in October, they take their departure in the same manner, so that no one can tell from whence they come, or whither they go. They are known to depart in the night from

all the villages, and have been seen in the air like immense clouds. They do not leave any behind, but



such as through infirmity are unable to fly. Hundreds of thousands thus annually return and depart.

This is wonderful; do any persons doubt of the migration of the martins and swallows, Papa?

It has been questioned; some have supposed that they do not migrate, but take refuge in caverns, or sink to the bottom of rivers, and there pass the winter in a torpid state.

At the bottom of rivers, Papa!

So it has been supposed: but I am not of this opinion. I think that swallows, and birds that are swift of wing, do actually quit our country for the wintry season. It is evident, that the birds which stay with us through the cold season of the year, are but few; it is not so easy to state, and prove what becomes of those which are absent.

Is there any other reason why they migrate, than the coldness of our winters?

Perhaps the want of food; and there may be several others with which we are unacquainted. Mr. White affirms, that when he was travelling early in the morning, near the coast of the British Channel, he saw a flock of swallows take their departure. At the beginning of his journey he was environed with a thick fog; but on a large wild heath the mist began to disperse, and discovered to him numberless swallows, clustered on the bushes, as if they had roosted there. As soon as the sun shone clearly, they were instantly on the wing, and with a placid flight they proceeded towards the sea.

Have any persons ever seen them at sea, Papa?

Sir Charles Wager says, "Returning from a voyage in the spring of the year, as I came into soundings in our Channel, a great flock of swallows came and settled on all my rigging; every rope was covered, they hung on one another like a swarm of bees; the decks and carving were filled with them. They seemed almost famished and spent, and were only feathers and bones; but being recruited with a night's rest, they took their flight in the morning." Testimonies of this kind are far less numerous than might be reasonably supposed on the hypothesis of their migration. On the whole, I think, from the evidence we possess, it appears probable, that the far greater part of the swallow species migrate; although a few may stay behind, and be found occasionally in hollow trees and caverns.

But how is it, Papa, that they come just as the flies appear? And how is it that they go away, just as the flies become less plentiful! How do they manage to agree to go together? How do they find their way

through the dark night? How do they know the road to the countries they want to go to?

Really, Edward, your *hows* are so many, and so difficult, that I know not how to reply to them; and some of them, I fear, cannot be answered. If we inquire, how it is that “the stork in the heavens knoweth her appointed times, and the turtle, and the crane, and the swallow, observe the time of their coming?” the question, perhaps, does not admit of a full and satisfactory answer; but must be regarded as a display of the wise, wonderful, and kind arrangements of Divine Providence.

The swallows I saw this morning, as they are evidently going away, seem to know, that their food will be very scarce here, and the cold so great, that they will not be able to endure it.

True; and

“ Thus taught, they meditate a speedy flight ;
For this, ev'n now they prune their vig'rous wing ;
For this, consult, advise, prepare, excite ;
And prove their strength in many an airy ring .

And does no pow'r its friendly aid dispense,
Nor give us tidings of some happier clime ?
Find we no guide in gracious Providence,
Beyond the stroke of death, the verge of time ?

Yes, yes, the sacred oracles we hear,
That point the path to realms of endless day ;
That bid our hearts, nor death, nor anguish fear ;
This, future transport ; that, to life the way.

Then let us timely for our flight prepare,
And form the soul for her divine abode ;
Obey the call, and trust our leader's care,
To bring us safe to see our Father, God.

Let no fond love for earth exact a sigh ;
No doubts divert our steady steps aside ;
Nor let us long to live, nor dread to die ;
Heaven is our hope, and Providence our guide !”

WALK XVI.

CONTENTS.

ANTS—DIFFERENCE BETWEEN ANTS AND BEES—THE APHIS—KING-FISHER—LION-ANT—SQUIRREL—FALLING LEAVES—SIR W. SCOTT'S LINES ON AUTUMN—ALL OBJECTS, IN EVERY SEASON, REMIND THE THOUGHTFUL INDIVIDUAL OF GOD.

HAVE you anything more to say, Papa, about ants?

“Anything more,” Edward; what a question, when, as I have often reminded you, any one branch of natural history, pursued in all its bearings, would fill a volume; and one of no mean size. I think I did not tell you, that this little creature has a tongue in the shape of a spoon, by which it laps up fluids with the greatest ease.

I thought, from your account, that they very much resembled bees.

They do, as to their being males, females, and neuters, or labourers in one family or community. In

both societies, the working class build the city, defend it, gather provision, and nourish and train up the rising generation. But the bees very much differ from ants in many important particulars.

I think you said there were many queens among the ants; and if there are but two in a hive of bees, one will be soon killed, or driven out. That is a great difference.

It is, Edward. Another is in the great diversity of their building, or style of architecture. Bees in Germany, England, or America, construct the same kind of waxen cells. This is not the case with ants; some employ merely earth as their materials; some collect leaves, bits of straw, or finely-pulverized portions of decayed wood. The solid substance of trees is excavated by another species into numerous apartments, having regular communications. The brown ant forms its nest of parallel or concentric stories, each four or five lines in height. The partitions are half a line in thickness, and built of such fine materials, that the interior is quite smooth. The ceilings are

supported by small pillars, slender walls, or arches. They construct halls, in which many passages terminate, like the streets and avenues to a market-place. The whole nest often contains twenty of these stories above the level of the ground, and at least as many below it. The surface of the nest is protected by a wall of greater thickness. As this species of ant is incommoded by much heat, it does not venture abroad till the dew or rain has refreshed the earth. When a shower falls, they immediately resume their building labours. Some, who seem to be miners, remove the earth below; whilst others, who are masons, take it to form an additional story to their dwelling. They raise a story in seven or eight hours. If the rain ceases, and a drying gale blows, they destroy the cells they had begun, but could not cover in, and distribute the materials over the upper story.

I thought, Papa, that an ant's nest was formed with very little art, but it seems quite the contrary.

Truly so; Mr. Huber observed, as he was watching the operations of these little creatures, that two op-

posite walls were made of such different elevations, that the ceiling of the one would not have reached half way the height of the other. But an experienced ant observing the defect, destroyed the lower ceiling, built the walls to a proper height, and with the extra materials formed a new ceiling.

This was very remarkable.

When the male and female ants quit the nest, the neuters lie in wait for the females, who are full of eggs, and, depriving them of their wings, they drag them to the nest, that their progeny may be secure. Those females which escape the voracity of the birds, find a suitable place for a new society; and, as they have no longer any occasion for wings, they deprive themselves of them; and without labourers, they perform all the duties of a parent; though when in a community, they actually do but little, if they are not altogether idle. What a singular accommodation is this to circumstances.

This is very unlike the bees, Papa.

It is. The ant gains much of its provision, as I

have told you, from the little insect called the Aphis. Huber says, that the honey-dew, yielded by the Aphides, is given very freely. The ant, not unfrequently, asks for it by striking the insect gently and repeatedly with its antennæ, just in the way in which it caresses its young. One aphis will supply many ants; and is evidently not displeased to do so, as it could fly away if it chose. It appears also, that this surprising insect becomes torpid at precisely the same temperature as the ant; which is a most singular coincidence. Some ants bring the aphides to their own nests, lodging them near the plants on which they feed; and guarding and defending them with as much care as they do their young. They take charge of the eggs of the insect, duly moisten them till they are hatched; and, if disturbed, they hasten to deposit them in a place of safety. They even go farther than this; it is affirmed, that they construct buildings, which they fortify, as colonies for this insect; where they are confined, as cows on a dairy farm, to supply the wants of a neighbouring city.

I cannot think how it is that they let one another know when any danger is approaching them; for it is evident that they all soon know it.

They place centinels, night and day, in suitable positions. As they do not give utterance to any sounds, they must communicate with each other by touch. Huber thinks, they do this chiefly by their antennæ; hence he calls their language *Antennal*.

How surprising it is that they should all try to help one another?

Their social qualities are very wonderful. Latreille, as he was making experiments, cut the antennæ from some ants; he soon observed that their companions perceived and shared their distress, and poured a transparent liquor from their own mouths to anoint and heal the wounds of the sufferers. Huber separated a nest for four months, and then allowed them again to have intercourse; when they evidently recognized and caressed each other; and took up their residence, as before, in one community.

One can hardly help loving the ants, Papa.

On this review of its history, it certainly appears a more respectable insect than is generally imagined. But it would be wrong to insinuate, that there is nothing exceptionable among them. One nation will often attack another with inconceivable fury and desperation. When an ant has fastened on its adversary, it will suffer its limbs to be torn one by one from its body, rather than let go its hold. They not unfrequently carry in their mouths, as trophies of their victories, the mangled pieces of those they have conquered. These conflicts take place chiefly in the forests inhabited by the fallow ants. They will attack a neighbouring nest, and when they succeed, they will carry off all the eggs, and the larvæ, or young ones, to their own settlements.

Indeed they are more savage than I had imagined. But how could Huber know all you have mentioned? When I have looked at an ant's nest, the little creatures have been all alarmed, and have run away so quickly, that in a little while not one of them was to be seen.

By placing wooden boxes with glass windows, in which he had introduced a nest of ants, on a table in his study, he had all the opportunities he could desire to notice their labours.

It is surprising they did not all leave their nest, and run away.

No doubt but that they would have done so, if they had been able; but they were prisoners, as each foot of the table was placed in a bucket of water. Habit, and the daily experience that no evil was intended to them, gradually reconciled the ants to the visits of their observer. But did you see that beautiful bird which fled from the bank of the river just now?

I did, but I did not like to disturb you in your remarks. Was it not the King-fisher? I never saw one alone before. It is a most beautiful creature.

Truly so. It is the *Alcedo Ispida*, or common King-fisher. It is of the order *Picæ*; and has a long, thick, triangular bill, with a fleshy, plain, short, flat tongue. These are the distinctions of the order.

It is not so large a bird as I supposed.

It is not much larger than a swallow. Its bill is two inches from the base to the tip; the upper part is black, and the lower yellow. "The crown of the head, and the coverts of the wings, are of a deep blackish green, spotted with bright azure; the back and tail are of a most resplendent blue; the whole under-side of the body is orange coloured; a broad mark of the same passes from the bill beyond the eyes; beyond which is a large white spot; the tail consists of twelve feathers of a deep rich blue; the feet are of a reddish yellow; and the three joints of the outmost toe adhere to the middle toe; while the inner toe adheres only by one."

Does it not live on fish, Papa?

It does; it is very rapacious, and catches a great many. It does this in the manner of the osprey, balancing itself above the stream for sometime, when it is seen to great advantage, and looks remarkably beautiful; then having fixed his eyes on his prey, he darts on it, swift as an arrow, and seizes it with unerring certainty. The beak of this bird is a for-

midable instrument; with it he excavates the bank or cliff to the depth of two or three feet, where he makes his nest. The eggs, which are from five to nine, are of a fine transparent whiteness. It is remarkable that the male bird, which used to twitter a good deal previously to the sitting of the hen, is then very silent, and visits the nest as quietly as possible.

That is very cunning; no doubt he does so, that no one may find his nest.

Perhaps so. When he darts at a fish, he seizes it cross-wise in his bill; and, retiring to a bough, or to his nest, he devours his prey, generally, bones and all; he afterwards throws up the parts which will not readily digest, in pellets. Though a short-winged bird, it flies with great swiftness and strength. There are many strange things said of this bird by classical writers, such as, that it builds its nest on the rolling waves, and calms the tempest, which are entirely fabulous. Its flesh is so strongly offensive, that no one can eat it.

It does not migrate, I think, Papa.

No; it stays with us all the year; though some of them perish, like other birds, by the cold. They are found in almost every part of the globe. There are a great number of species. But I was going to tell you, when the king-fisher fled from the bank, of a remarkable insect called the Lion-ant, or Myrmeleon Formicarius.

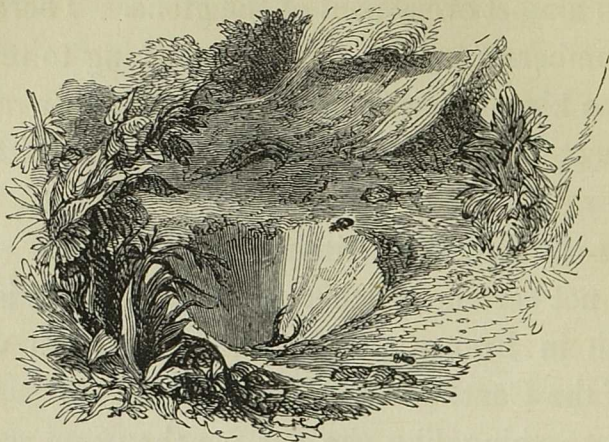
Is it to be found in Britain?

I am not certain whether it is or not. It is to be met with in France and Switzerland, and in various parts of the Continent.

Is it anything like the ant, as the name seems to intimate?

It is not; it has its name from its living on ants, which are its constant prey. A friend of mine tells us, that they abound in some parts of the East Indies. "It forms in the ground," he says, "a sort of funnel, about an inch in diameter at the top, and sloping to three quarters of an inch at the bottom. In this den, under a cover of loose sand, or light dust, it lies in ambush, with the top of its head scarcely

perceptible above the level, waiting till an ant, or a small insect of any kind, happens to trespass upon its



preserve, when, in an instant, it involves the stranger in such a cloud of dust and sand, which it throws up, that, bewildered and confounded, it becomes an easy capture. The ruffian then seizes, kills, and drags it away into his hole, or devours it upon the very spot. This insect of prey, fitly called the lion-ant, is about three quarters of an inch in length; the body is oval, like that of the tick, of a dirty brown colour; the back is raised, and marked with eight ringlets, and two

lines of black dots running round it. The neck is long; the eyes are protuberant; and the forceps meet in very sharp points. These, as well as the neck, are exceedingly strong, to hold and hurry off its victims, backwards or forwards, according to its convenience."

