FIRST STEPS IN GEOGRAPHY

BROOKS AND BROOK BASINS

ALEX. E. FRYE

8903

950

Office of Secretary
Feb. 2nd 1891.

From the collection of the

liments of

The Author.

Prelinger Library

San Francisco, California
2006

"Up in a wild, where no one comes to look,
There lives and sings a little lonely brook;
Liveth and singeth in the dreary pines,
Yet creepeth on to where the daylight shines." — *Whitney.*

First Steps in Geography

BROOKS AND BROOK BASINS

BY

ALEXANDER E. FRYE, LL.B.

AUTHOR OF "THE CHILD AND NATURE," "RAISED MAPS OF THE CONTINENTS," ETC.

"Come forth into the light of *things;*
Let Nature be your teacher"
—WORDSWORTH

PUBLISHED BY THE
BAY STATE PUBLISHING COMPANY
HYDE PARK, MASS.
1891

"Boys, flying kites, haul in their white-winged birds;
You can't do that way when you're flying words."

—Will Carleton.

Copyright, 1891,
By ALEXANDER E. FRYE.

All Rights Reserved.

Alfred Mudge & Son, Printers, Boston.

PREFACE.

The purpose of this book is twofold:

I. To inspire children with love of nature.

II. To suggest to teachers the subject-matter of primary geography, which, in the form of out-door nature studies, should precede the use of a text-book.

The study of mere forms of land and water, which usually completes the elementary course, is in reality only a very insignificant part of what should constitute the work. The aim should be to teach, *by leading children to discover*, the relations of these forms to the forces or working agencies, such as running water and currents of air, as they affect the development and distribution of plant and animal life.

The reason for selecting Brooks and Brook Basins as a title is fully stated on the page next following.

If this book possesses any merit, it is that of presenting the earth as a living, working, producing *organism*, in a form adapted to the minds of children.

Alex. E. Frye.

Hyde Park, Mass., Jan. 1, 1891.

TO TEACHERS.

Thoughts from
"THE CHILD AND NATURE."

I. Perception.

Every brook basin is a miniature world.

The forms of land and water; the forces at work wearing and building; the conditions that regulate the distribution of life, — all are there, repeated in endless variety.

The hillside leads to the greatest slopes of earth; the running water illustrates the principles of drainage of the largest rivers; the little delta shows how vast alluvial plains are formed; each blade of grass and tiny earthworm obey the same forces that cover the earth with flora and fauna.

But only after pupils have studied the relations of forms, forces and conditions *in nature*, can they imagine them on the grander scale on which our beautiful planet is constructed; for, in the development of mind, perception must precede imagination.

Teachers are earnestly advised to take their pupils, when practicable, out by a brookside, to read and discuss the topics in this book, where nature can speak for itself, and awaken new thoughts.

The brook basin is the unit-form of continental drainage.

II. Imagination.

Particular attention is called to the importance of cultivating the *power to imagine* the great natural features of the earth, by describing them to children *as soon as* their types have been studied in the school district.

By such teaching, the grove becomes a great selva, the meadow broadens to a vast prairie, the little ravine rises to a cañon of the Colorado; in short, through the geographical forms about home, pupils should be led to study types of families of great natural features, till the whole world lies mirrored in the district.

Not knowledge of particular foreign forms, but *power to imagine*, should be the aim. This is one of the most important steps in the teaching of primary geography. At the close of some chapters will be found stories illustrating this work.

Children revel in analogies, because they lead to the beautiful region of fancy, where all childhood must wander till the discovery of natural cause and effect reveals true relations governed by physical laws, and admits to the higher realm of imagination. Fancy is an iridescent bridge between memory and imagination, and unfortunate the child who is not permitted to cross at his leisure, and grow strong in imaging-power while crossing.

It is because of the great importance of fancy, or phantasy, in the development of the imagination, that so many analogies, in simple metaphor and simile, have been suggested in these pages.

III. Sensibility.

Another element is worthy of special notice; viz. the use of choice quotations as a means of leading children to a more reflective and refining study of nature.

Forms of land and water, whose beauty and lessons lie deeply hidden, are oft unveiled at the touch of the poet mind. Their influence sinks deepest when we are drawn nearest to nature in study; and the forms that first inspired the poet's ideal become the language by which we interpret it.

Science is an ocean of thought, with every wave a poem.

Reach out to childhood, and sow in the forming characters the purest thought-seeds of the noblest minds. To see truth is to love it, and every child naturally inclines to that which is pure and true.

Store the memories with such beautiful poems as lie scattered over these pages like gems in a rough river-bed, and in years to come they will adorn lives made nobler by their presence.

The philosophy of phenomena, difficult to grasp in the lower grades of school work, has been suggested in various figures of speech. For every fledgling idea in the text, there are a dozen pecking at the word-shells. Do not try to break the coverings from without, but wait for them to develop from within.

Let the children taste the joy that springs from the discovery of truth. Effort alone is the soil of growth.

CONTENTS.

BROOKS AND BROOK BASINS.

BROOKS AND BROOK BASINS.

CHAPTER I.

THE RAINDROPS SET OUT ON THEIR JOURNEY.

"O tell me, pretty brooklet!
Whence do thy waters flow?
And whither art thou roaming,
So smoothly and so slow?

"My birthplace was the mountain,
My nurse the April showers;
My cradle was a fountain
O'er-curtained by wild-flowers."

—ANON.

HAVE you heard the babbling brooklet tell the story of its travels?

There it comes! tripping down the hillside, like a band of fairies dressed in golden sunbeams.

Hear it tinkle, tinkle, tinkle, as it ripples o'er the pebbles. See the sunlight play on its silvery sheets, and dance in the flying spray.

Watch the shining bubbles spring up in each tiny water-break to catch the rainbow colors,—

then burst and fling their beauty playfully into the air.

Flakes of foam, like baby swans, chase around each little bend, and whirl in merry eddies.

Like a happy child at play, the brooklet hides its dimpled cheek behind the green bank, and then comes skipping lightly forth again. Now it glides into the meadow, where graceful willows bend above it, and snow-white clouds beneath its surface seem to float in fairyland.

On its banks, the wild-flowers stoop their pretty heads, and nod and sway. They love to listen to its noisy prattle. Even the timid rabbit, with one soft white foot uplifted, stops and pricks up its long ears, to hear the brooklet tell the story of its travels.

Hark! it is just beginning:

"Far away in the sunset gardens, where bright flowers cluster at eventide, there dwells a beautiful maiden, named Aurora, the goddess of Dawn.

"Just before the break of day, she rises from her downy couch and sets the morning star in her forehead, above a cloudy crown. Over her ruddy shoulders she spreads a rich mantle tinged with purple, and soars away on graceful wings that bear the hues and tints of morning.

"One touch, in passing, puts out the starry lights.

"Her gently swaying pinions fan away the cold, gray mists, as with rosy fingers she paints the

"Now it glides into the meadow."

sleeping hilltops, tinting them with dawning light. The sweet-voiced birds awake, and grateful flowers lift up their dewy heads to greet her as she passes.

"Open-wide she swings the gates of morning, and the flaming chariot of the sun rolls in to run its course across the arching sky. Then swift Aurora westward wings her way to welcome home the Prince of Light when his daily task is ended.

"One morning, long ago, a band of little raindrops, far away in the deep sea, were watching the rosy Dawn greet the coming Day.

"The noble Prince was just rising from his bed of roses. A thousand golden spear-points were thrusting aside the dark curtain of night. A thousand silver arrows were shooting across the sky. Old Ocean lay fast asleep.

"Soon a dazzling light poured out over the water, tipping each tiny ripple with gold. The merry waves awoke, and danced and sang:

"'Children are we
Of the restless sea,
Swelling in anger, or speaking in glee;
We follow and race,
In shifting chase,
Over the boundless ocean space!
Who hath beheld when the race begun?
Who shall behold it run?'

— BAYARD TAYLOR.

"'Now for a race!' shouted the passing sunbeams to our raindrop band.

"Away we went! Up, up, on our light vapor-wings. Up, up, over the tall masts of the ship. Up, up, into the bright blue sky.

"Far below, we could see the old white sea-gulls, chasing their own shadows among the clear blue waves.

"The air became cooler, so we put on our pretty white cloud-jackets. What a host we were! Above, below, on every side, the air was filled with water-dust. It made a cloud that cast a long, wide shadow over the sea.

"Hour after hour we floated, till the Prince of Light sank to rest on a pillow of fleecy clouds. Over him the Twilight wove a beautiful coverlet with rainbow threads. Then her rosy fingers gently swung the gates of evening, and left us alone in the darkness.

"Soon a gentle breeze came tripping over the sea. Pretty ripples sprang up to greet it. Then a timid little star peeped forth to see if day had gone. Another and another followed, till their bright eyes were blinking all over the sky.

"'The twilight hours, like birds, flew by
As lightly and as free;
Ten thousand stars were in the sky,
Ten thousand in the sea;
For every wave with dimpled cheek,
That leaped into the air,
Had caught a star in its embrace,
And held it trembling there.'

— AMELIA B. WELBY.

"O, how beautiful was the night!

"Low in the west, the crescent moon rocked in the deep grottos of the silver-lined clouds. Under its mellow light, the drowsy waves put on their sparkling night-caps, and went sailing off to bed.

"Above us, the Milky Way, pale rainbow of night, spanned the dark-blue sky, with its millions of starry drops, like a bridge of silver foam among its clusters of golden islands.

"There, too, o'erspread the countless stars, as if the sun, like a flaming rocket, had burst and showered its flickering sparks over the sleeping earth.

"Now and then, bright trailing meteors flew far overhead, like starry birds-of-passage, — flashed into sight for an instant, and then were gone, — whither?

"Here and there, weird shadows seemed to flit like dark-winged birds across the sea, to remind us that night was hovering near.

"What a merry train they were — the twinkling stars!

"Out of the east came beautiful Vega, brightest of all the evening host. Near it floated the graceful Swan, among the foamy flakes that drift adown the Milky Way.

"Then we heard the night Wind humming a sweet lullaby, telling how —

"'Wynken, Blynken, and Nod one night,
Sailed off in a wooden shoe;

Sailed on a river of misty light,
Into a sea of dew.
"Where are you going and what do you wish?"
The old Moon asked the three.
"We have come to hunt for the herring-fish
That live in this beautiful sea;
Nets of silver and gold have we,"
Said Wynken,
Blynken
And Nod.

"'The old Moon laughed and sung a song,
As they rocked in the wooden shoe;
And the wind that sped them all night long
Ruffled the waves of dew.
The little stars were the herring-fish
That lived in that beautiful sea,
"Now cast your nets wherever you wish,
But never afeard are we!"
So cried the stars to the fishermen three,
Wynken,
Blynken
And Nod.

"'All night long their nets they threw
For the fish in the twinkling foam;
Then down from the sky came the wooden shoe,
Bringing the fishermen home.
'Twas all so pretty a sail, it seemed
As if it could not be;
And some folks thought 'twas a dream they dreamed,
Of sailing that beautiful sea;
But I shall name you the fishermen three,
Wynken,
Blynken
And Nod.

"'Wynken and Blynken are two little eyes,
And Nod is a little head,
And the wooden shoe that sailed the skies,
Is a wee one's trundle-bed;
So shut your eyes while mother sings
Of wonderful sights that be,
And you shall see the beautiful things,
As you rock on the misty sea,
Where the old shoe rocked the fishermen three,
Wynken,
Blynken
And Nod.'

—EUGENE FIELD.

"As the sweet song died away, kind Night showered her drowsy drops over our weary band; and, swinging in the cradle of the gentle winds, we fell asleep.

"Then we dreamed we were captives of the golden Sunbeams who carried us away in little white-winged boats to a far-off land, and set us at work in cold, dark cells. One day we ran away. But just as we were gliding along a beautiful pathway, paved with golden sands, and bordered with bright flowers, we awoke to find ourselves still floating above the dark-blue ocean.

"'We saw the slow tides go and come,
The curving surf-lines lightly drawn,
The gray rock touched with tender bloom
Beneath the fresh-blown rose of dawn.'

— WHITTIER.

"The warm sun soon cleared away the pale mist, and just as far as our little cloud-eyes could reach, we saw broad fields and tall groves.

"Pretty white cottages nestled among the low hills. We heard the hum of the old mill-wheel, and the voices of happy children at play.

"But the fields were brown and bare. Cold Winter had just fled. We could still see his white footprints in the forest.

"'Here is work for all!' rustled the silver water-dust, as it danced with the merry sunbeams. 'The timid rabbit and sportive squirrels have watched the frosty autumn crawl slowly along, wrap itself in a warm cocoon of wintry snow, from which the spring, like a beautiful butterfly, will soon burst forth, fluttering in bright blossoms.

"'The gardens will then be filled with seeds. We must help them spring up and grow. We will cover the fields with violets, and send golden grain to wave in the meadows. We will hang rosy apples in the orchards, and purple grapes in the vineyards. How happy everybody will be when all nature wakes from its long quiet sleep!'

"Just then cold Winter turned and sent its icy breath whistling over the hilltops. How we shivered and huddled together! The warm sunbeams fled away in fright. Then, folding our little vapor-wings, we became drops of water, and began to patter down on the steep hillsides.

"'The pastures lie baked, and the furrow is bare,
The wells they yawn empty and dry;
But a rushing of water is heard in the air,
And a rainbow leaps out in the sky.'

—ANON.

"How glad the old pines were to see us!

"The early birds sang their sweetest songs. You should have heard them chirp and twitter among the branches.

"Merrily the little leopard frogs trilled, 'Pr-r-r, pr-r-r, spring is here, pr-r-r, pr-r-r!'

"And the old ones croaked their deep bass, 'Tb-b-b, tb-b-b, winter is gone, tb-b-b, tb-b-b!'

"Pretty pink earthworms came crawling from their narrow cells to find out what all this fuss was about. Even the old brindle cow stood out in the rain, and blinked and blinked, for now the springs would all flow pure sweet water again.

"What a stir it made just because the cold north-wind that morning scared the warm sunbeams away, and sent an April shower to bless the earth!"

CHAPTER II.

AT WORK IN THE DARK SOIL.

"BUT what can little raindrops do?" piped a robin redbreast next morning, as he dipped his bill in the clear cool water.

"Do?" bubbled the brook; "you should see us at work!"

"Chip, chip, che-chip!" chattered a saucy chipmonk who was listening to the story.

"Chuck, chuck, che-chuck!" barked an old gray squirrel, and he snapped his teeth and shook his bushy tail at the thought of a raindrop doing any work.

"All at once *crack* went the dead branch on which they sat, and *splash* they went into the water. How they did sputter and chatter as they scrambled ashore, and ran to hide in the old stone wall.

"A merry ripple went up and down the brook. The little wild-flower would have smiled too, but it was afraid that the gray squirrel would come and snip off its head. So it only nodded its pretty blossom, as the brooklet went on with its story.

"Yes; we all went merrily to work, for there are no lazy raindrops. The ground was full of

By the Brookside. Where is Redbreast?

cracks and holes, where our cousin Jack had been before us.

"What! you do not know Jack Frost? O, he is a merry fellow, bright and full of life. Sometimes he is mischievous, too. He likes to nip the flowers and fruits, — yes, and the toes and ears of little girls and boys.

"But he is very useful, for all that. Every year he comes to loosen the soil with his little icy ploughs, so that the raindrops can reach the roots and seeds in early springtime.

"Down, down, we ran into the thirsty ground, — down into rich loam that held fast nearly half our band, — down through sandy soil which could not stop our flowing, — down to a bed of clay whose doors were closed against us.

"How dark it was in those tiny cells. Not one ray of light to show us the way; not a sunbeam to cheer us on.

"We met cold earthworms crawling along in their slender caves. Brave little creatures they are, toiling there in the dark. Day after day they gnaw the leaves, and change them into loam. Then back to the surface they crawl, and bring their rich load.

"'The tiny mounds by earthworms cast, —
The richest gift in Nature's hand, —
Contain the life of ages past,
The hope of every flowering land.

"'Far less of wealth should we behold,
Far less of happiness secure,
If every second mound were gold,
And every first a diamond pure.'

—A. E. F.

"We passed by families of queer little ants, building their pretty hills. How busy they were, carrying the soil to light and air. All over the hillside, you can now see hundreds of their rich mounds, waiting for the raindrops to come and spread them over the surface.

