BIRDS and NATURE

IN NATURAL COLORS

A MONTHLY SERIAL

FORTY ILLUSTRATIONS BY COLOR PHOTOGRAPHY

A GUIDE IN THE STUDY OF NATURE

TWO VOLUMES EACH YEAR

VOLUME IX

JANUARY, 1901, TO MAY, 1901

EDITED BY WILLIAM KERR HIGLEY

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BIRDS AND NATURE.

ILLUSTRATED BY COLOR PHOTOGRAPHY.

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THE OLD YEAR.

Ring out, wild bells, to the wild sky,
The flying cloud, the frosty light:
The year is dying in the night;
Ring out, wild bells, and let him die.

Ring out the old, ring in the new,
Ring, happy bells, across the snow:
The year is going, let him go;
Ring out the false, ring in the true.

Ring out the grief that saps the mind,
For those that here we see no more;
Ring out the feud of rich and poor,
Ring in redress to all mankind.

Ring out false pride in place and blood,
The civic slander and the spite;
Ring in the love of truth and right,
Ring in the common love of good.

Ring out old shapes of foul disease,
Ring out the narrowing lust of gold;
Ring out the thousand wars of old,
Ring in the thousand years of peace.

Ring in the valiant man and free,
The larger heart, the kindlier hand;
Ring out the darkness of the land,
Ring in the Christ that is to be.

—Alfred Tennyson.

THE WHITE-WINGED CROSSBILL.

(*Loxia leucoptera.*)

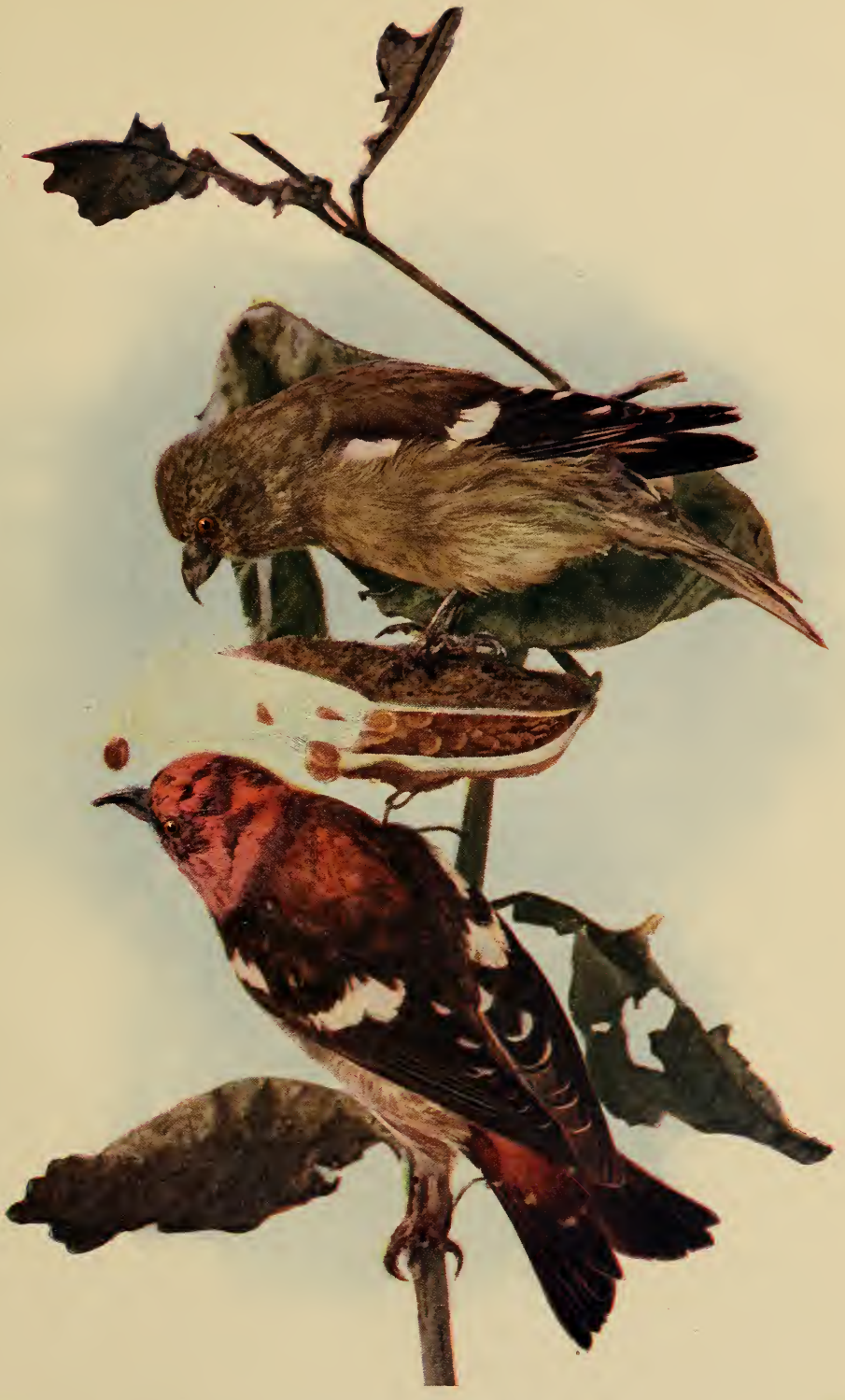
The Crossbills, together with the finches, the sparrows, the grosbeaks, the redpolls, the goldfinches, the towhees, the cardinals, the longspurs, and the buntings, belong to that large family of perching birds called the Fringillidae, from the Latin word Fringilla, meaning a finch.

Mr. Chapman tells us, in his "Birds of Eastern North America," that "this, the largest family of birds, contains some five hundred and fifty species, which are represented in all parts of the world, except the Australian region. Its members present a wide diversity of form and habit, but generally agree in possessing stout, conical bills, which are admirably adapted to crush seeds. They are thus chief among seed-eaters, and for this reason are not so migratory as insect-eating species." Many of the birds most highly prized for the cage and as songsters are representatives of this family and many of the species are greatly admired for their beautiful coloring. The White-Winged Crossbill is a native of the northern part of North America, migrating southward into the United States during the winter months. Its technical name, Loxia leucoptera, is most appropriate and descriptive. The generic name Loxia is derived from the Greek loxos, meaning crosswise or slanting, and the specific name leucoptera is from two Greek works, meaning white and wing, and has reference to the white tips of the feathers of the wings. The common name, Crossbill, or, as the bird is sometimes called, Crossbeak, describes the peculiar structure of the bill which marks them as perhaps the most peculiar of our song birds. The bill is quite deeply cut at the base and compressed near the tips of the two parts, which are quite abruptly bent, one upward and the other downward, so that the points cross at an angle of about forty-five degrees. This characteristic gives this bird a parrot-like appearance. The similarity is heightened by the fact that these hook-like bills are used by the birds to assist in climbing from branch to branch.

The Crossbills are even parrot-like in captivity. Dr. Ridgway, in the "Ornithology of Illinois," writes as follows regarding the habits of a pair: "They were very tame, and were exceedingly interesting little pets. Their movements in the cage were like those of caged parrots in every respect, except that they were far more easy and rapid. They clung to the sides and upper wires of the cage with their feet, hung down from them, and seemed to enjoy the practice of walking with their head downward. They were in full song, and both the male and female were quite good singers. Their songs were irregular and varied, but sweet and musical. They ate almost every kind of food, but were especially eager for slices of raw apple. Although while they lived they were continually bickering over their food, yet when the female was accidentally choked by a bit of egg shell her mate was inconsolable, ceased to sing, refused his food, and died of grief in a very few days."

Their peculiar bills are especially fitted for obtaining their food, which consists to a great extent of the seeds of cone-bearing trees, such as the pine, the hemlock and the spruce. The ornithologist Wilson says: "On first glancing at the bill of this extraordinary bird one is apt to pronounce it deformed and monstrous; but, on attentively observing the use to which it is applied by the owner and the dexterity with which he detaches the seeds of the pine-tree from the cone and from the husks that inclose them, we are obliged to confess on this, as on many other occasions where we have judged too hastily of the operations of nature, that no other conformation could have been so excellently adapted to the purpose; and that its deviation from the common form, instead of being a defect or monstrosity as the celebrated French naturalist insinuates, is a striking proof of the wisdom of the great Creator."

As an accidental malformation this structure of the bill has been noted among other birds, and, it is said, with some fre-



OM COL. F. M. WOODRUFF.

WHITE-WINGED CROSSBILL.
(Loxia leucoptera.)
About 3/4 Life-size.

quency among the crows. A mediaeval legend gives as the cause for this conformation of the bill and the red color of the plumage that it was acquired "in recognition of the pity it bestowed on the suffering Savior at the Crucifixion."

Probably due to the nature of their food, which can usually be procured in any season, these birds are apparently not under the control of the usual laws that govern migration, but wander about in a seemingly aimless manner and are not influenced to any great extent by the changing seasons. They do not seem to be a constant inhabitant of any given locality for any length of time, but appear and disappear as if constantly dissatisfied with their surroundings.

The two sexes vary in color, the body of the male being a dull carmine-red, which is brighter on the rump, and that of the female is brownish, tinged with olive-green and with brownish yellow on the rump. The young males are similar in color to the females, but pass through a changeable plumage while maturing.

The Crossbill usually builds its nest in a cone-bearing tree and does not always choose the most inconspicuous locality. The nest is generally constructed of rather coarse twigs and strips of birch or cedar bark and lichens. This is lined with hair, the softer fibers of bark, fine rootlets, grass and feathers. The whole nest is saucer-shaped and about four inches in diameter, outside measurement, by one and one-half in depth. Authorities tell us that the eggs are usually three in number. In color they are a pale blue, nearly spotless at the smaller end, but at the larger end marked with irregular streaks or dots of lavender or reddish-brown. The eggs are small, about eight-tenths of an inch long by nearly six-tenths in diameter.

On account of their vagrant habits, Dr. Brehm was wont to call them the "Gypsies" among birds. While seeking food or flying from place to place, they continually utter a plaintive note and their song is soft and sweet.

THE LEGEND OF THE CROSSBILL.

On the cross the dying Saviour
Heavenward lifts his eyelids calm,
Feels, but scarcely feels, a trembling
In his pierced and bleeding palm.

And by all the world forsaken,
Sees he how with zealous care
At the ruthless nail of iron
A little bird is striving there.

Stained with blood and never tiring,
With its beak it doth not cease,
From the cross 'twould free the Saviour,
Its Creator's Son release.

And the Saviour speaks in mildness:
"Blest be thou of all the good!
Bear, as token of this moment,
Marks of blood and holy rood!"

And that bird is called the Crossbill;
Covered all with blood so clear,
In the groves of pine it singeth
Songs, like legends, strange to hear.

—From the German of Julius Mosen, Henry Wadsworth Longfellow.

THE STUDY OF BACTERIA.

The bacteriologist is working in a wonderland fully as remote to the average mind as that ever occupied by the astronomer or psychologist; and yet it is as real to him as though he were walking through a forest and noting the different kinds of trees. Such popular doubts as have been held regarding bacteriology and even the existence of bacteria are no longer justified. The evidence is too overwhelming not to be accepted by anyone who has sufficient interest to investigate. The methods used in bacteriologic studies are to-day giving us information fully as concise as that obtained by the general botanist in the study of higher plants. Indeed, the phenomena of bacterial activities and the chemistry of the products of growth of many species of bacteria have already received attention not equaled in the study of some of our most useful plants.

Bacteria are plants; not because of any absolute characteristic that separates them from animals, but because comparative study shows that they are more like plants than animals. They are single-celled organisms and each individual has the prime factors of life, assimilation, growth and reproduction. Each bacterium is an independent cell and although the cells in some species remain attached to one another, giving rise to characteristic groupings, they are mostly detached and free individuals. Bacteria can increase in numbers to a remarkable extent when favorable conditions exist. The mother-cell simply splits into two daughter-cells and these form a generation of four cells, while later generations, consisting of perhaps one million cells, can in fifteen or twenty minutes produce two million bacteria. But conditions must be favorable for this active growth, ample food stuffs, free from other bacteria, together with mosture and reasonable warmth are most essential. There are many circumstances constantly at work to prevent an overgrowth of bacteria; exhaustion of food supply, antagonism of species and fresh air with sunshine, are the most important. Bacteria are present everywhere in greater or less numbers, except within the bodies of healthy, growing plants and animals. It is for this reason that bacteria become so active and multiply with great rapidity when once established in the tissue fluids of larger organisms, either before or after they have died. Vital activities during health prevent the entrance of bacteria into our bodies. There are, however, times when the association of different species of bacteria and also the association of bacteria with higher plants is of mutual advantage. The association of decomposition and pathogenic bacteria frequently makes it possible for the latter to infect an animal, when alone it perhaps would not take place. Again, the growth of certain bacteria within the root-structure of plants greatly improves their functional activity. The leguminuous plants are enabled to assimilate much larger quantities of nitrogen when associated with bacteria than when growing alone. No such mutually advantageous relationships are known to exist between bacteria and animals; the tendencies are rather destructive, leading to the infectious diseases. The general biologic function of the bacteria is very important and in a general way the need of their existence can be much better appreciated than that of many living beings. Decomposition may be stated as being their chief functional activity. Decomposition stands before life; without it the progress of the generations would terminate. The gradual and ever rapid disappearance of the substance of vegetable and animal bodies after death makes room for growing life. With an absence of decomposition the bodies of plants and animals would collect on the earth and cover it so deeply with organic matter that plants in particular would be entirely unable to obtain requisite nourishment. Higher plants having chlorophyll are able to feed on inorganic material, while bacteria require organic matter to sustain life. Bacterial food is then derived from the higher forms of life, while these higher forms feed on the end products of bacterial decomposition,

with the addition of salts from the earth. An evolutionary query might then arise as to the early conditions in the history of organic life on the earth. It is certainly a fertile field for the theorist. Accepting the general rule that simplicity of structure indicates priority, what then was the food supply of the primordial bacterium before the advent of higher plants to supply requisite organic matter? We can hardly believe that there was already in existence sufficient ammonia-bearing compounds of suitable quality to sustain these lowest organisms until evolutionary conditions added organisms having the capacity of collecting nitrogen and carbon from purely inorganic sources. These general facts, as we now see them, would apparently strengthen the thought that different kinds of organisms became extant at the same time.

The methods used in bacteriologic study are based on a few very distinct principles. Successful cultivation of bacteria depends upon a knowledge of sterilization, preparation of culture media and isolation of species. It is in fact miniature gardening. A rod of platinum wire is the trowel and this is kept clean and free from undesirable organisms by heating it red hot in the gas flame. With it bacteria are lifted from tube or plate. The culture media required are mostly beef-tea and gelatine mixtures and are prepared with extreme care as to their composition and reaction. The decomposition of the culture medium is prevented by keeping it in test tubes or flasks plugged with cotton and sterilized by boiling. By means of the cotton plug the air passing in and out of the tube is filtered and the bacteria floating in the air are caught in the cotton and cannot get into the tube. It also prevents bacteria from the culture getting out of the tube and spreading infectious material. Each test tube represents a little greenhouse, but one that is free from all life; it is sterile when ready for use. To the media or culture soils in the tubes the bacteria are transplanted with the platinum rod, and active growth is obtained by placing the tubes in a suitable temperature. Such a growth of bacteria in a test tube can contain many millions of bacteria, while the resulting appearance of growth is due to the heaping up of the individuals. To the naked eye the cells are invisible, but the mass is recognized in the same way that one would know a field of wheat in the distance without being able to see each separate plant. Species of bacteria are separated by distributing a few organisms throughout a fluid and then planting upon solid media. The individual cells then grow in place and produce colonies. These are separate and distinct to the eye and each contains bacteria, all of the same kind. From colonies transplantations to tube cultures are made, and the species is propagated on different media. The observations from such growths, together with the microscopical study and sometimes inoculation experiments on animals are the data by which the species is recognized. Microscopic methods, although somewhat complicated have been so far developed that some species of bacteria can be as promptly recognized under the microscope as an acquaintance met upon the street.

Bacteriology is now being studied and investigated as a field of research in hundreds of laboratories, and in every university in Europe and America. Bacteriology has added as much to man's wealth and happiness as any of the applied sciences. All the methods of preservation of food depend upon bacteriological principles, while modern sanitary science is based on the recognition of the cause of infectious diseases. The presence of specific bacteria in the secretions or tissues of man and animals is now such a certainty for many diseases that the work of making bacteriologic diagnoses is in itself an extensive vocation. Within the next few years every city in America will have a diagnosis laboratory for infectious diseases. We can safely predict that the trained bacteriologist will be called upon to stand between each sick person or animal and the community to direct measures that will prevent infection of others Hygienists are learning more every day as to the exact way in which disease bacteria pass from person to person, and the reasons for the occurrence of diseases They have learned that the accidental and unusual circumstance is least important,

but that there is a regular train of cause and effect, and in the knowledge of how to break this chain is the key to the proper control of an epidemic. Veterinary medicine has been able to obtain benefits from bacteriology much beyond those already so important to human medicine. This is so because of the persistent prejudice opposed to bacteriology in medicine, while the veterinarian has been allowed to treat his patients practically as the experiment animals are treated in the laboratory.

Bacteriologists are frequently meeting demands made of their science that are beyond its present stage of progress. It is frequently forgotten that this is biology whose deductions are always subject to the variation of growing things, and not chemistry or mathematics, with their definite determinations and strict limitations. Bacteriology is now an established science, and it is as competent to render service in due proportion to its development and with the same integrity as any biological subject. There are now many known facts in bacteriology that cannot be made useful because intermediate steps in their study have not been learned It will require long series of experiments in some cases, but when added to the present usefulness of bacteriology the results may be expected to satisfy the most severe critics.

Adolph Gehrmann.

THE YELLOW-BREASTED FLYCATCHER.

"Come here! come here! come here!
My Philip dear, come here! come here!
Philip, my dear! Philip, Philip, my dear!"

Poor mournful Mrs. Flycatcher,
With ample breast of dainty buff,
Now don't you think you've called your mate,—
To say the very least—enough?

I'm sorry for you, plaintive one;
I would be glad to make him fly
From his long tarrying place to you,
If that would stop your weary cry.

Can't you decide to give him up?
All over town you've called his name;
I heard you calling this week, last,
The week before you called the same.

Perhaps some boy with "twenty-two"
Has shot him for his sister's hat.
Go! search the churches through and through;
If he's not there, accuse the cat.

—Carrie B. Sanborn.

TOWNSEND'S WARBLER.
(Dendroica townsend)
About Life-size.

THE TOWNSEND'S WARBLER.

(*Dendroica townsendi.*)

Dr. Robert Ridgway, in the Ornithology of Illinois, uses the following words in speaking of that family of birds called the American Warblers (Mniotilidae), "No group of birds more deserves the epithet of pretty than the Warblers; Tanagers are splendid; Humming-birds are refulgent; other kinds are brilliant, gaudy or magnificent, but Warblers alone are pretty in the proper and full sense of that term."

As they are full of nervous activity, and are "eminently migratory birds," they seem to flit rather than fly through the United States as they pass northward in the spring to their breeding places, and southward in the fall to their winter homes among the luxuriant forests and plantations of the tropics. All the species are purely American, and as they fly from one extreme to the other of their migratory range they remain but a few days in any intermediate locality. Time seems to be an important matter with them. It would seem as if every moment of daylight was used in the gathering of food and the night hours in continuing their journey.

The American Warblers include more than one hundred species grouped in about twenty genera. Of these species nearly three-fourths are represented in North America at least as summer visitants, the remaining species frequenting only the tropics. Though woodland birds they exhibit many and widely separated modes of life, some of the species preferring only aquatic regions, while others seek drier soils. Some make their homes in shrubby places, while others are seldom found except in forests. As their food is practically confined to insects, they frequent our lawns and orchards during their migrations, when they fly in companies which may include several species. Mr. Chapman, in his Handbook of Birds of Eastern North America, says, "Some species flit actively from branch to branch, taking their prey from the more exposed parts of the twigs and leaves; others are gleaners, and carefully explore the under surfaces of leaves or crevices in the bark; while several, like Flycatchers, capture a large part of their food on the wing."