It seems, Papa, to be very much like the spider in its habits.

It does. Seen through a good microscope, it resembles the hedge-hog, or porcupine. It has six legs and two singular horns, which are about the sixth part of an inch long, hard, hollow, and hooked at the end like the claws of a cat. At the origin of these horns, it has a clear black and bright eye. It has no mouth, but evidently receives nourishment through the medium of its horns. If these are cut off they grow again.

Does the ant-lion undergo any transformations?

Yes; after a time it spins itself a rough case, in which it includes many grains of sand, cemented by a glutinous humour, which it emits from its body. This

outer covering is lined by a web of exceedingly fine silk, of a beautiful pearl colour, which the insect spins, and wraps around its body. In this new habitation, it throws off its outer skin, its horns, and its eyes, and becomes an oblong nymph, showing the form of the fly into which it is about to be transformed. At length, in the form of a dragon fly, through an opening in the back of its dwelling, it becomes an inhabitant of the airy regions.

How surprising is its history. But see, Papa, that pretty squirrel which has just leaped over the pales of the park; there, he has run up that tall fir; how nimble he is! Do give me an account of him.

He is one of the most sprightly and beautiful animals to be met with in our country. It is the *sciurus vulgaris*, or the common squirrel. It belongs to the order of glires. The characteristics of the order are, two fore teeth in each jaw; those above shaped like wedges, and the lower ones compressed. There are eleven species. The eyes are very large for its size, and peculiarly animated.

And what a pretty tail it has, Papa! How would you describe its colour?

I should say it is of a bright brown, inclining to red. In Russia many black squirrels are met with; and in some parts of England the brush tail is of a beautiful white.



Do you recollect, Papa, we found last spring, in a copse, a squirrel's nest, made of moss, and dried leaves?

Yes, it had two entrances to it; it is said, that it closes the one at which the wind enters, that its young may be kept warm. It lays up a store of nuts and provision for the winter.

Do they do any mischief, Papa?

I think not, of any moment. But the grey squirrels, in North America, from their immense numbers, will destroy whole plantations, and fields of corn; so that, some years since, the magistrates in Pennsylvania, offered threepence per head for all that could be destroyed; and in one year, for these rewards, they had to pay as much as eight thousand pounds. The squirrels in our woods, I think, are rather of some service to the owner of the domain than otherwise.

Of service, Papa; in what way?

A gentleman going through the woodlands belonging to the Duke of Argyle, observed a squirrel very busy on the ground, and, watching his motions, he saw him deposit an acorn in the earth, and cover it up. He then, as rapidly as the little creature you

saw just now, ran up the oak which was near him, and brought down another, which it buried in like manner. This he continued to do till he was disturbed. These, no doubt, were laid up for the coming winter. Thus, it is not improbable that the squirrel plants many a beech, and many an oak.

But if he lays seeds up till he wants them, and then devours them, how is this doing good, Papa?

Why, Edward, it is not to be supposed that he finds again the whole of the treasure which he secretes. Many, it is certain, must remain in the earth, and grow to maturity. So, then, as an oak and beech planter, the squirrel does good to the country which he inhabits.

It is a beautiful creature; I should much like one. But how the gale brings down the leaves, Papa; the path is full of them.

Yes, everything around us marks the approach of winter;—

* * * “For now the leaf
Incessant rushes from the mournful grove ;
Oft startling such as, studious, walk below ;
And slowly circles through the waving air.”

Yet the season to me is pleasing ; I think it seems very naturally to awaken the reflecting mind to profitable thought. I am delighted in spring with the innumerable shades of green by which the foliage is distinguished ; and, really, I think that I am but in a small degree less gratified with the diversity of shades of brown, and red, and other colours, which now everywhere meet the eye.

Do not the leaves fall because the cold nights make the sap retire from them to the roots of the plants and trees, and so they are deprived of their usual nourishment ?

This is certainly a principal reason ; but trees in our green and hot-houses, which are carefully cherished, lose their foliage. It is the appointment of the Creator that everything should decay, and die in its season. The fall of the leaf may well remind us of

our own mortality, and of the frailty of all beneath the skies. These little monitors to every thoughtful mind do indeed say, in the language of Bishop Horne,

“ On the tree of life eternal,
Man, let all thy hopes be staid ;
Which alone, for ever vernal,
Bears a leaf that shall not fade.”

Are not the leaves of plants and trees for mere ornament, Papa ?

They certainly form a large part of their beauty ; but they are not for show only. Plants and trees breathe and perspire through their leaves ; and they receive much of their nourishment from the dews, the rains, and the atmosphere, through the same medium. Hence, you recollect how the young mulberry tree, in the next garden to our's, died the last year, because the greater part of its leaves were gathered for the silk-worms.

Would every tree, then, die if it were stripped of its leaves ?

No doubt many would, especially if this were done

in the season of spring ; but I am not sure that this would be the case with all. Many, I think, would sprout again. But leaves are very useful, as affording a very grateful shade, both to men and cattle, amidst the sultry heat of summer ; and they also make a most excellent manure.

Sir Walter Scott has written some fine lines about the departure of Autumn. I have them here in my scrap-book ; shall I read them ?

Do, Edward.

“ Autumn departs ; from Gala’s fields no more
Come rural sounds our kindred banks to cheer ;
Blent with the stream, and gale that wafts it o’er,
No more the distant reaper’s mirth we hear.
The last blithe shout hath died upon our ear,
And harvest-home hath hushed the clanging main ;
On the waste hill no forms of life appear,
Save where, sad laggard of th’ autumnal train,
Some age-struck wanderer gleans few ears of scatter’d grain.

Deem’st thou these sadden’d scenes have pleasure still,
Lov’st thou thro’ autumn’s fading realms to stray,
To see the heath-flower withered on the hill,
To listen to the wood’s expiring lay,

To note the red leaf shivering on the spray,
To mark the last bright tints the mountain stain,
On the waste field to trace the gleaner's way,
And moralize on mortal joy and pain ?
O, if such scenes thou lov'st, scorn not the minstrel strain.

No, do not scorn, altho' its hoarser note
Scarce with the cushat's homely song can vie ;
Tho' faint its beauties as the tints remote
That gleam thro' mist on autumn's evening sky,
And few as leaves that tremble, sear and dry,
When wild November hath his bugle wound ;
Nor mock my toil ; a lonely gleaner I,
Thro' fields time-wasted, on sad inquest bound,
Where happier bards of yore have richer harvest found !”

How do all things, through every season, remind us of God, and show forth his praise. The hills and the mountains crowned with forests ; the vales and the meadows, rich in sweet pasture, in which the flocks and the cattle exult as in a paradise ; the heavens, with the sun and moon, and stars without number ; the flowers, with their delicious fragrance, and beautiful and endless hues ; the lovely fields, with their gently-waving and golden crop, the hope and the stay

of man; the birds, which fill creation with their untiring melody; the plants, and shrubs, and majestic trees, which everywhere so richly adorn the landscape; and the innumerable tribes of beings which live in the air, on the earth, in the rivers, and in the mighty waters; all, all, thou adorable First Cause and Sustainer of all beings, and of all worlds, proclaim thy praise, and display thy infinite perfections. "These wait all upon thee, that thou mayest give them their meat in due season; that thou givest them, they gather; thou openest thine hand, they are filled with good. The glory of the Lord shall endure for ever; the Lord shall rejoice in his works; I will sing unto the Lord as long as I live, I will sing praises to my God whilst I have my being:"

" To Him whose temple is all space,
Whose altar, earth, sea, skies;
One chorus let all beings raise,
All nature's incense rise!"

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WINTER.  
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WINTER.

WALK XVII.

CONTENTS.

USEFULNESS—THE ATMOSPHERE—THE OCEAN—EVAPORATION—SALT-
NESS OF THE SEA—THE TIDES—THE WHALE—THE NAUTILUS—GOD
TO BE ADORED AND PRAISED AS THE FORMER OF ALL THINGS.

I HAVE been thinking, Papa, of the questions which the gentleman who dined with us yesterday said he often asked himself; they were, What good have I done in the world? What good am I doing? and, What good do I purpose to do?

They are very important questions.

But what did he mean when he said, that he feared he had done but very little good; since you said, after he was gone, that he gave money to everything that

was worthy of encouragement, and that he always had in hand some benevolent project.

No doubt he thought he had not done so much good as he might, and ought to have done. Even the most useful persons feel, when they calmly review their lives, that they have lost much precious time, and have not availed themselves of many opportunities of usefulness.

I wish I knew how to be useful, Papa.

You are laying up knowledge daily, by which I hope, Edward, you will be fitted for a long life of usefulness; for this is the great end for which we should live. A man might as well have been formed a stock, or a stone, if he be really of no service to his fellow-creatures. No one ought to be idle; all have talents entrusted to their care—one or two, at least; if not seven, or eight, or ten. Capacities and opportunities of usefulness must be accounted for;—

* * * * * “human life
Is but a loan, to be repaid with use,
When he shall call his debtors to account,
From whom are all our blessings.”

Ministers of religion, and persons who fill important offices, or who possess great abilities, may be useful.

People who have but very moderate talents may be useful. There are many such who are so. Not a few who have had great talents, without just principles, so far from doing the more good, have only been much more mischievous. But if we are not called to those active public services which some are, there are duties incumbent on us in the family, in the circle of our relatives and friends, and which we owe to ourselves, by which we may be very useful. Our duty may begin, but it does not end, at home. We all expect great benefits from our fellow-creatures; it is but just that we should repay, so far as we are able, the obligations which we have received. Very few, comparatively, have ability to do what is great and splendid for the welfare of society; but all, even the humblest individual, may be of some service. The very desire of usefulness, if it be sincere and ardent, as it ought to be, will create opportunities of doing good; these will readily be found by all who really seek for

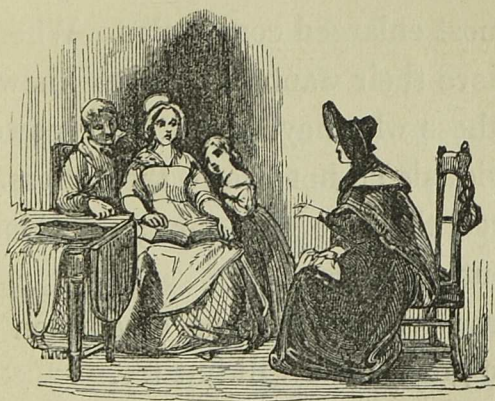
them. If we are not useful, then, it must be because we do not really wish to be so; and, surely, such a person must not only be very criminal, but also very miserable.

Besides the common duties of our station—

* * * * “and to know
That which before us lies in daily life,
Is the prime wisdom”—

in the discharge of which we should be exemplary and diligent; every one should have some little scheme of benevolence, by which he may be of use to his fellow-creatures. These need not be costly, nor does it require a fertile imagination to discover them. You know, Edward, an excellent young female, who, among other little plans of doing good, sends around through the village and neighbourhood in which she resides, half a dozen entertaining volumes on important and useful subjects. She takes some pains—and nothing valuable is attained without labour—to keep these in constant circulation. She is accustomed to call in the

evening at the cottages, when the whole family is at home, or on the Sabbath-day, to converse with them on the subjects contained in these good books, and on others, connected with their welfare. In this way she has been exceedingly useful.



I know not a few of the young, who have minds well-informed, and who are sincerely concerned to do good; and though they have but little leisure on the week days, yet they delight to employ some of the hours of the Lord's-day in teaching the children of the poor around them to read and to understand the Holy

Scriptures, which we know, from infallible authority, are able to make even "a child wise unto salvation."

There is your uncle Alfred; he takes pleasure in visiting the afflicted. He endeavours to ascertain their true character, and to give them suitable instruction. He is often the means of administering to them the most enlarged consolation. Where he is unable to relieve their wants, he makes known their distresses to those who have it in their power to do so. Such individuals do not live to themselves. In some small degree, they are like our great Exemplar, who "went about doing good."

Why, Papa, you seem to be of opinion that every one may do good, if he will but try.

I think so, by the blessing of God. Each, I am sure, ought to inquire, Cannot I do something by which I may benefit my fellow-creatures? May I not save something eventually, by economy and self-denial, for benevolent purposes? Is there no individual among my acquaintance whom I may kindly admonish and instruct? Are there are no poor children whom I

may train up for God, and for happiness, both here and hereafter? Have I no books that I could lend, to do good to mankind? Cannot I visit, at least some afflicted individual, and in some way alleviate his sorrows? Are there no fatherless little ones whom I might assist? Have I no cast-off garments, which are in danger of being moth-eaten, and which, in this wintry season, should be given to the destitute? And have I no talents by which, in private, or in public, I might do good to those who are around me?

And we should not be satisfied with merely asking such questions; let conscience answer them. Life is rapidly passing away. Our days on earth will soon be all gone, never to return. The hour is lost in which nothing is done serviceable to ourselves, or our fellow-creatures. Pray God, Edward, to make you useful. But let us find some object in our walk, about which we may converse. What shall it be?

You said you would tell me about the atmosphere, Papa.