"We took the loam wherever we went, and placed it near the roots and seeds. We even carried it into the plants and trees. The sun sent down its warm rays, and soon all nature was awake once more.

"We ran into little grass culms, where tender blades had hidden from cold winter storms. Soon the fields were green again. We stole up into each sleeping bud, and rosy leaflets unfolded in the warm sunshine. We waked up every seed in the garden, and their pretty heads came peeping through the dark soil. The air was filled with sweet songs of birds, and spring had come.

"'Whether we look, or whether we listen,
We hear life murmur, we see it glisten;
Every clod feels a stir of might,
An instinct within it that reaches and towers,
And groping blindly above it for light,
Climbs to a soul in grass and flowers;

The cowslip startles in meadows green,
The buttercup catches the sun in its chalice,
And there's never a leaf nor a blade too mean
To be some happy creature's palace.'

—LOWELL.

"Soon the snowy blossoms on the apple-trees hung like clouds. The violets in the meadow looked like the clear blue sky above. Still we toiled on in the dark ground.

"Day after day, merry showers pattered down. One morning, as the silver drops came singing from the clouds, we heard them shout, 'Catch us, if you can!'

"Away they scampered down the hill, for the soil had water enough.

"'Wait for me!' cried one little fellow, and where do you think it was? It had fallen straight into the tiniest buttercup on the whole hillside, and could not get out. It looked just like a diamond set in a little golden crown, only it was much prettier. Perhaps a passing sunbeam helped it out next day, but no one waited to see.

"Weeks passed. The apple-blossoms sifted down like snow. Golden grain waved in the meadow. Rich yellow corn flung out its silken tassels along our brookside.

"'All the long August afternoon,
The little drowsy stream
Whispers a melancholy tune,
As if it dreamed of June
And whispered in its dream.'

—W. D. HOWELLS.

"At length the branches hung low with ripe fruit. Yellow sheaves dotted the stubbly meadow. Long ears of corn stood ripening in the sun. Out in the grain fields we heard happy voices singing —

"'Heap high the farmer's wintry hoard!
Heap high the golden grain!
No richer gift has Autumn poured
From out her lavish horn!

"'Through vales of grass, and meads of flowers,
Our ploughs their furrows made,
While on the hills the sun and showers
Of changeful April played.

"'We dropped the seed o'er hill and plain,
Beneath the sun of May,
And frightened from the sprouting grain
The robber crows away.

"'All through the long bright days of June,
Its leaves grew green and fair,
And waved in hot midsummer's noon,
Its soft and yellow hair.

"'And now with Autumn's moonlit eves,
Its harvest time has come,
We pluck away the frosted sheaves,
And bear the harvest home.'

—WHITTIER.

"At length our long, cold journey was ended, and we could come out of the dark soil, as other little raindrops had every day, and could play with the sunbeams once more. Soon we should be home again! How happy we were!

"Have you ever seen a spring? You should have been there to see us burst from ground. I will tell you what it was like.

"Go all the way up the hillside where we have been flowing. Gather up every merry ripple, every silver bubble, every sparkling sunbeam.

"Take even the tiny whirlpools with their flakes of foam, — the gliding sheets and flying spray. Over all sprinkle a dozen of the brightest rainbows you have ever seen.

"Now carry them to yonder green spot on the hillside, where the pretty flowers love to cluster round; and there beneath the branches of the graceful willow, bury them deep in the dark, cold ground.

"Then, when the sweet-voiced birds are awake, and the air is heavy with perfume, — there, where the sunbeams seem to beckon, let them all burst forth like a Jack-in-a-box, and run sparkling, bubbling, prattling, dancing, dashing down the hillside, and you will see our spring. Now —

"'I'm hastening from the distant hills,
With swift and noisy flowing;
Nursed by a thousand tiny rills,
I'm ever onward going.

"'The willows cannot stay my course,
With all their pliant wooing;
I sing and sing till I am hoarse,
My prattling way pursuing.

"'I kiss the pebbles as I pass,
And hear them say they love me,
I make obeisance to the grass
That kindly bends above me.

"'So onward through the meads and dells
I hasten, never knowing
The secret motive that impels,
Or whither I am going.'"

—EUGENE FIELD.

As the voice of the brooklet seemed to die away in soft ripples along the banks, two nimble squirrels sprang from the old stone wall, and ran down to the edge of the water. Can you guess what they whispered to the little brook?

This was the kind and gentle answer: "O yes, be sure to come! We know that you meant no harm. But remember that —

"'Small service is true service while it lasts;
Of meanest friends, bright creatures, scorn not one;
The daisy, by the shadow that it casts,
Protects the lingering dewdrop from the sun.'

—WORDSWORTH.

"We like to see you sporting among the branches, and we have helped to fill a great oak with sweet acorns for you to store away for the long, cold winter.

"Come early to-morrow, and you shall hear about the beautiful valley in which you live.

"Good by!"

"Good by!"

Surely enough, when the brooklet began its story next morning, there sat Chip and Dick on the bank, looking just as happy as good little squirrels ought to look.

CHAPTER III.

ON THE WATER-PARTING.

"Behold the rocky wall
That down its sloping sides
Pours the swift raindrops, blending, as they fall,
In rushing river-tides!

"Yon stream, whose sources run,
Turned by a pebble's edge,
Is Athabasca, rolling towards the sun
Through the cleft mountain ledge.

"The slender rill had strayed,
But for the slanting stone,
To evening's ocean, with the tangled braid
Of foam-flecked Oregon."

—HOLMES.

"HERE you are, little squirrels, bright and early," babbled the brook, next morning. "But where is our pretty friend Bunny?

"Ah, there he comes, hopping along. And here comes Robin Redbreast, too."

The little wild-flower nodded its round head, and the squirrels shook their bushy tails. That is the way they said good morning to Bunny and Redbreast.

Bunny's Home.

"Did all the raindrops sink into the dark soil?" asked Chip, as soon as they were ready for the story.

"O no!" rippled the brook. "Shall I tell you what became of the others, and what they saw on the hillside?"

"Please do!" chimed the whole party, and so the brooklet began.

"We all felt very sad when we parted from our brother raindrops on the hilltop. But some were on one side of a low ridge, and some on the other. We could not climb over, for raindrops can only run down hill.

"'Good by!' cried our tiny brothers.

"'Good by!' we answered sadly, and we have not seen them since. Perhaps we shall all meet again when we go back to the sea, — but who can tell?"

Just then, two silver bubbles came wriggling up from the bed of the brook. They looked like teardrops, and we thought the pretty pebbles must be weeping at the sad story. But the brooklet chattered on.

"The same day that we fell on the hill, a teacher came with a class of happy children to visit our valley home. She did not know that raindrops could hear, and we did not tell her.

"They all climbed to the top of the ridge, just where we had fallen. Then they could look into the valley on either side.

"'When the rain falls on the very top of the ridge, which way will the drops flow?' asked the teacher.

"Every little raindrop on the hillside knew the answer; but we all kept still.

"Many pupils said that the water would flow into our valley, but others thought that it would run down the slope on the other side of the ridge. One bright little girl said that it might flow either way.

"Then the teacher asked them to find other spots where the raindrops might turn either way. She gave them sharp sticks to set up all along the very top of the ridge.

"'Here's a place!' 'Here's another!' rang their merry voices. What sport they had! One little boy hit his bare toe against a stump, and away he rolled down the steep hillside. It didn't hurt him, and he ran back laughing.

"Soon there was a long row of tiny stakes all around the valley,—up by the spring, and on both sides. Then the teacher told her little folks that the very top of the ridge, on which the poles stood, was called a 'water-parting.' We all thought it a good name, for that was just where we parted from our raindrop brothers last spring.

"The little children found only one water-parting around our valley, but my tiny rills know that there are two. Many of the drops that soak into

the soil settle till they reach a layer of clay or rock on which they can flow. The highest part of this clay-bed or ledge forms a parting or 'divide' for the underground streams, just as the top of our ridge does for the surface-water.

"But we must not lose sight of the teacher yet. Her next question was a queer one: 'To which valley does the water-parting belong?'

"Do you think that you can tell, pretty rabbit?"

"I think that it belongs to both," was Bunny's answer.

"It isn't in either," piped Redbreast.

"It comes just between the valleys," said Chip.

"I don't know," sighed the little wild-flower, "for I have never moved from this spot."

The old gray squirrel gave a knowing wink, and said, "That water-parting is on the edge of both valleys. The slopes meet there."

Which was right?

The silver brook only bubbled softly, as it went on with its story.

"That ridge is the boundary of our valley home. All the raindrops that fall on this side belong in our family. All that fall on the other side run away to other streams. But here comes a shower! If Bunny and Dick will go up to the ridge, they can see just what happens."

Away they jumped, and reached the top as the drops began to fall.

"Come under this old stump, Bunny," said Dick, "and the rain will not wet your soft fur."

How pretty they looked, sitting there together! Two pairs of bright eyes peeped out at the rain. Two pairs of sharp ears listened to the patter on the old stump.

"O look, Bunny! we are on the water-parting. Here is just where the raindrops are parting. Many are also sinking into the ground. Here go some down this slope, and there go the others into our valley. See! they are forming two little rills."

"It has stopped raining now, Dick. Let us follow these tiny streams both ways. I will go to the right, and you to the left. Then we will return to the brookside, and tell what we have seen."

* * * * * * *

"Why, here comes the rabbit all alone!" sighed the little wild-flower. "What has happened to Dick?"

"Ha! ha!" laughed Bunny. "I played a joke on him. He will come back by and by. Shall I tell you what I saw?"

"O yes, tell us your story. We have been waiting to hear it."

So Bunny told how they went to the top of the hill, and hid in the dry stump. How they watched the drops fall on the ridge. How he had agreed

to follow the rill on one side, while Dick went down the other.

"It was such a joke! Ha! ha! Poor Dick, he did not think! His rill will lead him away over into the other valley." Then Bunny rolled in the sand, and laughed till tears ran down his soft cheeks.

"But what did you see, Bunny?" asked Chip.

"O yes, I forgot to tell my story. The tiny streams moved slowly at first, till they came to the place where the boy rolled down the hill. Then they pitched headlong over and ran to the bottom as fast as I could jump.

"How pretty they looked as they went leaping over the stones. Many little rills flowed together, but there were low water-partings between the others that kept them from joining. They had a merry time. I heard one little fellow singing—

"'One morn I ran away,
A madcap, noisy rill;
And many a prank that day,
I played adown the hill.'

—ANON.

"Then the tiny streams wound slowly across the meadow, and where do you think they went?"

"Here we are!" rang a merry chorus.

Surely enough, all the little rills had run into our brook, and had just reached the place where Bunny was telling his story.

"Here comes Dick!" cried sharp-eyed Chip, as down the hillside tripped the graceful squirrel, hopping over the tufts and hollows.

His first words were, "That was a good joke, Bunny, but it turned out well. I found a big nut-tree over the ridge. As soon as the frost comes to open the burrs, I shall hide the nuts away under the old stump. I wish you could eat some, Bunny. Little Chip may have as many as he wants this winter."

"You are always kind to me," whispered Chip, as he rubbed his pretty cheek against Dick's soft fur.

"But what else did you see over the ridge?" rustled the wild-flower.

"I followed the rills on the other side till they all flowed into another brook just like ours. Now what do you think of this? That little stream was telling the selfsame story that we heard yesterday. I wonder if all brooks work as hard as ours?" queried Dick.

Robin Redbreast was very quiet. He had been thinking. All at once he dipped his head, as robins often do, gave a few quick hops, flapped his wings, and chirped so loud that he scared poor Bunny half out of his wits.

"What is the matter?" asked Dick, as he stuck his tail straight out, ready to run.

"When I flew northward last spring," piped

Redbreast, "I was caught by a strong wind that blew me far out of my course. I saw a great stream, wider than this whole meadow. I cannot tell how long it was, for it reached farther than I could see.

"How the wind blew! I flew over high hills, yet I could always see the river in the valley. But as I went higher and higher up the long slope, the stream became ever smaller and smaller.

"At length I saw a high mountain whose top was above the clouds. On its side, the stream looked very narrow. Over the great highland I flew, and saw only a little brook starting near its highest point.

"Then, on the other side, I saw another stream, —yes, many little rills and brooklets. Down they ran, and flowed together in the lowlands. They made a river that was wide and deep. It was just like our brook, only many times larger. Away, as far as I could see, the dark-blue river wound across the plain.

"'So blue yon winding river flows,
It seems an outlet from the sky;
Where, waiting till the west wind blows,
The freighted clouds at anchor lie.'

—LONGFELLOW.

"At length the storm passed by. Then I flew north to my old apple-tree, just as fast as my wings could carry me.

"Now I see it all! The top of that high mountain is a water-parting like our low ridge. It parts the raindrops for those great rivers, as the ridge does for our brooks."

"You are right, little bird," rippled the brook. "But all water-partings are not high, or even like ours on the hill. Some are so low that you can scarcely see them. Yet they part great rivers.

"A parting may be on mountains, hills, or even low plains. Often it is on all three, for it must go around a valley. It need only be high enough to part the raindrops."

The pretty wild-flower nodded to Redbreast, and whispered, "What a wonderful bird you are!"

All the others thought so, too.

CHAPTER IV.

IN THE BROOK-BED.

"Good morning, Dick."

"Good morning, Bunny; where are you going?"

"Down to the brookside. We shall find Chip and Redbreast there before us, this morning. I saw them pass by some time ago. There they are now. And hark! that is the brooklet singing. Let us sit here on this pretty knoll and listen."

"'I chatter over stony ways,
In little sharps and trebles,
I bubble into eddying bays,
I babble on the pebbles.

"'I wind about and in and out,
With here a blossom sailing,
And here and there a lusty trout,
And here and there a grayling.

"'And here and there a foamy flake
Upon me as I travel,
With many a silvery water-break
Among my golden gravel.

"'I draw them all along and flow
To join the brimming river,
For men may come and men may go,
But I go on forever.'"

—TENNYSON.

"Bravo, little brook!" shouted the rabbit. "What a pretty song!"

"Here are Bunny and Dick," called out the lively chipmonk. "Now you can begin your story."

"What shall it be to-day, Chip?" asked the brooklet.

"O, tell us, please, how the raindrops found their way into the brook-bed," said the happy little creature; and so the silver drops in the passing stream began their story.

"We told you how we came out in the bubbling spring, but we did not tell you that there are several of these sparkling fountains in our valley. All around the foot of the hill, and on its sides, you will find them creeping forth to form the tiny rills and brooklets.

"When we came out of the dark ground, we found many slopes on the hillside. Some were so steep that we could roll straight down into little pools. Others were covered with sharp rocks that cut us into foamy sheets. In one place, we ran so fast that a barefoot boy who came to fish clapped his hands and shouted, 'O, see the pretty rapids!'

"Now we would only glide over the yellow sand, without a ripple on the smooth surface. Then the banks would almost meet, and how we would rush through! Again they would widen, and spread us out into round ponds.

"So you see, my little friends, that a brook must

follow its slope. If it rushes, if it glides, if it courses straight away, or winds about, it is because it obeys the slope of its bed."

"But why must you always run down hill?" asked Dick.

"That we cannot tell. The snow-white blossoms fall to earth. Later, the apples follow. Our pretty robin beats the air with his wings, and floats upwards into the sky. But let him furl those tiny sails, and he falls with the apple.

"We only know that something draws us down the slope. We feel it at work, and call it 'gravity.' Sometime we may know what it is.

"Moved by the same secret force, many streams flow down all sides of our valley. They reach the place where the side-slopes meet, and then where do you think they go?"

"They cannot flow back again," said the wild-flower, meekly. "They must make ponds."

"The slopes are so wide that the place where they meet is a long hollow," chirped the robin. "If they form a pond, it must be very long."

"The slopes meet in the bottom of our valley, too," added Dick, looking about. "But I cannot see any long pond here."

The brooklet seemed to chuckle at the answer, and dimpled waves ran from shore to shore.

"O, I see!" rustled the wild-flower. "It is in the bed of our own brook!"

"So it is!" chimed the merry voices; and they all laughed heartily to think how long they had tried to find the place where the slopes met.

"We ought to have seen that, Bunny," said Dick. "Only yesterday we followed the rills down the slopes, and saw them run into the brook. Yes, the side-slopes of our valley meet in the bed of the stream."