The Townsend's Warbler is a native of Western North America, especially near the Pacific coast. Its range extends from Sitka on the north to Central America on the south, where it appears during the winter. In its migration it wanders as far east as Colorado. It breeds from the southern border of the United States northward, nesting in regions of cone-bearing trees. It is said that the nest of this Warbler is usually placed at a considerable height, though at times as low as from five to fifteen feet from the ground. The nest is built of strips of fibrous bark, twigs, long grasses and wool, compactly woven together. This is lined with hair, vegetable down and feathers.

The eggs are described as buffy white, speckled and spotted with reddish brown and lilac-gray, about three-fifths of an inch in length by about one-half of an inch in diameter.

THE STORY OF SOME BLACK BUGS.

We were going to visit Aunt Bessie, and John and I like few things better than that. To begin with, she lives in the country, and there is always so much to do in the way of fun that the days never seem half long enough.

Then, besides, Aunt Bessie knows everything, and can tell such famous stories. So when she asked us one morning to go to the pond with her and see something interesting, you may be sure we were not slow in following her.

The rushes grew thickly along the sides, but the water was clear, and we could plainly see the black bugs she pointed out to us crawling, slowly and clumsily, over the muddy bottom.

"Those things!" said John, not a little disgusted. "I don't think they are much. Are they tadpoles?"

"Tadpoles!" I echoed. "Why, whoever saw tadpoles with six legs and no tail?"

"The absence of a tail is very convincing," laughed Aunt Bessie. "They are certainly not tadpoles. Now watch them closely, please, and tell me all about them."

"They are abominably ugly. That is one thing," broke in John. "They look black, and have six legs. But how funny their skin is. More like a crust, or lots of crusts laid one on the other. They are about the stupidest things I ever saw. They seem to do nothing but crawl over that mud and—Hello! they aren't so stupid, after all. Did you see that fellow snatch a poor fly and gobble him up quicker than you could say Jack Robinson? And there's another taken a mosquito just as quick. I'll take back what I said about the slow business. But really, Auntie, do you think them very interesting?"

"I'll ask you that question when you have learned something more about them," was her answer. "Tell me now what you think of that Dragon fly darting over the water?"

"Oh, he is a beauty," we answered in a breath. "But please let us hear something about those things down there."

"Not to-day, boys. I wish you to see something for yourselves first. Watch here for a few days and your patience will be rewarded, I promise you. Then I will have a story to tell you."

I knew that Auntie never spoke without reason, so John and I kept a close watch on those bugs. For two days nothing happened. The old things just crawled over the mud or ate flies and mosquitoes, as usual.

But the third day one big fellow decided to try something new. It was nothing less than to creep up the stem of one of the rushes. I suppose it was hard work, for he took a long time to get to the surface of the water. Here he stopped a while and then seemed to make up his mind to go further. Soon he was quite out of the water and could breathe all the air and sunshine he wished. I believe he did not like it very well. He seemed so restless and uneasy. I was expecting to see him go back, when I heard John cry out:

"Look! oh, do look!"

I did look, and could scarcely believe my eyes.

His skin (the bug's, I mean), was actually cracking right down the back, just as though the air and sunshine had dried it too much.

Poor fellow, he seemed in great trouble about it. Then, to make matters worse, a part of his coat broke off at the top and slipped down over his eyes, so that he could not see. After a moment, however, it dropped further, quite under the place where his chin would have been, had he had a chin.

"Oh! he is getting a new face. A prettier one, too, I am glad to say."

It seemed as if John was always first to notice things, for it was just as he said; as the old face slipped away a new one came in its place.

I guess that by this time that old bug was as much astonished as we were. He was wriggling about in a very strange fashion, and at last quite wriggled himself out of his old shell. Then we saw two pairs of wings, which must have been folded away in little cases by his side, begin to open like fans. Next, he stretched

his legs, and it was easy to see that they were longer and more beautiful than those he had had before.

Then, before we could admire his slender, graceful body, or fully realize the wonderful change that had occurred in him, he darted away before our astonished eyes, not a black bug, but a beautiful Dragon fly.

"Hurrah!" we both shouted. The next second we were rushing at top speed to tell Auntie all about it; just as though she had not known all along what was going to happen.

She listened and then told us what we did not know.

How months before the mother Dragon-fly had dropped her tiny eggs in the water, where they hatched out the black bugs, which were so unlike their mother that she did not know them for her children, and had no word to say to them during the long hours she spent in skimming over the water where they lived.

These bugs were content at first to live in the mud. But soon came the longing for sun and air. And then followed the wonderful transformation from an ugly black bug to the beautiful dragon-fly.

If you will go beside some pond in the spring or early summer, and find among the water grasses such a bug as I have described, and will then watch long enough you will see just what John and I saw. Afterwards I am sure you will agree with us that it is very wonderful indeed.

Louise Jamison.

THE SOLITARY SANDPIPER.

He is a curious little chap, the Solitary Snipe, and we used to call him Tip-up. He delights to "see-saw" and "teeter" down a clay bank, with a tiny "peep-po," "peep-po," just before he pokes in his long, slender bill for food.

He is very tough, and possesses as many lives as the proverbial cat. I have taken many a shot at him—fine sand-shot at that—and from a gun with a record for scattering, and I never succeeded in knocking over but one Tip-up while on a hunt for taxidermy specimens. I failed to secure even this one, though he flopped over in the water and floated down upon the surface of the shallows toward where I stood, knee-deep awaiting his coming. He was as dead as any bird should have been after such a peppering; yes, he was my prize at last, or so I thought as I reached out my hand to lift his limp-looking little body from the water. He was only playing possum after all. With a whirl of his wings and a shrill "peep-po," "peep-po," he darted away and disappeared up stream and out of sight beyond the alders. To add to my disappointment a red-headed woodpecker began to pound out a tantalizing tune upon the limb of a dead hemlock. No sand-shot could reach that fellow, desire him as much as I might. Then a bold kingfisher, with a shrill, saucy scream, darted down before me, grabbed a dace and sailed to a branch opposite to enjoy his feast, well knowing, the rascal! that I had an unloaded gun and had fired my last shell. How he knew this I am not able to say, but he did. Wiser fellows in bird lore than I may be able to explain this. I cannot.

The Solitary Sandpiper is well named. He is always at home wherever found, and always travels alone, be it upon the shelving rock-banks of a river or the clay-banks of a rural stream. He possesses, after a fashion, the gift of the chameleon and can moderately change the color of his coat, or feathers, rather. When he "teeters" along a blue clay bank he looks blue, and when he "see-saws" along brown or gray rocks he looks gray or brown, as the case may be.

The city boy who spends his vacation in the rural parts and fishes for dace, red-fins or sunfish, knows the Solitary Sandpiper. To the country boy he is an old acquaintance, for he has taken many a shot, with stone or stick, at the spry little Tip-up, who never fails to escape scot free to "peep-po," "peep-po" at his sweet content.

H. S. Keller.

THE KNOT OR ROBIN SNIPE.

(*Tringa canutus.*)

The Knot or Robin Snipe is a bird of several names, as it is also called the Red-breasted Ash-colored Sandpiper, the Gray-back and the Gray Snipe. It is quite cosmopolitan, breeding in the far north of both hemispheres, but in winter migrating southward and wintering in the climate of the southern United States and Central America. The Knot belongs to the Snipe family (Scolopacidae), which includes one hundred or more species, about forty-five of which are inhabitants of North America. Nearly all the species breed in the higher latitudes of the northern hemisphere. These birds frequent the shores of large bodies of water and are seldom observed far from their vicinity. Their bills are long and are used in seeking food in the soft mud of the shore.

The Knot visits the great lakes during its migrations and is frequently observed at that time. Its food, which consists of the smaller crustaceans and shells, can be as readily obtained on the shores of these lakes as on those of the ocean, which it also follows.

Dr. Ridgway tells us that "Adult specimens vary individually in the relative extent of the black, gray and reddish colors on the upper parts; gray usually predominates in the spring, the black in midsummer. Sometimes there is no rufous whatever on the upper surface. The cinnamon color of the lower parts also varies in intensity."

Little is known of the nest and eggs of the Knot owing to its retiring habits at the nesting time and the fact that it breeds in the region of the Arctic Circle, so little frequented by man. One authentic report, that of Lieutenant A. W. Greely, describes a single egg that he succeeded in obtaining near Fort Conger while commanding an expedition to Lady Franklin Sound. This egg was a little more than an inch in length and about one inch in diameter. Its color was a "light pea-green, closely spotted with brown in small specks about the size of a pinhead."

VIOLA BLANDA.

(Sweet White Violet.)

Serene the thrush's song, all undisturbed,
Its rows of pearls, a marvel of completeness,
Then the soft drip of falling tears I heard,
Poor weeping bird, who envied so thy sweetness!

—Nelly Hart Woodworth.

FROM COL. CHI. ACAD. SCIENCES.

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KNOT OR ROBIN SNIPE.
(Tringa canutus.)
About ¾ Life-size.

THE AUTOBIOGRAPHY OF A BIRD.

My name is Dewey, and no bird was ever prouder of his name. I know if Admiral Dewey could see me he would feel proud of his namesake, as I am said to be an unusually handsome, intelligent bird. I have been laughing in my wings for many months, hearing people say what kind of a bird I am. Some say I am an oriole; some a male, others a female; another a meadowlark; another not a meadowlark, but some kind of lark. One thing they agree upon, that I go on a lark from early morn till "Dewey eve." I am said to have a little of the bluejay, and points like dozens of birds. When I was about six weeks old I was quite large and fluffy, but very much of a baby, for I knew nothing about feeding myself. My tail was long, olive on top, yellow underneath; wings black, with cream color on the edges—on the lower feathers just a line, on the upper ones quite a little wider, at the top short yellow feathers, making lovely little scallops; head and back olive-brown; rump more on the yellow; throat and breast light yellow, with a tinge of blue under the wings, and belly only tinted. As I grew older I kept changing, and now at nine months old my breast is light-orange, belly light-yellow, head and back deeper olive, rump deeper yellow. I broke my tail all off in the fall, and when it came in, the upper feathers were black, with yellow a quarter of an inch at the rump; under ones yellow and black. On my head are almost invisible stripes of black, on my neck pretty broken wavy ones. My eyes are large and bright, my bill everyone says is the handsomest they have ever seen, very long and pointed as a needle. Underneath ivory white, on top black, with a white star at the head. The admiration of all are my legs and claws, as I keep them so clean, and they are a beautiful blue, just the shade of malachite. I am seven inches long, and for the last month have been getting black spots over my eyes and on my throat. Now what kind of a bird am I?

One June afternoon I thought I was old enough to take a walk by myself, so off I started, without asking permission of my father or mother. All went well for awhile, and I was having a delightful time, seeing many new strange things. Then all at once I began to feel very tired and hungry, and thought I would go home, but which way to go I knew not. I went this way and that and peeped as loud as ever I could, calling "Mother! mother!" but no answer came. Finally I sat down, tucked my head under my wing and went to sleep. The next thing I knew something was coming down over me and I was held very tight. I screamed, pecked, and tried my best to get away. Then someone said very gently: "Don't be afraid, little birdie; I am not going to harm you, but send you to a lady who loves little birds, and will take good care of you." I was dreadfully frightened, but I did not make another peep. We went a long way. Then I heard the little boy say: "Charlotte, will you please take this bird to Miss Bascom, for she was so kind to me when I was sick?" I changed hands, and off we went. Soon I heard some one calling out: "There comes Charlotte with a bird." Then another voice said: "I wonder if it is another sparrow;" but when she saw me she exclaimed, "What a perfect beauty!" took me in her hand and I knew at once I had found a good friend and new mother. Bread and milk were ordered. Of course, I did not know what bread and milk were, but I was so hungry I could have swal-

lowed dirt or stones, so there was no trouble about my taking it, and I wished all birds could have such delicious food. I was taken up-stairs to my new home, where everything was in pink and green and looked so fresh I thought I was back in the clover field. My new mother (for that is what I mean to call her) took me up to what she called a cage and said: "Tricksey and Cervera, I want to introduce you to your new brother." Tricksey charmed me at once, for he was like a ray of sunshine in his dress of gold, but when I looked at Cervera I laughed right out in his face. It was very rude, but I know if any of you had been in my place you would have done the same thing. Of all the ugly specimens of a bird I had ever seen he was the very worst. He was Tricksey's size, but only had his baby feathers and one tail feather. He was dirt color, had big staring eyes, and such a bill, almost as large as his head, which was perfectly flat. He looked so common and ill-bred that I wondered how dainty Tricksey ever sat beside him. I was too sleepy to ask any questions and was soon fast asleep on my new mother's finger; then was put into a nice little basket filled with cotton. The next day Tricksey was very kind to me, but Cervera was cross and pecked me every time he got a chance. Tricksey said: "I have tried to be kind to that old Spaniard, Cervera, but I do not like him and will not have him snuggle close to me nights, so I fight him until he gets into the swing. If you will sleep in the cage you may put your wings close to mine, for you are so pretty and clean." When bedtime came my new mother said I was too large for the basket, and I might try sleeping in the cage, so she put me in and made Cervera get up into the swing. Just as Tricksey and I were going to sleep Cervera began swinging with all his might, and would reach down, peck us on the head and pull our feathers out. When he was caught he was taken out and made to sleep in the basket. In the morning we were all let out on the floor, and it was amusing to see Cervera mimic everything Tricksey did. If Tricksey took a drink Cervera did, and would follow everywhere he went.

About that time I saw coming into the room a large, striped thing, with shining, green eyes, and my heart beat so fast I could hardly breathe. Tricksey whispered in my ear: "You need not be at all afraid; that is only Taffy, the cat, and we are the best of friends. Taffy jumped into my new mother's lap, and we three stood on the table and ate bread and milk together. The first time I was left in the room alone I looked around to see what would be nice to play with. First I went over to the dressing table, carried two large cuff-buttons and put them into my drinking cup, another pair I put on the floor of the cage with two large coral hairpins, two shell pins, and some studs. I stuck all the pins on anything I could pick up and threw them on the floor; turned over a basket which was filled with ribbon and lace; some I left on the floor, and with the rest I trimmed the cage. When I heard my new mother coming I began to tremble. She stood speechless for a moment, then said: "You rogue of a bird; how shall I punish you?" Then took me in her hand and kissed me, and I knew the future was clear, and I could have all the fun I wanted. Tricksey had the asthma very bad, and sometimes a little whisky on some sugar would relieve him. It was funny to see that bad Cervera maneuvre to get Tricksey off the perch so he could eat the sugar and whisky. Tricksey grew worse instead of better, and one morning my new mother was wakened early by his hard breathing. She took him off from his perch and found his claws ice-cold, and he was so weak he could hardly hold on. He lay in her hand a moment, then threw back his pretty head and all was over. We were all heart-broken and shed many tears, for we were powerless to bring back to life that little bird we loved so dearly. I really felt sorry for that horrid Cervera. He missed Tricksey, and for days seemed to be looking for him. One evening he went out the window, and we never saw him again.

I am very fond of sweet apples and generally whenever I want anything that is down-stairs I go and get it. I love grapes better than any other fruit. When I want one I hop back and forth on the back parlor table, then on top of a high back chair and tease until one is given to

me. I like best to have my new mother hold a grape in her right hand while I perch on her left and suck all the rich, sweet juice next the skin out first; then I take the grape over on the table on a paper and knock it until all the seeds come out before I eat it. I like bananas, too, and go to the fruit dish and open one myself. Every morning I perch on the plate or finger-bowl and eat my orange.

We usually have our orange in our room, and sometimes I get so impatient I fly over to the bed, back to the orange, and beg my new mother to get up. I always take a drink out of the finger bowl and often said to myself, "What a fine bathtub this would make." When fall came I began going to bed at 5 o'clock, and at 7 was awakened and taken out to dessert. One night I became tired of waiting and went out into the dining-room very quietly, and the first thing I spied was a finger-bowl, so thought that was just the time for a bath. In I went. They heard the splashing and looked up to see everything as well as myself soaking wet. Of course they thought it very cunning, but after I did it for three nights I was told two baths a day were too much for me. I made up my mind if I could not take a bath in the finger-bowl at night, I would in the morning and, as I refused to go near my old bathtub, the bowl was given me for my own. There was a bowl of Wandering Jew on the dining-table, and several times I took a bath in the center. All said I made a beautiful picture, but when they found I was tearing the vine all to pieces it was not so pretty and many lectures were given to me, but I heeded them not, and if taken away I would walk (for I can walk as well as hop) all over the table on the ends of my toes and look every way but towards the bowl; then, when no one was looking, grab a piece and take it up on top of a picture. One day I trimmed all of the pictures, and there was none left in the bowl, so I had to look up some other mischief.

When I go out to dinner I have my own little table cloth and plate put by my new mother's. I usually take a little of everything; chicken and cranberry jelly is very good. Sometimes I do not behave very well, for I go tiptoeing across the table to my grandmother's plate, hop on the edge, and see if she has anything I like. When dinner was ready to be served I went over on the sideboard, made holes in all the butter balls, then took some mashed potato and boiled onion and put them to cool in a big hole I had made in an apple. Few people know that birds are ever sick at their stomachs. I had been in the habit of eating a little shaved hickorynut that was put in a half shell and kept in a dish on the back parlor table. When I came down stairs I usually took a taste, and it seemed to agree with me. For a change I ate a little chestnut, and soon began to feel bad, so went off by myself and tried to go to sleep. When my new mother saw me she said she knew I was not well, for I never acted that way in the daytime. She put me in my cage, and sat down beside me. I would close my eyes and open my bill, and she thought I was dying until I opened my bill very wide and out came the chestnut in a lump a half inch long and a quarter wide.

My mother's writing desk is a favorite place of mine. I get into drawers, pigeon holes and ink; pictures and all sorts of small things I throw on the floor. Once I stole ever so many dimes and pennies. I can lift a silver dollar and often carry a coffee-spoon all about the room, so you see I have a very strong bill. If anything is lost all say "Dewey must have taken it." One day my new mother looked until she was tired for her thimble. When she asked me for it, I pretended I did not hear, but as she was going into the dining-room I dropped it down on her head from the top of the portiere. I often perch on a basket on top of the book case in the writing room. When I saw a new white veil beside me I went to work and made ten of the prettiest eyelet holes you can imagine, right in front; some were round and some star-shaped. As I grew older I said, "I will not sleep in my cage." For a few nights I insisted upon sleeping on the brass rod at the head of the bed, then changed to the top of the curtain. I have a piece of soft flannel over some cotton put on the ledge and on the wall, so I will not take cold. If it is very cold I get behind the frill of the curtain, so no one can see me. If

warm I turn around so my tail hangs over the outside. When my new mother comes in I open my eyes, make a bow, and, if not too sleepy, come down and sit on her hand. I never chirp or peep, and when I hide and hear "Dewey," Dewey," I do not answer but fly down on my new mother's head, shoulder or hand. Taffy gets so angry at me. I know he often feels like killing me. I wake up early mornings, and take my exercise by flying back and forth from a picture on one side of the room to the head of the bed. When Taffy is on the foot of the bed I fly very low, almost touching him with my wings, and say, "You lazy cat, why don't you wake up and hear the little birds sing to God Almighty; why don't you wake up?" I soon hear words that are not used in polite society, and next see the end of his tail disappearing around the corner of the door. Before I go to sleep at night I exercise again. One afternoon Taffy was trying to take a nap in a chair in the back parlor. I kept flying over him, making a whizzing sound with my wings. When he could endure it no longer he went into the writing-room and sat down by his mother. I went in to take a luncheon on the table. Taffy stood up on his hind legs, reached out a velvet paw, and gave me such a slap I fell upon the floor. I was not hurt in the least, flew up on a picture and shook with laughter at the punishment and scolding Mr. Taffy was getting. He said very naughty words, scratched and bit, but he was conquered at last, and has behaved like a gentleman ever since. The first time I saw the snow I was wild with delight, flew to the window and tried to catch the pretty white flakes. But when I heard the sleigh bells they struck terror to my heart, for I thought a whole army of cats was coming, as all I knew about bells are Taffy's. Not long ago my new mother was very ill and had to send for a strange physician, who knew nothing about me. When I heard him coming upstairs I hid behind the curtain and watched him fix a white powder in a paper. When he laid it on the table I swooped down, grabbed it and took it into my cage. After that I was kept busy, as my grandmother was ill for many weeks. I would carry off all the sleeping powders; one day I put them behind the bed, for I thought they would not taste so badly, and do just as much good.