A large and an interesting subject, Edward; I

know not that you could have named a better. The word is derived from two Greek terms, which mean, a sphere of vapour. It includes the vast body of air which encompasses the globe. There is reason to believe that it extends all around our planet, as far as forty or fifty miles. Its temperature varies in proportion to its distance from the earth. It has been computed, that, at forty miles above the level of the sea, it would be more than three hundred degrees below the freezing point of Fahrenheit.

Is not the air we breathe composed of different kinds of gas?

It is a compound of oxygen and nitrogen, with a small quantity of carbonic acid, and water in a state of vapour.

I thought I had read, that it was composed of oxygen and nitrogen alone.

These, certainly, are the constituent parts of the atmosphere, or air; yet the others are often found mingled with it.

Can you tell me the proportion in which these gases are mingled?

Eighteen grains of common air contain four grains of oxygen, and fourteen of nitrogen. These proportions are the same, so far as we know, throughout the atmosphere.

Is not air a greatly elastic fluid?

Certainly. Do you not recollect how I continued to increase the heat to a little air in a bladder, till, at last, it expanded so much that it burst?

Yes, I recollect it very well.

Air is evidently a fluid, as you very properly say, Edward, greatly elastic. It differs in density, in proportion to the external pressure. Hence a cubic foot, a thousand feet above the surface of the earth, weighs less, and does not contain so much air, as a cubic foot on the face of it.

Did you not say that every one had to sustain a great burden, on account of the weight of the atmosphere?

It has been computed that there is a pressure of

about fifteen pounds on every square inch of the human frame.

Then, as there are one hundred and forty-four inches in a square foot, there would be 2,160 pounds weight on every square foot.

There would ; and, supposing there are fifteen square feet on the surface of the human frame, this weight would be equivalent to 32,400 pounds, or sixteen tons.

Why, Papa, this would utterly crush the strongest man.

True, if the Divine wisdom had not counterbalanced it, by distributing air through the whole body; and thus it becomes no burden.

How wonderful. What a pressure there must be on the face of the earth, from the weight of the atmosphere; and this pressure, perhaps, keeps it from being broken into pieces.

It has been calculated, that the weight of the atmosphere on the earth is equal to that of a globe of lead, sixty miles in diameter. Now I have told you the

difficult parts of the subject, I think, Edward, you can easily give me an account of the uses of the atmosphere.

Why, Papa, we should all die if we had not air to breathe.

Certainly we should; a man might live a long while without light, but he would live a very short period without air.

The birds and insects must all creep and walk upon the ground without air. The air fills the sails of the mill, which grinds the corn; it bears the ships from one country to another; and, I suppose, neither plants, trees, or animals of any kind, could live without it. Is it of any other use?

Yes, indeed; there could be no rain, if the atmosphere did not gather, and bear those lakes of water which we often see pendent over our heads. There could be no sound,—

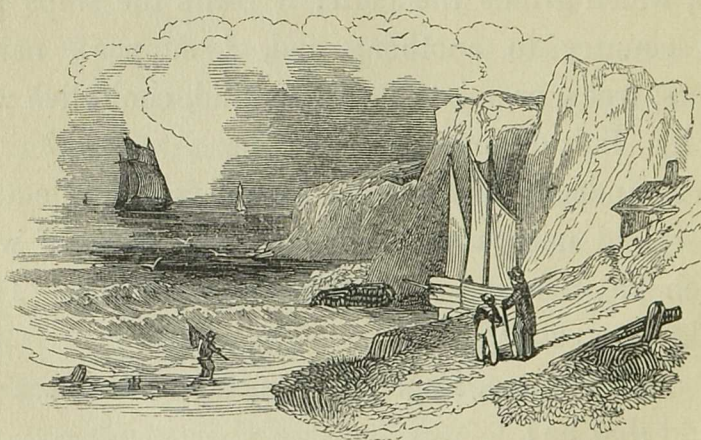
And, of course, Papa, no music; and what a loss would that be!

And if no sound, of course, no conversation; and

this would be a far greater loss than that of music. Nor would there be any light, colours, or fragrance, without air. It is, indeed, an essential part of the system of the creation.

And how one thing, Papa, depends on another.

Yes, the whole creation is finely and wonderfully connected together by its infinitely wise Creator; it is an immense and a beautiful chain, not a link of which can be spared without injury to some part of the mighty whole.



But our walk has brought us to the beach, and to

the margin of the immeasurable ocean. Let us rest on this seat, and think and talk of it.

We might spend a week here, Papa, and not say all which the very sight of the sea suggests.

True, Edward; these vast waters seem to present to us volumes of thought. To me, the subject, in all its bearings, is often overwhelming. Who can help exclaiming,

“ Beautiful, sublime, and glorious,
Mild, majestic, foaming, free ;
Over time itself victorious,
Image of eternity.

Whether morning's splendours steep thee
With the rainbow's glowing grace ;
Tempests rouse, or navies sweep thee,
'Tis but for a moment's space.

Earth, her vallies, and her mountains,
Mortal man's behest obey ;
Thy unfathomable fountains
Scoff his search, and scorn his sway.

Such art thou, stupendous ocean ;
 But, if overwhelm'd by thee,
 Can we think, without emotion,
 What must thy Creator be ? ” *

Milton has the same thought as is expressed in the last verse ; it is one that is very natural and sublime. Speaking of the glorious works of the Most High, he exclaims,

“ Thyself—how wond’rous then ! ”

Is the surface of the sea greater than that of the land?

Yes, it is as three to one.

Do you know the depth of the sea, Papa ?

It is difficult, and even impossible, in all cases, to ascertain this. It appears, that the greatest depth to which it has been sounded is a mile and sixty-six feet. No doubt but that its depth is irregular. We are sure that many parts are unfathomable.

How is it that the sea does not often overflow, since all the rivers run into it?

In some particular places it has overflowed its

* Bernard Barton.

banks ; and now and then it does so. It is true, that all the rivers pour their waters into it ; and the quantity, of course, must be immense. It has been computed, for example, that the river Po discharges into the ocean four million eight hundred thousand cubic perches of water in a day !

It is no wonder, then, that the sea should run over.

But stay, Edward ; you forget how much the sun raises, by evaporation, out of it every day. If the rivers pour their waters into the ocean, the sun is constantly taking an equal quantity of water out again, to replenish the springs and the rivers.

What, then, are rivers rising out of the ocean, as well as pouring into it, at the same time ?

Certainly.

Is not the sea-water heavier than fresh ?

Yes ; a cubic foot of river-water will weigh seventy pounds ; but the same quantity of sea-water will weigh seventy-three pounds.

How is it that the sea-water is so salt ?

It has been thought, that it arises from mountains

of salt among its waters. Your question, perhaps, cannot be fully answered; the ocean is more salt at the equator, than at the poles; this has been supposed, in some measure, to account for the immense quantities of ice in these quarters, as fresh water freezes much more readily than salt.

The Psalmist, Papa, calls the sea “the great and wide sea!”

He might well do so; for who can measure the vastness or extent of its waters? And yet it is said that the Almighty “holds them in the hollow of his hand!” And, at first, he said, “Let them be!” And they came at his call. “Let there be a firmament in the midst of the waters,” said he, “and let it divide the waters from the waters;” that is, those in the clouds from those on the earth,—“and God called the dry land earth, and the gathering together of the waters called he seas; and God saw that it was good.” But, Edward, cannot you readily mention some things which are very memorable relative to this world of waters?

It is wonderful to think how many creatures live in it!

Truly, its inhabitants are wonderful! The great Creator bade the waters "bring forth abundantly;" and they have obeyed his word; for the creatures in the ocean are innumerable. And who can describe their diversity of form and size, and the suitableness of their organs to the place of their abode! What a glorious display is here of the power, wisdom, and goodness of God! How inexhaustible is the provision which the Great Benefactor has laid up in this vast storehouse, for the welfare and nourishment of man!

And what a noble highway is the ocean for the ships to travel on!

It is,—by these means the productions and the treasures of one country are readily conveyed into another; so that our shops and our tables present us very commonly with articles and luxuries from almost every part of the habitable globe.

And how wonderful it is, that the waters do not overflow their bounds, and drown the world!

They would do so, were they not at every moment under the control of the adorable Creator. He has thrown a chain around them, which, though it be made of sand, is strong as adamant, to keep them every moment in their place. Indeed, he says, to the raging billows, "Hitherto shall ye come, but no farther! Here shall your proud waves be stayed! The great God sitteth king upon the floods!"

The tide is now flowing, Papa; you have not noticed the tide.

True; nor very many other things relative to the ocean.

Will you explain to me, how the waters rise and flow so regularly? St. Pierre says, that it arises from the melting of the polar ices. How did he know this?

How, indeed, Edward; he imagined it was so; he could not prove it. We are sure he was wrong in his judgment. "Were there even ten times more ice and snow floating on the northern sea than there is, and were it all to melt in one minute, there would be

no flowing of the waters, that is, no tide from it; for it would only fill up the space which it formerly occupied in the water. Of this any person may be convinced, who will put a handful of snow, squeezed hard, into a jar of water, noting its exact height. When the snow is melted, the water will be of the same height." When you have become a better scholar in mathematics, which I hope will be the case in a short time, I will help you through Sir Isaac Newton's calculations on the subject, which I will explain, and prove the truth of his theory in a way in which I cannot now do it. But I will make a few general remarks. The rise and fall of the waters is very variable, at the same place, and on the same day. At Plymouth, for instance, it is sometimes twenty-one feet between the greatest and least depth of the water in one day, and sometimes only twelve feet. Yet these tides succeed each other in a regular series, lessening from the greatest to the least; and then increasing from the least to the greatest. The highest point the water reaches, is called the spring tide; and

the least a neap tide. This series is accomplished in about fifteen days. The spring tides are between two or three days after the new or full moon; and the neap tides at a certain interval after the half moon. The tides, then, are evidently regulated by the attractions of the moon; and hence, as might reasonably be expected, they are the greatest when the moon is in her perigee, or nearest to our globe; and they are the lowest when she is in her apogee, or farthest from our earth.

Does not the sea flow and ebb twice every day?

It does; the decrease of the waters continues for six hours; then they begin to rise and increase for six hours. This flux and reflux of the waters is of the greatest service to commerce, as it brings the vessels easily into the harbour, and takes them out of it. And this perpetual motion of the waters, together with their saltness, preserves them from putrefaction.

What a wonderful creature is a fish, Papa! How unlike the animals on land.

It is; its scales furnish it with a most beautiful covering; and they are as suited to the element in which it lives, as feathers are to the birds which fly through the air!

Is not the fish's bladder a singular article?

Very much so; by it the fish becomes heavier or lighter as it pleases; and, of course, rises or sinks in the mighty waters.

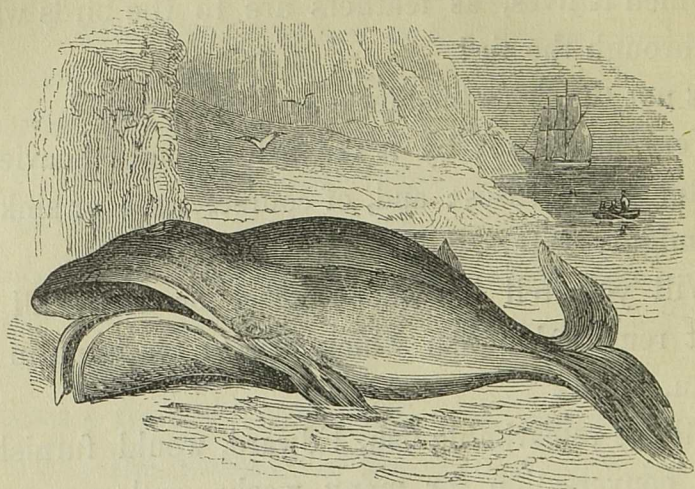
Will you tell me about some, or about all the most remarkable fish which are to be found in the ocean, Papa?

All the remarkable fish, Edward, would furnish us with conversation for many weeks, and even years. Cannot you think of one or two yourself?

The whale, Papa?

A very remarkable one, indeed; and the largest that lives, and sports in the mighty deep. They have been taken sixty, seventy, and even eighty feet long, and eighteen feet high, and have yielded one hundred and thirty barrels of oil. It is wonderful, also, that though they live in the cold, frozen, northern ocean,

yet their blood is warm. Twelve species have been described. The most remarkable and important

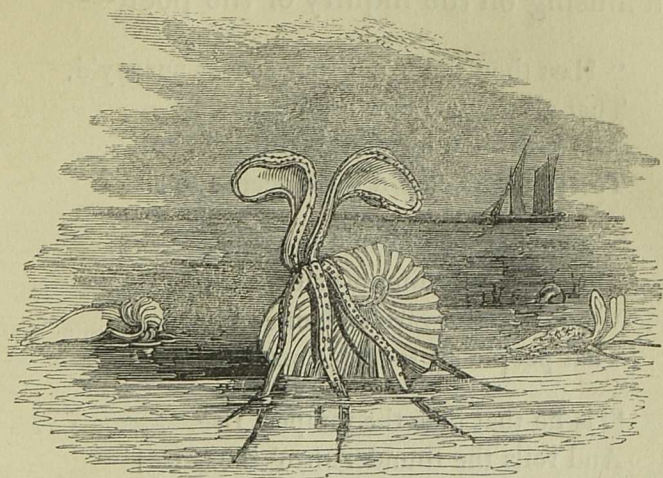


(from its producing the largest quantity of oil and whalebone) is the Greenland whale, called by naturalists, *Balena Mysticetus*.

Did you ever see a Nautilus? Is not that a remarkable fish?