"And I see why the brook always flows one way," cried Chip. "It is because the bed slopes from the source towards the mouth."

"Now I know why all streams are not alike," piped Redbreast. "Small ones flow in little valleys, and have only short slopes to drain."

"But the stream in a large valley would be small if only a few showers fell on its slopes," added the wild-flower.

"Deep beds must lie along the lower edges of steep slopes," said Dick; "and I should think that gradual slopes, like these in the meadow, would form wide streams."

"But why do some brooks wind about?" asked the robin.

"They must follow the low line along which the slopes meet," was Bunny's answer. "If the slopes come together in a straight line, the stream will be straight. In the gently sloping meadow, the bed winds more than it does on the steep hillside. Slow brooks must wander about more than swift ones."

"You are right, Bunny," bubbled the stream. "That is nearly always true of large rivers as well as tiny rills. A swift stream can wear a straight bed for itself, by cutting away the lower edges of the side-slopes. But a slow one is easily turned aside.

"Sometimes a bed widens into a valley with inward slopes on all sides. Then the stream spreads out and forms a pond or lake. Nearly all ponds are wide places in brooks; and nearly all lakes are still wider places in rivers.

"During a rainy season, ponds and lakes store up water and prevent it from making torrents in brooks and rivers. Low bogs and marshy places also hold back a part of the rainfall, and feed the streams during dry seasons.

"Marshes are often half pond and half meadow. They are like shallow ponds filled with growing mosses, ferns, and coarse grasses; but they help to regulate the supply of water, and to prevent streams from overflowing their banks.

"Now if you will look at the branches or tributaries flowing into the main brook, you will find that there are three kinds. There is the little stream that runs down the steep hillside, and winds a long way across the meadow. Another flows nearly its whole length on the bluffs or low plateau, and then leaps down into a small pool near our rapids. A third rises on the bluffs, and reaches

the lowland by a series of cascades and rapids, like a stairway.

"If we were to travel the wide world over, we should see countless streams, large and small, wide and narrow, deep and shallow, rapid and slow. But each would have a slope like one of these three tributaries. We will therefore call our three slopes, down which the little brooks flow, 'types' of the slopes that send all streams to the sea.

"Put on your thinking-caps now, my wise little friends, and tell me the difference between a water-parting and a brook-bed."

"The parting is a ridge, and the bed a valley," came the first answer from the nodding wild-flower.

"You are a bright-eyed posy," said Bunny. "When Dick and I were under the old stump, we saw the ridge part the raindrops, and we know that the tiny rills brought many of them to our brook-bed in the valley."

"The water-parting goes around the valley, but the brook-beds cut across," chattered the lively chipmonk.

"I think that the bed is just like the parting," began Dick. "Where the edges of the slopes join on the ridge, they form a water-parting. Where they meet in the valley, they make a brook-bed."

"If they are alike, Dick," piped Redbreast, "why doesn't the brook-bed scatter the raindrops?"

"I see!" called out Chip; and surely enough the little fellow did. "The parting is where the *upper* edges of the slopes come together, while the *lower* edges meet in the deepest part of the brook-bed, — in the channel."

"Well done, Chip!" cried Dick. "We thought that out very well together, didn't we? The bed is the bottom of the valley, and the parting is the top or rim."

"You have all done well," rippled the happy brook. "Now I will tell you another name for our valley. It is called a 'brook basin.' All the land that sends its raindrops to the streams in our valley belongs to our basin.

"Shall I tell you of a great river-bed that I once saw as I went sailing over the earth in the white-winged clouds?

"Far away beyond the hill over which the sun rose this morning, there is a great forest. Robin would have to fly straight away for many long days and nights to reach it. Indeed, I fear our little bird would die on the way, for he would have to try to cross the wide ocean. His strong wings would need to rest many times, and he would fall into the sea.

"One time we floated over there in a great cloud. We saw lakes so wide that their shores were below the horizon on every side. There were mountains, too, so high that their white tops

seemed to touch the sky. They looked just like the great banks of rain-clouds that often roll up before a storm.

"There were also countless streams, — some rising in the mountains, others flowing from the lakes. At length we saw the place where they all ran together and formed a river that was deep and wide.

"Many of the raindrops fell from the clouds, and started on a long journey with this mighty stream.

"You should see the water rushing over the steep places in the rocky bed. How it roars and foams!

"Far below, it glides along towards another high bank. Down it plunges with a crash like thunder. Here and there other streams flow in, till it looks like a long, wide lake, reaching from sky to sky, across a great plain.

"Day after day it glides and rushes along its bed. Then it flows through a land where no more rain falls, and no other streams come to join it. For miles and miles it has not a single tributary.

"On every side the hot sun beats down. The air is stifling. The banks are parched and dry. Can anything live in such a place? We shall see by and by.

"Down, down we go. Weeks pass. Still the same hot sun, the stifling air, the shining stream,

the thirsty soil. Where is the water going? What is it doing?

"At length we see rounded house-tops. We flow under wide bridges. We pass large cities. Then the river divides and flows slowly among hundreds of low islands, till it pours its muddy water into a great salt sea.

"This is the wonderful river Nile that flows through a vast desert. Sometime I will tell you what the great stream does as it follows its bed over the slopes of that dry country. Now, my little friends, I must bid you good night, for already —

> "'Day hath put on his jacket, and around
> His burning bosom buttoned it with stars.'"
>
> — HOLMES.

CHAPTER V.

BROOK BASINS AND SYSTEMS.

"'Thou, ever joyous rivulet,
Dost dimple, leap, and prattle yet;
And sporting with the sands that pave
The windings of thy silver wave,
And dancing to thy own wild chime,
Thou laughest at the lapse of time.'"

—BRYANT.

THUS sang the cheerful robin, while he flew down to join his friends by the brookside, next morning, as Bunny asked the silvery drops to tell how they found their way out of the cold ground.

"O, that was easy enough. We just ran along till we found a place where the clay-bed came to the surface on the hillside."

"But how did you know which way to flow?" chirped the robin.

"At first we did not know. But when many raindrops met on the bed of clay, we soon found a way. Isn't it strange that in this wide world of ours, there is no level land where the raindrops fall?"

"Ho, ho, Master Brooklet!" cried Dick.

"Where are your eyes? Our own meadow is just as level as the pond."

But the watchful wild-flower knew better than that. Had it not seen the dimpled waves go dancing by all summer?

"Can you tell me why our brook doesn't flow the other way, Dick?" it whispered softly.

"Chip, chip! hurrah for posy!" sang a merry voice from under the leaves.

"You are right, little flower," bubbled the stream. "I could not move if the meadow were level. In the open air I must flow down the slopes, except when the sunbeams spread my vapor-wings. Where water runs, the land must change its level."

"But wait," replied Dick. "Here is a pond in which the water only stands, and does not flow away." Then he blinked his bright eye as if to say, "How do you explain that?"

The wild-flower only nodded and asked, "Why does it not spread out evenly over the whole meadow?"

"Because the banks hold, — oh, I see!" said the honest squirrel. "The land must slope towards the pond. Our meadow looks level, but it must slope a little. If the meadow were as high in one place as in another, the water could not drain away, could it?

"Then there would be no brooks, no ponds, —

only muddy fields. The whole surface would be covered with water. All the plants would die. There would be no hills, no valleys, no streams. Poor Bunny could not dig in the ground, and I don't know what the squirrels would find to eat. Why! the salt ocean would flow over the land, and then — but we need not think of that, for the fields do slope."

"Yes," added the brook, "even the beds of rock and clay beneath the surface slope. That is how the raindrops got out of the dark soil. We just ran along on the clay-bed, and leaped into the warm air.

"When there has been no rain for weeks, the water that is in the soil keeps flowing out. The ponds and marshes also give up their store of water, and the streams flow on during the dry season.

"Which of you can tell me how much land is drained by our brook?"

"All the land in the valley sends its water to the brook-bed," piped the robin.

"You must drain all the slopes on this side of the highland," said Chip.

"All the land that slopes downward to the brook-bed must send its water into the brook," added Dick.

"The whole basin within the water-parting must drain into our brook-bed," was Bunny's answer.

"Is every basin bounded by a water-parting?" asked the wild-flower.

"Yes, every basin on earth," rippled the stream. "Beyond the hill, there is another valley in which Dick saw a brooklet flowing. The slopes that meet to form its bed stretch upwards on both sides till they reach the rims of other basins.

"The upper edges of these slopes are water-partings, or lines of highest level, between the valleys.

"Little rills have basins also, bounded by lower water-partings; and so have ponds, lakes, rivers, and even the great oceans. The surface of the whole earth is made up of basins and beds surrounded by a network of water-partings.

"Now let us begin at the rim of our valley and trace all the streams. First, there are the tiny rills that trickle among the grasses during a rainstorm, and form the thread-like rivulets. Then these little streams wind about to join our brook.

"All the streams together form a 'system,' by which the valley or basin is drained. A system in a brook basin is called a 'brook system'; in a river basin, a 'river system.' Thus we may have also a 'lake system,' or an 'ocean system.'

"Then there are other streams that belong in our brook system, but which we cannot see. They are the tiny rills that flow underground and feed the springs. We must not forget these little branches, for they are as useful as the surface rills.

"Between a basin and its system there are lines

which we call 'shores.' They are the lines along which the slopes pass under the water, or the lines which show how high the water rises in the beds. Shores are the boundary lines of beds. They are also the lower edges of basins. A shore separates a bed from a basin.

"If we wished to be very exact, we should perhaps say that a basin is bounded at its upper edge by a water-parting, at its lower edge by a shore, and that the basin is made up of the slopes that lie between.

"Now I have a few questions to ask you, and then I will tell you of a great river valley that I saw a few years ago, far away towards the midday sun.

"What is the difference between a basin and a system?"

"A basin is land, and a system is water," said Chip.

"I should say that a basin is made of slopes, and a system of streams," was Bunny's answer.

"Doesn't a system carry water away from a basin?"

"It does, bright flower," replied Dick. "I do hope that you will grow here again next summer. We should be very lonely without you. I shall look for you as soon as the snow melts."

The pretty wild-flower trembled, it was so happy. Then it nodded its little head as if to say, "Yes, I will try to be here with you all."

Just then the brooklet asked another question: "Have the basins of all our rivulets the same shape?"

"O, no!" chirped the robin. "I saw one, as I came along this morning, that spreads out like a maple-leaf. It is near the old pine, and is as long as it is wide."

"Near the large spring there is a basin that lies among a group of knolls," said Bunny. "There is a long narrow valley leading from it towards the meadow. The upper part of the basin looks like a water-lily leaf, with the narrow valley for its slender stem. The tiny streams that flow in it look like a beautiful vase-shaped elm with wide-spreading top on a long trunk."

"Between the two bluffs, on the east side of the pond, there is a very long basin that is shaped like a blade of grass," added Dick. "And there is another very queer one in the rough land near the spring. It is like a row of leaves on a single stem. There are four round valleys joined by narrow gullies. In each valley there is a small pond, but one slender stream runs through all."

"You have sharp eyes, my friends," rippled the brook. "There are hundreds of basins shaped like each of these, and so we will call the valleys of our little rivulets 'types' of the great river basins that cover the earth's surface. Now for my story of the Amazon:

"It is nearly midday, and if Redbreast should fly far south to the land just under the sun, he would see hundreds of white-capped mountains. They are many times higher than the one which he flew over in the storm.

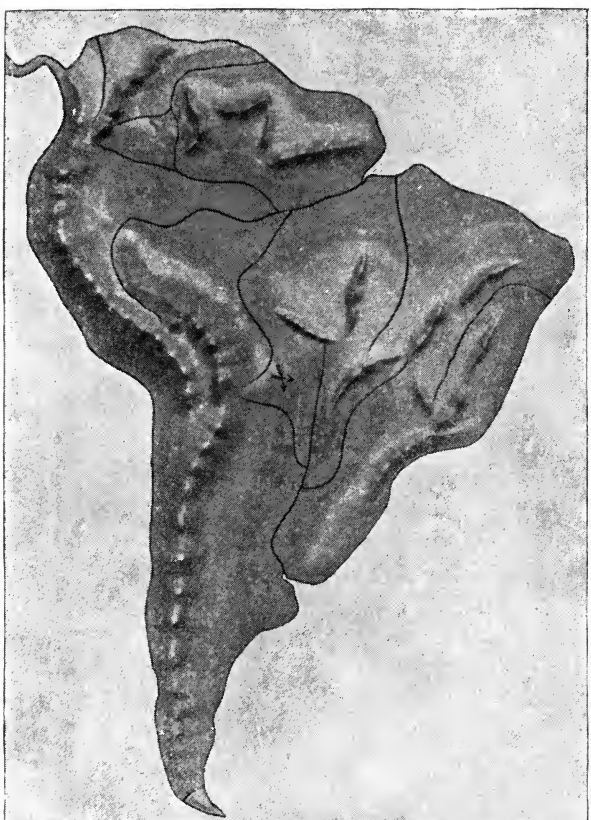
"All along the east side of this great highland there are countless streams flowing in as many basins. If we could see ten times as far, we could see ten times as many.

"Down the steep slopes they run, sparkling in the clear sunlight. Here and there they flow together, just like our slender rivulets, only many times wider and deeper.

"Now they enter a dense forest, and from all sides other streams come in, till they form a great river. Its basin is so wide that we cannot see across it.

"On, on, for days and weeks, it winds along a low plain, through a forest so thick that the sunlight can scarcely creep in. Again and again great rivers flow in, till it looks like a vast sea. Its basin is so wide that if our robin should fly all day and all night he could not cross it.

"At length the mighty stream pours its muddy water into the dark-blue ocean, and the raindrops that fell on the distant mountain sides have reached their home. All the rills and rivulets, brooks and rivers, that join to make this great stream belong to the Amazon system; while every



Trace the Water Partings.

slope that sends one drop of water towards the dark forest, and into the broad river, is a part of the Amazon basin."

As the brooklet ended its story, the sun sank slowly behind the low hills. The evening breeze came floating into the valley, and seemed to whisper —

"The day is done, and the darkness
Falls from the wings of night,
As a feather is wafted downward
From an eagle in its flight."

— LONGFELLOW.

CHAPTER VI.

HOW SOIL IS MADE AND CARRIED.

"See the brooklets flowing,
Downward to the sea,
Pouring all their treasures
Bountiful and free!

"Yet to help their giving,
Hidden springs arise;
Or, if need be, showers
Feed them from the skies."

— ADELAIDE A. PROCTER.

"AH! it has been raining," thought Bunny, as he peeped from his burrow to see the sunrise.

"How the water has worn the hillside! See the little valleys it has made. It must have rained very hard. I will call for Dick and Chip, and then hurry down to the brook. What a wonderful story it will have to tell this morning."

* * * * * * *

"How muddy you are, little stream," whispered the wild-flower, as it shook the raindrops from its pretty head.

"And how wide!" chirped Redbreast. "But here come our friends down the hillside, and now we can hear the brooklet's story."

"O tell us, please, where all this muddy water comes from," were the first words of the chipmonk. "What will you ever do with it? You are not nearly so pretty as you were yesterday."

"When I have told you my story, Chip, you may think that I am much prettier with my dark load than when I was a clear stream.

"Last night a heavy shower fell in our valley. The hillsides were covered with tiny streams that chased each other down the slopes like playful squirrels.

"But my little rills were hard at work. You should have seen them roll the pebbles down the bluffs, and break off the sharp edges. Then they washed the sand together, and rounded its corners.

"They wore deep gullies in the steep places, and carried away the finest soil. They swept the light loam down the slopes. They ran away with the pretty earthworm mounds and tiny ant-hills. They spread the rich soil all over the meadow, and some of it they even brought to me. That is why I am so muddy this morning.

"O, my little rills were not lazy last night!

"But the work is not yet done, as you will see. I am flowing towards the rapids, and will soon be in the pond. I want you all to follow and see what becomes of my load of silt, or fine rich soil. You may also throw some sand and pebbles into the rapids, and then watch closely."

Bunny and Dick scraped some gravel from the bank, and it fell into the water just where it rushed over the steep place in the brook-bed.

"How muddy it is!" chirped the robin. "We cannot see the bottom."