It did not take more than a minute to get down there when I heard the doctor come in, for I had to see that the medicine was mixed all right. It was great fun peering into the tiny little bottles in his case. I would stand on the ends of my toes and crane my neck to watch him drop the medicine into the tumblers. The other day some Christmas roses were brought in. They looked so tempting I took several bites, and the next day took some more. I felt a little queer, and kept opening my bill. My new mother thought I had something in my throat and gave me some water. The next afternoon she found me on the floor panting, took me to an open window, gave me wine and the attack seemed to pass. We went up to our room, and apparently I was as well as ever when she went down to dinner. After she had gone another attack came on and I am too weak to write any more, and can only warn little birds never to taste of a Christmas rose, as they are said to be deadly poison.

When I went to my room late in the evening no little birdie peeped over the curtain to greet me. I looked on the floor, and there lay my darling Dewey, stiff and cold.

Caroline Crowninshield Bascom.

AMERICAN HAWK OWL.
(Surnia ulula caparoch.)
½ Life-size.

THE AMERICAN HAWK OWL.

(*Surnia ulula caparoch.*)

The typical form of this owl (Surnia ulula) is a native of Scandinavia and Northern Russia, and incidentally is a visitor to Western Alaska. We are told by Mr. L. M. Turner, who was stationed by the United States Signal Service in Alaska from 1874 to 1881, that the natives assert that this form is "a resident, and breeds in the vicinity of St. Michaels; also that it is a coast bird, i. e., not going far into the interior, and that it can live a long time in winter without food, as it remains for days in the protection of the holes about the tangled roots of the willow and alder patches." Its true breeding range, however, is the northern portion of the Eastern hemisphere. It is somewhat larger and lighter in color than the American Hawk Owl.

The bird of our illustration, the American Hawk Owl, is simply a geographical variety of the Old World form, and is a native of northern North America, from Alaska to Newfoundland. This is its usual breeding range, though it migrates in winter to the northern border of the United States, and is an occasional visitor, during severe winters, as far south as Maine and Idaho. It is much more common in the northern portion of its range.

Unlike the other owls, as we usually understand their habits, it may be considered as strictly diurnal, seeking its prey, to a great extent at least, during daylight, usually during the early morning or evening hours. Its principal food consists of the various species of rodents, insects and small birds. Its southward migration is caused by that of its food species, especially that of the lemmings.

It is a tame bird and may be said to know no fear. We are told by Dr. A. K. Fisher that "specimens have been known to return to the same perch after being shot at two or three times. It is a courageous bird, and will defend its nest against all intruders. A male once dashed at Dr. Dall and knocked off his hat as he was climbing to the nest; other similar accounts show that the courage displayed on this occasion was not an individual freak, but a common trait of the species."

Not alone in its diurnal habits is it like the hawks, but it also resembles some of them in selecting the dead branch of a tall tree in some sightly locality from which to watch for its prey. From this position it will swoop down hawk-like. Like the hawks its flight is swift and yet noiseless, a characteristic which is common to all the owls.

As a rule its note, which is a sharp, shrill cry, is only sounded when flying.

As a nesting site, hollow trees are more frequently chosen. However, nests built of twigs and lined with grass are not infrequent. These are usually placed on the tops of stumps or among the branches of dense cone-bearing trees. The number of eggs varies from three to seven, and are frequently laid long before the ice and snow have disappeared. "The eggs vary from oval to oblong oval in shape, are pure white in color, and somewhat glossy, the shell is smooth and fine-grained." Incubation begins as soon as the first egg is laid, and both sexes participate in this duty, and occasionally both are found on the nest at the same time. At the nesting season the courage of both sexes is very marked. The male will fight with its talons, and even when wounded will still defend itself. We are told by Mr. Gentry that "calmly and silently it maintains its ground, or springs from a short distance on its foe. So, bravely it dies, without thought of glory and without a chance of fame; for of its kind there are no cowards."

This bird, like the other species of owls, though possibly not to so great an extent because of its diurnal habits, is looked upon by the Indian tribes as a bird of ill omen and by some tribes all owls are called "death birds." As a whole, the hawk owls are perhaps more useful to man than any other birds that are not used as food. They cause but little trouble in the poultry yard and are of incalculable value to the farmer because of the large number of small rodents that they destroy.

A BIRD CALENDAR BY THE POETS.

January.

This is not the month of singing birds.
"Silently overhead the hen-hawk sails
With watchful, measuring eye, and for his quarry waits."
—Lowell

February.

Sometimes a flock of strange birds descends upon us from the north—the crossbills. There is an old tradition that the red upon their breast was caused by the blood of our Saviour, as they sought to free Him with their bills from the cross.

"And that bird is called the Crossbill,
Covered all with blood so dear,
In the groves of pine it singeth
Songs, like legends, strange to hear."
—Longfellow.

March.

No birds are more closely associated with early spring than the swallows.

"Gallant and gay in their doublets grey,
All at a flash like the darting of flame,
Chattering Arabic, African, Indian—
Certain of springtime, the swallows came.

Doublets of grey silk and surcoats of purple,
Ruffs of russet round each little throat,
Wearing such garb, they had crossed the waters,
Mariners sailing with never a boat."
—Sir Edwin Arnold.

April.

"Winged lute that we call a Bluebird,
You blend in a silver strain,
The sound of the laughing waters,
The sound of spring's sweet rain,

"The voice of the wind, the sunshine
And fragrance of blossoming things.
Ah, you are a poem of April
That God endowed with wings."

May.

This is the month of the Bobolinks.

"Merrily, merrily, there they hie;
Now they rise and now they fly;
They cross and turn and in and out,
And down the middle and wheel about,
With 'Phew, shew, Wadolincoln; listen to me Bobolincoln!'
Happy's the wooing that's speedily doing,
That's merry and over with bloom of the clover,
Bobolincoln, Wadolincoln, Winterseebee, follow me."

June.

"Then sings the Robin, he who wears
A sunset memory on his breast,
Pouring his vesper hymns and prayers
To the red shrine of the West."

July.

The full tide of song is on the ebb, but you still hear in the shadowy woods the silvery notes of—

"The wise Thrush, who sings his song twice over,
Lest you should think he never could recapture
That first fine careless rapture."
—Browning.

August.

The humming-bird.

"When the mild gold stars flower out,
As the summer gloaming goes,
A dim shape quivers about
Some sweet rich heart of a rose.

"Then you, by thoughts of it stirred,
Still dreamily question them,
'Is it a gem, half bird,
Or is it a bird, half gem?'"
—Edgar Fawcett.

September.

There is something wistful in the notes of the birds preparing to depart. In the woods we see—

"A little bird in suit
Of sombre olive, soft and brown,
With greenish gold its vest is fringed,
Its tiny cap is ebon-tinged,
With ivory pale its wings are barred,
And its dark eyes are tender starred.
'Dear bird,' I said, 'what is thy name?'
And thrice the mournful answer came,
So faint and far and yet so near—
'Pewee! Pewee! Pewee!' "

—Trowbridge.

October.

This brown month surely belong to the sparrows.

"Close beside my garden gate
Hops the sparrow, light, sedate."
* * * "There he seems to peek and peer,
And to twitter, too, and tilt
The bare branches in betweeen
With a fond, familiar mien."

—Lathrop.

November.

In cold weather the little gray Chickadee cheers us with his "tiny voice"—

"Gay and polite, a cheerful cry,
Chick-chickadedee! Saucy note,
Out of sound heart and merry throat!
This scrap of valor, just for play,
Fronts the north wind with waistcoat gray."

—Emerson.

December.

The sleep of the earth has begun under the white, thick snow. The Owl is abroad by night—

"A flitting shape of fluffy down
In the shadow of the woods,
'Tu-wit! tu-whoo!' I wish I knew;
Tell me the riddle, I beg—
Whether the egg was before the Owl
Or the Owl before the egg?"

Arranged by Ella F. Mosby.

So when the night falls and the dogs do howl,
Sing ho! for the reign of the horned owl.
We know not alway
Who are kings by day,
But the king of the night is the bold brown owl.

—Barry Cornwall.

THE OYSTER AND ITS RELATIVES.

Of all the grand divisions of the Animal Kingdom, the subkingdom Mollusca is probably the least known to the ordinary observer, and if one were asked to enumerate as many different kinds of "shell fish" as he could, it is probable that not over six or eight different varieties would be named. The majority of people think of a clam, oyster, mussel, snail or Nautilus and their molluscan vocabulary ends with these names. And yet this group of animals is second only to the insects in number of different species, beauty of coloration and interest of habitat. They may be found everywhere, in salt and fresh water, in our forests and fields, our ponds, brooks and rivers; in the valleys and on the mountain tops, and even in the waters of the frozen north, while in the warm waters of the tropics they flourish in uncounted millions. In size they range from the little sea-snails hidden in the eel grass along the shore, with tiny shells scarcely an eighth of an inch in length, to the giant squid, which measures forty feet or more from the tip of its tail to the end of its long arms; and they range from the tide-washed beach to the abyssal depths of the ocean. It is to these lowly creatures that I would draw the reader's attention.

In nearly all the species of the Mollusca the animal is protected by a hard shell, made of carbonate of lime, which is covered with a horny epidermis to protect the limy shell from being dissolved by the acids in the water. This shell is generally capable of containing the entire animal, thus affording, in most cases, adequate protection for the soft body. Those animals not provided with a shell, as is the case with the land slugs, are capable of covering themselves with a sort of mucus which encysts and protects them from both extreme heat and cold.

The lowest branch of Mollusca is known as class Pelecypoda, which comprises all of the different kinds of clams, mussels, quahaugs, etc., in which the body is protected by two hard, calcareous shells placed, generally, opposite each other and connected on the upper margin by a ligament, and the two valves work back and forth in teeth and sockets, making a kind of hinge. A set of stout adductor muscles keep the two shells or valves together and allow them to open and close at the will of the animal. The majority of clams live in the mud in a horizontal position, the anterior end being buried and the posterior end, containing the siphons which draw in and expel the water, being out of the mud, in the water. The clam progresses by pushing forward its strong, muscular foot, getting a firm hold of the mud and then drawing the shell after it. Some pelecypods, as the oyster, live attached to some object on the bottom of the water, as a stone, piece of wood or piling of an old wharf, and are not able to travel from place to place as are the true clams, examples of the latter being fresh water mussels and the marine quahaug or round clam.

Some bivalves also attach themselves by a byssus composed of a number of silk-like threads, which anchor their shells to stones, sticks, and other foreign objects. In one group (genus Pinna) found in the Mediterranean Sea, this byssus is so fine and silky that the Italians weave it with silk and make caps, gloves and other articles of wearing apparel.

Another wonderful and interesting arrangement for the comfort of the animal is its breathing organs or branchiae. These are two or four in number, and are made up of numerous small chambers, covered with little whip-like organs or

FROM COL. CHI. ACAD. SCIENCES.

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WATER SHELLS.

Sunrise Shell (Tellina radiata)
Coccle (Cardium isocardia)
Mussel (Mytilus edulis)
Fresh Water Clam (Unio luteolus)

Spiny Oyster (Spondylus princeps)

Pearl Oyster (Margaritiphora radiata)
Scallop (Pecten dislocatus)
Oyster (Ostrea lacerans)
Spiny Venus (Cytheria lupinaria)

cilia, which keep up a constant motion, creating currents of water, bring thousands of minute organisms to the clam to serve as food. These little organisms, many of them microscopic, are caught upon the surfaces of the gills, rolled into little masses, and passed into the animal's mouth. Besides being food-gatherers, the gills serve to keep up a circulation by which fresh water is constantly brought in to purify and aerate the blood and also to expel the waste products. There is no head in this class, and the mouth is an oval slit surrounded by four lips or palps, and leads almost directly into the stomach.

The currents of water spoken of above are controlled and directed in several different ways. In attached forms, and those living above the surface of the mud, like the oyster, mussel and scallop, the soft mantle which lines the shell is divided, forming a slit nearly the whole diameter of the shell, and the water is allowed to circulate freely through the open edges of the shells. But in those animals which burrow in the mud, as the common little neck clam, fresh water clam and quahaug, this mantle is closed and prolonged posteriorly into one double or two single siphons or tubes, one being fringed with little finger-like cilia and drawing in the water by their motion, and the other expelling the water after it has circulated through the animal.

One of the most attractive families of bivalve shells is the Veneridae, or venus shells, in which the shelly skeleton is ornamented by many bright colors, the patterns occurring in spots, dashes, zigzag lines and rays. Some varieties, as the spiny venus (Cytheria lupinaria) have the posterior end of the shell provided with long, sharp, curved spines, and the shell is also frilled in a beautiful manner. The common quahaug (round or hard-shelled clam), which is esteemed an article of diet on the Atlantic coast, and also to some extent in the interior, is a prominent member of this family. The Veneridae comprise some five hundred species, found throughout the world, and ranging from the shore between tides to several hundred fathoms in depth.

The family Cardiidae, the heart-shells or cockles, comprise some of the largest and most attractive of mollusks. The name Cardium, signifying a heart, is given them because of the close resemblance to that organ when a shell is viewed from the anterior end. These animals live in sandy or muddy bays, and generally congregate by thousands. In England, the edible cockle (Cardium edule) is considered quite a delicacy and thousands are used for this purpose. In our own country they are not generally eaten, except by the poor in Florida and in some places along the Gulf of Mexico, but the waters of Florida furnish some very handsome species, among them the Cardium isocardia figured on our plate, and the large Cardium magnum, which grows to a length of five inches and whose shell is ornamented by beautiful color-patterns of brown and yellow. The foot of the Cardium is very peculiar, being shaped like a sickle, which enables the animal to pull itself along at a lively gait. A California cockle (Liocardium elatum) grows to a diameter of seven inches and would furnish a meal for several people.

In the family Tridacuidae size seems to have reached its limit. Tridacena gigas, found in the Indian Ocean, grows to a length of nearly six feet and weighs upwards of eight hundred pounds. Tryon records that a pair of these shells, weighing five hundred pounds, and two feet in diameter, are used as benetiers in the church of St. Sulpice, Paris. In some parts of the Indian Ocean, where pearl and sponge-fishing are carried on, this clam (known as the giant clam), is a source of great danger to the divers, many losing their lives by being caught between the great valves of the shell, by either hands or feet. Many times a diver has amputated his fingers, hand or foot, and thus saved his life at the expense of one or more of these members.

The Tellinas (family Tellinidae) number among its five hundred or more species some very beautiful and interesting animals. They live for the most part buried in sand or sandy mud and are found throughout the entire world. Our common Tellina radiata, familiarly called sunshell, is found in Florida and the West Indies, and a typical valve looks not unlike the horizon at sunrise, the brilliant rays of

color spreading in different directions from a common center. At Newport, Rhode Island, the writer has gathered many thousand specimens of a beautiful little Tellen (Tellina tenera), whose shell measures scarcely half an inch in diameter and is tinted a lovely pink or pinkish white. The siphons of this family are very long and are separated, the upper one being half or three-quarters as long as the lower one, and the foot is rather long and pointed, admirably adapted for burrowing. The long siphons enable the animal to bury itself to quite a depth beneath the surface of the sand.

Closely related to the Tellinidae is the Psammobiidae, a characteristic form of which (Psammobia rubroradiata) is thus spoken of by Prof. Josiah Keep, in his interesting little book, "West Coast Shells:" "But I wanted to see more of him, so I took a large jar, filled it half full of beach sand, added as much sea-water as it would hold, and plunged my prize into the same. He rested quietly for a few minutes, and then began to open his shell and cautiously put out his two siphons. Soon afterward, from between the edges of his shells, came his big, white, spade-shaped foot. He drove it down into the sand, curved it a little to one side, gave a vigorous pull, and lo! his shell followed, though just why I could not clearly understand. Though the jar was large he reached the bottom before his shell was wholly covered with sand, and had to content himself with a half-above-ground tenement."

"Next morning his siphons were stretched out some six inches in length. * * * I never thought before that there was any particular beauty to the siphons of a clam, but for this red-lined one my opinions quickly changed. Imagine two tubes made of the finest pink and white silk, stretched over delicate hoops arranged at regular intervals; then think of them as endowed with life, and waving with a graceful motion through the water, and you will have a faint idea of their exquisite texture and elegant appearance."

To those readers who live in the West, away from the ocean, the Unio, or fresh-water mussel, is more or less familiar. What child in Chicago has not played on the sands of Lake Michigan and scooped up the little grains with the broken half of a clam shell? Or who, wading in the muddy water of Lake Calumet, has not wondered what the curious little hollow, fringed objects were which protruded from the surface of the mud? These latter were the siphons of the clam and if you were to dig under them a little way you would find the beautiful green-rayed shell of a river mussel. These are no less interesting than the marine shells already described and in beauty of ornamentation they frequently excel many of their salt-water relatives. Such excrescences as knobs, spines and rib-like undulations are common, while the colors of the interior range from pure silvery white through orange, pink and salmon to dark purple, and the rich, pearly iridescence rivals that of any of the marine shells. In many parts of the West mussels are collected by men in search of pearls, which are generally of an inferior quality, and thousands of shells are used annually in the manufacture of pearl buttons.

One of the most familiar objects to the seaside visitor is the huge banks of sea-mussels (Mytilus) which line the shore at low water. The shells are generally dark-colored, our common mussel (Mytilus edulis) being frequently jet black, and are more or less wedge-shaped in form. They attach themselves to mud banks and shore vegetation by a strong byssus made up of stout, more or less silky threads. The mussels are of great value economically, thousands of bushels of the edible mussel (Mytilus edulis) being consumed annually in Europe. They are also used as bait, and millions of the mussels are thus used every year. Although considered a delicacy in parts of Great Britain and Europe, it has not yet been adopted as an article of diet in this country, the clam and quahaug taking its place.

The family Aviculidae, comprising the wing-shells or pearl oysters, is of great interest, both scientifically and economically. At the present time there are a little over one hundred species living, but the family has been known from early geological times and over a thousand species have been found in the rocks. The pearl-oyster (Melleagrina margaritifera) is the most important member of

this family, furnishing as it does the beautiful pearls of commerce. These animals are found at Madagascar, Ceylon and other parts of the Indian Ocean, several hundred tons being imported into Europe annually. These pearls are formed by some irritating substance, as a grain of sand or some parasite, getting in between the shell and the animal, or lodging in some soft part, which causes the animal to cover it with pearly matter to prevent irritation. The shells also furnish a considerable part of the "mother-o'-pearl" which is so largely used for ornamental purposes. The Margaritifera radiata, figured on our plate, is a member of this family.

The scallop is an object well known to the tourist visiting New England summer resorts, who has reveled in "fried scallops." The family to which this belongs (Pectinidae) is composed of rounded shells, many with frills or ribs and nearly all ornamented with beautiful colors. Unlike the animals which we have been considering, these mollusks have no siphons and the shell is open all the way around save at the hinge, and the edge of the mantle is provided with little, round, black eyes. It is an interesting sight to observe a beach at low water, the receding tide having left on the shore or in little pools of water hundreds of these mollusks, attached by a byssus to bits of sea weed. As one is gazing wonderingly over this vast field of yellow sand and green weed, an object will suddenly move through a pool of water with astonishing rapidity, accompanying the movement by a quick snapping sound. This is the scallop, which is imprisoned in the pool and which desires to get out. The movement is effected by rapidly closing and opening the two valves of the shell, thereby causing a clicking sound. The noise of several hundred of these shells opening and closing and the sight of as many scallops with strings of sea weed attached to them, shooting through the water, looking not unlike a comet with a long tail, is quite bewildering. In Europe, the scallop is considered quite a delicacy and several tons are gathered annually. One species (Pecten jacobaeus) has been dignified as a badge of several orders of knighthood and it was also worn by pilgrims to the Holy Land a good many years ago. It was called "St. James' Shell."