It is; I have never seen one alive. It is a shell-fish, in the shape of a snail; but its shell is very beautiful, and its method of sailing wonderful. It is

very commonly at the bottom of the ocean ; but when it wants to come up to the surface, it moves forward



on its shell ; and, by doing so, it throws out the water, becomes lighter, and thus, of course, ascends ; then, by stretching out a thin membrane, it sails along very happily, using its legs as oars, and takes the air, till it chooses to descend ;—it does so, by retiring into its shell ; thus the little boat is filled with water, and naturally sinks on account of its weight. But we must return to our home ; yet not without grateful

and admiring thoughts of the great Being who is the Creator of the earth, and sea, and skies; not without solemn musing on the inquiry of the poet,—

“ Hast thou the wond’rous scenes survey’d,
That all around thee are display’d ?
And hast thou never rais’d thine eyes,
To Him who caus’d these scenes to rise ?

’Twas God who form’d the concave sky,
And all the shining orbs on high :
Who gave the various beings birth,
That people all the spacious earth.

’Tis he that bids the tempest rise,
And rolls the thunder thro’ the skies ;
His voice the elements obey ;
Thro’ all the earth extends his sway.

His goodness all his creatures share ;
But man is his peculiar care ;
Then, while they all proclaim his praise,
Let man his voice the loudest raise ! ”

WALK XVIII.

CONTENTS.

WEIGHT OF THE ATMOSPHERE—FOOT OF THE FLY—OF THE LIZARD—
OF THE SEAHORSE—COLD GALES—INSECTS AND REPTILES IN WIN-
TER—MOSES—HERRINGS—CODFISH—HADDOCK—LOBSTERS—LOB-
STERS JANSON SAW IN AMERICA.

As I was reading Lord Brougham's tract on Science yesterday, I met with a paragraph which much pleased me about the weight of the atmosphere, and which you had marked with your pencil.

Does it refer to the formation of the foot of the fly?

Yes.

I recollect it; it is a striking paragraph,—read it, Edward.

“The weight of the atmosphere is nearly fifteen

pounds on every square inch ; so that if we could entirely squeeze out the air from between our two hands, they would cling together with a force equal to the pressure of double this weight, because the air would press upon both hands ; and if we could contrive to exclude the air between one hand and the wall, the hand would stick fast to the wall, being pressed on it with the weight of above two hundred pounds ; that is, near fifteen pounds on every square inch of the hand. Now, by a late most curious discovery of Sir Edward Home, the distinguished anatomist, it is found that this is the very process by which flies, and other insects of a similar description, are enabled to walk up perpendicular surfaces, however smooth, as the sides of walls, and panes of glass, and on the ceiling of a room, with their bodies downwards, and their feet overhead. Their feet, when examined by a microscope, are found to have flat skins, or flaps, like the feet of web-footed animals, as ducks and geese ; and they have towards the back part or heel, but inside the skin or flap, two very small toes, so connected

with the flap as to draw it close down upon the glass or wall the fly walks on, and to squeeze out the air completely, so that there is a vacuum made between the foot, and the glass or wall. The consequence of this is, that the air presses the foot on the wall with a very considerable force compared to the weight of the fly; for if its feet are to its body in the same proportion as ours are to our bodies, since we could support by a single hand on the ceiling of the room,—provided it made a vacuum,—more than our whole weight, namely, a weight of fifteen stone, the fly can easily move on four feet in the same manner by help of the vacuum made under its feet.

“It has likewise been found, that some of the larger sea animals are by the same construction, only upon a greater scale, enabled to climb the perpendicular and smooth surfaces of the ice hills among which they live.

“Some kinds of lizards have the same power of climbing, and of creeping with their bodies downwards along the ceiling of a room; and the means by which they are enabled to do so are the same. In the large

feet of these animals, the contrivance is easily observed, of the two toes, or tightners, by which the skin of the foot is pinned down, and the air excluded in the act of walking or climbing; but it is the very same, only upon a larger scale, with the mechanism of a fly's or a butterfly's foot; and both operations, the climbing of the sea-horse on the ice, and the creeping of the fly on the window or the ceiling, are performed exactly by the same power, the weight of the atmosphere; which causes the quicksilver to stand in the weather glass, the wind to whistle through a key-hole, and the piston to descend in a steam-engine."

Your paragraph from Lord Brougham, Edward, is indeed a very pleasing illustration of our former conversation on the atmosphere. But let us walk a little faster; it is a chilling gale.

How is it, that it is so cold, Papa?

I thought you knew how to account for the cold, Edward. I have certainly told you, repeatedly, when explaining the wonderful way in which the seasons are produced.

It arises from the position in which the earth is placed in reference to the sun, does it not?

Certainly; the northern hemisphere is turned away from his direct influence; his beams are thrown aslant over it; and he is but a short time above our horizon. These circumstances evidently produce the cold of our climate. Though the subject, perhaps, like most others, does not admit of an entire explanation. Some winters are more cold than others; and some places, in nearly the same latitude and longitude, differ considerably in their temperature.

Winter does not come upon us all at once, Papa.

True; it is a kind appointment of Providence, that the cold should be gradual in its increase. If the extreme cold were to come on us suddenly, it would be a great shock to the human frame; and would, no doubt, overwhelm not a few of our race. And not only would it be inconvenient to man, but also to the different tribes of birds and beasts. The fine down of their plumage thickens, and the short, warm hair on the skin, increases, by degrees, to fit them to bear the

chilling blasts of winter. So that they would not be prepared for them, if they were to come, as you say, all at once.

I recollect, you made the same remark about the falling of the leaves: you said, that their gradual change and decay, prepared us for their entire loss.

True; it would be a great shock to our senses to see them cut off at a stroke. And their re-appearance in spring is gradual, that we may have ample opportunity to observe and examine them.

It is surprising that most of the insects and reptiles do not perish by the cold.

Most of them fall into a profound sleep in holes and sheltered places. Not a few of them are very fat at the commencement of their sleep, and they are nourished by this till spring awakens them, when they are very thin and poor. Some of the larger animals, as the bear and the badger, sleep away the greatest part of the cold season. There is, however, no doubt, but that very many insects, reptiles, birds,

and even some of the larger creatures, perish by the severe cold of winter.

And the flowers, Papa, at least those of the field, are all gone.

I think not; many of the different kinds of mosses are now in bloom; but they are so small, that they are seldom observed. What you would call flowers, are, indeed very scanty. We shall not, however, be long without the snow-drop, and the sweet primrose.

Will you tell me about the mosses?

They belong to the last class of the Linnæan system. Cryptogamia, Papa.

Yes; the flowers of many of them are invisible to the naked eye; and, of course, cannot so easily be ranked according to the parts of fructification, like the other classes.

Did you not say, that Linnæus had made a different arrangement of plants from the one to which we commonly refer?

Yes, he has divided vegetables into fifty-eight classes; of which the musci, or the mosses, form the

fifty-sixth. They are generally perennials and evergreens. Some of the smallest which have been observed are only the third of an inch in height. They are of slow growth; and the seeds take from four to six months to ripen. Mosses appear an insignificant part of the creation; there can be no doubt but that they were formed for important ends, though we may be ignorant of them. The colours of some of the musci, are very beautiful. They flourish most in winter; and shelter and preserve the seeds and roots of plants from cold. Many birds make their nests, principally of moss; not a few animals make a warm bed of them for winter; and the rein-deer, so important to the Laplanders, live upon a species of moss. As seen through a good microscope, most of the mosses appear very curious and beautiful. We are perpetually reminded by the works of the Most High, that he is great and glorious, not only in the formation and arrangement of the planetary worlds, but in the structure of a flower, or an insect, so minute as not to be discovered by the naked eye.

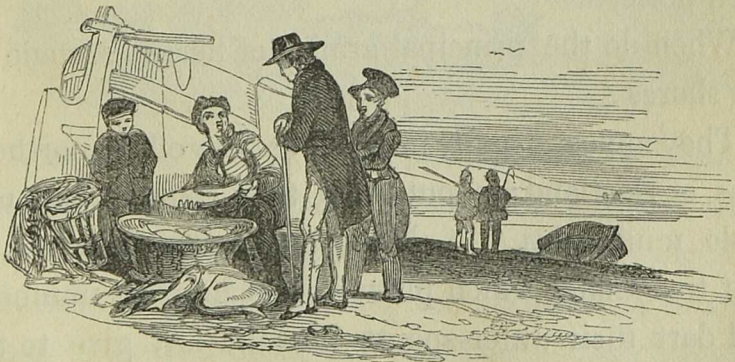
The discoveries of the microscope are wonderful. But the objects which in the winter attract our attention are but few, compared with those of the spring and summer!

I am not of that opinion. If we reflect on, and examine into things, we shall find that the works of God which invite our attention in every season, are innumerable.

Why, what have we seen this morning, Papa?

What! why where did you go with me before we entered into the fields?

To buy fish.



Very well; and what fish did you see there?

Many different kinds; let me see; herrings, codfish, lobsters, crabs, oysters, whiting, and * * *

Stay, Edward; these will be enough to occupy us in the present walk. Let us begin with the herring. Its name is derived from the German word *heer*, an army; because they are usually met with in immense shoals, or armies. It is found in the highest northern latitudes, and in immense multitudes on the American shores. Fish form the fourth class of animals in the Linnæan system. The herring is in the order of abdominales; or those fish which have the ventral placed behind the pectoral fins. Eleven species have been noticed.

When do the principal armies of herrings come to our shores?

They appear usually in April or May off the northern isles of Scotland; about June they come in innumerable multitudes. A Norwegian writer assures us, that the whales which pursue them in great numbers, and dart their water-spouts into the air, give to the sea the appearance of being covered over with smoking

chimnies. The herrings, to elude the pursuit, throw themselves close on the shore into every little bay or creek, and may be taken by baskets-full, or by the hand. The great number of birds which prey on them, make their approach evident. The shoals are divided into distinct columns, five or six miles long, and three



or four broad. The very appearance of the ocean is altered by them. When the sun shines full on them, they reflect the most splendid colours, and look like a vast field of precious gems; but no quantity of gems, it has been well observed, could be so truly valuable, as this stupendous gift of Divine Providence.

Do they come in all our ports ?

They are found, I believe, in most of our bays and creeks.

But how is it, that they come, when they are taken, and destroyed, in such immense numbers ?

It is supposed, that they leave the northern seas to deposit their spawn in a milder climate. Certainly it is not for want of food, as they are always plump and fat when they come, and are observed to be very lean and poor when they return.

Do they return, Papa ?

It is generally supposed that a part of those that escape their foes do return. Certainly, the hand of the great Benefactor is very visibly displayed in the annual migrations of this useful fish ; and it ought to be very gratefully acknowledged. St. Pierre, however, says, on the subject of their return to the frozen seas, " I no more believe that herrings return from whence they came, than that fruits reascend the trees from which they have once dropped ; nature being so magnificent in the entertainment which she provides

for man, that she never serves up the dishes a second time ! It is the opinion of the same writer, that the spawn of the herring is so abundant, that if they were unmolested for three or four generations, the ocean itself would be unable to contain them.

You said, "Nature provides;" what is nature, Papa?

A very proper question, Edward. It is, I think, a very silly term; and generally adopted by persons who have no suitable reverence of the divine majesty. It is nothing more than "the name for an effect, whose cause is God." But to return to our fish,—an old historian informs us, that in 1389, the quantity of herrings in the Straits of the Baltic were so prodigious, that for several leagues together you might have cut them with a sword. Sir Walter Raleigh tells us, that in 1603 the Dutch sold in the markets of Europe as many herrings as produced them £1,759,000 sterling. And in 1610, this revenue was increased to £2,650,000 sterling. When the first cargoes of herrings arrive in Holland they create a general joy, like that of harvest home.

I think you said, that they come into our bays in Spring; how is it that we have them in our markets now?

Why, they are said to go into deep water in the latter end of August; but in November they return to the shallows, and the fishery continues till January.

Will you tell me something about the fishery?

They are generally taken in the night. The vessels go out a little before sun-set, and continue their labour till day-light. They often draw up their large nets, ten or twelve times in a night. Eighty barrels of them have been taken in a night, by the boats of a single vessel. "It once happened," says Mr. Pennant, "near the isle of Skies, that a buss of eighty tons might have taken two hundred barrels in one night, with ten thousand square yards of net, but the master was obliged to desist, for want of a sufficient number of hands." But what was the next fish you mentioned?

Codfish, Papa.

This is as wonderful a fish as the herring. It be-

longs to the order of jugulares; that is, the fish who have the ventral before the pectoral fins. Seventeen species have been observed and described. The fish you saw was the *gadus mortua*, or common cod. As you have often seen it in the shop, and on the table, let me hear whether you can describe it?

It is not very easy, Papa, to do this without some thought. Its back and sides are ash-coloured, spotted with yellow; the belly is white.

You are correct so far; but you forgot the side-line, which is white, broad, and straight. They, however, somewhat vary in colour. It is singular, that they are never met with in the Mediterranean sea; it is entirely an ocean fish.

Are they not caught principally on the banks of Newfoundland?

They are; and on the sand banks of Cape Breton, Nova Scotia, and New England. They are attached to the northern seas, like the herring; and, before the discovery of Newfoundland, the principal fishery was off Iceland, and the western Isles.

The bank off Newfoundland, on which these valuable fish are innumerable, consists of a vast mountain under water, more than five hundred miles long, and three hundred broad. The seamen catch these fish by the rod and line. They seek for them at the depth of from sixteen even to sixty fathoms, according to the inequality of this immense bank. As many as fifteen thousand mariners are employed in this fishery.