"Look here!" shouted Dick. "The pebbles have all sunk in the rapids. Some are rolling down the steep bed. The rushing water must be moving them there."

"And here is the sand below the rapids!" cried Chip. "It is spreading over the bed of the brook like a great oak-leaf."

"Perhaps the stream cannot carry it any farther," said Bunny. "In the pool just below the rapids, the water moves very slowly."

"Here goes the black loam!" piped Redbreast. "It is flowing into the pond now."

They all ran quickly to the spot, and surely enough, there it was in the still water.

"Watch closely!" bubbled the brook.

"The silt is settling now," said sharp-eyed Chip. "The bed of the pond, near where the stream flows in, is nearly black. O see! it is making a bank of soil there!"

"Why doesn't it spread all over the bed of the pond, Dick?" asked the robin.

"It may be because the water flows very slowly, and must now lay down its fine soil, just as it dropped its sand near the foot of the rapids," was the gray squirrel's answer.

"You are right, Dick," rippled the brook. "I must leave nearly all of my silt here. I can carry it no farther. It is not the current, or forward motion, that keeps the sediment from settling higher up the stream. It is the rolling, mixing motion of the water.

"All day long I shall pour this rich loam into the pond, and build the muddy bed higher and higher.

"Now, my little companions, you know how all the brooks in the world are at work, — yes, and the tiny rills and large rivers. They are all doing just what you have seen me do to-day.

"They are wearing down the slopes, grinding the pebbles and sand into fine soil, and carrying their rich loads down to the lowlands. Grain by grain, the hills are covering the valleys, for it is the work of water to wear down the highlands, and fill in all the low places, so that the land will slope evenly from the water-partings to the sea.

"If you will look about, you will see many places where the streams have been at work. All along the foot of the bluffs, there are large stones that have rolled down the steep slopes, after the rills have washed the fine sand and loam from around them. You will also find them along the shore, where they have dropped from the banks.

"When I was here many years ago, the bluffs were much nearer than now. But we have worn

them away a little during every rainstorm, and my little rills will work on to try to make the hills level with the meadow.

"Now look once more at the mud-banks forming in the pond. They are made of the richest soil in our valley. The water is very high now, but when it has settled, you will find little islands where the silt-beds are.

"When it rains again, I shall bring down more soil, and make the muddy bank still wider on the pond-bed. After a long time, the little shallow place will be filled with loam, and then there will be no pond, but another fertile spot in the meadow. The green place above the rapids shows where there was once a pretty pond that has been filled in this way.

"The islands that you see growing are called a 'delta.' In the mouths of great rivers, deltas often form so large that cities are built upon them. Some are also covered with grain fields and forests. Deltas are made by all muddy streams that flow into ponds, lakes, seas, or any bodies of water that have but little motion. Of course they cannot grow in water that runs swiftly, because the silt is swept away and cannot settle.

"You must not think that a delta is the only place where a stream deposits its rich load. All over the valley, in every nook and corner, the raindrops and rills spread the fine soil. But they sweep the greater part into the lowlands.

"Wherever the water eddies into little bays and becomes calm, you will find a dark muddy bottom. There you will also see the water-plants growing. All up and down my shores, behind nearly every bend in my course, along every part of the banks where the current is weak, the fertile land is forming.

"But my greatest work is done along the beds of the tiny rills that spring into life only during a rainstorm. Wee little streams they are, trickling down every part of the slopes, — so small that even the tufts of grass and rounded pebbles turn them aside. They flow into every crack and crevice all over the slanting sides of our valley, and spread a feast of the finest and richest soil for the plants. Every time it rains the work goes on."

"But what becomes of the rills when the storm is over?" asked Bunny.

"A part of their water sinks into the earth, and forms underground rills that feed the springs; some creeps into the roots and seeds; some runs down the surface of the slopes and carries soil to the brooks; and some is taken away by the sunbeams.

"You can see a picture of these tiny rills if you will look closely at the upper surface of a large maple-leaf. The finest network that you can find will show how the rills cover the slopes during a heavy shower; and just as these hair-veins all

lead to the great mid-vein of the leaf, so the rills all run together down the slopes, becoming larger and larger as more of them are joined, till they unite with the mid-stream of our valley, — the brook that flows along the line of lowest levels.

"Little by little the rills wear away the slopes each year, and help to lower the surface of the highlands.

"There are also our cascades and rapids, where the beds are steep and are often rapidly worn away. Sometimes the melting snow makes torrents in the narrow gullies on the hillsides. The rushing water will then sweep large stones and coarse gravel into the meadows, except where the trees and bushes check the flow of the water and stop the rolling stones.

"There were no torrents in our valley years ago, when the surface was covered with trees. Only about one-half as much rain fell on the ground then as now, because so much was taken in by the bark and leaves. A great deal also followed the tree-trunks into the soil.

"Then, too, in winter the snow that lay in the forest melted very slowly, because the warm sunbeams could not reach it so easily, and strong winds could not sweep over the drifts and scatter the flakes through the air.

"In those days the streams flowed more evenly than now. During the rainy season they rose a

little, and then fell slightly while the dry months lasted. But they were never without water.

"Now when heavy rain falls, or snow melts, the banks cannot hold all the water that rushes down the slopes. But after weeks pass without rain, and the fields are brown and bare, the brook becomes only a series of muddy pools. Sometimes its bed dries and cracks under the hot sun, and not a drop of water can be found in it.

"What you have seen to-day, little friends, tells the story of how soil is being made and carried, not only in millions of brook valleys all over the earth, but also in the vast river basins.

"Remember that the finest loam is carried farthest, and that it does not settle till the water is almost still. Then you will know why the highland has coarser soil than the meadow, and why the steep slope cannot produce like the more level lowland.

"It is the same everywhere, — in the valley of the tiniest rill on our hillside, and in the basin of the mighty Amazon. Now I will tell you the story I promised about the Nile at work in the desert:

"Once more we will visit the high mountains. The snow of winter is just melting. Hundreds of little streams rush and foam down the steep slopes.

"It is early morning, and a bright star shines

above the first gray tints in the east. It is the 'Dog Star,' and how happy the poor people in the valley are to see it, for now the dry banks of the Nile will — but I am ahead of my story.

"Let us watch the foaming streams as they flow into the great river. It seems as if its banks can hold no more. How the old stream roars as it tears over the rapids! What will become of the flood that is sweeping into the valley?

"Let us follow! Now we can see the parched banks once more. The sun is nearly overhead. How hot and dry the air feels! O, if it would only rain!

"But look! The river still rises, — higher and higher. Now it creeps slowly over its banks! Where will it stop? What will become of the poor people?

"See! they are shouting and dancing for joy! What can it mean?

"Wider and wider flows the stream. The dry fields are covered. We look for the river. It is gone. In its place is a long, wide lake.

"Still it spreads, — wider and wider. Will it never stop? June passes. The July sun beats down. Yet the water rises. August is here, and now the whole valley is covered by the wonderful stream.

"At length the water begins to go back. Day after day it settles. September comes and goes;

and if we were there on this bright October morning, we should see only the muddy river, flowing in its old bed once more.

"We look again for the dry banks and the desert. They are not there. Everything is changed. For miles on both sides, the water has covered the valley with rich soil.

"Now we know why the people were shouting and dancing. The land is ready for their seeds; and soon the golden grain will wave all over the valley. There will be food for the next long, dry season.

"Every year this wonderful river overflows its banks when the Dog Star rises in the early morning. Then the heavy rainfall around its sources, and the melting snow on the mountains, send down the flood to spread the soil over the parched valley.

"The slopes supply the food for plants, and the water carries it down in that great river just as in our little brook. That is why I am so muddy to-day.

"Now good by till to-morrow."

Just then little Chip ran down, and whispered something to the brook. What do you think it was he said? Then he scampered away to the old oak just as fast as his little legs could carry him.

CHAPTER VII.

FORMS OF WATER.

"Fill soft and deep, O winter snow,
The sweet azalias' oaken dells!
And hide the bank where roses blow,
And swing the azure bells!"

—WHITTIER.

"WHAT has become of my little pond on the flat rock?" chirped the robin, when the happy band had gathered for a story next morning.

"Yesterday I took a bath in it, and now it is gone. It could not have run out, for it was in a hollow place. Where has it gone?"

"If you should place a piece of ice on the rock in the warm sunshine," began the brooklet, "it would soon melt and form a pool. Then the water would slowly change to vapor, and spread through the air. We could not see it going, but the rock would in time be dry.

"When dew is on the grass, the sunbeams help it to float away. There is vapor everywhere about us in the air, but we cannot see it till it becomes a cloud or water-dust.

"Beautiful cloudy forms often float far above

us, where it is cold. You can see many there now. Perhaps that pretty fleecy speck just overhead is made in part of your pool that was on the rock, little Redbreast."

"But why does water change to vapor?" queried Bunny.

"That I cannot answer," mused the brook. "It is not changed by the air, for vapor will form and float about where there is no air. We know that when water is heated it evaporates; but we do not know why.

"When vapor is chilled it often changes to raindrops, but no one knows why they form, or why they fall. We can name the forces, but we do not know why they act.

"When many drops have fallen, and the soil is filled, the sun's heat changes some of them back into vapor. This makes the air cooler, for each tiny vapor particle always carries a warm sunbeam prisoner away with it. When the vapor changes again to raindrops, hailstones or snowflakes, it sets the sunbeams free."

"But we often see drops of water on the grass and in the spider-webs, early in the morning, when it has not been raining," said Chip.

"That is true; and what do you think they are, little chipmonk," asked the brook.

"They may be tiny raindrops that have lost their way in the darkness, and have fallen from the clouds," was Chip's bright answer.

"I think the clouds must weep when the sunbeams leave them alone in the night, for the teardrops are soon dried when the warm beams return in the morning," said the wild-flower.

"Perhaps," chattered Dick, "the little clouds themselves, weary with flying all day, fold their white wings and come down to sleep in the spiders' silken hammocks, where each passing breeze will swing them nearer to dreamland."

"They may be tiny rainbows, just growing," added Bunny. "I am sure that I have seen all the bright colors in them."

"They are my pretty cousin dewdrops," bubbled the brook. "When vapor floats against cold grass or stones at night, it is changed to dew. The little vapor-wings are chilled by the cold objects, and they have to wait for the warm sunbeams next day before they can fly away.

"One cold morning last autumn the frozen dew looked just like snow in the meadow.

"'The Frost looked forth one still, clear night,
And whispered, "Now, I shall be out of sight,
So, through the valley, and over the height,
In silence I'll take my way.
I will not go on like that blustering train —
The wind and the snow, the hail and the rain —
Which make so much bustle and noise in vain,
But I'll be as busy as they."

"'Then he went to the mountain and powdered its crest;
He climbed up the trees, and their boughs he drest
With diamonds and pearls, and over the breast
Of the quivering lake, he spread
A coat of mail, that it need not fear
The downward point of many a spear,
That he hung on its margin, far and near,
Where a rock could rear its head.'

—H. F. GOULD.

"O, you should see Jack Frost in his soft, white furs, skimming about over the hills, and through the vales; peeping in at the windows, and covering them with silver ferns; dressing the grass-blades in velvety ice; hanging ivory lances on the trees; and sprinkling diamond dust in every nook and corner, where a dewdrop falls asleep.

"He even creeps into the dark soil, and changes the raindrops there into sharp, icy needles. You can often see them, on very cold mornings, bristling like quivers of silver darts out of the gardens, where they cut the hard ground into fine soft soil."

"I saw hundreds of glassy threads on our pond, one day last winter," said Bunny. "Did Jack Frost make them there, also?"

"Yes; and it is a beautiful sight to see him weaving a warm icy covering over the ponds when winter weather sets in.

"Just before water is cold enough to freeze, it swells and rises to the surface. The ice-coat forms,

therefore, at the top instead of on the beds of ponds and streams. If the freezing took place at the bottom, the ponds would become solid blocks of ice; all the fish would die; and even the warm summer sun could not melt the frozen mass in deep water.

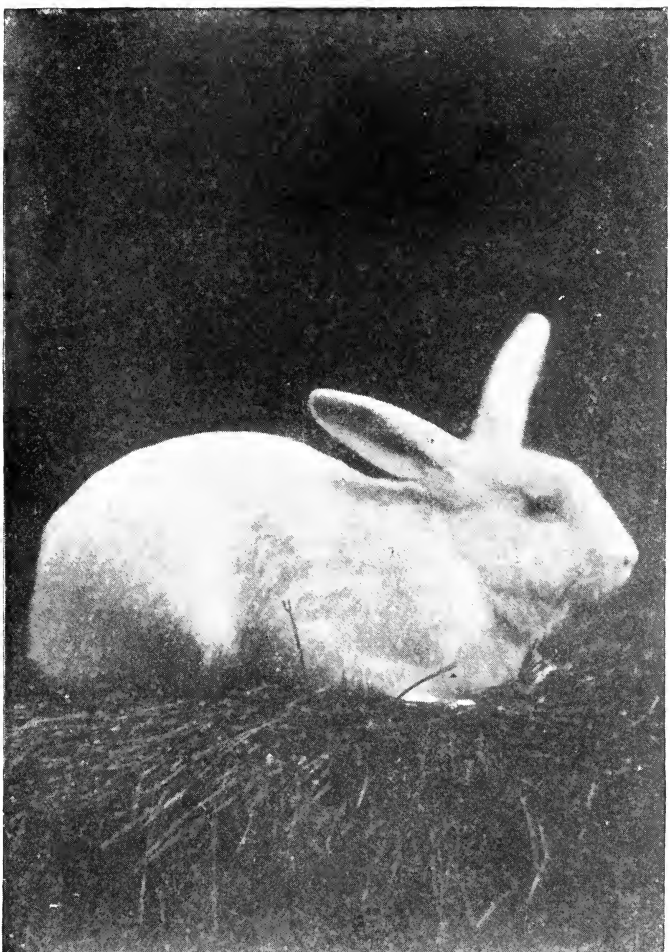
"When the air is very cold and still, you can see sharp needles shoot back and forth over our pond, making a fine network of icy thread. Soon a smooth sheet is woven, which becomes thicker and thicker as long as the cold spell lasts.

"When melting, myriads of stars often appear in the ice, like snowflakes with their six silver rays meeting in points that glisten like dewdrops."

"But all ice is not smooth," said Dick. "What makes the little rough places on the brook and pond?"

"When the wind blows, the waves break the ice-needles, and rub the pieces against each other, so that they freeze in bunches. The ice of rough running streams is almost always covered with nubbles that look like frozen ripples, or tiny ice-waves.

"There are many beautiful sights here in winter, but none more charming than our pond with its snow-bound shores. It looks like a strip of bright blue sky set in a frame of fleecy clouds, and hung on the hilly walls of our valley home by a fine brooklet thread."



"I am here every winter," shouted Bunny, joyfully, "and I see all the pretty snow views. I live in a deep hole on the side of the hill just under the old pine-tree. I dug it there so that the trees and bushes would stop the snowslides, and keep them from burying my burrow under the soil and rocks which they sweep towards the valley.

"The children often go out there to coast or slide. They start on the ridge where the raindrops fell last April. Such sport! The air fairly rings with merry shouts, as they spin over the crisp snow, singing their pretty song:

"'Flakes of snow, with sails so white,
Drifting down the wintry skies,
Tell us where your route begins,
Say which way your harbor lies?

"'In the clouds, the roomy clouds,
Arching earth with shadowy dome,
There's the port from which I sail,
There is tiny snowflake's home.

"'And the cargo that you take
From those cloudy ports above—
Is it always meant to bless,
Sent in anger or in love?

"'Warmth for all the tender roots,
Warmth for every living thing,
Water for the rivers' flow,
This the cargo that we bring!'"

—E. A. Rand.

"Thank you, Bunny," bubbled the brook, "that is a very pretty song. Here is another that I heard long ago, when the beautiful snowflakes were sifting down:

"'Out of the bosom of the Air,
Out of the cloud-folds of her garments shaken,
Over the woodlands brown and bare,
Over the harvest fields forsaken,
Silent, and soft, and slow
Descends the snow.'

— LONGFELLOW.

"Now, bright friends, you must hasten home, or it will be dark before you find your suppers. Already the twilight is strewing the sun's pathway with roses, and soon the bright flowers will fade in the west.

"Good night!"

"Good night!"

CHAPTER VIII.