The most common shell to the layman is the oyster (Ostrea virginica), the cultivation of which occupies the attention of a large number of men and the investment of considerable capital. The oyster is free and active when young, but becomes attached to some submerged object early in life. Oyster culturists take advantage of this habit by erecting poles in the water to which the young oysters attach themselves. The shells of the different species of oyster are not generally of much beauty, but a related family, the Spondylidae, or spiny oysters, are among the most beautiful of bivalves. In this family the shell is ornamented by many long spines and frills, and the colors are different shades of red, yellow and pink. The most beautiful species are found in the Gulf of California.

The space at our command is far too limited to adequately discuss the many curious and interesting animals which make up the class Pelecypoda. Much might be said of the Solen or razor-shell, with its curious foot which is so great a help in digging burrows; of the Pholads, which perforate and make burrows in clay, wood and even in the hardest rock; and of the strange Teredo or "ship-worm," with a long, worm-like body which bores into ships, wharves and any wooden object within reach. But enough has been written and pictured to show the reader that the unpretentious clam, mussel or oyster and their relatives have many interesting habits, are encased in beautiful shells, and that some species are of great economic importance to man.

Frank Collins Baker.

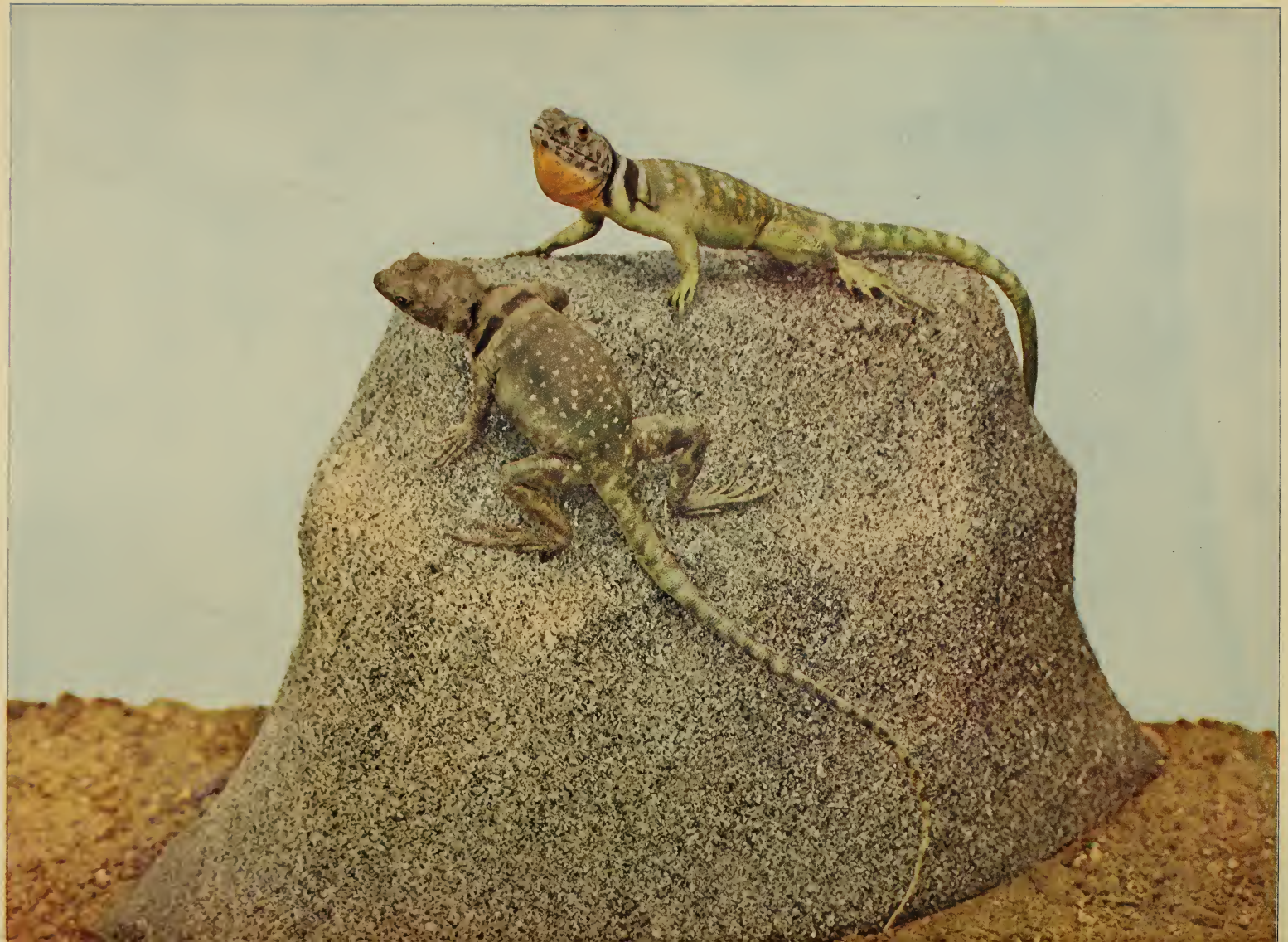
THE PASSING OF SUMMER.

Where have the charms of summer gone?
Part of its sunny, azure skies
The bluebirds southward bore away,
And how could sunset splendors stay,
Or glory of the early dawn,
When not a tanager now vies
With orange-flaming orioles,
And humming-birds no magic bowls
Of nectar drain in gardens fair,
Or flash like jewels through the air?

Where have the summer's beauties flown?
Afar on swallows' purple wings;
With blackbirds' iridescent throats,
And with the thrushes' perfect notes
Of rapture into music grown;
With blue the indigo bunting brings,
A sapphire set with emerald leaves,
And finch-gold that June interweaves
With silver from the kingbird's breast
And studs with pearls of many a nest.

When will the summer come again?
When olive warblers northward fly,
And to their hints of budding green
The grosbeaks add a rosy sheen
Of warming skies: O, not till then
Will summer come and winter die!

—Benjamin Karr.



THE COLLARED LIZARD.

(*Crotaphytus collaris.*)

The Collared or Ring-necked Lizard may be found among the rocks and open woods of the plateau or in desert regions from southern Missouri southward into Mexico, westward to southeastern California and northward to southern Idaho. However, this is its general range, and it is not common over all this territory. Though it has been known to ascend to an altitude of nearly six thousand feet, yet it does not seem to have crossed the Sierra Nevada range, as it has not been observed at any point on the Pacific coast or the interior of California.

The Collared Lizard is so called because of the black bars, which resemble a collar, and are situated between the fore legs and extend across the back of the animal. They vary greatly in color, depending on their age or geographical position. The back is usually some shade of dull or rather dark green, or it may have a bluish cast, with numerous oblong or rounded lighter spots, which may be either whitish, or various shades of red, orange or yellow. These spots may be quite definite or they may form quite continuous bands. The variations in color are much more marked in the young.

Dr. Cope tells us that "it runs very swiftly, carrying the tail over its back. In its manners it is perhaps the most pugnacious of our lizards, opening its mouth when cornered, and biting savagely. Its sharp teeth can do no more than slightly cut the skin."

Mr. Frank M. Woodruff relates the following interesting account of his experiences with this lizard: "I found the Collared Lizard at three points in Missouri—Vineland, DeSoto and Pilot Knob. They are restricted to the rocky slades, where they live with the scorpions and the rattlesnakes. The only place where I found them abundant was between Vineland and the old Kingston mines. During the hot summer months they make their appearance upon the broad slabs of rock, often quite a distance from their lairs. When disturbed they make a dash to escape and usually in the direction that leads to their accustomed crevice, even though the intruder is in its path. I have had them run almost across my feet in their frantic efforts to hide. They are a somewhat terrifying object as they run toward you. At this time they apparently assume a partly upright position, looking for all the world like a small edition of Mephistopheles. The negroes are mortally afraid of them. They call them 'Glade Devils,' and the more superstitious believe that the souls of the very bad negroes reside in them. A negro will never go through a glade frequented by this species, and will make a long detour to avoid doing so. The only time I ever saw a negro 'turn gray' was when I brought one of these lizards to Ironton and asked for assistance in capturing it when it escaped. They are so swift in their movements that I found the best method of capturing them was by tying a noose of fine copper wire to a fish pole. This can be slipped over their heads, as they lie sunning themselves, as they seem to pay but little attention to the loop as it touches them. By exercising caution it is possible to approach from the rear to within eight or ten feet without exciting them. They make delightful pets, if a lizard can be considered such. By feeding them through the winter on meal worms and in the summer on flies and grasshoppers they can be kept for a year or more."

A NIGHT IN THE FLOWER GARDEN.

A FAIRY STORY.

The day had passed and the sun had gone to sleep in a bed of crimson and gold. The wind blew softly, at which the leaves on the great trees in the garden began to murmur; though it was evening they were not sleepy like some of the flowers who thought it time to go to sleep when the sun did. Sometimes the leaves were awake all night; you could hear them moving gently in the breeze. The clover leaves were folded close in sleep long ago and the Poppies declared they could not sit up a moment longer. But the tall white Lilies, who loved the night, were wide awake; they could not sleep when the garden was full of moonlight. They said the Crickets were so noisy and the Katydids so quarrelsome that it disturbed them, so they stood fair and white gathering the dew in their silvery cups which filled the soft night air with sweet perfume. The Roses were looking pale and sad in the moonlight; they reveled in the golden sunshine and grew brilliant in the heat of day. But they were languid now and sometimes a little breeze would send their velvet petals floating to the ground to fade and die.

The Pansies nestled low with closed eyes. You would not have known where the Mignonette and Heliotrope were had you not breathed their sweet perfume, for they were fast asleep. The Nasturtiums, Hollyhocks, and Marigolds were still as bright and gay as if the sun, whom they loved, could see them and they felt like sitting up with the Four O'Clocks and Evening Primroses, who never went to sleep until very late.

But of all the flowers in the garden, the Sweet Peas were the widest awake. There they stood in rows, dainty and fair, never thinking of going to sleep, but trembling with excitement. You could see them whispering together, for they had heard that to-night the Fairy Queen was to come to the garden and would give a soul to some flower; which one they did not know but hoped it would be to them.

A little Humming Bird had brought the news and had told it only to the Sweet Peas, so they thought it must be for them that this beautiful change was to come. Had they not heard that years ago a sweet flower called Narcissus had been changed into a beautiful youth, who could wander where he wished? What delight that would be! And had they not also heard of Pansies changing into little children, and Larkspurs into larks that soared away into the bright blue sky? Of Water Lilies changing into maidens, who made their homes under the green waves? And they had always thought that myriads of brilliant flowers were changed into the daintiest of all things. The little Humming Birds must have been flowers at one time, for they were always hovering around them, kissing them and making love to them. Oh! if the Fairy Queen would only change them into birds, or velvet bees, or, better still, into the beautiful butterflies, that came to them so often and fluttered like a cloud around them. Yes, they would rather be butterflies than anything else.

Slowly the moonlight faded from the flowers, the shadows of the night deepened and the soft dew fell like a benediction. A Fairy form floated over the sweetest of blossoms, then disappeared, and all was dark and silent save a gentle flutter, as of wings.

But in the morning when the sunbeams had awakened the sleeping blossoms, a flight of bright-winged Butterflies floated in the air or lighted for a moment on the flowers, but the Sweet Peas had all disappeared and were nowhere to be seen.

Fannie Wright Dixon.

RABBIT'S CREAM.

Everyone is well acquainted
With the arts of Frosty Jack—
With his etchings on the windows,
With the tints that mark his track;
But the quaint and merry artist
Has a fancy of his own
That is delicate and graceful,
But is not so widely known.

When no green is in the forest,
And no bloom is in the dell,
Not a flower star to twinkle,
Not the smallest blossom-bell,—
Here and there, an herb he singles,
Brown and dry, and round its stem
Fastens, with his magic fingers,
One great, silver-shining gem;

Shell-like, delicate and dainty,
White and lucent as a pearl;
Just as though he took a fragment
Of the mist, and with a twirl
Froze it into shape and substance—
Such a fine and fragile thing,
That the fairy queen might crush it,
If she brushed it with her wing.

Then he steals away, delighted;
He has planned a morning treat
For a troop who soon will flutter
Through the wood, on dancing feet;
All the little country urchins
Love to see its silver gleam—
Love to fancy it a dainty,
And they call it "rabbit's cream."

—Hattie Whitney.

THE APPLE.

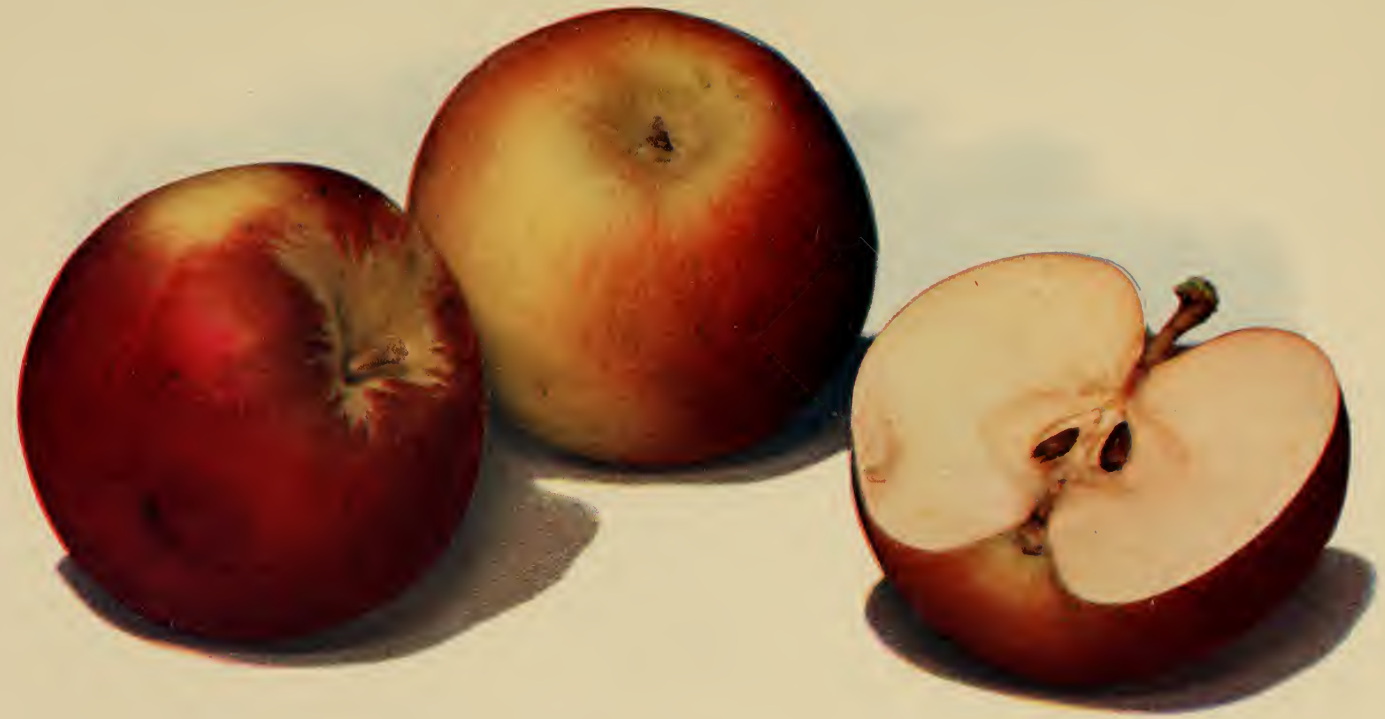
Both pagan and Christian mythologies have endowed the Apple with wonderful virtues. It has possessed a symbolism for man in all stages of civilization. Standing for the type of the earthly in its contrast with the spiritual, it represented the idea of that conflict between Ormuzd and Arimanes in which the evil principle is continually victor. The stories of Eve, of Paris, the Hesperides and Atalanta all emphasize this thought, showing the Apple to have been a reward of appetite over conscience.

The allegorical tree of knowledge bore apples guarded by the serpent, and the golden fruit of the garden of Hesperides was apples protected by the sleepless dragon, which it was one of the triumphs of Hercules to slay. The Assyrian tree Gavkerena, the Persian "Jima's Paradise," "Indra's heaven" and the Scandinavian ash tree Yggdrasil, all prefaced the story of Paris and the apple of discord which Ate brought to the banquet of the gods. In Greece it became the emblem of love, being dedicated to Venus. Aphrodite bore it in her hand as well as Eve, and it is said that Ulysses longed for it in the garden of Alcinous, while Tantalus vainly grasped for it in hades. The fruit was offered as a prize in the Grecian games given in honor of Apollo.

Among the heathen gods of the north there were apples fabled to possess the power of conferring immortality, which were carefully watched over by the goddess Iduna and jealously preserved for the dessert of the gods who experienced the enervation of old age. Azrael accomplished his mission by holding the apple to the nostrils of his victims, and the Scandinavian genii are said to have possessed the power of turning the fruit into gold.

The ancients better appreciated the importance of the apple than do the moderns, who treat it chiefly as "the embryonic condition of cider or as something to be metamorphosed into pies." It is said to be indigenous to every part of the inhabited globe except South America and the islands of the Pacific. It is equally at home in the fierce heat of the equator and among the frosts of Siberia. In olden times, the fig was the index of a native civilization. Later on, the vine was king, but at the present time there are many who maintain that the Apple is the only genuine index of civilized man, and claim that it flourishes best in those regions where man's moral and intellectual supremacy is most marked.

The Athenians made frequent mention of the cultivation of the Apple, and Pliny enumerates twenty varieties that were known in his day. It is generally supposed that the Goths and Vandals introduced the manufacture and use of cider into the Mediterranean provinces and references to it are made by Tertullian and the African Fathers. The use of cider can be traced from Africa into the Biscayan provinces of Spain, and thence to Normandy. It is supposed to have come into England at the time of the conquest, but the word "cyder" is said to be Anglo-Saxon, and there is reason to believe that it was known in the island as early as the time of Henghist. As the mistletoe grew chiefly on the apple and the oak, the former was regarded with great respect by the ancient Druids of Britain, and even to this day in some parts of England, the antique custom of saluting the apple trees in the orchards, in the hope of obtaining a good crop the next year, still lingers among the farmers of Devonshire and Herefordshire. During the middle ages, the fruit was made the pretext for massacring the op-



APPLES.
(Jonathan.)

pressed tribes of Israel, as it was supposed that the Hebrews used apples to entice children into their homes to furnish their cannibal banquets.

The different varieties of apples have all descended from a species of crab found wild in most parts of Europe. Although there are two or three species of wild crab belonging to this country, yet none of our cultivated varieties have been raised from them, but rather from seeds of the species brought here by the colonists from Europe—over two hundred varieties of apples are known at the present time. As a rule, the Apple is a hardy, slow-growing tree, with an irregular head, rigid branches, roughish bark, and a close-grained wood. It thrives best in limestone soils and deep loams. It will not flourish in wet soils or on those of a peaty or sandy character. As a rule, the trees live to be fifty or eighty years of age, but there are specimens now bearing fruit in this country that are known to be over two hundred years old. The wood is often stained black and used as ebony. It is also made into shoe lasts, cog-wheels and small articles of furniture, and is greatly prized in Italy for wood carving and statuary.

New and choice varieties of apples are derived from seeds planted to produce stocks. One stock in ten thousand may prove better than the original, and its virtues are perpetuated by layers, cuttings, graftings and budding. The tree is not subject to disease. Insects, notably the borer, the woolly aphis, the caterpillar, the apple moth and the bark louse, have to be guarded against, and several blights occasionally attack the foliage, but as a rule small loss is experienced from these sources.

Charles S. Raddin.

Shed no tear!—O shed no tear,
The flower will bloom another year.
Weep no more!—O weep no more,
Young buds sleep in the roots' white core.
Dry your eyes!—O dry your eyes
For I was taught in Paradise
To ease my breast of melodies—
Shed no tear!

Overhead!—look overhead
'Mong the blossoms white and red.
Look up! Look up!—I flutter now
On this flush pomegranate bough.
See me! 'Tis this silvery bill
Ever cures the good man's ill.
Shed no tear!—O shed no tear!
The flower will bloom another year.
Adieu!—adieu!—I fly, adieu—
I vanish in the heaven's blue.
Adieu!—adieu!

—John Keats.

GEOGRAPHIC DISTRIBUTION OF SEED-BEARING PLANTS.