But how is it that they can bring them, as they do, fresh to England?

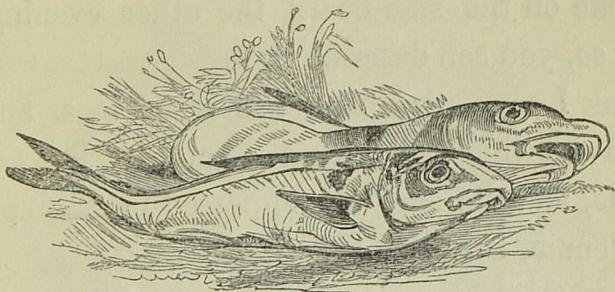
Why, the fishermen pierce the bladder with a needle, and put them into well-boats. Isinglass is made from the air-bladder, or sound of the cod-fish.

I think you said they multiplied as rapidly as herrings.

Leuwenhoeck affirms, that he counted 9,384,000 eggs in a middling-sized cod-fish. So, we may readily conclude, that the supply is inexhaustible. Mr. Penant mentions one, the largest that had ever been taken on our coasts, which weighed seventy-eight pounds. Its length was five feet eight inches, and the

girth round the shoulders, was five feet. It was taken at Scarborough, in 1755, and was sold for one shilling. But the general weight of these fish in the Yorkshire seas, is from fourteen to forty pounds.

The *gadus eglesinus*, or haddock, is of the same order. I merely mention the fish to remind you of the large black spot beyond the gills on each side.



I recollect them.

The superstitious have said, that it was a haddock which brought the money to Peter; and that those dark spots were left by his fingers when he laid hold of it.

What, do they mean that all the haddocks since that time were marked by Peter's fingers?

Yes; your surprise, Edward, is very natural, for few things can be more absurd. The next fish in your list was lobsters; was it not?

Yes, Papa.

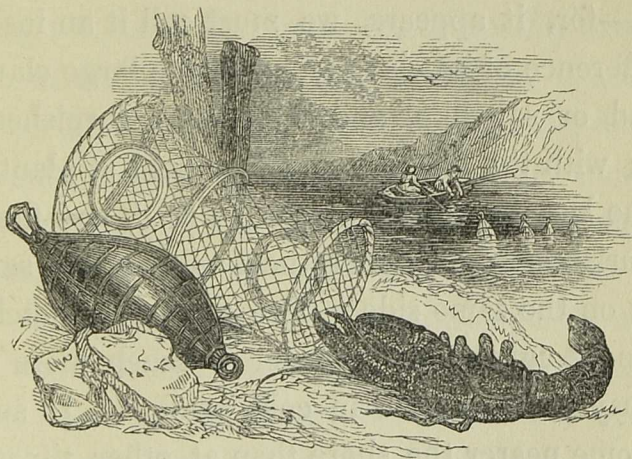
A most singular creature. We call it a fish, but naturalists have placed it among insects, of the order of aptera, or insects without wings. I bade you examine one on the side-board the other evening. If you did so, you can describe it.

I think I can. A lobster has eight legs, and two large claws, which are a kind of hands. The tail has six joints, and the eyes are supported by small pillars; four antennæ, two long and two short.

You are tolerably correct, Edward. The shrimp is the lobster in miniature. There are eighty-seven species of the cancer, or crab; they are distinguished chiefly by the length of their tails, and "the margins of their breasts." The species you saw, is the *cancer gammarus*, or common lobster. It is found all around the rocky coasts of our island. From the neighbourhood of Montrose alone, about seventy thousand are

annually brought to the London markets. I think you have seen how they are commonly taken.

Yes; the fishermen have baskets made of twigs, something on the plan of the wire mouse-trap, so that when the lobster gets in, he cannot get out. These are fastened to a small buoy, and sunk among the rocks in the sea.



They begin to breed in the spring, and continue to do so the greater part of the summer. An eminent naturalist says, that he counted twelve thousand four hundred and forty-four eggs under the tail of a hen

lobster; these are deposited in the sand, and are speedily hatched.

Is it true, Papa, that if they lose their claws they will grow again?

Yes, only they are never so large as they were at first. They feed on sea-weeds, on dead bodies, or on any garbage. You forgot, in your description of this insect,—for, it appears, we must call it an insect,—the difference of its claws; one of the large claws are serrated, or saw-like, and the other is furnished with knobs; with the first it keeps firm hold of plants, and with the last it carefully breaks its food, and fits it for its nourishment. Neither the knobs, or the saw, are always on the same side. The young are hatched in July and August. The lobster is much more active and busy in warm than in cold weather. In summer they come nearer the shore than at other times, and are often taken in shallow water; but in winter they are not found in less than twelve or fifteen fathoms. They will spring, if alarmed, tail forwards, full thirty feet at once. It has been affirmed, that they are so

much affrighted at thunder, as sometimes to cast off their claws.

I believe they annually change their coat of mail; don't they?

They do. The manner of this change is said to be very curious. The animal becomes sickly, languid, and restless, so that its flesh shrinks; and thus becoming too small for its house, it readily creeps out of it; at first it is quite soft, and then, if it does not conceal itself carefully, which it generally does, it is the ready prey of its foes. This is the time, whilst the new shell is forming, and is in its soft state, that the lobster grows. The hen lobster does not cast her shell the same year in which she deposits her eggs. A foreign writer says, "The lobster is certainly one of the most extraordinary creatures that exists; an animal whose skin is a shell; whose flesh is in its tail and legs; and whose hair is in the inside of its breast. Its stomach is in its head; this is changed every year for a new one; and the new begins its operations by devouring the old one. It can throw off its legs when

they become troublesome, and can replace them with others." We must notice the remainder of your list another time. But how varied and wonderful are the works of God! "In wisdom he has made them all; the earth is full of his riches."

Janson, in his travels in the United States, says, that he saw, at New London, two extraordinary lobsters; one on which seven persons dined very heartily, and yet enough was left for any individual; and another, on which ten hungry men supped, and sufficient was left for the meal of an eleventh!

Extraordinary lobsters, truly, Papa!

WALK XIX.

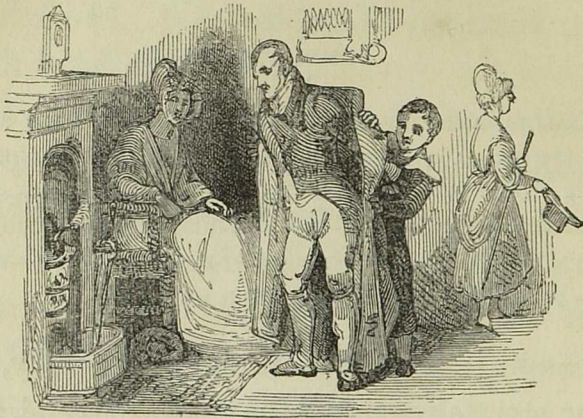
CONTENTS.

WINTER—INSECTS AND BIRDS IN THAT SEASON—WINTER AS NECESSARY AS SPRING—A SEASON OF MUCH ENJOYMENT—PARRY'S VOYAGES—ICE MOUNTAINS—SEVERE COLD—MELVILLE ISLAND—A POLAR WINTER—EFFECTS OF FROST—NO SUN-RISE—AURORA BOREALIS—ESQUIMAUX, POLAR BEAR—LAMP BOUGHT BY CAPT. PARRY—THE WOLF—SNOW—HUNTING—SWAN'S NEST—OUR OWN LAND.

How pleasant it is of an evening, especially, Papa, whilst the storms rage, and the snows descend, to have a comfortable home, and a good fire. How happy we all were the last evening !

We were, Edward. Nor should we forget to be very thankful to God for his great goodness. Nor can we show our gratitude better, than by visiting and relieving the poor, who are in very different circumstances. Their cottages are often in such indifferent repair, that they do but ill shield them from the wintry blasts ; and their clothing is so scanty, that they

need more than all the aid we can give them, to preserve them from the ill effects of the cold.



It is wonderful how any insects, or birds, survive such a frost as we had the last night.

In some respects it is; but a kind Providence takes care of them in winter, as well as in the spring and summer. As the cold season approaches, the feathers, furs, wool, and covering of the different animals, grow thicker, and, of course, more warm. And as to provision, some do not need any, as they sleep away the whole of the winter months. Many of them lay

up in store, as if they were mindful of the time of need which was coming on. This, as I have told you, is the case with the squirrel, and with others. Bees, you know, gather sufficient honey in the fine seasons, to support them through this chilling and gloomy part of the year.

Do you think, Papa, that they have a knowledge that the winter will come?

I think not; it is impossible that they should be acquainted with futurity. I rather think, that whilst they find their sweet provision all around them, they labour with diligence; and so, when the winter arrives, without any actual foresight of theirs, they find that they have an abundance of provision. In one way and another, God has provided for the varied tribes of his creatures in this inclement and stormy season.

Yet it would certainly be much more pleasant, Papa, if there were no winter.

I am not sure, Edward, that this would be the case. It is most likely, that we have a more sensible enjoy-

ment of spring and summer, on account of the cold and dreary months which precede them; just as a person who constantly lives in the midst of a great city, has a more lively taste of the beauties of the country, when he occasionally visits them, than the individual possesses, who constantly resides in the midst of the most delightful scenery.

Besides, we may be sure that God's arrangements are all made in infinite wisdom. Winter, chilling as it is, is beneficial in various ways; the frosts purify the air, and render it more healthful. Man could not labour always, night and day; he must have his hours of sleep and repose; so it is with the earth,—in the winter it rests, and ceases to bring forth. We may be well satisfied that this is the case, since it has already given us more than we shall want, till the months arrive, when it will again, by the divine blessing, become fruitful.

To be sure, Papa, we have, as I said, much enjoyment in our winter evenings.

Certainly, we have much more intimate converse

and intercourse with our friends, at this season of the year, than at any other period. This is also the time for acquiring knowledge. Most of us read much more in the winter than in the spring or summer. It is with no common pleasure that I have voyaged lately, with Captain Parry, to the wonderful regions around the North Pole. Doubtless, Providence has arranged every thing in infinite wisdom and goodness, and we ought to be as well satisfied with the winter as with the spring.

I wish, Papa, you would tell me about Captain Parry's voyages.

You shall read them, Edward.

Yes, but I think I recollect what you tell me even better than what I read.

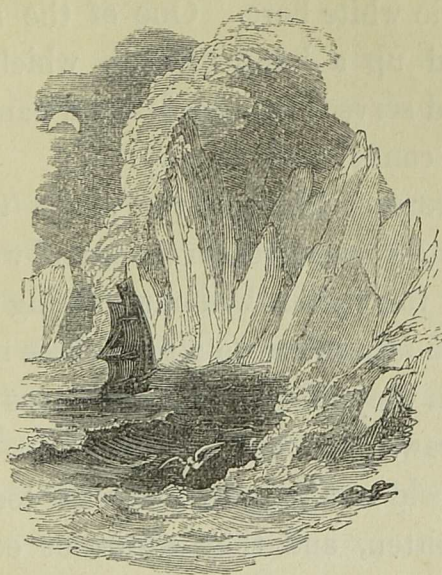
That is, I fear, because you do not pay attention. But, as you wish it, I will give you a brief account of the volumes which have so much entertained me. Our winters, much as we are prone to complain of their severity, are mildness itself, when contrasted with those of the poor people who live in the islands of the northern ocean.

Two ships, named the *Hecla* and *Griper*, were fitted out in 1819, to explore the regions near the North Pole, and especially to search whether there was any north-west passage near it, out of those dangerous seas. The command of these vessels was given to Captain Parry. There were ninety-four men on board the two ships; they were furnished with provisions for two years; especially they were provided with warm clothing of every kind, with a wolf-skin blanket for every man; and a large quantity of coals were stowed instead of ballast.

The coals would be very useful, Papa.

Truly so; and all the other articles. I think it was the middle of June on which they entered on Davis's Strait, and fell in with the first immense bodies of ice. Soon after, they counted more than fifty ice-mountains, some of them were one hundred and forty feet high, against which the billows broke with such a tremendous force, as to throw up the spray more than a hundred feet above them, with a noise like dreadful claps of thunder.

The sound would be sublime; I should like to have heard it.



No doubt it was. Well, at length, surmounting vast obstacles, they reached the meridian of one hundred and ten degrees, in latitude seventy-four, and became entitled to five thousand pounds, which the king promised to those who should first reach this point. They now cast anchor for the first time at

Melville Island. A party landed with the hope of shooting some animals for fresh provision; they found only a single white hare. One of the seamen, however, picked up a lump of coal, which burnt very brightly, and served both for fire and candle.

Like our cannel coal, Papa.

It appears so. Some of the party, who were delighted to find themselves on land, and were unwilling to return to the vessels without gaining their object, ventured too far, and were absent three nights. Happily for them they killed a fowl, a species of partridge, and ate it raw. But two of them were so much exhausted by cold and fatigue, that their toes and fingers were frost-bitten, and they were not cured without great difficulty.

It was at Melville Island that Captain Parry determined to winter; to do this securely, they were obliged to cut a canal for two miles through the ice; the officers united with the men in effecting the work, and many of them stood much of the day up to their knees in water. Having covered the deck with planks,

and thick cloth, to shield them from the wind and snow, they regarded themselves as prepared for the dreary season of a polar winter.

I wonder they did not meet with some of the white bears, like that I saw in the Zoological Gardens!