THE ATMOSPHERE IN MOTION.

"UGH! how cold the air feels this morning!"

Dick's pearly teeth chattered as he spoke, and the gray hair bristled all along his back.

Poor little Chip looked like a ball of trembling fur, as he squeaked, "I wish we might have only warm south winds in our valley."

"Oho, my pretty grumbler!" said Bunny. "Was it not the north wind that chilled the vapor-wings last April, and sent our early showers from the clouds as they came flying northward? But listen! what is the brooklet singing this morning?"

"'Whichever way the wind doth blow,
Some heart is glad to have it so;
And blow it east or blow it west,
The wind that blows, that wind is best.

"'My little bark sails not alone,
A thousand fleets from every zone
Are out upon a thousand seas;
And what to me were favoring breeze,
Might dash some other with the shock
Of doom upon some hidden rock.

* * * * *

"'So whichever way the wind doth blow,
Some heart is glad to have it so;
And blow it east or blow it west,
The wind that blows, that wind is best.'"

—CAROLINE A. MASON.

So soft and sweet the song, it seemed as if the brook o'erflowed with liquid music; and that each dimpled wave, rippling upon the shore, poured its rich melody over the listening pebbles, till they burst forth in purling echoes.

The gentle spell was broken by the robin's cheery voice, calling, "Come, let us go down and ask the waves to tell us why the cold winds blow, for I fear that winter is not far off."

"It will be a long story," bubbled the brook; "but you can all help me tell it.

"Near by where Bunny sits, there is a very queer plant. Its leaves look as if they were sewed together to form deep, narrow pitchers."

"O, you mean the pitcher-plant among the cranberry vines! Here it is full of water!" shouted nimble Chip, who was first to peep in.

"Bunny, I wish you would nip off one of the coarse grass-stems, so that the top of the stubble will be just on a level with the mouth of the pitcher," said the brooklet.

"That is well done.

"Now, Chip, you may find a piece of dry twig as long and wide as the pitcher, — one that will just

fill it. Dick may bring a stone of the same size; Bunny may get me several small pebbles; Redbreast may gather some gray moss from the north side of the old pine-tree, and we shall be ready."

Away they hurried, and soon came back with their light loads, wondering what stones, sticks and moss had to do with cold north winds.

"Can you tell me, Chip," babbled the brook, "which is heavier, the piece of wood you have brought, or the water in the pitcher?"

That was a poser for the bright chipmonk, and set him thinking.

"And which is lighter, Dick, your stone or the water?"

Then Dick also put on his thinking-cap.

"Now it is your turn, Bunny. You brought the pebbles and —"

"I have it!" broke in Dick. "I can find out which is heavier," and he dropped his stone into the green pitcher, spilling the water over its sides.

"The stone is heavier than water, for it bends the hollow leaf far below the top of the grass-stubble. Here, Chip, put in your wood and weigh it."

The chipmonk placed the twig in the hollow leaf and, to his surprise, it rose above the stubble.

"Who would have thought that pine is so much lighter than water?" chirped the merry fellow.

"In with the pebbles, Bunny!" bubbled the

brook, and down went the pitcher below its water-mark on the grass-stem. Then came the dry moss, and the pretty folded leaf stood nearly upright.

"Now bring them all here," babbled the silver stream. "Throw them into the water, and see which will float."

Down went the rock and pebbles, but the wood and moss sailed off like tiny boats. Then they weighed dry bark, leaves, feathers, grass, old nails and bits of glass, and threw them into the brooklet. At length the rabbit stopped. His eyes sparkled, and his pretty face was all aglow.

"What is it, Bunny?" asked Dick.

"We need not weigh any more in the pitcher-plant. Don't you see that only those things that are lighter than water will float? Wood, moss, bark, leaves, grass and feathers do not sink because they are not so heavy as water."

"Then tell me, bright rabbit, which is lighter, water or air?" came the brooklet's soft voice.

"Air, of course," chattered Bunny. "It floats on water. Besides, it doesn't bend our pitcher so low as the grass-stubble."

"Vapor must be lighter than air," added Dick, "for the clouds float far above our heads. And I know that very warm breath rises in winter time, for I have often seen it float away like water-dust."

"One day," piped the robin, "the dry grass in our meadow was afire. When I tried to fly over

it, the hot air came rushing up, and almost stifled me. It lifted large burning leaves and thick smoke higher than the tree-tops.

"I could fly round and round the meadow, near the ground, and could feel cold air rushing towards the fire. But every time I flew above the flames, my feathers were singed."

"You have used your bright eyes well, pretty Redbreast," rippled the stream, "and what you have said is true. Warm air will float on cool air, just as a stick will float on water, and for the same reason.

"There are often many gases besides air and vapor sailing above and around us. Altogether, they are called the 'atmosphere.' When heated in one spot, the cooler atmosphere round about will flow under and float the warmer. We feel it in motion, and then call it 'wind.'

"Thus you see that vapor and other gases are moved, not *by* the air, but *with* it, — the same force moving all by drawing the heavier under the lighter.

"It is the same force that sinks the rock, and draws the water under the stick. It causes the heavy cold vapor and air to float the light warm gases of the same kind. It makes the raindrops fall, and the brooklet flow down hill. It is the wonderful force called 'gravity,' without which everything on the earth's surface would fly off into space."

"But what heats the atmosphere, and so makes it possible for gravity to move it about?" queried Dick.

"Can't you tell me what it is?" asked the brooklet.

"It may be the sun," was the squirrel's answer. "But why are some parts of our valley warmer than others? The sun shines on all alike, yet the sand-pit is much warmer than the meadow.

"Then there is our great flat rock which is so hot when the sun shines, while the old log beside it is only warm. At night the sand and rock are much cooler than the grass-land and wood.

"The top of the hill, too, is often cooler than its foot; yet the sun shines on both. And the sand-pit is warmer than the top of the nut-tree, although the boughs are nearer the sun."

"I think that the heat must come from the earth," sang the robin, "for the higher I fly, the colder I find the air."

"How can that be?" asked Bunny. "My burrow is cool all day long."

"But if the sun heats the atmosphere, why is it not warmer among the clouds than down here? It is nearer the sun up there," chirped Redbreast.

"I cannot answer that," replied honest Bunny. "But if the heat comes from the earth, why is the air cooler when a cloud hides the sun?"

"O, I know!" whispered the wild-flower.

"When the sun shines very brightly, our blossoms often send out a cloud of perfume to keep the hot rays from wilting them. Perhaps the great clouds above our heads also stop a part of the sun's heat."

"Wait a minute!" cried Chip; and up he ran into a tree that hung over the sand-pit.

Soon he called from his lofty perch, "It is much cooler here than down near the sand. Now I can tell you how the atmosphere is heated. First, the sun heats the surface of the earth, and then the surface warms the atmosphere."

"I believe that Chip is right," said Dick. "Now it is all clear to me. The sun shines on the rock, the sand, the trees, the meadow and the pond, and they give back the heat to the air. That is why it is warmer near the earth's surface than it is up among the clouds; and that is also why the valley is cold at night."

"I knew that you could tell me, if you tried," rippled the brook, gleefully. "But there is something else that I wish you to learn. Bunny may dig a small thin sod out of the meadow, in the shadow of the thick willow, where the grass is short and dry. While he is gone, Dick may fill this pretty shell with cool water from the spring."

The nimble creatures soon came back with their loads, and laid them in the warm sunshine, on the sandy beach. Then they brought a cold flat stone,

and some cool sand which they dug out of the bank, and placed them beside the sod and water.

"Try to find out which will become warm first," was all the brooklet said.

In a few minutes Chip called out, "The rock is warm already, and the sand is still warmer. The sod and water are cold yet."

"Wait a little longer," bubbled the brook.

Soon the watchful chipmonk sang out, "The grassy side of the sod is quite warm now, and the water is not so cold as it was. The sand is hot, and the rock is very warm."

"That will do for the sunlight," rippled the little stream. "Now you may bring the stone, sod, water and sand to my thick button-bush, and place them in its cool shadow. We will learn which will give off its heat soonest."

They had not waited long, when the same merry chirping voice was heard, telling them that the sand was cooling very fast, and the rock a little more slowly. But it was quite a while before Chip felt any change in the other two. At length he found that the sod was a little cooler than the water. Then the brooklet was ready to tell them more about how the earth heats the atmosphere.

"Nearly the whole surface of our valley is covered with grass, sand, rocks, trees and water, upon which the sun shines every pleasant day.

You have just found that all parts of this surface are not warmed equally fast. The sand and rocks heat quickly, while the trees and grass-lands warm slowly, and the water still more so.

"You know, also, that sand and rocks give off their heat sooner than trees, grass or water. That is why the air above our sandy field is warmer than it is over the pond, when the sun is shining.

"But cool air will flow under and float warm air, and so we find a breeze often flowing from our pond towards the sandy field in the daytime. We call this a 'sea-breeze.'

"At night, long after the sand has given its heat to the atmosphere, the water still warms the air above it. Then a gentle wind flows from over the fields towards the warm pond, and makes a 'land-breeze.'

"Now you know why the atmosphere is always in motion. The winds are flowing away from cool surfaces towards warmer ones."

"But some winds flow across our valley, over the pasture, water and everything else. Even the hot sand does not turn them aside," said Dick.

"Our sand-pit is very small," replied the brook, "and it heats but little air. In some places there are miles and miles of hot dry surface. The cool atmosphere often flows towards them with great speed and in large quantity.

"Or, if a great deal of vapor rises, it makes the atmosphere lighter, and then the dry winds sweep in with such force that small heated spots, like our pasture and sand-pit, do not stop or bend them from their course. It is only when the atmosphere is almost calm that our pond and field can set the gentle breezes flowing in our valley.

"And who has not listened to the many-sounding winds, sighing in the tall meadow-grasses, whistling up the hillside, or moaning on the edge of the forest that towers and sways like a dark cliff against a background of scudding clouds, and along whose base the waving grains seem to break like surging billows?

"'The wind has a language, I would I could learn!
Sometimes 'tis soothing, and sometimes 'tis stern,
Sometimes it comes like a low sweet song,
And all things grow calm, as the sound floats along;
And the forest is lulled by the dreamy strain,
And slumber sinks down on the wandering main;
And its crystal arms are folded in rest,
And the tall ship sleeps on its heaving breast.'"

—LANDON.

CHAPTER IX.

AN EVENING UNDER THE STARS.

"'Dear Mother, how pretty
The moon looks to-night!
She was never so cunning before;
Her two little horns
Are so sharp and so bright,
I hope she'll not grow any more.

"'If I were up there
With you and my friends,
I'd rock in it nicely, you'd see;
I'd sit in the middle
And hold by both ends,
Oh, what a bright cradle 'twould be!

"'I would call to the stars
To keep out of the way,
Lest we should rock over their toes;
And then I would rock
Till the dawn of the day,
And see where the pretty moon goes.

"'And there would I stay
In the beautiful skies,
And through the bright clouds we would roam;
We would see the sun set,
And see the sun rise,
And on the next rainbow come home.'"

—Mrs. Follen.

"How happy you are this evening, little brook," called out Bunny, as he sported about in the bright moonlight, cropping sweet clover. "What a pretty song you were just singing!"

"And why should I not be happy?—

"'I am the blue sky's looking-glass,
I hold the rainbow bars;
The moon comes down to visit me,
And brings the little stars.'"

—Mrs. M. F. Butts.

"Cheerily sung!" cried Dick and Chip. "We heard your merry voice, and crept out of our nests to listen. May we come down and sit by the wild-flower while you are singing?"

"Br-r-r, br-r-r, better be in bed, br-r-r, br-r-r!" rattled a deep voice among the tall reeds.

"Ha, ha!" bubbled the brook. "That is only one of my old green frogs in the marshes. Perhaps I woke him with my singing, and he is angry with me. But, come along, my frisky friends! If it were only summer now, I would send my tiny fire-flies to light your way out of the woods. Do you remember, Bunny, how my bright messengers used to lead Chip and Dick through the forest?"

"Yes, I often think of one night when I saw them. The two little squirrels came tripping over the dry leaves; four shining bead-eyes went peeping into every dark corner, while scores of fairy

fire-flies waved and swung their faint flash-lights on every side to frighten the shadows back into the dense woods; and all the while the brook kept singing:

"'When softly mother earth is dreaming — sleeping,
I question whence the fire-flies come;
The Moon says, "Tears they are from stars that, weeping,
Have lost the path that leads them home.'"

— EUGENE ASHTON.

"But here are our friends waiting for your story, kind brooklet."

"If Redbreast were only here, we should have our whole party," chirped the thoughtful chipmonk. "Wait a moment, and I will call her."

Away scampered the lively creature, and soon we heard him calling, "Chip, chip, che-chip!" under the apple-tree.

"Chirp, chirp!" came the shrill answer from among the branches, and down flew the robin.

"Why, Chip! you are out very late," piped the ever-cheerful little bird.

"The brooklet is to tell us a story about the stars, and I thought you would like to hear it. So I ran over to call you."

"You are very kind, and I hope I may be able to repay you in some way."

"You have already done so, Redbreast," said Chip. "Have you not sung for me from morning till evening, all summer? And once, when the

gray cat came creeping up behind the stone-wall, did you not chirp so loud that I looked over and saw him just in time to dodge his sharp claws?

"But here we are by the brookside. I never heard the little stream ripple so sweetly before. Let us sit near by where the pretty waves frisk and frolic among the smooth pebbles, and listen to its story, for it is just beginning."

"When you went home to-day, the long shadows were beginning to creep into our valley. Soon the Prince of Light sank behind the low hills. He must have been weary with his long journey, for we saw him lie down on a bank of bright flowers and fall asleep, while o'er his couch the evening star kept watch.

> "'O'er me, like a regal tent,
> Cloudy-ribbed, the sunset bent;
> Purple-curtained, fringed with gold,
> Looped in many a wind-swung fold.'
>
> — WHITTIER.

"The silvery waves that had played all day were fast asleep. Even the little clouds had folded themselves in their gray-tinted bankets, and seemed to float in dreamland.

"One by one, the pretty stars brought out their flickering torches, and began their silent march across the sky.

"Now the night is filled with glory, and we must not spend it in dreaming. Let us be up, looking

at its bright moving pictures, and reading its wonderful stories."

"What! is the sky a story-book?" asked Chip, his eager eyes glowing like fire-flies.

"Yes, and a picture-book as well," sang a moon-lit wave. "Come a little nearer, and I will show you the beautiful forms, and tell you one or two of its charming stories.

"Every little squirrel can find the Great Dipper which is a part of the Great Bear."

"There it is, low in the northwest," said Dick; "and I know another star, also. The two bright twinkling dots in this Dipper, farthest from its handle, are called 'pointers,' because a line drawn through them points nearly towards the pole or north star. It is in the end of the Little Dipper handle, or the tip of the Little Bear's tail."

"How came two bears to be among the stars?" asked timid Bunny, dropping his head as if to run and hide in his burrow.

"It is an old, old story," began the brooklet. "It was told to little girls and boys who lived many years ago, in a land far away towards the rising sun.

"There, on a high mountain — so the story runs — dwelt a powerful king named Jupiter, and his beautiful queen, Juno. In the dense forest, far below, lived a lovely princess who spent her time in hunting.

"Juno was jealous of her great beauty, and changed her into a bear. Down she fell upon the ground. Her soft white hands and feet became great paws, while her fingers grew into sharp claws. When she tried to speak, only a savage growl rolled through her fierce jaws.

"All night long she slept in the dark woods, yet she did not feel cold, for a heavy coat of long hair had grown all over her body.

"One day she met her only son hunting. O, how happy she felt, as she turned to embrace him. 'He will surely know his mother,' thought she.

"But alas! he saw only a savage bear, and as it rushed towards him, he raised his hunting-spear to kill it. Then Jupiter, filled with pity, changed the son into a little bear; and, taking them both into the sky, chained them near the den of the north star.

"How angry Juno was to see them shining there. She begged old Ocean not to let them bathe in its cool water. So there they prowl, the Great and Little Bear, round and round the pole star, yet never dip below the horizon that we see from our valley."

"What a pretty story!" cried Chip, sporting about in glee. Please tell us just one more. We never knew before you came, little raindrops, how many beautiful things there were around us."