This is one of the most difficult and important subjects connected with the study of plants. Before it can be well organized it will be necessary to bring together very many more observations of plants in all parts of the world than is possible now. However, a few facts are known which are both interesting and suggestive. In order to make their presentation as definite as possible, this paper will be restricted to a brief account of the geographic distribution of seed plants.

One of the two great groups of seed plants is known as the Gymnosperms, a group which in our region is represented by pines, spruces, hemlocks, cedars, etc. In the tropics the group is represented by a very different type of trees, known as the Cycads. They resemble in general habit tree-ferns, or palms. The group of Gymnosperms with which we are acquainted have been called Conifers on account of the very characteristic cones which they bear. Several principles connected with geographic distribution may be illustrated by considering briefly these two groups of Gymnosperms.

The Cycads are absolutely restricted to the tropics, a few forms reaching into semi-tropical conditions, as in southern Florida. If a comparison be made between the eastern and western tropics, it will be discovered that the Cycads are almost equally divided between the two regions. For an unknown time, but certainly a very long one, these eastern and western Cycads have been separated from one another. As a consequence they have become so unlike that one kind of Cycad is never found in both hemispheres. Their long separation from one another, and their somewhat different conditions of living, have resulted in working out differences of structures which botanists recognize as species, genera, etc.

The Conifers, on the other hand, are characteristic of temperate regions. If the distribution of Conifers were indicated upon a world map, there would be shown a heavy massing of them in the northern region and a lighter massing in the southern region, the two being separated from one another by a broad tropical belt. This tropical belt is traversed in just two places; one is by means of the East Indian bridge, across which certain Australasian forms reach China and Japan; the other is the chain of the Andes mountains, along which a single northern type has worked its way into the southern part of South America. The two great masses of Conifers, therefore, lie in the northern and southern hemispheres, rather than in the eastern and western hemispheres, as is the case with the Cycads. This long separation has resulted just as it did with the Cycads; that is, the northern and southern Conifers are not any longer alike, but differ so widely from one another that botanists cannot discover any form which is common to both the northern and southern hemispheres, excepting the single one already mentioned, which has succeeded in crossing the tropics by means of the Andes bridge.

Another interesting fact in connection with the distribution of the Conifers is that their great centers of display are in regions which border the Pacific Ocean, and they have often been spoken of as a Pacific group. There are three special centers of display; one is the China-Japan region, a second is the general Australasian region, and the third is western North America. Just why this border region of the Pacific is especially favorable for this sort of plant life is a question which we do not as yet pretend to answer. Another fact which illustrates this persistent distribution in connection with

the Pacific is that in the case of the Conifers which belong to the southern hemisphere, the continental masses which pair in the display of similar forms are Australia and South America.

Another fact, which is true of all large groups, is that certain forms have a very extensive distribution, and others are very much restricted in their occurrence. For example, the greatest genus of Conifers is the genus made up by the pines, at least seventy kinds of which are recognized. This great genus sweeps throughout all the north temperate regions of the globe. There is a similar extensive distribution of the different kinds of spruce, larch, juniper, etc. On the other hand, the giant redwood, known as Sequoia, is restricted to certain comparatively small areas in California. In China and Japan, and also in Australia, there are numerous illustrations of forms very much restricted in their occurrence.

The other great group of seed plants is known as the Angiosperms, and to it belong all those seed plants which are most commonly met in this region. The distribution of Angiosperms is a very much more difficult question than that of Gymnosperms; for while there are only about four hundred kinds of living Gymnosperms, there are more than one hundred thousand kinds of living Angiosperms. In presenting the distribution of this great group, it will be necessary to consider its two main divisions separately, for they differ from one another very much. One of the groups is known as the Monocotyledons, to which belong such forms as the grasses, lilies, palms, orchids, etc.

Some prominent facts in reference to the geographical distribution of these Monocotyledons are as follows: They contain four great families, which include almost one-half of their number, and which have become world-wide in their distribution. These families are the grasses, the sedges, the lilies, and the irises. This world-wide distribution means that these families have succeeded in adapting themselves to every condition of soil and climate. In this world-distribution the grasses easily lead, not only among Monocotyledons, but among all seed plants.

Another fact in reference to the Monocotyledons is that they include an unusual number of families which are entirely aquatic in their habit. These aquatic families are also world-wide in their distribution, so far as fresh and brackish waters can be called world-wide. It is important to notice that while the world-families which belong to the land have worked out about ten thousand different forms, the world-families which belong to the water have worked out considerably less than two hundred different forms. This seems to indicate that the great number in the one case is due to the very diverse conditions of the land, while the small number in the latter case is due to the very uniform conditions of water life.

A third fact of importance is that the Monocotyledons are mainly massed in the tropics, and in this sense are almost an exact contrast to the Conifers we have been considering above. The same effect of separation in working out diversity in structure is shown by the Monocotyledons as was shown by the eastern and western Cycads, and the northern and southern Conifers. For example, the palms represent the great tree group of Monocotyledons, and are restricted to the tropics as rigidly as are the Cycads. They are found in about equal numbers in the eastern and western tropics, but there are no forms in common. The eastern and western forms have become so different that they might almost be regarded as different families.

The Monocotyledons are also somewhat famous for the number of air plants which they contain—that is, plants which have sometimes been called "perchers," because they fasten themselves upon trunks and branches and supports of various kinds, and absorb what they need directly from the air. It is a notable fact that these so-called "perchers" are very much more abundant in the western tropics than in the eastern. An explanation for this is to be found in the fact that the western tropics have a very much greater rainfall; in fact, in the rainy woods of the Amazon region the air is saturated with water, and everything is dripping.

One of the facts in connection with the distribution of Monocotyledons is quite puzzling, and that is the very poor representation of the whole group in the south-

ern hemisphere. In examining the distribution of other groups in the southern hemisphere, it is found that Australia and its general vicinity is prolific in peculiar forms. In the case of the Monocotyledons, however, the Australasian region is the most poverty-stricken one in all the southern hemisphere. Just why the southern hemisphere in general, and the Australasian region in particular, are unfavorable for Monocotyledons, it is hard to say. Of course in these cases the world-families already mentioned are represented.

The other great division of Angiosperms is known as Dicotyledons, which include such forms as our common forest trees, buttercups, roses, peas, mints, sunflowers, etc. As there are about eighty thousand of these Dicotyledons, it is impossible to state anything very definite in reference to the distribution of the group as a whole. Taking the higher forms, however, as representing the general tendency of the group, some of the facts of distribution are as follows:

It has been noticed that the Monocotyledons are massed in the tropics, and that the temperate and boreal regions have been left comparatively free by previous groups, with the exception of the Conifers, which only develop tree types. With the coming of the Dicotyledons, therefore, the vast temperate and boreal regions presented a particularly favorable field, which they have entered and taken possession of. This vast group is prominently adapted to living in the unoccupied temperate and boreal regions. This does not mean that they are not found in the tropics for they hold their own there with the other groups.

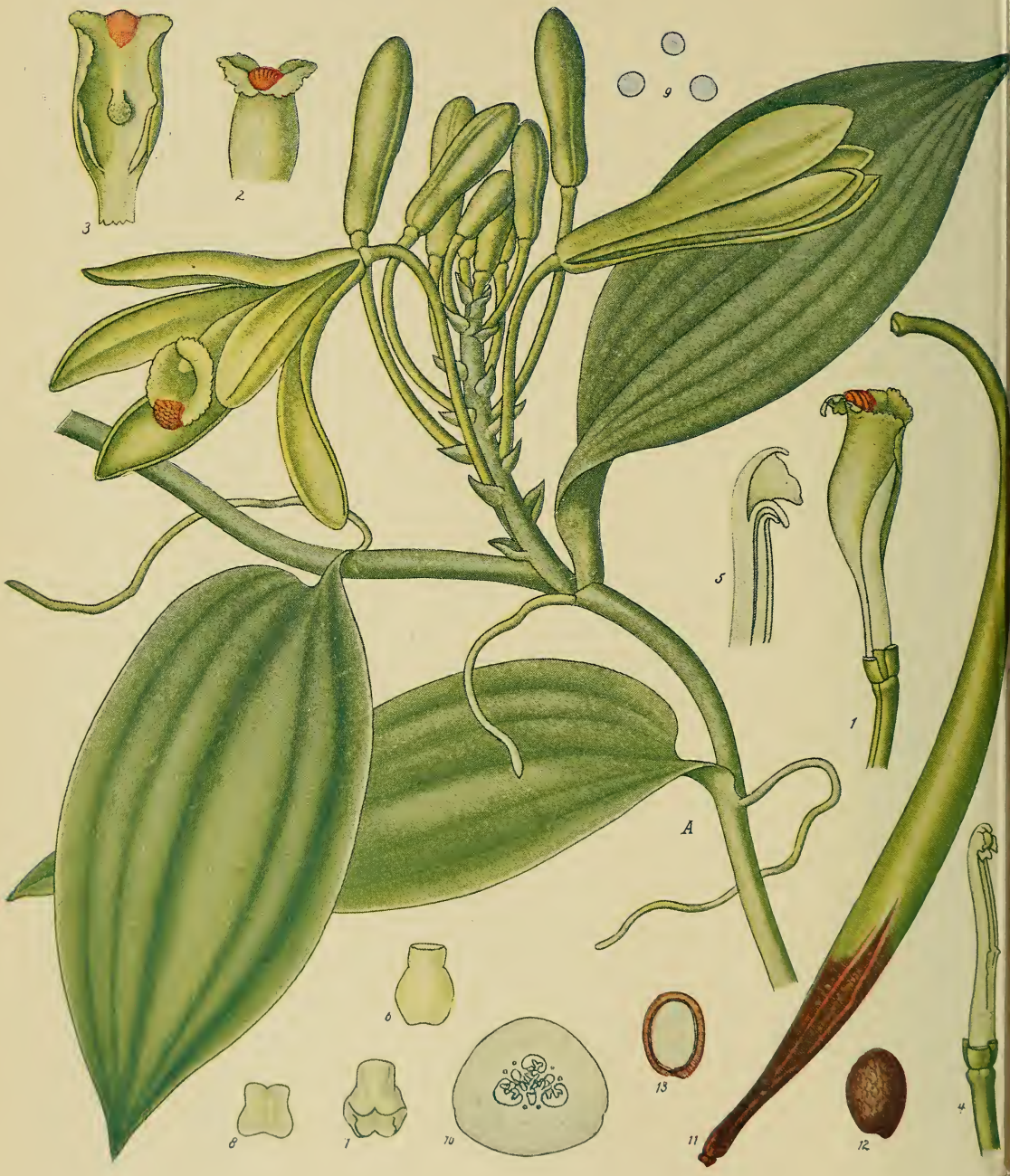
Dicotyledons, however, succeeded in working out but three world-families: Composites, to which the sunflowers, dandelions, etc., belong; the Mints; and the Plantains. There are other large families which characterize certain great areas, but they are not world-wide in their distribution.

Another fact, which might indicate that the Dicotyledons have taken possession of comparatively unoccupied regions only, is that they are very poorly represented, so far as higher groups are concerned, in aquatic conditions. It would seem as though the conditions of life in the water had been fairly well taken up by other groups. In looking over the display of Dicotyledons in the tropics of the eastern and western hemispheres, it becomes evident that there is no such difference between the forms of the two regions as in the groups previously mentioned. It will be remembered, however, that in the case of the Cycads and palms, which were used as illustrations, they are restricted to the tropics, and their eastern and western forms are separated from one another, not merely by oceans, but by temperate and boreal lands. In the case of Dicotyledons this is different, for while they are found in the tropics, they are found in the other regions as well, and have better chances for intermingling than the other groups.

This tropical display of Dicotyledons further shows the great prominence of America in the display of forms. This appears not merely in the greater number of peculiar forms and often families which appear in tropical America; but whenever the continents are paired in the display of forms, America is always one of the pair, Asia or Africa being the other member.

It will be recognized from what has been said that the whole subject of geographic distribution is a very extensive one, and that it will be a long time before the important facts are recorded. The importance of the subject rests not so much upon the mere presence of certain plants in certain regions, but it has to do with explaining just why the conditions are suited to the plants, and also just how the plants have come to be what they are and where they are.

John Merle Coulter.



FROM KŒHLER'S MEDICINAL-PFLANZEN.

384

VANILLA.

CHICAGO:
A. W. MUMFORD PUBLISHER

VANILLA.

(*Vanilla planifolia*, Andrews.)

You flavor everything; you are the *vanille* of society.—Sydney Smith: Works, p. 329.

Vanilla planifolia belongs to the Orchid family (Orchidaceae), though it has many characteristics not common to most members of the family. It is a fleshy, dark-green perennial climber, adhering to trees by its aerial roots, which are produced at the nodes. The stem attains a length of many feet, reaching to the very tops of the supporting trees. The young plant roots in the ground, but as the stem grows in length, winding about its support and clinging to it by the aerial roots, it loses the subterranean roots and the plant establishes itself as a saprophyte or partial parasite, life habits common to orchids. The leaves are entire, dark-green, and sessile. Inflorescence consists of eight to ten flowers sessile upon axillary spikes. The flowers are a pale greenish yellow, perianth rather fleshy and soon falls away from the ovary or young fruit, which is a pod, and by the casual observer would be taken for the flower stalk. The mature fruit is a brown curved pod six to eight inches long, smooth, splitting lengthwise in two unequal parts, thus liberating the numerous, very small, oval or lenticular seeds.

There are several species of vanilla indigenous to Eastern Mexico, growing in warm, moist, shaded forests. It is now extensively cultivated in Mexico; also in Mauritius, Bourbon, Madagascar and Java. It is extensively grown in hothouses of England and other temperate countries. The wild growing plants no doubt depended upon certain insects for pollination, but with the cultivated plants this is effected artificially by means of a small brush.

The word vanilla is derived from the Spanish vainilla, the diminutive of vaina, meaning a sheath or pod, in reference to the fruit. There is little doubt that the natives of Mexico employed vanilla as a flavor for cocoa long before the discovery of America. We received our first description of the plant from the Spanish physician Hernandez, who, during 1571-1577 explored New Spain or Mexico. In 1602, Morgan, apothecary to Queen Elizabeth, sent specimens of the fruit to Clusius, who described it independently of Hernandez. In 1694 vanilla was imported to Europe by way of Spain. In France it was much used for flavoring chocolate and tobacco. During the first half of the eighteenth century it was extensively used in Europe, particularly in England, after which it seems to have gradually disappeared. Now it is, however, again very abundantly employed in nearly all countries.

Vanilla must be cultivated with great care. In Mexico a clearing is made in the forest, leaving a few trees twelve to fifteen feet apart to serve as a support for the vanilla plants. Cuttings of the vanilla stems are made three to five feet in length, one cutting being inserted into the soil to a depth of about ten inches near each tree. The cuttings become rooted in about one month and grow quite rapidly, but do not begin to bear fruit until the third year and continue to bear for about thirty years. In Reunion, Mauritius and the Seychelles the young plants are supported by a rude trellis fastened between the trunks of trees. In cultivation pollination is universally effected artificially; the pollen being transplanted from one flower to another by means of a small brush or pencil. Only the finest flowers are thus fertilized so as to prevent exhaustion and to insure a good commercial article. Among wild growing plants pollination is effected through the agency of insects, which evidently do not occur in the vicinity of the plantations; thus man is called upon to assist nature. The pods are cut off separately as they ripen; if over-ripe they are apt to split in drying; if collected green the product will be of an inferior quality.

The peculiar fragrance of the vanilla pods is due to vanillin, which occurs upon

the exterior of the dried fruit in the form of a crystalline deposit, which serves as a criterion of quality. This substance does not pre-exist in the ripe fruit. It is developed in the process of drying and fermentation. In Mexico the collected pods are placed in heaps under a shed until they begin to wilt or shrivel, whereupon they are subjected to the sweating process conducted as follows: The pods are wrapped in woolen cloth and exposed to the sun during the day or heated in an oven at 140° F., then enclosed in air-tight boxes at night to sweat. In twenty-four to thirty-six hours they assume a chestnut-brown color. They are then dried in the sun for several months.

In Reunion the pods are first scalded for a few minutes in boiling hot water, then exposed to the sun for about one week, wrapped in woolen blankets; then spread out and dried under sheds, turning frequently so as to insure uniform drying. When the pods can be twisted around the finger without splitting or cracking the "smoothing process" begins. This consists in rolling the pods between the fingers to distribute the unctuous liquid, which exudes during the sweating process (fermentation), and to which the pods owe their lustre and suppleness.

Vanilla workers are apt to suffer from an affection known as vanillism, characterized by an itching eruption of the skin, nasal catarrh, more or less headache and muscular pain. By some this is said to be caused by a poisonous substance in the vanilla or perhaps the oil of cashew, with which the pods are coated. According to others the trouble, at least the itching and eruption, is caused by a species of acarus (itch mite) found upon the pod. It must also be borne in mind that most of these workers are anything but cleanly in their habits. Bacteria, dirt, etc., find their way to the pods from the dirty hands of the workmen. The entire process of gathering, sweating, drying, smoothing and packing, as carried on in Mexico and South American countries is not conducted in accordance with recognized sanitary rules.

There are a number of commercial varieties of vanilla named after the countries in which they are grown or after the centers of export, as Mexican, Vera Cruz, Bourbon, Mauritius, Java, La Guayra, Honduras and Brazilian vanilla. The most highly valued Mexican variety is known as Vainilla de leg (leg, meaning law). The pods are long, dark-brown, very fragrant and coated with crystals. Since vanilla is a costly article adulteration is quite common. Useless pods are coated with balsam of Peru to give them a good appearance. Split, empty pods are filled with some worthless material, glued together and coated with balsam of Peru.

Vanillin also occurs in Siam benzoin, in raw beet-sugar and in cloves. It has been artificially prepared from coniferin, a substance found in the sap-wood of fir-trees, and from asafoetida. In Germany commercial vanilla is now largely prepared from eugenol, a constituent of oil of cloves.

Vanillin seems to have some special action upon the nervous system, and has been employed in the treatment of hysteria. It is also used to disguise disagreeable tastes and odors of medicines, as in lozenges and mixtures. Its principal use is that of spice for flavoring chocolate, confectionery, ices, ice-cream, drinks, pastry; in the preparation of perfumery, sachet powders, etc. It has a very pleasant, delicate aroma when properly diluted and can be very effectively combined with other odors. Vanilla, combined with almonds, simulates heliotrope.

The poisonous effects of ice creams flavored with vanilla are perhaps not due to vanillin, but to toxins formed by bacteria found upon vanilla pods, or the bacteria of the milk and cream used.

Description of Plate—A, flowering twig; 1, 2, 3, corolla; 4, 5, pistil; 6, 7, stamen; 9, pollen; 10, 11, fruit; 12, 13, seed.

Albert Schneider.

BIRDS AND NATURE.

ILLUSTRATED BY COLOR PHOTOGRAPHY.

VOL. IX. FEBRUARY, 1901. No. 2

FEBRUARY.

Still lie the sheltering snows, undimmed and white;
And reigns the winter's pregnant silence still;
No sign of spring, save that the catkins fill,
And willow stems grow daily red and bright.
These are the days when ancients held a rite
Of expiation for the old year's ill,
And prayer to purify the new year's will;
Fit days, ere yet the spring rains blur the sight,
Ere yet the bounding blood grows hot with haste,
And dreaming thoughts grow heavy with a greed
The ardent summer's joy to have and taste;
Fit days, to give to last year's losses heed,
To reckon clear the new life's sterner need;
Fit days, for Feast of Expiation placed!

—Helen Hunt Jackson.

FROST-WORK.

These winter nights, against my window-pane
Nature with busy pencil draws designs
Of ferns and blossoms and fine spray of pines,
Oak-leaf and acorn and fantastic vines,
Which she will make when summer comes again—
Quaint arabesques in argent, flat and cold,
Like curious Chinese etchings . . . By and by,
Walking my leafy garden as of old,
These frosty fantasies shall charm my eye
In azure, damask, emerald, and gold.

—Thomas Bailey Aldrich.

THE HAWKS.

Among the birds that are most useful to man may be classed the Hawks. They, with the vultures, the eagles and the owls, belong to the bird order Raptores, or birds of prey. Unlike the vultures the Hawks feed upon living prey while the former seek the dead or dying animal. The vultures are often called "Nature's Scavengers," and in many localities they have been so carefully protected that they will frequent the streets of towns, seeking food in the gutters.