They did meet with many. The servant of Captain Sabine, who one day wandered alone too far from the ships, was followed back almost all the way by one of these animals. This same man, having gone out without his gloves, returned with his hands so much benumbed, that though the surgeon did every thing in his power for him, yet he was obliged to lose four fingers from one hand, and three from the other.

When we think of such a climate, we may, indeed, be well satisfied with our own!

Truly, we may; and very thankful too. Early in October, one of the sailors, pursuing a deer too eagerly, fell down a steep bank of snow. Here, just as he was going to sleep, from which he would never have awakened, his companions providentially found him,

and brought him on board. His fingers were quite stiff, and bent to the form of the musket which he had in his hand. He looked very wild, and spoke



unintelligibly. His hands were so bitten by the frost, that, a short time afterwards, the surgeon was obliged to cut off three of his fingers.

In November, there was no water visible; the sea

was entirely frozen over, as far as could be seen from the greatest eminences. After the fourth of this month, the sun set on them, not to rise again for a long period. The men were allowed to go on shore for exercise every day till dinner time. When the weather would not permit, they ran round and round the deck, keeping a regular step to a tune on a hand-organ. On the Lord's-day, a sermon was read, and prayers offered to heaven. Nothing but ice and snow were now to be seen; and a death-like silence every where reigned; occasionally and feebly broken by the sound of a few human voices.

What a dreary place this was to keep Christmas in, Papa!

It was; but they had a piece of beef roasted on Christmas-day, which, owing to the intense cold, had kept without salt ever since May, and was quite good.

But they must have been in almost perpetual darkness without the sun.

No; the moon often shone on them with much beauty and brightness. And about noon, though the

sun was not visible, in clear weather, there was a fine arch of red light, which overspread the southern horizon; and in the middle of January, the aurora borealis were very brilliant. Magnificent streamers of light, frequently varying in shape, overspread the heavens in different directions, and covered them with inconceivable glory.

The aurora must be very beautiful; what is the cause of them?

They have been ascribed to the decomposition of the two airs, oxygen and nitrogen, by an accumulation of the electric fluid in the polar regions. "This explanation," says Capt. Brown, "is supported by a very accurate attention to the chemical phenomena produced on the atmosphere by electricity, which decomposes it, and forms nitrous gas."

Towards the close of January they began, by turns, to watch for the sun. On the third of February, about twenty minutes before twelve, they saw the sun for the first time for eighty-four days. The crew then began to collect stones for ballast, of which they

wanted seventy tons, to make up the loss of weight in stores and provisions which had been consumed. In March, the snow began to melt; they had also constant day-light; as the sun did not now disappear below the horizon. In the middle of May, the ice round the ships was only six feet thick, though in other parts of the harbour it was twenty-four. In one of their excursions on land, a fine rein-deer came up,



and played around them for a quarter of an hour; when they walked on, he trotted by their side, like a

dog, sometimes getting before them, and then coming back.

Before they left the island, they built a monument twelve feet high on the highest point; and put a tin box in it, with an account of the party, and some English coins. On the 25th of July they weighed anchor, and set sail for England. On their way homewards, in the river Clyde inlet, they were visited by some Esquimaux, who expressed their admiration of what they saw on board, till they were hoarse, and out of breath; and by incessant jumping. Some of the crew landed, and met with more of this singular people. They gave them trinkets and knives, in exchange for whalebone, and seal-skin dresses. A young man was in raptures at the sight of a looking-glass, and some other articles. Captain Parry again crossed the Arctic circle, Sept. 24th; they had been within it fourteen months; and they arrived in England, November 3rd, 1820.

Did he not soon go out again for the Arctic regions?

He did; he set sail from London, in May, 1821, in the ship called the *Fury*; Captain Lyon attended him in the *Hecla*, accompanied by the *Nautilus* transport, to carry stores. In the first part of their voyage, the wind was very contrary, so that they were nineteen days sailing sixty miles. They then saw a large bear on a sheet of ice, which they killed.



I opened the volume yesterday on that very page; the sailors ate its flesh, and made a large tub of oil from its fat, for their winter's use.

True; just as they came to the Savage Islands, at the entrance of Hudson's Bay, three canoes, full of Esquimaux, came along-side the ships. Their skin was so covered with grease and dirt, that it was impossible to discover their real colour. They were so eager to exchange everything they had for our trinkets, that many of them went away with scarcely any clothes. A nail was enough to buy some of the principal things which they had; they seemed to va-



lue iron as much as we do gold. One of them, indeed, offered her child, a little girl of four years old,

for a knife. These poor creatures supped, sitting on a piece of ice, near the ships, on raw flesh of seals, fat, birds, and entrails. One young woman bit the inside of a seal into pieces, and gave it to her companions.

On the 17th of August they landed, and found a hut made of two jaw-bones of a whale, set upright, and covered with whalebone. The sailors brought it on board to make brooms. Among the presents given to the natives, none pleased them so much as an empty tin canister, which they hugged, and kissed exceedingly.

As the winter now came on in its severity, Capt. Parry laid up his vessels. A school was established, to teach the men to read and write. And on Christmas-day, sixteen men presented copies of writing, who did not before know a letter.

Did they again see the aurora borealis?

Yes; they often passed a good part of the night in gazing on the lights in the heavens; these appeared at first like a shower of falling stars, which soon spread into a beautiful arch, from east to west; and

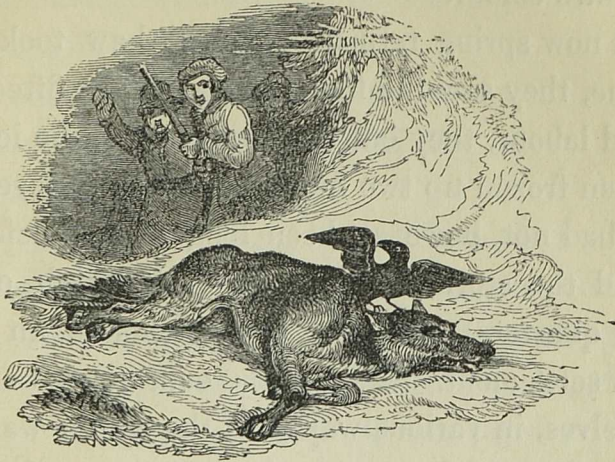
when a storm arose, they shot out into rays and streamers, and spread over the heavens like lightning.

On the 1st of February, a company of Esquimaux again visited them. Our English friends went with them to their huts, which were made of snow, and lit up with lamps; these, often shining through the transparent walls, looked very beautiful. The people were clad in their best dresses of dark-coloured deer-skin; their summer dress was made of the skins of ducks. There were fourteen families in the village. In each hut there was a window, formed of a broad piece of fresh-water ice. Captain Parry bought one of the lamps; the lady who owned it licked it quite clean with her tongue, devouring the soot and oil with which it was covered, before she delivered it into his hands.

What a lady, Papa!

Not a very delicate one, Edward, according to our notions. One evening, a wolf was caught in a trap they had set for him; three balls were fired at him,

when the men thought that they might safely drag him out; but he bit one of their arms, and got away. He was, however, so badly wounded, that he was



found the next morning frozen to death, and a raven was picking out his eyes. Among the few birds they saw, peculiar to the country, was one called the snow-bunting; its wings were black, and its body white as the snow; a cream-coloured mark, in the shape of a horse-shoe, was on its breast, and the neck was beautifully tinged with pink. The sailors also found a

swan's nest, with three eggs in it. It was a large pile, built of pieces of turf, not bigger than a walnut, neatly laid one upon another. The eggs were of a dull white colour.

But now spring returned, and a thaw took place. In June, they saw the first flower. After fifteen days of hard labour, they cut their way out of the ice, having been frozen up two hundred and sixty-seven days. They had not, however, been long at sea, before the ice and the storms obliged them to think of fresh winter quarters. So they cast anchor at an Esquimaux settlement. Here they continued to amuse themselves, in various ways, till the winter was really gone; often driving about in little cars, drawn by dogs, in teams of nine, ten, or eleven.

It must have been very cold riding.

No doubt it was; but these amusements enabled them more agreeably to pass away their dreary winter. On the second of December, the sun again set on them, to rise no more for a long period. On Christmas-day they roasted a piece of beef, which,

owing to the intense cold, had been hanging a year and a half; and yet it was very good. At length, this second winter closed; and, about the middle of August, having been blocked up nearly eleven months, they set sail for England.

But did not Captain Parry try to reach the North Pole over the frozen surface of the ocean? I think you said he did.

Yes; in order to do so, he was furnished with two boats, or waggons, for sailing, or drawing, formed so as to combine the greatest strength and lightness. An ample supply of flannel shirts, frocks, drawers, and thick fur suits to sleep in, was provided for the expedition; but, after the most patient and laborious efforts, the object could not be accomplished. The utmost latitude at which they arrived did not amount to eighty-three degrees; this, though the highest ever attained by man, left them far distant from the high point which they desired to attain.

What a wretched state these poor Esquimaux must be in, Papa!

Compared with ourselves, Edward, this is, indeed, the case. We should be concerned that our advantages may, as far, and as soon as possible, be extended to them; and especially those which we enjoy by Divine Revelation. And how thankful we should be, that God has given us a country so much better than that of these poor people; “a land of brooks, and water, which spring out of valleys and hills. A land of wheat and barley; a land which the Lord our God peculiarly careth for; for his eyes are on it for good, from the beginning even to the end of the year.”

WALK XX.

CONTENTS.

COWPER'S ADDRESS TO WINTER—HIS PICTURE OF A WOODMAN—AND
OF THE REDBREAST—THE CRAB—OYSTERS—WHITING—THE EEL—
SALMON—THE MOON—FIRE—LINES ON THE WINTER EVENING.

WHAT a fine address the poet Cowper has to Winter,
Papa.

I know not the particular lines to which you refer ;
can you repeat them ?

I think I can ;—

“ O Winter, ruler of the inverted year,
Thy scattered hair with sleet like ashes fill'd ;
Thy breath congeal'd upon thy lips ; thy cheeks
Fring'd with a beard made white with other snows
Than those of age ; thy forehead wrapt in clouds ;
A leafless branch thy sceptre, and thy throne
A sliding car, indebted to no wheels,
But urged by storms along its slippery way,
I love thee, all unlovely as thou seem'st,
And dreaded as thou art ! ”

It is a fine address. But, Papa, you did not tell me all about the fish which we saw; will you do so now?

Of which did we speak?

Of the herring, haddock, codfish, and lobster. You were about to speak of the crab.

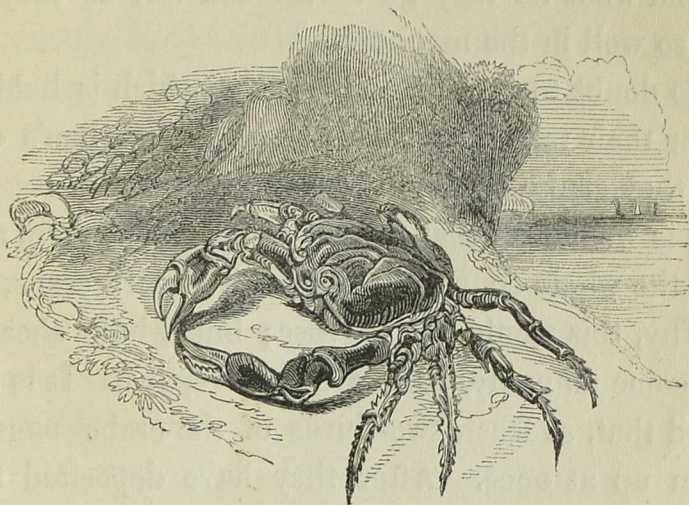
There are many species of them. The cancer mænas, or common crab, which you saw, has five serrated teeth on each side; it is of a dirty green colour, but red when boiled. It is found everywhere around our shores.

The cancer ruricola, or land violet crab, is a very remarkable creature. Its thorax is smooth, and the two last joints of the feet are armed with spines. It abounds in the Bahama Islands, and feeds on vegetables.

But what is remarkable in its history?

Several things. They live in a kind of orderly community in their retreats in the mountains; but once a year, in a vast army, composed of several millions, they march down to the sea-side, in April, or

May. The whole country is then covered with them. They take a direct line, climbing over everything in their way to the ocean. They are usually arranged in three battalions, of fifty paces broad, and three miles deep. It has been observed that they travel



mostly in the night. Though they appear to be very sociable, yet, if any one of them is wounded, so as to be unable to proceed, his companions fall on him, and devour him on the spot.

Surely, they ought rather to help him in his march. But how long are they getting to the sea?

That depends on the distance which they have to travel. Sometimes they are one or two months, and not unfrequently three.

And what do they go to the sea for, as they can live so well in the mountains?

No doubt to deposit their spawn, which is held up under their tails, in a bunch as large as a hen's egg; this they shake off into the water.

It is wonderful that the sea is not full of them; and that the whole country is not covered with crabs.

Why, this would be the case; but whole shoals of fish come annually, and devour the spawn. It is supposed that, at least, two-thirds of the crabs' eggs are eaten up at once. After they have deposited their spawn, the crabs depart again to the mountains, and on the way cast off their old shells, and remain in holes while the new ones are forming; they are then covered with a skin resembling soft parchment. At this time, they are said to be very delicious, and are eaten

by men, and birds of prey, in immense multitudes. The negroes, in some of the West India islands, would fare very hard without this annual provision furnished for them, in such abundance, by a bountiful Providence.

Then do they all perish?

No; many find their way back to their caverns and holes in the hills; and millions of young crabs, which escape their devourers, find their way from the sea to the mountains. So that it is conjectured that they do not, on the average, increase or decrease.