"Let me see. What shall it be?" mused the

dimpled stream. "O, yes! there is a very pretty one in the northeastern sky.[1]

"Start with me from the handle of the Great Dipper, and travel straight through the north star till we reach five bright stars that make a W in the edge of the Milky Way. These are in the group called 'Cassiopeia.'[2] It is about as far from the pole star on one side as the Great Dipper is on the other.

"Farther down in the sky, in the same straight line, beneath the W, there is a row of shining stars, just to the left of a large starry square. The bright row is Andromeda,[3] a beautiful princess. The square is a part of the great winged horse, Pegasus.[4]

"Now set out once more from the W, and move down the Milky Way towards the northeast. About half-way to the horizon, you will see three or more bright stars, pointing downwards, with a

[1] These star-clusters may be seen in the positions described, as follows:

Sept.	1. — 9.20 p.m.	Oct.	1. — 7.20 p.m.
	6. — 9.00		6. — 7.00
	11. — 8.40		11. — 6.40
	16. — 8.20		16. — 6.20
	21. — 8.00		21. — 6.00
	26. — 7.40		

They are also visible in other parts of the sky, but in the same relative positions, nearly every night in the year. The observer will, of course, find it necessary to rise before the sun to see them during the spring time, but the sight will well repay him.

[2] Pronounced: Kăs-sĭ-ọ-pē′ĭ-ạ. [3] Ạn-drŏm′ẹ-dạ. [4] Pĕg′ạ-sŭs.

large twinkling dot to the right. This group is Perseus,[1] a noble prince.

"As far above the W as Perseus is below it, and reaching in towards the pole star, there is a faint cluster that shows where old King Cepheus[2] sits upon his throne."

"What a bright star nearly overhead!" piped the robin. "It is the brightest that twinkles in the whole sky."

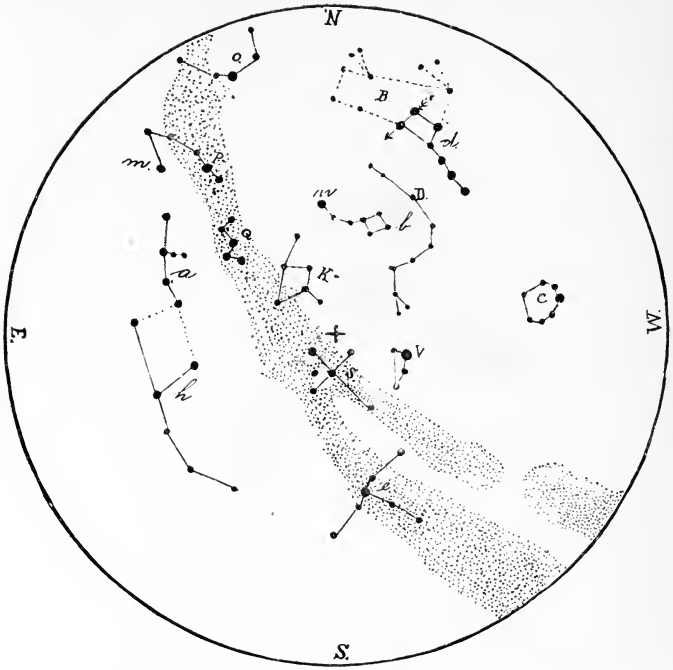
"And what a pretty cross just above us in the Milky Way!" chirped the frisky chipmonk.

"Do you remember the dark night when the raindrops set out on their journey?" rippled the brook. "'Out of the east came beautiful Vega, brightest of all the host. Near it floated the graceful Swan among the starry drops that glisten in the Milky Way.'"

"Now I know!" sang Redbreast. "The brilliant star above us is Vega, and the cross is a part of the Swan. I looked for them the evening after you told us the first story, but I found them just rising in the northeast."

"And if you will look in the same place next spring, you will see them there again as soon as the sun goes down," bubbled the silver stream. "But Vega and the Swan are not in the story I am to tell, and so we will go back to Perseus and the Princess.

[1] Pronounced: Pĕr'seus (sūçe). [2] Çē'pheus (fūçe).



EXPLANATION OF CHART.

(N., S., E., W. = North, South, East, West.)

To find the stars above any point of the horizon, face that part of the sky, turn the above circle till the corresponding point of the compass on the chart is at the *bottom* of the page. Then look for the groups in the lower half of the circle.

For example, to find the star-groups above the northern horizon, the observer should face the north and hold the above chart vertically, with the N. at the *bottom* of the page. The lower half of the circle will then show the relative positions of the northern constellations.

KEY TO CHART.

Groups.

a = Andromeda.
b = Little Bear.
B = Great Bear.
c = Northern Crown.
d = Great Dipper.
e = Eagle.
h = Flying Horse.
K = King Cepheus.
P = Persens.
Q = Cassiopeia.
S = Swan.

Bright Stars.

D = Thuban.
m = Persens' Shield.
n = North Star.
o = The Kid.
V = Vega.

"Many years ago, near the sacred river that winds like an endless serpent across an almost boundless desert, ruled a wise king, named Cepheus.

"One time, his vain young queen, Cassiopeia, boasted that she was as beautiful as the graceful Nymphs that sported in the waves. Then the angry Water-Sprites sent a fierce storm to destroy her land; and with it came a horrible sea-monster that killed many poor people.

"'There is but one way to save your homes,' the Nymphs said to the king. 'Chain your beautiful daughter, Andromeda, to a lonely rock on the shore, and when our frightful monster has devoured her, he will leave your coasts in peace.'

"Then was the good king very sad, for he loved his daughter dearly. But his dying people begged him to save them, and at length he yielded. The lovely princess was chained to a great cliff overhanging the sea, while her father and mother sat weeping on the shore.

"Just then a dark speck was seen far off in the sky. Nearer and nearer it came, till, with the speed of an eagle, down flew the noble prince, Perseus, son of Jupiter. Some claim that he rode on flying Pegasus, while others say he came on winged sandals. On his left arm he carried a magic shield that would turn to stone any creature that looked upon it.

"Scarcely had the story of grief been told, when

across the sea came the hungry monster, bellowing and splashing. Straight for the rock he swam, where lay the helpless princess. With glaring eyes and open mouth, he dashed forward, to seize his prey.

"But what was that? Like the flash of a meteor, brave Perseus darted through the air, and plunged his sword into the great scaly back. Then, as the angry beast turned to meet his foe, the brave prince held out his shield, while turning away his own eyes, and where the giant creature swam, there rose a great ledge from the sea. The trusty shield had changed him into stone.

"Of course the noble prince wedded the fair Andromeda, and his proud father carried them all off to live forever in the starry sky.

"But the wrathful Nymphs had Cassiopeia placed so near the pole star, that one half the night she hangs with her head down to teach her to be humble."

As the brooklet ended its story, little Chip looked up with surprise into the sky, and cried, "The Great Bear seems to be moving! When Dick first pointed it out, it was in the northwest. Now it is in the north, under the pole star. Why! I believe every spot in the sky is moving; for Cassiopeia is just overhead, and the Swan is flying low in the west. I hope the pretty stars will not leave us forever."

"Never fear!" laughed the brook. "You need to sleep now. But when the bright golden buttercups have faded along the dusty roadside of the Milky Way, come back, and I will tell you why the sun, moon and stars seem to move across the sky."

CHAPTER X.

DAYS, NIGHTS AND SEASONS.

Daybreak.

"'A WIND came up out of the sea,
And said, "O mists, make room for me."

"'It hailed the ships, and cried, "Sail on,
Ye mariners; the night is gone!"

"'And hurried landward far away,
Crying, "Awake! it is the day."

"'It said unto the forest, "Shout!
Hang all your leafy banners out!"

"'It touched the wood-bird's folded wing,
And said, "O bird, awake and sing."

"'And o'er the farms, "O chanticleer,
Your clarion blow; the day is near."

"'It whispered to the fields of corn,
"Bow down, and hail the coming morn."

"'It shouted through the belfry tower,
"Awake, O bell! proclaim the hour."

"'It crossed the churchyard with a sigh,
And said, "Not yet! in quiet lie."'"

—LONGFELLOW.

Thus sang the brooklet, as the pretty stars, like shining gold-fish, sank deeper and deeper into the pale-blue sea of the sky.

"I wish my little friends were here to see the break of day," it added, and its purling ripples seemed to linger near the sleeping pebbles, as if searching for Bunny and his cheerful companions.

"Here we are!" rang a merry chorus, and down trooped our happy band, with nimble Chip running before.

"Just in time!" rippled the brooklet softly; "for I am to show you why the days, nights and seasons visit our valley, and here is a day close at hand.

"First, let me tell you that the earth is a large ball, rounder than the button-balls on the bush that hangs over the water; rounder than an apple,—yes, rounder than the base-ball with which the boys sometimes play in our valley; and yet it is not perfectly round.

"This great ball rolls over and over in space just like the soap-bubbles which the little girl blew here yesterday."

"Does the earth float about in the air just as the soap-bubbles did?" asked Dick.

"O no!" babbled the brook. "The air does not hold the earth in its place; but land, water and air form this great ball that turns in space, while the sun shines in nearly the same place in the sky both day and night."

That was too much for little Chip, for had he not seen the sun move across the sky every pleasant day for many months? At last the bright creature broke forth. "Then why do we not see the sun at night as well as in the daytime?"

"I will show you, my cheery friend, if you will help me. We will use this large wind-mill which the boys made here last summer. See it turning very slowly in the morning breeze. The top is rolling towards the sun, and the bottom away from the burning ball which shines high above the horizon.

"Now, Chip, I want you to climb to the very top of the wind-mill, face the sun in the east, and swing slowly round with the great wooden wheel. You can then tell us how the sun seems to move."

"There it is!" chirped the cunning creature, as he climbed nimbly to the topmost point of the wind-mill. "The bright sun is just in front of me. O see it go! now it is over my head and shines on my back. Now it is behind me. There it goes out of sight behind the wind-mill. I never saw it travel so fast before. It will be night before I can reach home"; and the little fellow was about to scamper down and away, when he heard a merry laugh below him.

"Why, Chip! the sun is in just the same place," chirped Redbreast. "Wait a minute, and you will see it again."

"There it comes!" shouted the chipmonk. "It is rising in front of me once more."

So over and over the great wheel swung, with Chip clinging to its long arm, while the sun seemed to him to rise and set at every turning. First his back and then his legs were towards the flaming ball, as he was rolled into the sunlight, then back into the shade.

"If the wheel were very, very large," chirped the robin, "it would be day on the light side, and night in the shadow."

"Yes; and morning as he swings into the sunlight, and evening as he sinks into the shadow," added Dick.

The little stream seemed to bubble with joy as it listened to the chatter. Then it told its little friends how the great ball on which we live turns or rotates like the wind-mill; how it rolls us into darkness every evening, and back to the light every morning, thus causing days and nights in the valley.

"But you must not think that the whole sky above us is dark at night," prattled the stream. "Try to find some shadows on my beach, and I will then tell you about the one cast by the great earth."

"Here is one now, behind this rock," piped Redbreast. "It looks like the long cones hanging on the pine-trees."

"Yes; and as the earth is much smaller than the sun, its shadow runs to a point far above our heads at midnight," added the brooklet. "Night is a long, cone-shaped shadow cast by the earth far into space.

"Once in a while, the moon sails into this shadow, and its round face is no longer lighted by the sun. Then it sails out again, and the eclipse is over.

"So round and round goes our valley on the great earth, swinging us into the light of day, and then into the shadow of night."

"But why do we not fall from the earth at night when our heads hang down?" queried Bunny. "I should think that all the water would spill out of our pond, too."

The pretty stream was puzzled for a moment. How could it explain to the rabbit that its head did not hang down? But soon its silvery voice rang out, "There is a small dark stone at the foot of the ledge, near the sweet acorn tree. I saw it one day as I trickled down the steep slope. If you will bring it to me, Bunny, I will show you why we do not fall from the earth at night."

"Here it is!" called out the rabbit from the ledge. "There is a small nail clinging to it."

"What a queer rock!" cried Dick. "It holds the nail so firmly that I cannot shake it off."

"It is a piece of iron ore that acts like a mag-

net," began the brook. "It is called a 'loadstone,' and draws to itself small pieces of steel and iron. Now if you will stand the little nail on its flat end, and turn the stone round and round, you will see that the nail will always point to the centre of the magnet. Over or under, right or left, the nail still stands upright, away from the loadstone.

"The earth acts like a great magnet also, and draws towards itself not only iron and steel, but also every other substance. Whether our heads or our feet are nearer the sun, we are drawn towards a point near the centre of the earth. 'Up' is not towards the sun, or any one place in the sky. *Up* means away from the centre of the earth, and *down* means towards the centre.

"At night, the trees still stand upright because they point away from the earth, even though the trees half-way round the great ball grow in the opposite direction.

"And when we walk at midnight, our heads do not hang down, for *down* is towards the earth."

"But why does not the sun rise in the same place day after day?" piped robin. "Sometimes we see it come over the hill, then over the narrow gully, and even over the treetops when the snow is on the ground."

"And it does not always set in the same place," squeaked Chip.

"Nor rise so high in the sky in winter," added Bunny. "In summer the noon shadows are very short, and the bright ball is nearly overhead."

"I will tell you why it rises farther north, and travels in a higher arch in summer time," began the brook.

"Last night we saw a bright star just in line with the top of our tallest pine. Can you recall its name?"

"Pole star!" cried Chip.

"North star!" sang Redbreast.

"Both are right. It has several names, and is the most useful to us of all the stars. It is nearly due north, and as it does not rise and set, it can be seen every clear evening. If it were night now, we could see it shining there just above the treetop.

"A point on earth nearly under that star is called the 'north pole.' If we could run a line from the north star, through the centre of the earth to the opposite side, it would come out near a point called the 'south pole.'

"Let us call the place on this plump round apple, where the stem grows, the north pole, and the blossom end, the south pole. Just midway between the poles, Dick may scratch a line round the apple. The north pole is in the centre of the northern half, and the south pole in the centre of the southern.

"That dark spot on the apple, more than one-third of the distance from the equator towards the north pole, shows you where our valley is on the earth.

"Now Robin may peck into the blossom end, — the south pole, — and hold the apple on his bill so that the stem end — the north pole — will point over the top of the pine towards the north star.

"Chip may sit on that rock about a foot behind Robin, just on a level with the apple, and watch closely. What part of the apple can you see, little chipmonk?"

"There is the south pole, but I cannot see the north," said Chip.

"If your head were the sun, which half of the apple would be lighter?" asked the brook.

"The southern," was the quick reply; "for I can see more of it."

"Now Robin may move slowly round the little squirrel, towards the west, still keeping the apple-stem pointed over the pine, and Chip may tell us when he can see the north pole," bubbled the stream.

"Hold! there it is!" came the shrill chirp, when Redbreast had hopped one-quarter way round. "Now I can see both poles. If my head were the sun, it would light north and south alike."

"Look again, Chip, while Robin moves round another quarter. Now what parts can you see?" asked the brook.

"The south pole is not in sight; but I can see far beyond the north pole, and more than half the northern part of the apple."

"Hop round a little farther, Redbreast, and Chip will call out when he can see both poles again," rippled the brooklet.

"There they are!" sang the bright-eyed squirrel, as the robin reached the third quarter.

Then the willing little bird moved along to the starting-point, and again the north pole sank out of sight, still pointing over the tall pines.

"We will now speak of the apple as if it were the earth, and we will call the line which Dick scratched upon it 'the equator,'" said the brook. "Chip may tell us whether the part of the apple nearest him is north or south of the equator."

"South," was the prompt answer.

"If your head were the hot sun, would the north or south part of the earth receive more heat?" bubbled the stream.

"It would be much warmer south of the equator than north," said Chip.

"Yes," added the brook; "in the southern half warm summer is just beginning, while on the northern side cold winter is setting in.

"Now Robin may hop round once more, till Chip

can see both poles again. Ah! keep the north pole over the old pine, little Redbreast. There! on which side of the equator do the warmest rays shine now?"

"Both sides of the equator are heated alike," said Chip. "The sun is just over the middle line."

"Then which half of the earth is warmer, Bunny, — the northern or southern?" came the query, and a roguish ripple rolled in among the smooth pebbles.

"One side must be just as warm as the other," said the rabbit, "for the sun shines on both alike."