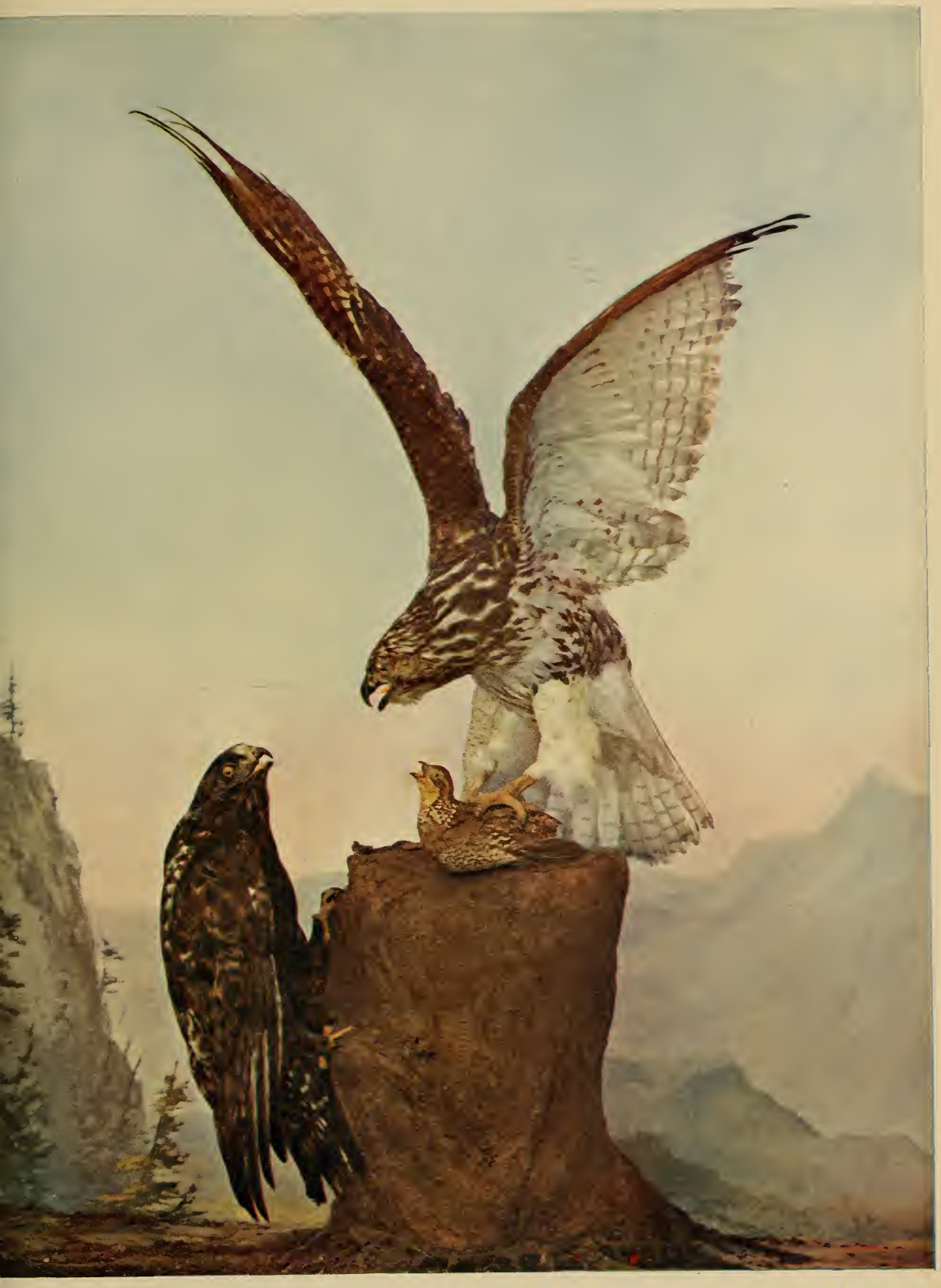
The family Falconidae, which includes the Hawks, the falcons, the vultures, the kites, and the eagles—all diurnal birds of prey—numbers about three hundred and fifty species, of which between forty and fifty are found in North America. The remainder are distributed throughout the world.

The flight of the Hawks is more than beautiful, it is majestic. Even when perched high in the air on the top of a dead monarch of the forest, there is a silent dignity in their pose. It is from these perches that some of the species watch the surrounding country for their prey, swooping down upon it when observed and seizing it in their long, sharp and curved claws. Their food is almost invariably captured while on the wing. The bill, which is short, hooked and with sinuate cutting edges, is used for tearing the flesh of its victim into shreds.

Among our more common hawks there are but five or six that may truthfully be classed among the birds that are injurious to the interests of man. Among these, the Cooper's hawk and the sharp-shinned hawk deserve the most attention, as they feed almost entirely upon other birds and poultry. To these two the name chicken hawk may be aptly applied. The domestic pigeon is a dainty morsel for these ravagers of the barnyard. On the other hand, by far the larger number of the Hawks are of great value to man. They are gluttonous whenever the food supply is unlimited, and, as their powers of digestion are wonderfully developed, it takes but a short time for the food to be absorbed and they are then ready for more. With their keen eyesight they readily detect the rodents and other small mammals that are so destructive to crops and with a remarkable swiftness of flight they pounce upon them. Dr. Fisher says, "Of the rapacious birds with which our country is so well furnished, there are but few which deserve to be put on the black list and pursued without mercy. The greater number either pass their whole lives in the constant performance of acts of direct benefit to man or else more than make good the harm they do in the destruction of insectivorous birds and poultry by destroying a much greater number of mammals well known to be hostile to the farmer."

Dr. Fisher obtained the following results from the examination of the stomachs of two thousand, two hundred and twelve birds of prey. This number does not include any of those that feed extensively upon game and poultry. In three and one-half per centum the remains of poultry or game birds were found; eleven per centum contained remains of other birds; forty-two and one-half per centum contained the remains of mice; in fourteen per centum other mammals were found and twenty-seven per centum contained insect remains. This summary includes not only the Hawks but also the owls, eagles and related birds. It is evident from these results that man has a friend in these birds that is of inestimable value to him.

The use of falcons and Hawks in the chase dates far back in the history of the Old World. For ages it was one of the



FROM COL. JOSEPH STEPPAN.
85

YOUNG RED-TAILED HAWK HOLDING A QUAIL.
(Buteo borealis.)

AMERICAN ROUGH-LEGGED HAWK.
(Archibuteo lagopus sancti-johannis.)
About 1/7 Life-size.

principal sports of mankind and especially of the nobility. Hawks may be trained to a high degree of efficiency in the capturing of other birds. It is said that the Chinese knew of this characteristic of the Hawks at least two thousand years before the time of Christ. In Japan the art of falconry was practiced about six or seven hundred years before Christ.

The art is also believed to be represented in a bas-relief found in the Khorsahad ruins in which a falconer is apparently bearing a hawk on his wrist. Thus these ancient ruins of Nineveh show that the art must have been known at least seventeen hundred years before Christ.

That falconry was known to the ancient races of Africa is highly probable, though there is but little in the earlier written history of that continent regarding it. Egyptian carvings and drawings, however, indicate without a doubt that the art was there known centuries ago. Falconry is still practiced to some extent in Africa.

The art, though not obsolete in those countries of Europe where, in the middle ages, it was regarded as the greatest and most noble of all sports, is not national in its character. During the reign of William the Conqueror laws were enacted in England which were most stringent regarding falconry. At one time "falcons and hawks were allotted to degrees and orders of men according to rank and station, to royalty the jerfalcon, to an earl the peregrine, to a yeoman the goshawk, to a priest the sparrow-hawk, and to a knave or servant the useless kestrel."

To train a hawk for this sport requires great skill and patience. The temper, disposition and, in fact, every peculiarity of each individual bird must be carefully studied. In these respects it may be said that no two birds are exactly alike. Technically the name falcon, as used by the falconer, is applied only to the female of the various species used in the conducting of this sport.

The peregrine falcon or hawk is usually accepted as the type falcon of falconry. The name peregrine, from the Latin peregrinus, means wandering, and refers to the fact that this species is almost cosmopolitan, though the geographical races are given varietal names. The duck hawk (Falco peregrinus anatum) is one of the representatives in America. "The food of this hawk consists almost exclusively of birds, of which water-fowl and shore birds form the greater part."

The Hawks of our illustration are natives of North America ranging from Mexico northward. The American Rough-legged Hawk (Archibuteo lagopus sancti-johannis) is a geographical variety of a rough-legged form that is found in northern Europe and Asia. It is also known by the names of Black Rough-legged and Black Hawk.

This Hawk is one of the largest and most attractive of all the species of North America. Dr. Fisher tells us that "it is mild and gentle in disposition, and even when adult may be tamed in the course of a few days so that it will take food from the hand and allow its head and back to be stroked. When caged with other species of hawks, it does not as a rule fight for the food, but waits until the others have finished, before it begins to eat."

In spite of its large size and apparent strength it does not exhibit the spirit that is so characteristic of the falcons. It preys almost entirely on field mice and other rodents, frogs and probably, at times and in certain localities, upon insects especially the grasshoppers. It is said that they will feed upon lizards, snakes and toads. They do not molest the poultry of the farmer or the game birds of the field, forest or of our water courses, at least not to any extent. Their size and their slow and heavy flight would nearly always give sufficient warning to permit the ordinary fowls to seek cover.

No better evidence as to the character of its food can be furnished than the results of the examination of forty-nine stomachs as related by Dr. Fisher. Of these forty contained mice; five, other mammals; one, lizards; one, the remains of seventy insects (this specimen was killed in Nebraska); and four, were empty. It is interesting to note "that the southern limit of its wanderings in winter is nearly coincident with the southern boundary of the region inhabited by meadow mice."

Sir John Richardson says, "In the softness and fullness of its plumage, its feathered legs and habits, this bird bears some resemblance to the owls. It flies slowly, sits for a long time on the bough of a tree, watching for mice, frogs, etc., and is often seen sailing over swampy pieces of ground, and hunting for its prey by the subdued daylight, which illuminates even the midnight hours in the high parallels of latitude." Mr. Ridgway says, "for noble presence and piercing eye this bird has few equals among our Falconidae."

The eggs of this species vary from two to five and are usually somewhat blotched or irregularly marked with chocolate brown on a dull white background.

The Red-tailed Hawk (Buteo borealis) of our illustration is young and shows the plumage of the immature form.

This species may be called our winter hawk and for this reason the name borealis is most appropriate. "The coldest days of January serve to give this hawk a keener eye and a deeper zest for the chase." The best locality to seek the Red-tail may be found at the wooded borders of pastures and streams, where it can easily perceive and swoop down upon its prey. It seldom visits a barnyard, but will occasionally catch a fowl that has strayed away from the protection of buildings. Its food consists to a great extent of meadow and other species of mice, rabbits and other rodents. The remains of toads, frogs and snakes have also been found in its stomach. One writer says, "The Red-tailed Hawk is a powerful bird and I once saw one strike a full-grown muskrat, which it tore to pieces and devoured the greater part."

Dr. Fisher gives an interesting summary of the examination of five hundred and sixty-two stomachs. Fifty-four contained poultry or game birds; fifty-one, other birds; two hundred and seventy-eight contained mice; one hundred and thirty-one, other mammals; thirty-seven, frogs and related animals or reptiles; forty-seven, insects; eight, crawfish; one, centipedes; thirteen, offal, and eighty-nine were empty. This surely is not a bad showing for this bird, so often maligned by being called "hen" or "chicken-hawk." Its preferred food is evidently the smaller mammals, and as it is common or even abundant it must be of great value to agricultural interests. The younger birds are more apt to take poultry because of "a lack of skill in procuring a sufficient quantity of the more usual prey."

Mr. P. M. Silloway says, "None of the Hawks has suffered more undeserved persecution than has the Red-tailed Buzzard or Hawk, whose characteristics place it among the ignoble falcons, or hawks, of feudal times. Lacking the swiftness and impetuosity of attack peculiar to the true falcons, it depends on its ability to surprise its prey and drop upon it when unable to escape."

During the summer months it retires to the forests to breed, where it builds a large and bulky though shallow nest in trees, often at a height of from fifty to seventy-five feet from the ground. The nest is constructed of sticks and small twigs and lined with grass, moss, feathers or other soft materials. The number of eggs is usually three, though there may be two or four. They are a little over two inches long and less than two inches in diameter. They are dull whitish in color and usually somewhat marked with various shades of brown.

The full plumage of the adult is not acquired for some time and the bird has been long full grown before the characteristic red color of the tail appears.

Seth Mindwell.

INTERESTING STONE HOUSES.

While the children were playing in a small brook, they found something entirely new to them, and as usual, came with hands full, shouting, "We have found something new! Do you know what these are?"

These new treasures proved to be the larvae of the caddis fly in their stone houses. This little creature is noted for its complete metamorphosis. The female fly often descends to the depth of a foot or more in water to deposit her eggs. As the eggs hatch the habits of their larvae are exceedingly interesting.

They are aquatic, being long, softish grubs, with six feet. The fish are very fond of them, for which reason they are in great demand for bait. The angler looks for "cad-bait" along the edges of streams, under stones, or on the stalks of aquatic plants. One can easily see that their lives are not free from care and danger, and so to protect themselves, they are very wise in building cylindrical cases in which they live during this dangerous period. The different species, of which there are many, seem to have their individual preference as to the substance which they employ in building these houses, some using bits of wood, others shells, pebbles, or straws. They readily disregard these preferences when there is a lack of the material which they usually prefer.

Those brought to me were made of different colored pebbles and were very pretty homes. We counted the pebbles in one of them and found there were eighty-nine used, and built so securely that it could not be easily crushed by our fingers. They were all about an inch in length, a quarter of an inch in diameter and were perfect cylinders with a large pebble fastening one end; so no fish could catch them unawares. We placed them in water, where we could watch their development. They never willingly left their homes, only thrusting the head and a portion of the body out in search of food.

When about to pass into the torpid pupa state, they fastened their houses to some sticks and stones in the water, and then closed the end with a strong silken grating, which allowed the water to pass freely through their houses, keeping them sweet and fresh. We are told that this fresh water is necessary for the respiration of the pupa. Thus they remain quiet for a time until they are ready to assume the imago form. When that important period arrives they make an opening in the silken grating with a pair of hooked jaws, which seem to have developed while resting in the pupa state. They also have become efficient swimmers, using their long hind legs to assist them. After enjoying this new exercise of swimming for a short time they evidently become anxious for a wider experience, and coming to the surface of the water, usually climbing up some plant, the skin of the swimmer gapes open and out flies the perfect insect. Sometimes this final change takes place on the surface of the water, when they use their deserted skin as a sort of raft, from which to rise into the air, and away they go to new fields and new experiences. These insects are known as the caddis-fly of the order Neuroptera, having four wings, measuring about an inch when full spread, with branched nervures, of which the anterior pair are clothed with hairs; the posterior pair are folded in repose. The head is furnished with a pair of large eyes, with three ocelli, and the antennae are generally very long.

If you know the haunts of this interesting house builder, scatter some bright sand and tiny pebbles in the water, and when they are deserted, gather the houses for your collection.

Rest H. Metcalf.

THE ALASKAN SPARROW.

There's a far-away country, a wonderful land
That the twilight loves best, where the finger of God
Touched the land into shadows; unlighted they stand
As they stood at the first over-ocean and sod,

And the cloud and the mountain are one; all unheard
Is the murmur of traffic, the sigh of unrest,
And the King of the land is a golden-crowned bird
With a robe of plain brown and an ashy-gray vest.

Where the shadows are deepest a musical sound
Cleaves their darkness, the song of the golden-crowned King.
Never day is so dark but the sweet notes are heard,
Never forest so dense but the melodies ring.

Sing on, little King of the twilight land, sing,
Thy kingdom extend through the oncoming days,
Till the spaces between us with music shall ring,
And the world hush its breath but to listen and praise.

—Nelly Hart Woodworth.

FROM COL. CHI. ACAD. SCIENCES.

386

DOWITCHER.
(Macrorhamphus griseus.)
Nearly ⅔ Life-size.

THE DOWITCHER.

(*Macrorhamphus griseus.*)

The range of the Dowitcher is limited to the eastern part of North America. It has been reported as far west as the Mississippi river. It breeds in the far north, usually within the Arctic Circle. Its migration is extensive for it winters in Florida, the West Indies and in the northern portion of South America.

The Dowitcher is one of the best known of our coast birds. It bears many popular names, such as Gray Snipe, Gray-back, Dowitch, Driver, Brown-back and Bay Bird. The generic name Macrorhamphus is derived from two Greek words, makros, meaning large, and rhamphos, meaning bill. The specific name griseus means gray, and probably has reference to the grayish color of the winter plumage.

The Dowitchers are the most numerous of the seaside snipes. Inland it is replaced by the Long-billed Dowitcher (Macrorhamphus scolopaceus), which has a longer bill and is a little larger. Mr. Wilson, in his Ornithology, gives the following interesting account of their habits: "They frequent the sandbars and mud of flats at low water in search of food and, being less suspicious of a boat than of a person on shore, they are easily approached by this medium and shot down in great numbers. I have frequently amused myself with the various actions of these birds. They fly rapidly, sometimes wheeling, coursing and doubling along the surface of the marshes; then shooting high in the air, there separating and forming in various bodies, uttering a kind of quivering whistle." At the retreat of the tide flocks will frequently settle on the shore in such large numbers and so close together that several dozen have been killed at a single shot.

Mr. Chapman tells us that "they migrate in compact flocks, which are easily attracted to decoys by an imitation of their call. Mud-flats and bars exposed by the falling tide are their chosen feeding grounds. On the Gulf coast of Florida I have seen several hundred gathered in such close rank that they entirely concealed the sandbar on which they were resting."

In summer the general color of these birds is dark-brown and the feathers are more or less edged with a reddish tinge. Underneath, the general color is light cinnamon, with white on the belly. In the winter the plumage is more gray and the under parts are much lighter in color.

This bird usually lays four eggs of a buffy olive color, which are marked by brown, especially near the larger end.

All the beautiful stars of the sky,
  The silver doves of the forest of Night,
Over the dull earth swarm and fly,
  Companions of our flight.

—James Thomson.

SOME THINGS WE MIGHT LEARN FROM THE LOWER ANIMALS.

Man has been instructed in many things by lower animals, but there is yet much to be learned. It is said that the first suspension bridge across the Niagara was constructed after the plainest sort of hint from a spider. Yet we have never found the name of Mr. Spider cut upon the buttresses of a bridge. Who knows but that the builders of the pyramids of ancient Egypt copied their engineering plans from the ants who for generations had pursued similar methods in the architecture of their cities? Spiders had been ballooning for many centuries before man swung his first parachute to the breeze. In fact, there is a species of spider, which, although they have no wings, are able to spin for themselves a sort of apparatus by means of which they navigate the air; yet man, with all his boasted intelligence, has not accomplished this, even with the most complicated machinery. So I might go on to suggest many mechanical and economic contrivances used by lower animals, some of which man has copied but many of which he has as yet been unable to equal.

Before the first potter of old had fashioned a vase or a jug the Eumenes fraterna had constructed his dainty little jugs of mud. But the making of jugs is not the only art man might learn from this little wasp. Upon examination we find the jug filled with small green caterpillars. After depositing her egg Mrs. Wasp thus provides for her baby when it shall appear upon the field of action. Now the peculiar part of this proceeding to which I wish to call attention is that the worm is not dead, but is merely in a comatose state. If it had been killed it would have putrified and entirely disappeared before the young wasp was hatched. Furthermore, the young wasp is fond of fresh caterpillar steak, preferably from the living animal. So Mrs. Wasp must have a method of preserving the fresh living victim for her rapacious progeny next spring, while he is too young to hunt for himself, and while the caterpillars are still securely hiding in their mummy cases, Mrs. Wasp finds the venturesome young caterpillar crawling somewhere, and pouncing upon him, carefully inserts her sting into the nerve ganglia that are located in a line along his dorsal surface. We don't know how she learned the exact location of the ganglia and that a few well-directed stabs will produce more effect than hundreds of misdirected thrusts in other parts of the body, but it is certainly true that she selects the very segments in which the ganglia are located to inflict the wound. And she had the location of these nerve centers for a long time before biologists made the discovery. What a fine thing it would be for the biologist if he could learn the secret of thus preserving living animals instead of the stiff, discolored and uninteresting alcoholic specimens. Then think of the economic value of such a discovery. Animals could be fattened in summer at much smaller expense and then injected and set away until needed. We would have no more difficulty in providing our armies with beef on the hoof, and fresh meat could be shipped at much less expense over long distances, as no ice would be necessary. We would have no more complaint of embalmed beef and putrid canned goods.