We saw a tub of oysters at the fishmonger's; but though they are so very common for a great part of the year, I know nothing of their history.

When things are very familiar, we often forget to inquire into their real nature. In zoology, the oyster is a genus pertaining to the order of vermes testacea. There are thirty-one species, distinguished by variations in their shells. "The oyster occupies, in the scale of nature, one of the degrees the most remote from perfection; destitute of defensive weapons, and

progressive motion, without art or industry, it is reduced to mere vegetation, in perpetual imprisonment; though it every day opens regularly, to enjoy the element necessary to its preservation. The animal figure, and the springs of its organization, are scarce discernible through the coarse mass of its habitation. A ligament, placed at the summit of the shell, serves as an arm to its operations. They cast their spawn in May, which adheres to the rocks, and other matters at the bottom of the sea. In the space of twenty-four hours, the young oyster is provided with shells, which never leave the spot on which they are fixed till the fisherman tears them from their element."* The best oysters are caught at the mouths of rivers, in clear water. The want of fresh water renders them hard, bitter, and unpalatable. Red and russet-coloured oysters are found in Spain. No country produces better oysters than our own. Leuwenhoek, from the discoveries of his microscope, calculates, that

* Barbut.

there are between three and four thousand embryo oysters in every shell.

Are they not reckoned very wholesome food, Papa?

They are; they are often given to the afflicted, to strengthen them, as they contain much nourishment. The shell, calcined, is a good manure; it is also used as an alkali in medicine. There is a large bed of fossil oysters, extending over six acres of ground, near Reading, in Berkshire. But what other fish did you see?

Whiting and eels.

Let us have one at a time. Whiting is of the same genus as the codfish. It is called, in ichthyology, *gadus merlangus*. It is a handsome fish, as you saw. The upper jaw is longer than the lower; the eyes are large, and the nose sharp; the colour of the head and back is a pale brown; the belly and sides are silvery; on the latter is a streak of yellow. In the spring, vast shoals appear on our coasts. They are easily caught by the line, and are very delicate and wholesome food. They are very rarely found longer than about twenty inches.

The *muræna*, or eel, belongs to the order of apodes. The head is smooth; the eyes are covered with a slight skin; the body is slimy, and cylindrical. There are seven species, chiefly distinguished by their fins and tails.

What does *apodes* mean?

Animals without feet; this is the meaning of the word. In the Linnean system, it is the name of the first order of fishes, which have no belly fins. The *muræna anguilla*, or common eel, is very common in most of our ponds and rivers; but its entire history is unknown. It does not confine itself to the water; they roam occasionally through the meadows, from one pond or river to another, feeding on the snails or worms which they may find in their course. In the winter, they hide themselves in the mud, and seem, like many other animals, to sleep during the cold months. So tenacious is it of life, that when the animal is cut to pieces, the parts will move. It is matter of debate whether they spawn, like fish in general, or bring forth their young alive.

I saw, some time since, a large eel in a barrow, that had been brought from Jersey; the man said it weighed one hundred pounds.

This must have been a conger eel; the common eel very rarely reaches to twelve, fifteen, or twenty pounds. Mr. Tennant mentions a conger eel, taken near Scarborough, which measured ten feet and a half long, and which was eighteen inches in circumference in the thickest part. They are very voracious. The fishermen in Cornwall take them with strong cords, five hundred feet long, with sixty hooks, about eight feet apart, baited with pilchards, or mackarel. These have a large stone fastened to them, by which they are sunk to the ground. A number of these lines are tied together, often to the length of a mile.

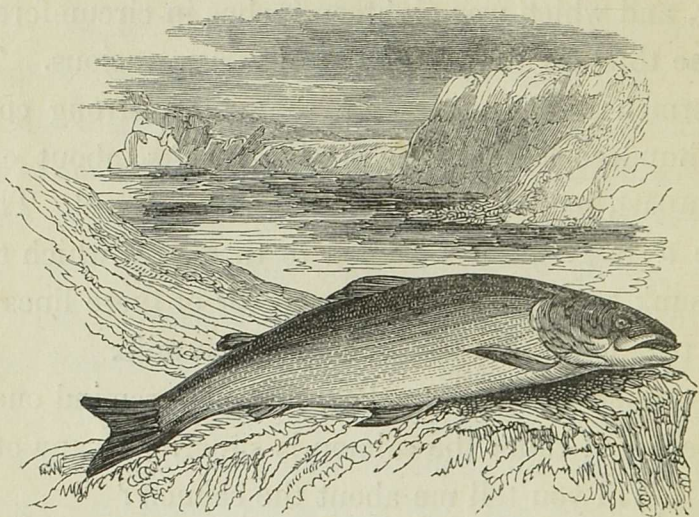
I cannot fancy eels; they so much remind one of serpents. I think the salmon is superior to any other fish. Will you tell me about the salmon?

It is a fish of a genus of the order of abdominales. Do you know what this word means?

They are fish of the fourth order of the fourth class

of animals in the Linnean system. The abdominales have the belly fins, placed behind the pectoral, or breast fins; is it not the case?

It is. There are twenty-nine species. It is so well known, that I need not describe it. But try if you cannot give me a likeness of it in words.



The colour of the back and sides is grey. The head is smooth; it has teeth, and a tongue; its nose

is rather sharp; the belly is silvery, and the tail is forked.

Your description is not a bad one, Edward. The *salmo salar*, or common salmon, is a fish of the northern seas; it is never found in the Mediterranean, or the very warm climates. It is plentiful in Newfoundland, in the northern parts of America, as far as Greenland. It is dried, salted, and pickled, and is a valuable article of commerce. The salmon lives both in salt and fresh waters. It is well known to ascend rivers, hundreds of miles, to deposit its spawn. Its strength must be very great, as it forces its way up the most rapid streams; and springs up waterfalls, and cataracts, with astonishing agility.

Do they ever become very large?

They are usually from ten to twenty or thirty pounds weight. I have seldom seen them larger, though I have read of salmon which have weighed fifty, and sixty, and of one which weighed seventy-four pounds. The young fish, which leave the rivers for the sea about May, and of which so many are

caught, are called salmon smelts, and are very delicate food. But see, where the moon is rising in unclouded majesty and beauty, and admonishes us to bend our way homewards. How she seems to shed over the hills and the vales a softer day.

From its nearness to the earth, and from the light it affords us, the moon is more important to us than any other planet of the solar system.

It is. She is an interesting object to the naked eye, but much more so, as seen through the telescope.

What is her diameter, and distance from us ?

I thought you had known these ; her diameter is two thousand one hundred and eighty miles, and her distance, near as she appears, is two hundred and forty thousand.

Do you think that the bright spots are mountains, which reflect the light of the sun from their summits, and that the dark spots are seas, and lakes, which absorb his rays ?

I cannot say, Edward ; but the case may be pro-

bably as you state it. Herschel, you know, has marked the volcanic mountains in the moon.

And is he correct?

I know not; but his conjectures may be well founded. Its utility to our earth is unquestionable. What a beautiful object is this great lamp, which God has lit up in the heavens! How readily and pleasantly do we prolong our journeys, or our walks, by its sweet light! How usefully does it mark the divisions of time! And how vast is its influence on the mighty waters! Whilst we thank God for the greater and more brilliant rays of the sun, we should not forget to praise him for the sweet, though lesser light of the moon. But let us quicken our pace; the gale is very cold.

The very thought of a good fire, by which we may spend our evening, is cheering. What a blessing, and what a comfort, is fire; especially at this season of the year.

It is. Without it, we could not light or warm our apartments, or dress our food; and winter would be especially dreary.

Nor could we melt metals, or change sand into glass; and poor old people, who cannot take any exercise, would be frozen, and die.

It is a kind appointment of Divine Providence, that this element is to be found everywhere. It is in all trees and vegetables; in wax, and fat, and sulphur; as well as in the coals which we daily consume. No doubt but that it is in the air we breathe, and in the hardest bodies, as in the flint and steel.

If it were not in them, it could not be got out, as we know it is. We should be thankful to God for fire, as well as for light.

What is fire?

It is difficult, if not impossible, fully to answer the question. No doubt, fire is matter; but "matter is divisible in length, breadth, and depth. Fire is divisible only in perpendicular length. Never will you divide a flame, or a ray of the sun, in its horizontal breadth. Here, then, is matter, divisible only into two dimensions. Besides, it has no gravity, for it continually ascends; nor levity, for it descends, and

penetrates bodies ever so much below it. How is it in bodies without consuming them; or in water, without being extinguished?" *

If we cannot fully define its nature, we know its effects pretty well, Papa.

Certainly, we do; we know it expands objects, and, when in a state of combustion, renders them hot, so that we cannot grasp them. Fluids become vapour, and solid bodies are decomposed, and dissipated by fire. Indeed, all animal and vegetable life, and the world itself, perhaps, depends on the existence of this element.

It does seem strange that a body, as a piece of coal, may be full of fire, and yet feel cold to the touch.

We know it to be the case; it is only one proof, among innumerable, which might readily be adduced, that there are mysteries in almost all the works of the Most High, which cannot be unravelled. But, Edward, here is our home, our dear home; let us

* St. Pierre.

enter it, thanking God for his abounding favours ; and saying, with our poetic friend, Bernard Barton,

“ The summer is over,
The autumn is past,
Dark clouds round us hover,
Loud whistles the blast ;
But clouds cannot darken, nor tempests destroy,
The soul’s sweetest sunshine, the heart’s purest joy.

The bright fire is flinging
Its splendour around ;
The kettle, too, singing,
And blithe is its sound :
Then welcome in evening, and shut out the day,
Its soul-fretting troubles,—O tempt not their stay.

We’ll turn to the pages
Of history’s lore ;
Of bards, and of sages,
The beauties explore ;
And share in the records we love to unroll,
The calm ‘ feast of reason, the flow of the soul.’ ”

WALK XXI.

CONTENTS.

MAN—HIS COUNTENANCE—HIS EYES—HIS EARS—HIS SENSES—HIS
FRAME—MOVEMENT OF HIS HEART—HIS HANDS—HIS SKIN—SPINAL
BONE—HIS MIND—SNOW—TRADE IN SNOW—FROST—WINTER IN
SIBERIA—DR. SOLANDER—HOW TO SPEND THE WINTER EVENINGS
HAPPILY—THE CLAIMS OF BENEVOLENCE—ANTICIPATION OF SPRING.

WE have noticed an immense variety of the works of God, but we have overlooked the noblest creature which his hand has formed; at least, in this lower world.

To which do you refer?

To ourselves, Edward; to man. To use the beautiful language of Revelation, God has “made him but a little lower than the angels, has put all things under his feet, and crowned him with glory and honour.”

blind. But what else is there worthy of our attention in the human head ?

The brain.

Truly so ; and man has a larger portion of brain than any other animal. It is covered with a beautiful net-work, and is divided into two parts, the cerebrum and cerebellum ; or, the larger and lesser brain. But you have forgotten the tongue, by which we speak, and mingle the saliva with our food ; the teeth, by which we cut and grind it to pieces ; and the lips, by which many of the letters are formed. How wonderful is the structure of the neck, by which we readily move the head, without moving the whole body.

In the throat, there are two passages ; the one we call the wind-pipe, or the way to the lungs by which we breathe ; the other is the gullet, by which the food passes into the stomach. Behind the root of the tongue there is a membrane, the epiglottis, which falls over the wind-pipe, that none of our food may go the wrong way, down the passage by which we breathe.

I have heard you compare the bones to the great beams of a building, which seemed to support the whole. Is there not a perpetual circulation of the blood, night and day?

There is; the heart, which is the great machine in this business, drives the blood through the arteries to the utmost extremities of the system; it is brought back by the veins. "The wisdom of the Creator," says Dr. Hunter, "is seen in nothing more gloriously than in the heart. How well does it perform its office! An anatomist, who understood its structure, might say beforehand, that it would play; but from the complexity of its mechanism, and the delicacy of many of its parts, he must be apprehensive that it would always be liable to derangement, and would soon work itself out. Yet does this wonderful machine go on, night and day, for eighty years together, at the rate of a hundred thousand strokes every twenty-four hours, having at every stroke a great resistance to overcome; and it continues this action for this length of time, without disorder, and without weariness.

“ That it should continue this action for this length of time without disorder, is wonderful; that it should be capable of continuing it without weariness, is still more astonishing. Never, for a single moment, night or day, does it intermit its labour, neither through our waking, nor our sleeping hours. On it goes, without intermission; rest would have been incompatible with its functions. Whilst it slept, the whole machinery must have stopped, and the animal inevitably perish.”

You have not noticed the stomach, Papa.

Nor many other parts; the human frame presents an extensive subject for observation. The stomach is the great laboratory in which all that refreshes the faculties, and recruits their strength, is prepared. The arms, hands, and fingers, are the guardians of the whole structure, and are actively employed in the discharge of the great duties of life.

Is it not wonderful, Papa, that the hand can perform so many things? It draws, and paints, and plays on instruments of music, and does a thousand

things, which it would take a great while even to mention.