"That cannot be," cried Dick. "It has just been summer south of the equator, and winter north. I think it would still be warmer in the south."

"You are right, Dick. I did not think of that," added Bunny. "It is like morning and evening. When the sun is setting, it is leaving a surface that has been warmed all day. When it is rising, it must first heat the earth before its warmth is given off into the air. Thus we find the dawn much cooler than the eve, although the sun's rays are just as slanting.

"Spring is the dawn of the seasons, and autumn the eve; winter is the night, and summer the mid-day."

"Well said, Bunny," babbled the waves; "but let us look again to Robin's earth. When it reaches

this point, and the sun shines above the equator, two seasons begin, and two end. In the north, cold winter goes out, and —"

"Warm spring comes in!" sang the merry voices.

"But how is it south of the equator, my little friends?" asked the brooklet.

"Autumn must follow summer there, for it does here," said Redbreast, as well as he could with the apple on his bill.

"That is true, pretty bird," sang the stream. "And now you may move round another quarter."

"O, I know that it must be summer in the north, for I can see only a little of the part south of the equator," called out Chip. Then he added, "It must be winter in the southern half, because the surface is turned so far away from me. The lighted place in the south is so narrow that the daylight cannot last so long as it does in the north."

"That must be the reason why our days are so much longer in summer; and the longer the day, the warmer it must be," said thoughtful Dick. "But there goes Robin again."

"Hold!" cried Chip. "The sun is over the equator again, and shines on both sides alike. It must be spring on one side, and autumn on the other."

"It is autumn in the north," said Bunny, "for

summer is just over. And it must be spring in the south."

"Here we are back to our winter in the north!" shouted Chip, as the robin hopped along to the starting-point, and dropped the apple from its tired bill. "It has taken four whole seasons for the earth to move round the sun. How slowly it must go!"

"O no!" rippled the brook. "It moves very rapidly. Our valley is about a quarter of a mile in length. Listen, while I count as fast as I can, — *one, two, three, four, five, six,* — and the earth has moved a hundred times the length of our valley while I was counting.

"Take this apple, please, Dick, and drop it from the bough that hangs over the water. Watch it! Let it go!"

"O, how swift!" chirped the robin.

"The apple fell only about sixteen feet," said the brook; "but while it was in the air, the earth whizzed along more than sixteen miles — sixty-four times the length of our valley — on its way around the sun. And every time it revolves, or goes round, we have our four seasons.

"As we look at the sun day after day for a year, it seems to rise higher and higher in the sky at noon for a while, and then to move in a lower and lower path. When it reaches its highest arch, our northern summer begins, while its

lowest path marks the beginning of our winter.

"Its middle arch, as it seems to travel higher and higher, opens the spring, while the same line, on its southward journey, brings in the autumn.

"Now, my little companions, you know why the days, nights and seasons visit our home, and tomorrow I will tell you how they help to cover our valley with life."

CHAPTER XI.

PLANT LIFE IN THE VALLEY.

WAS there ever such a morning before?

Far and wide, the frost had pitched its snowy tents of woven dew. Calm, cool and clear the air, as if the breath of night had fallen asleep in the cradle of the valley.

The limpid water of brook and pond slumbered with the soft blue sky above; and in their dreams there seemed to float the same pale castles of fairy mist.

Now and then, bright-tinted leaves fell fluttering from the swamp-maples, like feathers from the rosy wings of dawn. With the changing season, the foliage had ended its work, and decked itself in gayest colors.

> "Autumn's earliest touch had given
> To the woods below,
> Hues of beauty, such as heaven
> Lendeth to its bow;
> And the soft breeze from the west
> Scarcely broke their dreamy rest."
>
> —WHITTIER.

Such was the morning when our merry band gathered by the brookside to hear the story of Life in the Valley,—

"Of the wild-bees' morning chase,
Of the wild-flowers' time and place,
Flight of fowl and habitude
Of the tenants of the wood;
How the tortoise bears his shell,
How the woodchuck digs his cell,
And the ground-mole sinks his well;
How the robin feeds her young,
How the oriole's nest is hung;
Where the whitest lilies blow,
Where the freshest berries grow,
Where the ground-nut trails its vine,
Where the wood-grape's clusters shine."

— WHITTIER.

"Can you tell me where the little yellow cowslips grew last May, Bunny?" asked the brooklet.

"O, yes! and how pretty they looked in the wet meadow. I did not see any on the dry hillside. They were all here."

"I saw them, too," piped a cheery voice; "and at first I thought they were buttercups. They grew near the white violet beds."

"I know another flower here in the wet soil," chirped the little squirrel. "It has dark-red berries."

"Cranberries!" shouted Bunny. "Here are some of them. Ugh! how sour they are."

"There are the big brown cat-tails, also, standing on the marshy edge of the pond," said Dick. "They always grow in wet places."

"And so do the early pussy willows," added Red-

breast. "I look for them just as soon as I fly north in the spring time."

"Then there is our jovial friend, Jack-in-the-pulpit, down where the frog-choir sings," cried Dick; "and the water-cresses and graceful blue-flags."

"You must not forget my pure water-lilies," rippled the brook. "They float on the still water of my pond, and send their roots deep into the mud below. But let us look to another part of our valley, and see what plants grow on the steep hillside."

"There are not many pretty flowers on the abrupt slopes," said Dick. "The loam is easily washed into the valley, and the water flows so swiftly there that only a little sinks into the ground. The soil is coarser and drier than in the level meadow. A few bushes and tufts of coarse grass cling to the steep side, but they are not very pretty.

"Last May a few clusters of wild columbine grew among the rocks, and nodded their pretty scarlet and yellow blossoms. They looked so lovely, I thought they must have strolled away from home and lost their way."

"Bunny can tell us where to find the sweet clover," chirped a merry voice.

"O yes, I know where all the blossoms grow,— the pussy, hop, red and white. The pretty white

heads wave in the pasture. A little red clover grows there also, but most of it is in the rich meadow. I wish it would stay all winter. When the snow is deep and hard, I cannot always find tender branches, and I am often hungry for days and days."

"If you could only eat nuts, Bunny, you could come and live with Chip and me," said kind-hearted Dick. "Last winter I saw a great dog chase you, but you ran into your burrow just in time."

"Yes, Dick, he nearly caught me. It was a cold, frosty day. The ground was covered with snow. I was very hungry, and went out to nip a few buds and a little bark.

"Just as I began to nibble a tender twig, I was almost stunned by a loud noise. I felt a sharp pain, and tried to hop away. But a bullet had broken my leg, and I could only hobble slowly along.

"Then I heard a savage dog bark close behind me. O, how frightened I was. The hard crust cut my poor bleeding leg, and as I dragged it along, it left a red stain on the white snow.

"At length I reached my lonely home. I was still very hungry, but I did not think of that. How my poor leg did ache!

"Long dark days and nights, I lay there all alone in the cold ground, while my leg grew stronger. Then I crept out to gnaw a little bark.

"But when I saw the April showers, and heard the early blue-birds sing,—when all nature seemed to waken from its long winter sleep, how happy I felt!

"'Nature's voice is fraught with gladness,
E'en its showers can hope impart,
And each fading cloud of sadness
Leave a rainbow in the heart.

"'Is it from the white cloud flying,
Or the blue-bird, sweetly singing
In the branches, gently sighing,
Or the distant herd-bell ringing?

"'Is it in the golden sunbeam,
Streaming through the pines above,
Or the brooklet's silver thread-stream,
Comes the gentle voice of love?

"'As when cool, refreshing showers
Bless the earth with glad surprises,
Like the fragrance of its flowers,
Hope from nature sweetly rises.'"

—A. E. F.

When Bunny ended his story, the little flower was weeping, and Dick turned away his bright eyes, to hide the big round tears that were stealing down his cheeks.

"Poor Bunny!" was all he said.

Even the brooklet seemed to murmur more sadly as it went on with its story.

"Do you know any means by which plants or their seeds are carried from place to place, Dick?"

"I often find little quick-grass branches creeping through the soil, and sprouting into coarse green blades above. Sometimes I have seen branches go floating by in the stream, bearing pretty mosses with them to the sea.

"And who has not seen the tufts of thistle-down and dandelion carrying their tiny cargoes of seeds wherever the winds might waft them?"

"And some seeds, such as those that grow under the scales of our pine cones, float away in the brook," added Chip.

"And some are carried about by birds," piped the robin.

"Little animals, like field-mice, often take corn from the gardens and hide it in their nests. And you and I, Chip, carry away nuts, acorns and grasses," said Dick.

"In these and many other ways, plants and seeds are carried about," babbled the brook, "and if they reach proper soil, they spring up and live. But there are bounds beyond which they cannot grow. When the quick-grass reaches a pond or ledge, its branches must turn aside or die. If the tufts of the dandelion alight on the hot sand, their germs never waken to take root.

"The seeds of marsh plants may be carried in many ways to the hilltops, but there they will die. By dropping its seeds from its scaly cones a pine may in time start a growth of little trees all over

the upper slopes of a valley; but the tiny germs will only rot in a cranberry bog, or wither away on a sandy field.

"Many kinds of seeds — yes, and of plants — are eaten by animals. The leaves of an apple-tree often feed swarms of caterpillars, while its fallen fruit becomes the home of worms. Millions of tiny seeds of the common plantain are gathered yearly by sparrows and other small birds.

"In gardens, the tomato-worm and potato-bug destroy countless plants; and what shall we say of you, Redbreast? and of you, Bunny, and Dick, and Chip? How many seeds do you use for food each year, and so keep plants from spreading more?

"Flowers cannot live in every place where their seeds are sown, but only where the soil, heat and moisture will nourish them into growth. The lily needs much water, the pine but little. Meadow-grass will thrive only in rich soil, while thistles will spring up in rocky places. Clover holds its pretty head up to the sunlight, while many mosses and evergreen vines creep away into dark, damp woods.

"That is why our valley has plants of various kinds in its different parts, — here the meadow-grass, there the cranberry; here the water-cress, there the wild columbine; here the white violet, there the blue; here the willow, there the oak.

Each in its proper place outgrows the rest, yet cannot go beyond the bounds which nature has set in the soil.

"Every part of our valley helps to make the flowers grow in every other part. The hillsides give their loam to the valley, and their water to its soil and streams. During the day, vapor rises from the water, and at night forms drops of dew for the thirsty flowers on the hillside whence it came.

"But if it were not for the fine soil of the valley, the streams would soon run dry after a rainfall. The very loam sent down by the hills holds back the water for days and weeks, giving it to the brooks very slowly. Then as dew, rain or snow, it returns to the slopes, and thus the rich land in the valley repays the gift of the hillsides."

"But what has the sandy field to do with the life in other parts of our basin?" asked Bunny, with a puzzled look.

"Do you not recall how the hot sand sets the atmosphere in motion, and how the winds supply rain to the slopes?" asked the brooklet. "Then, too, warm air often flows from our tiny 'desert' out over the cool meadow, and gives a breath of summer to its flowers.

"'Desert,' did I call it? Some say that deserts are dead, — that they support no life. But there are no such places on earth. There are vast fields

of sand or parched soil where plants cannot grow. But these same heated tracts help to send warmth and moisture to other lands, just as the sandy field does in our valley.

"They help to cover the earth with life, but do not make gardens of their own at home. Like dingy cow-birds, they lay their eggs in the nests of others.

"Thus you see that even our sandy field is very useful, and helps to clothe the valley with plants.

"Then there is our shady grove where the snow slowly melts, and feeds the rills long after the open fields are bare and dry. Beneath its trees, the leafy mould gives off its water even after the meadow loam is empty.

"And when it rains, only a little more than one-half the drops fall upon the surface beneath its branches. Some are taken into the leaves, and many are carried along the cracks and seams in the bark, down among the roots.

"Most of the forest rains find their way into the soil, instead of forming surface rills. In this way the streams are fed by springs during long, dry seasons, and do not become rushing torrents after each heavy rainfall.

"Hillsides and valleys, water and wooded soil, fertile slopes and sandy fields, — all are parts of one beautiful whole, and that is our valley home."

CHAPTER XII.

ANIMALS THAT LIVE BY THE BROOKSIDE.

"If you were a bird, Chip, would you rather have toes like a duck's or a woodpecker's?" asked the brooklet, with a sly twinkle.

"Like a woodpecker's, of course, with two sharp toes in front, and two curved back, so that I could cling to the bark of nut-trees."

"And what kind of bill would you choose, pretty chipmonk?"

"I should like to have a duck's; for I could carry nuts and acorns in it."

"But how would you crack the nuts?" bubbled the roguish brook.

Little Chip was in a trap, but his bead-eyes fairly sparkled, as he chirped, "I should not wish to eat hard nuts if I were a bird. I should swim in the pond, dip my head among the bugs and weeds, and strain all the food I needed in my queer bill," and he perched his little head on one side, as if to say, "Now I am out of your trap, Master Brooklet."

"You would not paddle about very fast," laughed the silver waves. "Just look at the duck's broad webs, and then at the woodpecker's slender toes.

We fear that you would come from the pond quite hungry."

"But I could use my sharp toes to climb on the bark of the old apple-tree, where I could dig out bugs and worms, as the woodpeckers do," said Chip.

"You would have hard work pecking the bark with your blunt duck's bill, my merry friend," replied the brook.

"So I should. If I had a woodpecker's bill, I ought to have every other part of its body. I should need its stiff tail-feathers to brace against the trunks; its sharp, strong bill to peck the bark; its long, barbed tongue to drag the worms from their deep hiding-places; and, above all, its appetite for such food.

"And if I had a duck's bill, I should need its short, strong legs, its web-feet, and broad, oily body."

"That is just what I wished you to know," chuckled the little stream. "It would be a strange sight if cats had hoofs, mice carried long horns, horses wore sharp beaks, and dogs used wings instead of fore-legs.

"But every creature is just fitted to its home and habits of life. Birds and beasts that feed on flesh have sharp, tearing bills, beaks or teeth, and their claws are made keen and strong for holding their prey. Large animals that graze in pastures or

meadows have hoofs that will not easily sink into the soft ground or cling to the thick grass-roots; and their teeth are formed to grind the grasses which they bite or tear off.

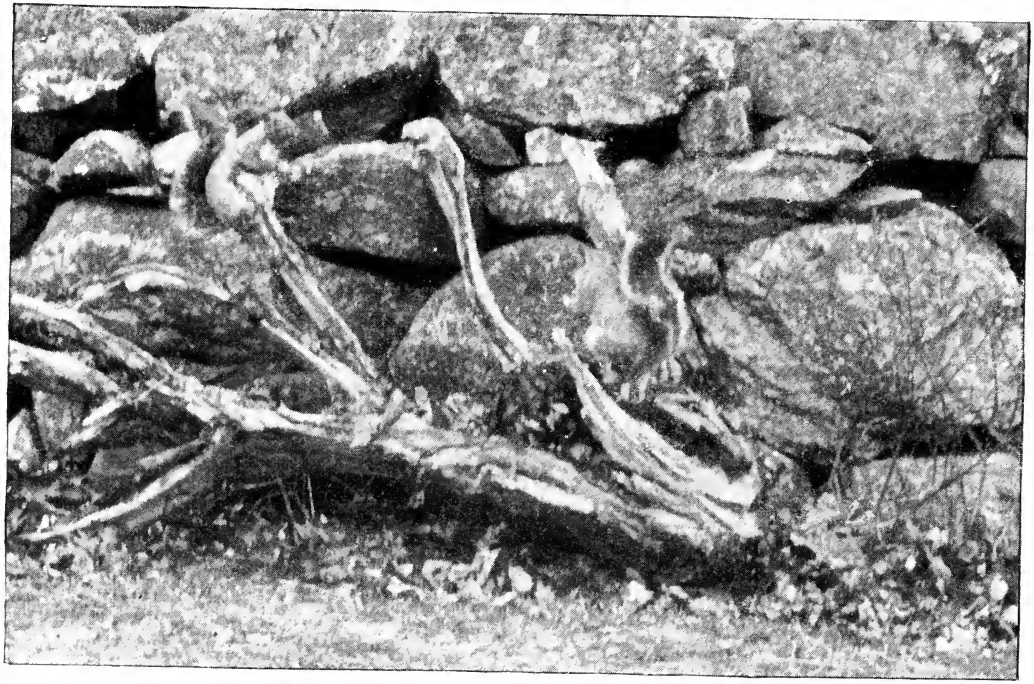
"There are many queer bills, legs, feet, tongues, noses and teeth, and each has special uses.