The common mud wasp that builds in old garrets fills his nest with a species of spider much relished by the young wasp and exhibits much judgment in supplying exactly the right number to provide for the growing wasp until he is able to sally forth and seize prey for himself. These spiders—often seventeen or eighteen of them—are stupefied in the same manner as in the case of the potter wasp, and are living when the young wasp begins his repast. This habit is peculiar to many

species of wasp and is, I think, worthy of careful study. I wish I had space to tell of the almost fiendish ingenuity that certain parasites show in maintaining themselves at the expense of their hosts.

The ground hog has a knack of spending his winter in a way that is at once economical and pleasant. They generally hibernate in pairs, rolling themselves up into balls. They do not seem to breathe or to perform any of the life functions during their long six months' sleep. There is, I fear, no foundation of fact for the ancient fiction of the ground hog appearing and making weather prognostications on the second of February. A gentleman writing in the New York Sun of some years since says: "I took the trouble once to dig into a woodchuck's burrow on Candlemas day, and a warm, cloudy day it was; just such a day when the ground hog is said to come out of his hole and stay out. I found two woodchucks in the burrow, with no more signs of life about them than if they had been shot and killed. From all outward appearances I could have taken them out and had a game of football with them without their knowing it."

Nor is it true that hibernating animals live upon their accumulated fat, for digestion, as well as other active life processes, ceases. Hibernating animals always begin their long sleep upon an empty stomach, and food injected into their stomach is not digested. The fat disappears, it is true, but it is not in any strict sense digested. Any experienced hunter is aware that unless the entrails are removed from the shot rabbit the fat will disappear from about the kidneys. The fat may, and no doubt does, assist in some way in the long sleep. It may act as fuel to keep up the right living temperature. At any rate, it is true that hibernating animals eat voraciously and grow very fat just before they go to sleep. It is a peculiar fact that many hibernating animals bring forth their young during this period. This is especially true of woodchucks and bears. It is a common experience with hunters that only male bears are killed during the winter season.

Mr. Andrew Fuller of Ridgewood, New Jersey, according to the article above quoted, had an interesting experience with a pair of Rocky Mountain ground squirrels. After missing them for a month he accidentally found them curled up under some straw, apparently frozen stiff. He brought them to the house to show his wife the misfortune that had befallen his pets. Soon they seemed to thaw out and scampered about as lively as ever. No sooner were they put out in the cold than they resumed their sleep, which continued all winter, their bodies maintaining a fairly constant temperature, seldom falling below three degrees above the freezing point of water. They came out in the spring as chipper as if they had been asleep but one night. Many hibernating animals will if wakened by being placed in a warm room, eat eagerly, but they soon show a desire to resume their nap.

The Loir, a peculiar little native of Senegal, never hibernates in its native clime, but every specimen brought to Europe becomes torpid when exposed to cold. The common land tortoise—wherever he may be and he is a voracious eater of almost anything—always goes to sleep in November, and wakes some time in May.

Just as in the north numerous animals hibernate upon approach of cold, so in the south there are species that may be said to estivate during the hottest weather. While the northern animals curl up so as to retain heat, his southern cousin straightens out as much as possible to allow the heat to escape from all parts of the body.

But it was not my intention to write an essay upon hibernation and allied phenomena, but merely to speak of it as a subject that should be investigated. What a splendid arrangement it would be for the poor, the sick, and the melancholy folk if they could just hibernate for six months occasionally.

I will merely speak of the light of the so called lightning bug, with its over ninety per centum efficiency and no heat and no consumption of fuel to speak of. Why doesn't some genius learn her language and find out how she does it? She has been trying for centuries to demonstrate it but we are too stupid to learn her secret.

Rowland Watts.

THE GREAT-TAILED GRACKLE.

(*Quiscalus macrourus.*)

The Great-tailed Grackle belongs to a family of birds that is "eminently characteristic of the New World, all the species being peculiar to America." It is the family of the blackbird and oriole, of the bobolink and the meadowlark. It is called the Icteridae, from a Greek word ikteros, meaning a yellow bird. The majority of the one hundred and fifty or more species that are grouped in this family make their home in the tropics where their brilliant colors are emphasized by the ever green foliage and the bright sunshine.

The family is interesting because the species, though closely related, vary so widely in their habits. They "are found living in ground of every nature, from dry plains and wet marshes to the densest forest growth." Here are classed some of the birds which are among the most beautiful of our songsters. Here, too, are classed some species that never utter a musical sound, and whose voices are harsh and rough. The sexes are usually dissimilar, the female being the smaller and generally much duller in color.

The Great-tailed Grackle is a native of Eastern Texas, and the country southward into Central America. The Grackles are sometimes called Crow Blackbirds. There are five species, all found in the United States, The Bronzed and the Purple Grackles are the most generally distributed and best known.

The Great-tailed Grackle, as well as the other species, usually builds rude and bulky nests in trees, sometimes at quite a height from the ground. It will also nest in shrubs and it is said that it will occasionally select holes in large trees. The males are an iridescent black in color and the females are brown and much smaller. Both sexes spend most of their time on the ground. Their feet are strong and large, and, when upon the ground, they walk or run and never hop.

THE EAGLE.

He clasps the crag with hooked hands;
Close to the sun in lonely lands,
Ring'd with the azure world, he stands.

The wrinkled sea beneath him crawls;
He watches from his mountain walls,
And like a thunderbolt he falls.

—Alfred Tennyson.

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GREAT-TAILED GRACKLE.
(Quiscalus macrourus.)
½ Life-size.

THE GEOGRAPHICAL DISTRIBUTION OF BIRDS.

What do we mean by the "Geographical Distribution" of birds? Are not birds to be found everywhere, over both land and sea? Are they not, then, universally distributed? As a class they certainly are, but not as species nor even orders. Parrots are not found in frigid regions, nor are snowflakes and snowy owls found in the tropical regions. Our Wood Warblers and Vireos are not found outside of America, while there are no birds of Paradise anywhere in America. We shall see that most of the birds found in the eastern hemisphere differ from those found in the western, speaking broadly, but that many of the island birds are different from birds of continents.

Since most birds migrate shorter or longer distances in search of a place to rear their young, and return again to warmer regions to pass the winter months, the question at once arises, What is the geographical distribution of such migratory birds? That is not so difficult as it may seem at first glance. We have only to inquire what governs the movements of the species in question in such a way that its appearance at certain places at certain known times may be confidently expected. The study of migration and breeding has shown that the impulse to move northward in the spring to the old nesting-places where the young are reared is more reliable than the impulse to move southward on the approach of cold. The birds are more certain to appear at their old summer homes in spring than they are to be found at any particular place during the winter. But if there be any objection to this view it will yet remain true that where a bird rears its young should more properly be called its home than the place to which it is forced by the approach of cold or the lack of food. In either case, therefore, we may regard the home of the bird, and therefore treat its distribution geographically as the place where it habitually rears its young. Having settled the question as to what shall determine the distribution of the separate species, it remains to study the physical conditions of the earth for the sake of finding what it is that determines the limits to which the different species may go.

We know that the distribution of land and water over the earth has not always been the same as it is now, but that many places that are now covered with water were once dry land, and that in many places where there is now land there used to be water. Now, America is wholly separated from Uro-Asia-Africa, but once they were connected together by a broad neck of land where Bering Sea now lies, and there may have been another neck of land connecting Europe with Iceland and Greenland and so with North America. Now Australia and New Zealand are wholly separated from all other lands, but they were not so long ago. So of the larger islands in general, they have not always been isolated as now, but connected with great land masses, sharing with them the animals which roamed over the whole vast regions. For in the earlier times before Man had appeared upon the earth, before the great Glacial Period, the whole earth was tropical in climate, making it possible for plants as well as animals to live anywhere upon the earth, as they cannot now. Then extensive migrations north and south were not necessary, but instead there were roamings about in all directions, or great invasions of new regions by hosts of animals of one kind.

As the land sank away here and there, and the sea covered it, barriers were thus formed to further roamings, except by the birds of strong flight or animals that could swim long distances, and there could no longer be an intermingling of the animals of the whole land surface of the world. Since all animals are inclined to change somewhat to meet or keep pace with the changes that are going on in vegetation and the general physical

conditions of the earth, those that have been separated in this way will grow more and more unlike. In some such isolated regions there may not be much change in their environment and so they will change but little, if at all, and so will not keep pace with those in other regions where life is a constant struggle with others for supremacy. It is just as true in the natural world as in the commercial, that competition is necessary for the highest development. It is probably true that the disturbances which caused the land to sink in places and so disconnect what had been connected lands, possibly a splitting up of one great flat land mass, also brought about the changes which made out of one great tropical world the one that we know with its frigid, temperate and tropical zones. So that just at the time when the animals of the different regions were separated from each other forever there came these changes in physical conditions which would make them change to meet the new conditions. But that is a long story for the geologist to tell. Of course the sinking of the land in different regions occurred at different times, probably thousands of years apart in many cases. And the changes from tropical to temperate and frigid must have been very gradual also, or there would have been no animals left alive in the northern and southern regions. Only those near the equator could have lived.

Probably New Zealand was the first considerable land mass to be separated absolutely and for all time from all other land, because here we find the lowest type of birds and lower animals. There are no terrestrial indigenous mammals even. Such birds as were not able to fly across the now wide stretches of ocean did not continue to develop rapidly because there was little change in their environment and because there was little or no competition with other similar forms. So to-day we find them either very similar to what they were when their island home was made an island home, or else even degenerated into flightless creatures. Australia seems to have been the next tract of land cut off, for here, too, we meet with the lower forms which show the lack of the keen competition which their relatives further north had to sustain. When North America was cut off from Siberia, marking the close of more or less extensive interchange of communication of the animals of both regions, there was little difference in their animal life; but following this separation there came about a more rapid change in the Orient than in the Occident. It may not be quite clear why this was so, but that it was cannot be doubted, for some of the lower forms of animals which still inhabit America have been completely destroyed in the Orient. At the time of their separation these forms were found in both places. What seems a probable explanation of this more rapid change in the Orient may be briefly stated. The configuration of the Orient is such that animals would have a far greater range east and west than north and south. A great mountain range and a great desert are thrown as barriers across the way of the northward and southward movement. In America there is a continuous gateway to the north and south, but barriers to an eastward or westward movement. With such creatures as the birds freedom to move north and south would always lessen competition, while the crowding of one group or race upon another eastward or westward would increase the competition. But Geology tells us that in the Orient such westward invasions have actually occurred, causing the death of the less hardy forms and the modification of all forms of animal life.

It must not be understood, from what has been said, that all the animals, especially the birds, found in any one country or island, are different from the birds found in all others, for that is not true. There are many species of birds that are found practically all over the earth. But what is true is that each country or region of any considerable extent, or group of oceanic islands has some species which are not found anywhere else in the world.

From what has already been said it will be clear that the world may be divided into several different regions, according to the animals which are peculiar to the different ones. Following Newton's system, because it seems the most logi-

cal, at least so far as the birds are concerned, we have first

THE NEW ZEALAND REGION.

Here we find the flightless Apteryx and a flightless goose now extinct, also the extinct Moa. There are also peculiar forms among the shore-birds, the birds of prey, the parrots, and some rather curiously constituted passerine birds. There have been several species introduced in relatively recent times, some of which already show signs of change.

THE AUSTRALIAN REGION

is but slightly connected with the preceding. The line separating this region from the Indian passes between the islands of Bali and Lombok, through the Strait of Macassar, between Borneo and Celebes, thence northward between the Philippines and Sanguir and Pelew; including, further on, the Ladrones, Hawaiians, all of Polynesia except the northern outliers of the New Zealand group, and finally sweeping back to encompass Australia. Here we find the curious egg-laying mammal, Ornithorhynchus. But to pass at once to the birds. Here we find such peculiar forms as the megapodes, cassowaries, sun-bitterns, birds-of-paradise, lyre-birds, and many not so familiar. Of the higher birds there are but few compared with Europe or America. It is evidently a continent which has long been separated from the rest of the world.

THE NEOTROPICAL REGION

includes, broadly, tropical America. The forms found here bear certain resemblances to those found in the two regions already discussed; but this resemblance is probably rather because they are low in the scale of development than that there has ever been any direct land connection between them. Much the same conditions of life must have prevailed for all, thus making the rate of development nearly equal. Here we find the rhea, tinamou and hoactzin, which show low grade; but mingling freely with them the higher forms which seem to have come down from the north later and all but crowded out these lower ones. There is abundant evidence that the struggle for existence in South America has been far less severe than in North America.

THE HOLARCTIC REGION,

as the name implies, includes all of North America, Europe, Asia north of India, and the Himalaya mountains, northern Africa where the great Sahara forms the natural boundary, and all islands belonging to the north temperate and north frigid zones. Many have divided this great belt into Palearctic and Nearctic, but the intermingling of species between northeast Siberia and Alaska seems to make such a distinction impracticable. But these distinctions should be and are retained in the divisions of the Holarctic. When we understand that at least one-third of the species found in the Nearctic are also found in the Palearctic, we shall understand why these two are grouped under one region. There are no orders, and there seem to be no families which are found in the Holarctic and nowhere else. Indeed, it is difficult to find even genera which do not have some species ranging into the Neotropical, Ethiopian or Indian. But among the species we find many. Indeed, there are few species which nest in both the Holarctic and in the regions bounding it on the south, and many of these are found only on the southern boundaries of the Holarctic. In our part of the Holarctic, that is, the Nearctic, the familiar birds about us do not nest also in the tropical regions.

THE ETHIOPIAN REGION,

as the name suggests, includes the whole of Africa except that portion north of the Sahara desert, and Arabia and Egypt, with Madagascar and other islands in the immediate vicinity. It seems hardly necessary to even mention the forms that are peculiar to this peculiar region. Even the word Africa brings trooping to our minds a whole continent of peculiarities in more realms than one. Here we find the Ostrich, the plantain eaters, the colies and several other families—nine in all. Of the lower groups there are the rollers, bee-eaters, horn-bills, the curious secretary-bird and many others. It is significant that among the Passerine birds there are but three families that are peculiar. So on the whole, this region has not developed so rapidly as the Holarctic.

There has not been the intense struggle for supremacy here which we see in the north temperate and higher regions.

THE INDIAN REGION

completes the list. Broadly speaking, this region comprises that part of Asia which lies east of the Indus river south of the Himalaya mountains except the eastern half of the drainage basin of the Yang-tse-kiang river, reaching the coast just south of Shanghai, including the island of Formosa, the Philippines, Borneo, Java, Sumatra and Ceylon. This is the Oriental Region of Wallace. There are, apparently, but two families of birds peculiar to this region: the bulbuls and the broad-bills; but there are very many genera and species found nowhere else in the world. The king-crows, sun-birds, swallow-shrikes, argus pheasant, jungle fowl and the well-known peacocks belong here. Very many of the birds of this region are gaudily colored and striking in appearance.

Each of these great regions, except possibly New Zealand, are readily divisible into sub-regions, and these again into areas of lesser extent, until each fauna may be assigned its proper place. Thus in the Holarctic Region we recognize the Nearctic, which comprises about all of North America, and a Palearctic sub-region, the outlines of which have already been sketched. Within the Nearctic three minor regions are recognized. The Arctic "includes that part of the continent and its adjacent islands north of about the limit of forest vegetation" (Allen). That is, extreme northern and northwestern Alaska, sweeping southeasterly through British America to and including Hudson Bay, northern and northeastern Labrador and northern Newfoundland. The Cold Temperate, which lies next south, begins in the east near Quebec, then sweeps westward past the Great Lakes almost to Winnipeg, thence in a northwesterly direction just west of Lake Winnipeg; from there in a more westerly direction to the mountains, which it follows even into northern Mexico as a narrow line; from the west coast at the north end of Vaucouver Island it runs east to the mountains. Maine and Nova Scotia are a part of the Allegheny belt which reaches to Alabama. Below this southern limit of the Cold Temperate lies the Warm Temperate, extending almost to Central America. But this is again subdivided into an eastern Humid Province which ends at the Plains, and a western Arid Province. These are again subdivided into an Appalachian Subprovince and an Austroriparian Subprovince for the Humid Province, and a Sonoran and Campestrian Subprovince for the Arid Province. But the boundaries of these minor subdivisions are not yet definitely settled, nor are the characteristic species in each finally decided upon, so it will not be profitable to carry our investigation further at this time.

We learn from this that when we find that one region, be it large or small, is unlike every other region in some particulars of climate or vegetation or temperature, or when it is not easily accessible from other regions, we may expect to find the animals somewhat different according to the conditions which prevail. From this it is a clear step to the truth that an animal's environment exerts a considerable influence upon its life and through its life upon its form; changing the form in some particulars that make it different from all other animals. It is also true of plants. Since, then, there are different physical conditions in every country of any considerable size, these changes in plants and animals are going on now, but so slowly that we are not able to see them. At the end of another thousand years or longer, the species of birds which we now know may be so changed that we should not know them if we could see them. But that need not worry us!

Lynds Jones.

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HOODED WARBLER.
(Silvania mitrata.)
Life-size.

THE HOODED WARBLER.

(*Sylvania mitrata.*)

"He was recognizable at once by the bright yellow hood he wore, bordered all around with deep black. A bright, flitting blossom of the bird world!"—*Leander S. Keyser, in Bird Land.*

This beautiful little warbler is a resident of the eastern United States. It is more common in the southern portion of this district and throughout the Mississippi Valley. Its breeding range extends from the Gulf of Mexico as far to the northward as southern Michigan. It winters in the West Indies, in Mexico, and in Central America. Though a wood warbler it prefers the shrubby growths in low and well-watered places rather than the forest. It is said to be abundant among the canes of the Southern States. Many other names have been given this warbler, all having reference to the arrangement of the black and yellow colors on the head. It is called the Black-headed Warbler, the Hooded Flycatching Warbler, the Mitred Warbler, and the Black-cap Warbler.

Activity seems to be the keynote of its life. It is in constant pursuit of insects, which it catches while they are on the wing. Unlike the flycatchers it seldom returns to the same perch from which it flew to catch its prey.

The words of Mr. Keyser most aptly describe the habits of the Hooded Warbler. He says, speaking of an hour spent in observing the bird's behavior, "He was not in the least shy or nervous, but seemed rather to court my presence. Almost every moment was spent in capturing insects on the wing or in sitting on a perch watching for them to flash into view. Like a genuine flycatcher, as soon as a buzzing insect hove in sight, he would dart out after it, and never once failed to secure his prize. Sometimes he would plunge swiftly downward after a gnat or miller, and once, having caught a miller that was large and inclined to be refractory, he flew to the ground, beat it awhile on the clods, and then swallowed it with a consequential air which seemed to say, 'That is my way of disposing of such cases!' Several times he mounted almost straight up from his perch, and twice he almost turned a somersault in pursuit of an insect. Once he clung like a titmouse to the bole of a sapling."

To some its notes, which are quite musical, lively, sweet and happy, seem to resemble twee, twee, twitchie. Mr. Chapman says the song "is subject to much variation, but as a rule consists of eight or nine notes. To my ear the bird seems to say, 'You must come to the woods, or you won't see me.'"

The nest of the Hooded Warbler is usually built in low shrubs, sometimes but a few inches from the ground and seldom higher than two feet. It is constructed of fine rootlets, and fibers of bark compactly interwoven with leaves, fine grass and hair. It is lined with grass, hair and feathers. The eggs, which are usually five in number, are white, or nearly white, in color, with red or brownish spots near the larger end. They are nearly three-fourths of an inch in length, and a little over one-half of an inch in their greatest diameter.

Three years or more are required for the development of the fully adult plumage. The throat of the female, though black, is not as pure a black as that of the male, and it is not so extensive or as well defined.

MRS. JANE'S EXPERIMENT.