The human hand is an extraordinary faculty. How beautifully is the whole frame covered with a fine skin, a large upper garment, without any seam, full of invisible apertures, by which the superfluous heat and moisture of the body insensibly escapes. The internal structure of the human frame is also in a high degree astonishing. The ribs, which serve the great purpose of respiration, are gently moveable, and form a safe dwelling-place for the lungs and heart. The back-bone is designed not only to strengthen the body, but also to bring down the continuation of the brain, called the spinal marrow. It both conveys and guards this "silver cord," as Solomon terms it. Had it been only strait and hollow, it might have served these purposes. But then the loins must have been inflexible; to avoid which, it consists of very short bones, knit together by cartilages. This peculiarity of structure gives it the pliancy of an ozier, with the firmness of an oak. Such a formation in any other of the

solids, must have occasioned very great inconvenience; here it is unspeakably useful, a master-piece of creating skill. Well might the Psalmist exclaim, "Fearfully and wonderfully am I made, and that my soul knoweth right well."

How is it that when I will to move my hands, or feet, or any part of my body, that my limbs accord to my wishes?

I know not; no one can tell you. Man has a soul, or spirit, which reigns over, and governs the body.

Wonderful as the construction of the human frame is, it is scarcely worthy of attention compared with the spirit which inhabits it. It is the intellectual world which presents to us the most extraordinary spectacle. "If the brightness of the heavenly bodies," says Lord Brougham, "the prodigious velocity of their motions, their vast distances, and mighty bulk, fill the imagination with awe, there is the same wonder excited by the brilliancy of the intellectual powers, the inconceivable swiftness of thought, the boundless range which our fancy can take, and the vast objects

which our reason can embrace. That we should have been able to resolve the elements into their more simple constituents, to analyse the subtle light which fills all space, to penetrate from that remote particle in the universe, of which we occupy a speck, into regions infinitely remote; ascertain the weight of bodies at the surface of the most distant worlds; investigate the laws that govern their motions, or mould their forms; and calculate to a second of time, the periods of their re-appearance during the revolution of centuries;—all this is in the last degree amazing, and affords much more food for admiration, than any of the phenomena of the material creation.” And when the tenement which this soul inhabits shall be taken down, and shall crumble into dust, the spirit shall survive; yea, it is to live for ever, in unutterable joy or woe. Well might the Great Teacher affirm, “that the welfare of this spirit is the one thing needful!” And that it will “profit a man nothing, if he could gain the whole world, and yet lose his own soul.” How solemn are these considerations!

* * * * *

The snow which fell so heavily at the beginning of the week, Papa, is nearly all gone. Will you give me an account of it?

An account of it! Why, is not snow, snow?

Yes; but you know, Papa, when things are explained, they are often very different to what we had imagined.

They are; and I am glad you know it; from this circumstance you will make inquiry, and gain much information. Snow is twenty-four times heavier than water; twenty-four gallons of snow would make but one gallon of water. Its exquisite whiteness arises from its reflecting very powerfully, all the rays of the sun.

But what is it, Papa?

A very proper question; we should always ask, what anything is, before we speak of its qualities. Snow is formed by the crystallization of vapours. The highest mountains in the world are covered with perpetual snows.

Does not crystallization imply peculiarity of form?

It does; if we catch the flakes of snow on a sheet

of white paper, and examine them with a magnifying glass, we shall see that they are beautifully formed, like little stars, with six or eight spicula, like rays, proceeding from a common centre. The size of the flakes is in proportion to the temperature of the atmosphere. In Lapland, the air is so cold, that the snow is like a fine dry dust.

I think you told me, that the snow was of great use in preserving the plants from extreme cold.

It serves as a warm mantle to shield them from the frosty winds. It is probable, that all the plants in the northern parts of the world would utterly perish without this fleecy covering. Besides this, there is a heat generally diffused through the earth to the forty-eighth degree of Fahrenheit's thermometer; and the snows may prevent the escape of this warmth.

But how is it, that the earth possesses this heat?

This is a question which, perhaps, cannot be fully answered.

Are the snows of any other use?

It has been supposed, that they afford manure to

the soil; but though they may contribute somewhat to its fruitfulness, it is not the case to any very great extent. Every person in Sicily makes use of snow in the warm seasons of the year; and the inhabitants of Naples and Malta employ a large quantity of snow to cool their wines, and for a variety of purposes.

But how can they get it, Papa! Snow in summer!

They lay it up in winter, in large caverns, which are in the sides of Mount Etna.

But how can they carry it to the towns of Sicily, Naples, and Italy? Would it not all melt by the way?

No,—they press it very close together, and place fresh leaves around the lumps, which are put into bags, and so very little of it melts, till it reaches its destination.

Well, I should never have even thought of a trade in snow!

Perhaps not; but this trade in snow employs many boats and vessels, and some thousands of mules, horses, and men. A scarcity of snow in these coun-

tries is dreaded with very much of the same feeling as a scarcity of corn. There was a most encouraging and delightful allusion to the snow and the rain in the chapter which was read this morning at our family devotion: do you recollect it?

Yes; "As the rain cometh down, and the snow from heaven, and returneth not thither, but watereth the earth, and maketh it bring forth and bud, that it may give seed to the sower, and bread to the eater; so shall my word be, that goeth forth out of my mouth, it shall not return unto me void, but it shall accomplish that which I please, and it shall prosper in the thing whereto I sent it." Isa. lv., 10, 11.

How would you define frost, Papa?

It is such a state of the atmosphere as occasions the congelation, or the freezing of water, and other fluids. The heat evaporates, or escapes from the water, hence it freezes, or becomes a solid body.

Not altogether so, Papa; as ice is lighter than water.

True, or else it would sink to the bottom of rivers

and lakes, and fill them up; as our summers would not be warm enough to melt the layers of ice.

How is it that frosts do not continue in winter without interruption, till the earth should become a vast mass as hard as stone?

God has so wisely arranged things, that when the frost has reached a certain point, it can proceed no farther. The vapours which are dispersed through the air, give out their latent heat, and a milder state of the atmosphere ensues, of which a thaw is the necessary consequence.

Does the frost extend far into the ground?

Not very far; Mr. Boyle examined an orchard after four nights of hard frost, and found that it had scarcely penetrated three inches and a half; and in a garden, near the house, only two inches; but after nine nights of successive frost, he found it had reached, on the same spot, to six inches and a half. A garden was examined at Moscow, in the winter, and it was found that the frost had affected the soil to the depth of only two feet. Frost contracts metals, but dilates water. In cold

countries, trees are often destroyed by frost; the ash, the oak, and walnut-trees, have been known to split with a great noise, like that of the discharge of fire-arms.

Do not vessels burst from the swelling of the water in them, when it freezes?

Certainly; nothing is more common. Strange as it may appear, this very expansion, in the case of freezing, is really the effect of latent heat, which, being discharged from the freezing water, combines with the air in its unelastic state; and by restoring its elasticity, gives it that extraordinary force, the like of which we see in the case of air suddenly set at liberty in the explosion of gunpowder. Some members of the Florentine Academy filled a hollow brass ball, of an inch diameter, with water, "exposing it to a mixture of snow and salt, in order to congeal the water, and try whether its force was sufficient to burst the ball. Being made very strong, it resisted the expanding power of the water twice, even though a considerable part of its thickness had been pared off when it

was perceived too strong at first. At the third time it burst; and by a calculation founded on the thickness of the globe, and the tenacity of the metal, it was found that the expansive power of a body of water, only one inch in diameter, was sufficient to overcome a resistance of more than twenty-seven thousand pounds weight, or thirteen tons and a half." This was a very striking experiment.

How thankful we should be that we have not eight and ten months' winter, as they have in some parts of the world. What a dreadful climate, Papa, must Siberia be to live in!

It must, indeed. I recollect a traveller, writing at Yeneseisk, * says, in the middle of December, such severe weather set in, that the very air seemed as if it were frozen, and had the appearance of a fog, which did not suffer the smoke to ascend as it issued from the chimnies. Birds fell down from the air as dead, and froze immediately, unless brought into a warm

* In $58\frac{1}{2}$ N. lat., and 92 E. long.

room. Whenever the door was opened, a fog suddenly formed round it. During the day, short as it was, parrhelia, and haloes round the sun, were frequently seen; and in the night, mock moons and haloes were about the moon. Finally, the thermometer left us no doubt of the state of the atmosphere; the quicksilver was reduced, on the 5th of January, to 120 degrees of Fahrenheit, lower than ever it had been before observed.

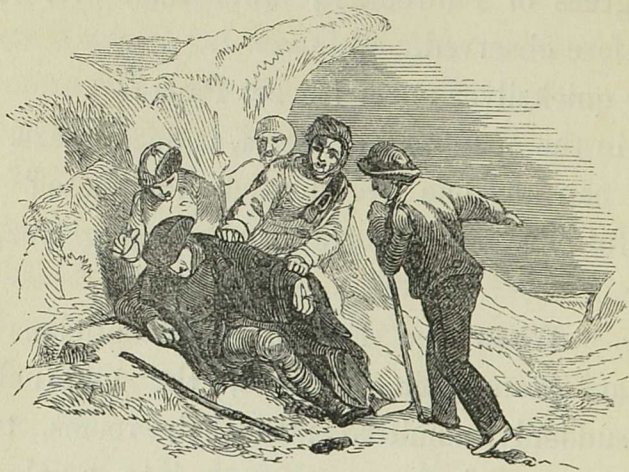
Does quicksilver never freeze, Papa?

Yes, in the open air in Siberia, it does freeze.

How can any one live in such a climate? It is wonderful how any creature escapes being frozen to death.

It is. When the French mathematicians wintered at Tornea, in Lapland, the external air, when suddenly admitted into their rooms, turned the moisture of the apartment into a cloud of snow; their lungs seemed to be torn when they breathed this atmosphere; they were obliged to confine themselves in their habitations; and the

spirit of wine, which had not been highly rectified, burst some of their thermometers by the freezing of the watery part. Seven thousand Swedes once perished by severe cold, when attempting to cross the mountains which divide Norway from Sweden. These are not solitary instances of the fatal effects of severity of climate. Do you not recollect the name of a



gentleman mentioned in the voyages you have been reading, who narrowly escaped perishing?

Dr. Solander?

Yes. When overwhelmed by the cold, the individual becomes restless and drowsy ; and sitting down to repose, falls to sleep, and wakes no more. When Dr. Solander, with several others, had taken an excursion up the country at Terra del Fuego, the cold was so intense, that one of their company died in this way. Dr. S. himself, though he had warned his friends against the danger of sleeping in such circumstances, had nearly perished in attempting to do so. He was awakened as soon as possible, but his flesh had shrunk so much, that his shoes dropped off his feet ; and it was with great difficulty that he was saved.

But winter with us, Papa, is not all storm, snow, and frost.

True ; and we should be thankful that this is the case. We have many fine days in winter. And it is in this season that the family are more frequently all together, and the parents survey their children and friends with elevated joy and gratitude. With us, you know, Edward, the winter's evening is often one

of much enjoyment. Some instructive volume, made vocal by one, edifies the whole company. Sprightly and entertaining conversation, or music, ensues; nor do we, in such truly rational exercises, deem the God who made us,

* * * “an intruder on our joys,
 Start at his awful name, or think his praise
 A jarring note.
 Cards were superfluous here, with all the tricks
 That idleness has ever yet contriv'd
 To fill the void of an unfurnish'd brain,
 To palliate dulness, and give Time a shove.”

Intimate, amusing, instructive, and protracted intercourse with agreeable friends, comfortable habitations, abundant fuel, suitable raiment, and most of the luxuries of life, are among the winter mercies of large classes of the community.

But amidst our comforts, we should never forget that winter is a season when considerable numbers of our fellow-creatures are in peculiar distress. What benevolent mind, in such a season, can help thinking of the poor prisoner, shut out from intercourse with

his friends; deprived even of many of the commonest mercies; on whom perpetually the doors close, “on whose hinges grate harsh thunder:”—of “those who go down to the sea in ships, who do business in great waters; who mount up to the heavens, who go down again to the depths, whose soul is melted because of trouble:”—of the multitudes of the poor, who now

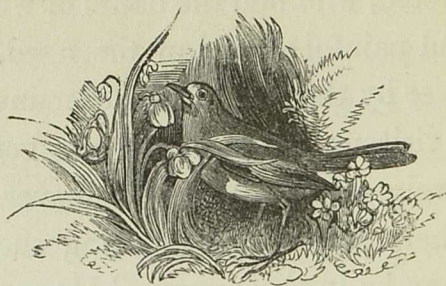
* * * “pierc’d by wintry winds,
Unpitied, sink into the sordid hut
Of cheerless poverty:”—

of the afflicted, who find the hours of winter peculiarly tedious and painful;—and of the aged, whose heads, silvered over by the revolutions of many such seasons, tell every visitant that the days are come, in which, comparatively speaking, they “have no pleasure.” Who can help pitying and relieving such as these, so far as it may be in their power? He cannot love God, whom he hath not seen, who does not love his brother, whom he hath seen; and if he does love his brother, he will show that this is the case by pitying and relieving him.

What a difference there is now in our walks, and those which we take in the other parts of the year !

There is ; but these delightful seasons will soon come again. Notwithstanding the snows, and the frosts, there are around us indications that the bleak winter is preparing for his departure ; for

“ The snow-drops by our garden-walk,
Long since to life have started ;
They wither now upon the stalk,
Their beauty is departed.



The robin, from the pear-tree bough,
Gives us of song our ear-full ;
The morns are getting lightsome now,
The evenings growing cheerful.”

I love the spring, Papa, better than any of the seasons; the very thought of its coming is pleasant to me.

My views, Edward, are in unison with your's. I often say of Spring, in the language of good Bernard Barton,

“ Sweet season ! appealing
To fancy and feeling ;
Be thy advent the coming of all I would crave ;
Of light more than vernal,
That day-spring eternal,
Which shall dawn on the dark wintry night of the grave ! ”

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
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