"Only look about you as the seasons pass, and see the strange creatures in our valley. There are humming-birds, with long, slender bills, which they thrust deep into sweet blossoms to draw out nectar and insects; mosquitoes, with hollow stings, through which they get their food; ground-moles, with long snouts, which they use as spades; fire-flies and worms that flash and glow like sparks from the starry workshop of the sky; blue-herons, with long legs for wading, and necks to match; spiders that weave winding webs for unwary flies; bright-colored crossbills that peck the seeds from the scales of spruce and pine cones.

"Then there are animals with different kinds of covering, — turtles, with strong, arching shells; fish, with thin, horny scales; birds, with light, warm feathers; frogs, with smooth, slippery skin; sheep, with thick, curling wool; and squirrels, with soft, sleek furs.

"How would you like to exchange your fur, Dick, for a coat of turtle-shell?" queried the brooklet.

"Not I!" cried the squirrel, quickly. "How



In the Old Stone Wall.

could I crawl among the stones, and squeeze through narrow holes? And how should I keep warm in winter?"

"Perhaps you would like to be covered with scales, pretty Redbreast, like our brook-trout," added the brooklet.

"O, no! for then I could not fly. If there were no feathers on my wings, I should fall to earth. Besides, I should freeze when the cold winds blow, and I could not keep my eggs warm at night. I fear that the hard scales would crush the pretty blue shells. O, no! I will keep my soft feathers."

"That is a wise choice, Redbreast; for no other covering in the wide world is so well suited to your cheerful life of flight," rippled the brook, softly.

"But why are some birds given such bright-colored plumage, when others wear only dingy colors?" asked Chip. "I have always felt very sorry for the wrens and sparrows who wear dusty brown and gray coats, while the humming-birds look like pretty winged flowers."

"All around us," began the brooklet, "there is a never-ending struggle for food — for life itself. The pathway of every creature is beset with enemies ready to pounce upon and devour it. The timid earthworm crawls from its lonely cave only to make a dainty meal for some sharp-eyed robin.

"Scarcely has the little bundle of sunshine burst from its cocoon into a fluttering butterfly ere a hungry bird swoops down and puts out its faint light.

"A long time ago, so the story runs, a lamb came to drink at the brookside. So soft and white its coat, it looked as if it had just dropped from the fleecy clouds.

"A hungry wolf had hidden behind a rock a little higher up the stream. Just as the lamb's pretty pink lips touched the water, the old gray wolf called out:

"'How dare you muddle the brook where I am drinking!'

"'I only touched the tips of my lips,' said the lamb, meekly; 'and how can I muddle the water where you are? You are higher up the stream than I.'

"'But you called my father names last year,' snarled the wolf.

"'That cannot be, for I am not a year old,' replied the lamb.

"'You need not make excuses,' growled the wolf; 'I shall make a meal of you all the same.'

"So saying, he sprang upon the helpless lamb, and killed it."

"How cruel!" cried Dick.

"Was it cruel?" asked the brooklet. "The wolf was hungry, and killed the lamb for food,

just as men do. But once some boys came here to stone my little singing frogs for fun. They broke their legs and left them to suffer for days and days before they died. Yes, and they shot at my pretty squirrels, and called it 'sport.'

"Which is more cruel, a wolf that kills a lamb for food, or a boy who shoots a little squirrel for fun?

"But I must go back to my story.

"The large and strong battle with the small and weak. The hawk is ever turning its sharp eyes downward to spy a meal among the feebler birds or fishes. The stealthy cat crouches behind the tuft of coarse grass, watching for a field-mouse, or even a bright songster, to come within reach of its sharp claws.

"But every creature has some means of defence or escape. The fly with its many eyes and its wings often saves itself by rapid flight; the turtle draws itself within its hard shell; the bee thrusts out its poison sting; the squirrel darts through the wall or among the branches; the horse kicks; the cow tosses; the dog bites; and the mouse runs into its slender hole.

"But in order that their enemies may not find them, and doubtless for many other reasons also, some animals seem to take on the coloring of the places where they live. Thus the wee humming-bird seems to borrow its colors from the flowers

where it sips, and its enemies often pass it by unseen. The sparrows, but for their motion, would look like a part of the ground and bushes on which they live. The brown-and-gray wrens can easily hide in the thickets of the same dusty shade.

"Color, then, like horns, hoofs, shells, claws and eyes, is a means by which animals often avoid being seen by their enemies.

"Nature has given to every creature just the structure and covering that will best enable it to live in its native haunts. Its whole body is formed to take and devour its proper food. Its covering prepares it to bear heat or cold, drought or rain, sunshine or darkness, and to live in or on the land, in the air, in the water, or in both air and water.

"In its home it is able to defend itself against some enemies, although it may fall a prey to others.

"Animals, like plants, are ever seeking new homes, new places to supply them with food. But as they roam about, they find lines in nature which they cannot cross and live.

"How interesting to watch the many ways in which the various creatures move from place to place. Now a bird passes far overhead, its sails gently swaying in the air. Yonder is a butterfly, feebly fluttering from flower to flower, or wafted away at the will of the gentlest breeze.

"Across the meadow, the pretty leopard-frogs make long leaps, then seem to push their way to the bottom of the pond. Shining fish steady themselves with their tiny paddles, and then dart through the water with lightning speed. The happy squirrels race and chase like dry leaves in an October wind.

"Yet swift and strong, as many of these creatures are, they cannot live beyond the places that produce their food. The wild-horse must stop at the border of the grass-land. The strong-winged bird must return to the places that feed it. The bee cannot long remain away from flowers and fruits, unless it has a store of honey.

"Animals whose food is in the sea cannot wander far from its shores. If the forest fruits alone nourish them, they cannot cross wide grass-lands. Grazing animals will follow the meadows or higher grassy plains, but cannot cross broad, rocky heights or sandy tracts, or pass through vast forests.

"Thus we find that animals, like plants, choose different parts of our valley for their homes. Squirrels live near the nut-trees and grain-fields; rabbits burrow not far from the clover-patches and gardens; caterpillars swarm on the branches whose leaves they like to gnaw; water-scorpions abound in the pond where they can catch mosquito-wrigglers and tadpoles; while near them the larva of

the dragon-fly feeds; in short, both plants and animals live only where they can find food.

"You will see them in the meadows, brooks, trees, on the hilltops, in the ground, and wherever their food grows. Thus it is all over our beautiful earth.

"Now I see by the shadows that I have only time to tell you about a queer animal that lives in the desert by the river Nile, and then you must scamper to your nesting-places.

"I shall tell you this story of the camel to show you how an animal may be fitted even for a home in a desert place.

"This wonderful creature is larger than the horse in our pasture. Its neck and legs are long, and its head quite small.

"There are pads of hair on its knees and feet, and over its eyes hangs a thick hair veil. On its back there is a large hump, and it has a great pouch in which it can carry water.

"For days and days, it can travel without being fed or led to drink. The fine sand that blows about would blind Dick or Bunny, but the camel does not fear it.

"Chip's little feet would blister and burn on the hot sand, but this wonderful beast travels during the hottest days, and even kneels on the burning desert to allow its master to get on and off its back.

"Shall I tell you how it lives in this drear waste?

"Its great rounded back is made of fatty flesh, and when it has not been fed for a long time, this homely hump supplies the body with food. When the noble creature is thirsty, its pouch supplies the body with water.

"The long lashes protect its eyes from the hot sands that blow about; and the thick pads prevent the parched ground from burning its knees and feet.

"Here again, we see how Nature cares for her children, and fits them to their homes.

"For miles and miles, the desert stretches away like an ocean; and as the camel bears heavy cargoes of oil, gums and salt across this sea of sand, it is called the 'Ship of the Desert.' Do you not think that it is an apt name?

"Now, my little friends, hie away to your nests to rest for another day."

CHAPTER XIII.

THE RAINDROPS GO HOME TO OLD OCEAN.

"To-day we must tell you the last story. When the evening shadows creep into our valley, other raindrops will fill the brook-bed, but we shall be home in the sea.

"'The sea! the sea! the open sea!
The blue, the fresh, the ever free!
Without a mark, without a bound,
It runneth the earth's wide regions round;
It plays with the clouds; it mocks the skies,
Or like a cradled creature lies.'

—Barry Cornwall.

"But watch for us! We may come again —

"'While the loom of winter weaves
The shroud of flowers and fountains.'

"We may sift down like apple-blossoms on the hillside, and spread our warm snow-blanket over Bunny's home.

"You may see us, Dick, hanging from the boughs of your old oak.

"We may fly away on our light vapor-wings to the sunny south, where Robin will sing his sweet songs all winter.

"Look for us in the early showers, next April. You may find us bubbling from the hillside, —

> "'When spring comes round again,
> By greening slope and singing flood.'

"When the pretty pink earthworms come crawling from their dark holes, ask them if they have met the raindrops at work in the cold earth.

"Speak kindly to each little rill, and cheer it on its way.

"When the new buds begin to unfold, and the tender grass-blades shoot from the dark soil, you will know that we are busy, and will soon be with you again.

"Away in the ocean our tiny brothers may be waiting for us. We shall have a merry time, and see wonderful sights. Next year, if you are here, we will tell you another story of our travels."

"Little brook," whispered the wild-flower, "won't you please tell us a story about your home in the sea? I shall think of you often when you are gone, and shall be so happy when I see your pretty dimpled waves go dancing by again. O, I hope I may grow in this same spot next summer!"

"So do I, little wild-flower," replied the brook. "You are always so cheerful that you make everyone near you happy. Yes, I will tell you a true story about a storm at sea, and then I must bid you a long, long farewell."

THE STORM AT SEA.

"It is evening on the ocean. The weary sun has just hidden its face behind a cold gray misty veil.

"'The twilight is sad and cloudy,
The wind blows wild and free,
And like the wings of sea-birds
Flash the white-caps of the sea.'
—LONGFELLOW.

"Now heavy clouds roll up in the east, and spread out over the whole sky. The trembling stars put out their lights and hide behind the dark curtain.

"The night wind sighs and moans as if in answer to the lonely call of the stray sea-bird, seeking a pathway shoreward through the darkness.

"Now comes a sound of rushing water. The surface is churned into foam. Great waves spring from the angry sea, and lash themselves in foaming fury.

"Suddenly a tongue of flames flashes through the clouds, and shoots across the sky. The air seems filled with barking, howling monsters, whose voices shake the very depths of old ocean.

"Rain pours down in torrents. The grand storm at sea has begun!

"Flash after flash lights every corner of the heavens. The clouds are torn into shreds. Peal upon peal of jarring thunder rolls out over the water. Then the sky becomes dark again, and the wind settles down with a dreary moan.

"Ah! but you should see old ocean now!

"Far as the eye can reach, the phosphorescent sea is filled with pale flame, as if swarms of fire-flies were flashing their tiny lanterns in every wave!

"Flying spray looks like shooting-stars. Shoals of fish dart about like flights of flaming arrows. The breaking waves are fringed with brightest silver on every crest.

"Now the sky becomes a vast fireplace. Dark clouds hang overhead like thick smoke. Plunging whales are burning logs. Leaping fish are sparks thrown up only to fall back again into the fiery sea.

"Again and again the lightning flashes through the clouds. Heavy thunder crashes and groans. Rivers of water seem to pour from the broken clouds. Now above, now below, Nature shows her grandest fireworks.

"At length the storm goes by. The dark clouds are drawn aside, and beautiful stars look down once more.

"But for a long time the water rises and falls as if panting from its long struggle with the fierce gale.

"Then the weary raindrops lie down in the cradle of the sea, and the great waves rock us to sleep."

* * * * * * *

As the brooklet ended its story, its pretty ripples broke for the last time over the rounded pebbles, with a low sad murmur, as if to bid farewell to its little friends.

They followed along the banks, and saw it glide into the waiting ocean. They watched its silver ripples join the dark-blue of the sea. The raindrops were home at last.

Sadly and silently the little band moved along the lonely valley where other raindrops filled the brook-bed.

They greeted the gentle wild-flower, but lo! its petals had fallen, and its weary head had drooped for the long winter sleep.

Then the robin turned to its pretty friends, and softly chirped, "I, too, must leave our lovely valley where we have spent so many happy days together. To-morrow's sun will light me many miles on my journey towards the bright and sunny south-land.

"Think not that I shall forget you, or the pleasant times we have had together. O, how closely will I watch the changing seasons.

"The April clouds shall not fly faster than I to meet you here when spring returns, but, till then, a long farewell."

No word was spoken as Bunny, Dick and Chip turned with moist eyes to watch their parting friend fade away in the gathering shadows.

But listen! what word of cheer is this?

A happy voice comes floating in on the evening breeze —

"The brooklet came from the mountain,
As sang the bard of old,
Running with feet of silver,
Over the sands of gold.

"Far away in the briny ocean,
There rolled a turbulent wave,
Now singing along the sea-beach,
Now howling along the cave.

"And the brooklet has found the billow,
Though they flowed so far apart,
And has filled with its freshness and sweetness,
That turbulent, bitter heart."

— LONGFELLOW.

A BOOK FOR PROGRESSIVE TEACHERS.

THE CHILD AND NATURE.

By ALEX. E. FRYE, LL.B.

A System and Method of Teaching Geography.

Sand Modelling Fully Illustrated.

Who is the Author?

New York School Journal: "Mr. Alex. E. Frye is probably the most progressive teacher of Geography in the country."

New England Journal of Education: "By his Institute lectures and writings, Mr. Frye has become the recognized leader in teaching Geography by sand modelling."

Pennsylvania School Journal: "Mr. Frye is perhaps the best *theoretical and practical* teacher of Geography in this country."

How many of the following Educators do you know?

Allen, Dr. Jerome: "'The Child and Nature' is the best book I have seen on the subject of applied Geography."

Baldwin, Dr. J.: "A book of great merit, — sound, and replete with suggestions. It will be of great value to me."

Balliet, Dr. T. M.: "Incomparably the ablest and best. Send me **100 copies** for my teachers and training class."

Hailmann, Supt. W. N.: "A living, spirited, thoroughly organic presentation. I am delighted with the book."

Payne, Dr. W. H.: "A thoroughly good book which will tend to improve Geography teaching."

Redway, Prof. J. W.: "The only book published in which the author shows a knowledge both of the science of Geography and the principles of teaching."

Sheldon, Dr. E. A.: "I wish it might be put in the hands of every teacher in the land."

Waller, Dr. D. J.: "It will prove in effect an '*Emancipation Proclamation*' to teachers and pupils of Geography."

Mailing Price, $1.00.

BAY STATE PUBLISHING CO., HYDE PARK, MASS.

"GEMS OF ART."

RAISED MAPS OF THE CONTINENTS

Modelled by ALEX. E. FRYE.

LARGE REFERENCE RELIEF MAPS.

21 × 24 INCHES.

In Accuracy, Beauty, Cheapness, and Durability, these Maps have

NO EQUAL IN AMERICA OR EUROPE.

Every portion of the Earth is shown in ACTUAL RELIEF on a UNIFORM SCALE OF ELEVATION; SLOPES, WATER PARTINGS, PLATEAUS, Mountain Ranges, Principal Peaks and Passes, RIVER BASINS, SYSTEMS OF DRAINAGE, Rivers, Lakes, etc. In short, a complete representation of the natural features of the six continents.

SMALL MODEL MAPS OF THE CONTINENTS.

6 × 8 INCHES.

With these little Maps for guides, any teacher can learn to MODEL THE CONTINENTS IN SAND in a very short time, as they contain ONLY the features of relief and coast-line that every teacher and pupil should be able to model accurately and quickly from memory. All unimportant details are omitted.

The Maps are used in the Schools of Boston, Springfield (14 sets), Lowell (20 sets), Quincy, Cambridge, Mass.; New Haven, Conn.; New York City, Peekskill, N.Y.; Scranton, Pa. (12 sets); Asheville, Goldsboro, Charlotte, Durham, N.C.; and in many other cities all over the United States.

They are also used in scores of NORMAL SCHOOLS in every section of the country.

FOR SPECIAL INTRODUCTORY RATES, ADDRESS

BAY STATE PUBLISHING CO.,

HYDE PARK, MASS.