One is surprised at the wonderful vitality to be found in an egg. The following incident, almost incredible as it seems, is an absolute fact.

Mrs. Jane, very fond of raising select breeds of chickens, put a setting of fine Brahma eggs under what she considered an absolutely trustworthy Biddy,—but, alas! Biddy proved unstable, like many another biped, and went off in a few days, leaving her nest and rather costly contents to the mercy of the elements.

Mrs. Jane, in three or four days, discovered the abandoned domicile, and, determined not to be outdone by any such maneuver on the part of Biddy, proposed to show her that Brahma chickens could be developed without the assistance of any old hen.

So, not having an incubator of any approved manufacture, she proceeded to make one. She secured a large bread pan to hold the water, a small wooden pail to hold the eggs, which were wrapped in warm flannel, and a good kerosene lamp, which was placed under the pan holding the water and then lighted.

The bucket containing the eggs was then placed in the pan of water and the whole apparatus left in a quiet bedroom.

Oh, how Mr. Jane and the boys and the neighbors twitted Mrs. Jane about wasting coal oil and time in keeping those eggs warm! But, behold! in a little over two weeks, one morning a shell was chipped, at noon another, and by the next morning four pert little downy fellows occupied the bottom of the bucket, with seven unhatched eggs.

Those chickens grew faster than almost any chickens ever known. They were never anything but tame, and the most active of the four, who bears the appropriate name of Theodore Roosevelt, allows any one to pick him up and fondle him, but is ready to fight with anything in the poultry yard—big chicken, little chicken, the skye terrier, the cat or anything else that is or might be in his way. Mrs. Jane says she never was sorry for her experiment but once, and that is all the time.

The cause for Mrs. Jane's regret is the fact that whether she be in the hen yard, kitchen or parlor, no place except right under her motherly gown is quite good enough for these enterprising birds.

Recently I saw "Teddy" open the screen and walk into the kitchen.

He lifted his foot, pulled the screen open wide enough to admit his head and then pushed his whole body, now quite large and plump, through the crack.

How long this interesting little hero, with his mates, will be permitted to enjoy the rights of chickendom yet remains to be seen, but the fact that "Mrs. Jane's incubator was a success" has been admitted by all who were so skeptical when she began her novel experiment.

Mary Noland.

A STROLL IN THE FROST KING'S REALM.

The rain of the night before had turned into a heavy sleet, followed by blustering weather. All day the sun was hidden by gray clouds, accompanied with fitful snow showers; but at last the clouds were dispelled and the following morning dawned clear and cold.

As the sun slowly rose above the horizon he added dazzling brilliance to the already lovely landscape.

The mercury was very little above zero as I sought the woods to reap the full benefit of this wonderful transformation of Nature. Just two days ago she wore her usual garb of neutral tints; but what a magical change the Frost King had wrought in this time! The earth was now covered with a white mantle of snow and every tree and shrub had on a glittering armor of sleet. A few minutes' brisk walk over the crisp snow brought me to a corn field, and by wending my way along a path through this field I arrived at a strip of woodland. Here the path merged into a narrow wagon road cut out of a steep bluff. The entrance to this road introduced me to a land of enchantment.

On either side the face of the bluff was covered with a tangled growth of shrubs, briers and weeds, while above were trees whose over-arching branches sparkled in the sun, showing all the colors of the rainbow. Every branch and twig was decked with gems—rubies, sapphires, emeralds and diamonds everywhere—and diamond dust formed a carpet underneath. The low bushes at the base of the bank where sheltered from the wind's disarranging blast, were wrapped in finest ermine. Just in front of me, to the left, was a wild rose, a fountain of purest crystal, the effect heightened by its scarlet hips. A little further on was a small tree draped with a tangled vine with clusters of pendant fruit, like crystallized grapes. On the other hand were raspberry canes, the livid red gleaming through the dazzling frost, and all around was goldenrod, more resplendent than when its golden blossoms lighted the way in autumn, and the asters shone like jewel-rayed stars.

A barbed-wire fence, as far as the eye could reach, was converted into endless strings of pearls. I gazed upon this vision until, becoming dazzled, I turned from the sun to rest my eyes, and in the background saw trees that formed pearly silhouttes against the dark blue sky. Was any enchanted land more entrancing?

Turning again, I resumed my walk to the foot of the hill, and, by the aid of the bushes and saplings, scrambled up its precipitous face and pushed onward through the underbrush, parting the interlacing branches as I went until I reached a ravine.

I continued onward, recognizing the familiar trees everywhere; though divested of foliage and incased in crystal, each variety has its distinctive form and bark. A musical tinkle accompanied every movement as I brushed the twigs and grasses along the way.

One not accustomed to the study of Nature in her various moods might suppose that such a landscape would be devoid of animation. But this was not the case. A very pleasing feature of the scene was the animal life that abounded. A rabbit snugly concealed beneath a bunch of grass started up, bounded away, and was soon lost to view in the thicket. Small flocks of snowbirds and chickadees were flitting gaily about. A crow sat in the top of a majestic oak and cawed lustily in answer to one that was faintly heard in the distance. A pair of cardinals flew about the border of the woods, and a single woodpecker was high up on the trunk of a tree, while another, whose form could not be detected, was hammering away. All these were suited to the environment, but not so was yonder lone blackbird, doubtless a straggler from a flock which had settled in the tree of the yard in the early morning.

Lured by the pleasant, mild weather of the preceding week, they had arrived only to encounter snow and mid-winter, and would doubtless retreat to more congenial surroundings and absent themselves until the true springtime should herald the approach of summer.

Addie L. Booker.

SNAILS OF THE FOREST AND FIELD.

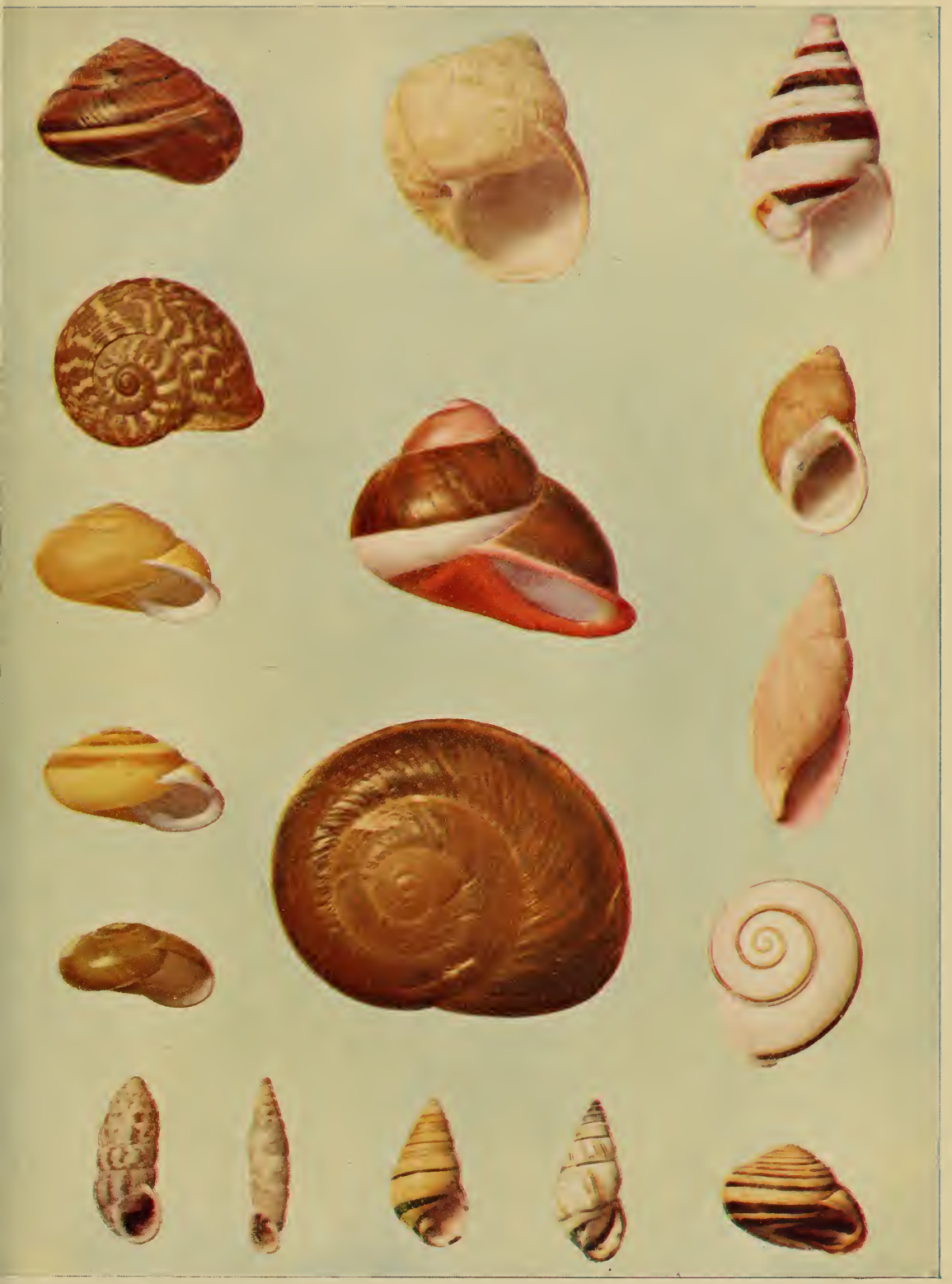
The forest is the home of the snail, where these interesting little animals may be found by any one desiring a closer acquaintance. They are not generally easy to find, being mostly nocturnal in habits and remaining hidden away under leaves, stones and old logs during the daytime. On rainy days, however, they may be seen crawling about, enjoying the delicious moisture.

In our last article we reviewed a few of the most interesting families of bivalve shells, and in the present paper we desire to draw the attention of the reader to the order Pulmonata, which includes those snails breathing air by means of a modified lung. The snails differ from the clams in having the body generally protected by a spiral shell which is capable of containing the entire animal. The former have a more or less expanded creeping disk which we call a foot, a head generally separated from the body by a neck (the reader will remember that the clams are headless), and also a pair of rather long eye peduncles protruding from the top of the head, which bear at their tips the round, black eyes, and a pair of short tactile organs, or tentacles, extending from the lower part of the head. The eye-peduncles are peculiar in being invertible in the same manner that a kid glove finger is pulled inside out.

The mouth is placed in the lower plane of the head and is recognized externally as a simple slit. Inside of the mouth is placed one of the most wonderful dental apparatuses known to science. This is called the radula, odontophore or tooth-bearer, and is a belt of chitinous, transparent, yellowish or colorless material, its upper surface being armed with numerous siliceous teeth arranged in longitudinal and parallel rows. The radula is placed in an organ called the buccal sac and occupies a position in the sac analogous to that of the tongue in a cat or dog, viz., on the floor of the mouth. It is formed from a layer of cells in the posterior part of the buccal sac, called the radula sac, and new teeth are constantly forming here to take the place of those which have become worn by use. The whole radula rests upon a cartilage, is strongly fastened at the anterior end, and is brought down between the two fleshy lips of the mouth where it performs a backward and forward movement, thus rasping off with the sharp teeth particles of food which have been cut into small pieces by the horny jaw. During this process the morsel of food is pressed against the top or roof of the mouth. The jaw is placed in the upper part of the mouth in front of the radula, and is frequently armed with ribs to aid in cutting or biting off pieces of food, as leaves or vegetables.

As before remarked, the radula is made up of parallel rows of teeth, the whole area being usually divided into five longitudinal rows, each row differing from the one next to it. We have first a central row, on each side of this a lateral row and finally a marginal row. Each tooth in each row is made up of different parts, a basal part attached to the radula belt and an upper part which is turned over or reflexed and bent backward so as to tear off food particles by a backward movement of the whole apparatus. This diversity of form in the teeth has led conchologists to adopt a tooth formula similar to that adopted for vertebrate animals, so that the teeth of different species can be compared and the animals classified thereby. Thus each tooth has certain prominences called cusps, which vary in size, number and position, and serve admirably to describe the different groups of snails. All the mollusca, except the bivalves, are provided with this radula.

One of the most wonderful and interesting facts connected with the radula is the large number of teeth on each mem-



FROM COL. CHI. ACAD. SCIENCES.

LAND SHELLS.

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Helix fidelis (California)
Cyclophorus appendiculatus (Philippines)
Helix albolabris (U. S.)
Helix profunda (U. S.)
Zonites fuliginosus (U. S.)
Cerion microstoma (Cuba)

Helix pomatia (Europe)
Helix haemastoma (India)
Naning lamarkiana (Philippines)
Achatinella (Sandwich Islands)
Clausilia macarana (Dalmatia)

Liguus fasciatus (Florida)
Bulimus chiliensis (South America)
Glandina truncata (Florida)
Helix intorta (Philippines)
Bulimulus multilineatus (Florida)
Helix nemoralis (Europe)

brane. Thus in some species of our common snails there are seventy-one teeth in a single row, and the whole radula is made up of a hundred rows of teeth, making a grand total of seventy-one hundred teeth in the mouth of a single snail!

Land snails are found almost everywhere, in valleys, high up on mountains, and even in deserts. They may be found in the cold climate of Alaska or in the tropical zone under the equator. As a rule, they prefer moist localities, where there is an abundance of vegetation and where the ground is strewn with rotting logs, beds of decaying leaves or moss-covered rocks. Open woodlands may be said to be their best habitat in the northern part of the United States.

The shells of the Pulmonata vary to a wonderful degree in size, shape and coloration. Some are so small that they can scarcely be seen with the unaided eye, while others attain a length of six inches; some have the aperture of the shell armed with numerous folds or teeth, while others are smooth and the colors vary from whitish or horn-colored to the gorgeously colored helices of the tropics with their bands and blotches of red, brown, white or green. With all this diversity the land shells or helices may always be distinguished from their salt or fresh-water relatives. The land snails breathe by means of a so-called lung which is a sac lined with a network of blood vessels and occupying the last turn or whorl of the shell. The air taken into this lung purifies the blood.

Much is written at the present time upon our new possessions, the Philippine Islands, but few people are aware that these islands are tenanted by the most interesting and beautiful group of all the land shells, the Cochlostylas, or tree snails. The animals live for the most part in the trees and bushes of the islands, the island of Luzon having, probably, the best known fauna. The animals are large and quite bold and the shells are of surpassing beauty, with their colors of white, green, brown, etc. Now that these islands have come into the possession of the United States it is to be hoped that these handsome creatures will receive the study they deserve.

The land shells of the United States, while numerous in species, are not as conspicuous in color-pattern as those of Europe, South America or the islands of the Indian and Pacific Oceans, although California produces some highly- colored species, as will be seen by consulting the figure of Helix fidelis, on our plate. The majority of our species are uncolored, like the figure of Polygyra albolabris.

One of the largest and most interesting of American shells is the Bulimus, found in South America. The shell of Bulimus ovatus attains a length of six inches and the animal is correspondingly large. In the markets of Rio Janeiro this mollusk is sold as food and is eagerly sought by the poorer people, among whom it is considered a great delicacy. Another interesting fact in connection with this species (as well as others of the genus) is the size of the eggs which it deposits, they being as large as pigeons' eggs. These are also eaten with avidity by the negroes of Brazil.

One of the most beautiful of the land shells found in the United States is the Liguus fasciatus, found in Florida and Cuba. The shell is about two inches long and is encircled by bands of white, brown and green. This species lives in great numbers at Key West, associated with many small shells of the Bulimus group. Closely related to the last-mentioned shell (Liguus) is the agate shell (Achatina), which attains a length of seven inches and is the largest of the land shells. Like the Bulimus mentioned above it lays eggs of large size with a calcareous shell, some being over an inch in length. Both the animal and the egg are eaten by the natives of Africa. The shells are very attractive, being variegated with different colors, like agate, from which they receive their common name.

Another of our new political possessions, the Hawaiian Islands, has a molluscan fauna peculiar to itself. This is the family Achatinellidae which is confined solely to the Sandwich Islands. There are no shells which can compare in beauty with the Achatinella with their encircled bands of black, yellow, white, red, etc. They live on the bushes, generally rather low and near the ground, and recently they have been threatened with

extinction because of the cattle which have been introduced into the islands. In feeding on the bushes, they also consume large quantities of these snails. A bush inhabited by these little creatures must be a beautiful sight, with the green foliage set off by the handsomely colored shells, like jewels on a costly dress.

Among the edible snails none excel in public favor the common edible snail of Europe (Helix pomatia). The cultivation of this animal has become an established business, like our oyster fisheries, and thousands are consumed annually. The early Romans considered this animal a dainty dish, and the inhabitants of France, Spain and Italy have inherited or cultivated a liking for the succulent "Shell-fish." This species has been introduced into New Orleans where it is eaten by the French inhabitants. Helix nemoralis, an edible snail of England, with a beautifully banded shell, is sold in the streets of London and eaten much as we eat walnuts, by picking out the animal with a pin! The edible snails, as well as many others, make good and interesting pets in captivity, the Helix pomatia being of such a size that it may be easily studied. It is interesting to watch one of these snails feeding upon a piece of lettuce. First the jaw is seen to protrude and to cut off a small piece of the leaf, which is drawn into the mouth and reduced to still smaller pieces by the rasp-like radula. A large piece of lettuce, after this snail has made a meal upon it, looks as if an army of worms had been at work. The pomatia is also of an inquisitive disposition and will wander about the snailery (or even the whole house if he can get out), examining everything in a very curious manner. No more interesting object can be placed in a library or study than a snailery with several species of snails. They are far superior in interest to goldfish or canaries.

The most interesting snails are by no means the largest. Frequently the small snail shells with their animals have habits or shell structures of absorbing interest. Among these are the Pupas, whose tiny shells frequently reach the astounding size of one-sixteenth of an inch in length! It is not until we place these mites under the microscope that their interesting characters are seen and appreciated. By such an examination we find that the little apertures are armed with many teeth and folds, and sometimes we wonder how it is that the animal ever gets in and out through such a labyrinth of apparent obstructions. These teeth serve in a manner to protect the little animal from its enemies. These tiny shells are always to be found plentifully under starting bark and under chips, stones and debris, in more or less moist localities.

In another genus of Pupidae, Clausilia, nature has provided the aperture of the shell with a little valve called a "clausilium," which acts as a spring door to close the shell against all its enemies. This door is an additional safeguard as the aperture is already provided with numerous teeth and folds. In this manner does Mother Nature look after her children.

It is a curious fact that in all the larger groups of animals there are one or more genera which have the cruel and bloodthirsty propensities of the shark. The Mollusca are no exception to this rule, and we find in the genus Testacella an animal having all the ferocious propensities of the terrible man-eating tiger. This mollusk has a long, worm-like body, the shell being very small and rudimentary, ear shaped, and placed on the extreme posterior end of the animal. Its principal food consists of earth-worms, although it will attack other mollusks and even its own species. It has been likened to the tiger and the shark in its cunning while pursuing its prey and in its ferocity when attacking it. The poor earth-worm stands but a slight chance of escape when Testacella scents it and starts in pursuit. The worm tries to escape by retreating into its underground galleries, but this is of no avail because the mollusk has a long, narrow body and can go wherever the worm does. If the worm, perchance, has the opportunity of retreating far into its galleries, the mollusk will dig tunnels to intercept it. Frequently the mollusk will make a sudden spring upon its victim, taking it by surprise. This slug-like snail will frequently devour a snail much larger than itself, but if the victim is too large for one meal it will be broken in the middle and one half eaten and di-

gested and then the meal completed with the other half.

The Testacella also resembles the tiger and the shark in the possession of long, fang-like teeth upon its radula. These teeth are recurved and aid the mollusk in getting a firm hold upon its victim, and also assist in the operation of swallowing. It is a curious fact that this animal will not feed upon other dead animals nor upon fresh meat, nor freshly-killed worms. Like the snake, which it greatly resembles in habits, it must hunt and kill its own food. Its wanderings are nocturnal and during the day it remains concealed, buried in the earth. Testacella is quite long lived, as snails go, its duration of life being about six years.

A genus allied to Testacella, and having the same predaceous habits, but being protected by a large shell into which the whole animal can withdraw, is the Oleacina or Glandina. The shell is long, with a narrow aperture and a dome-shaped spire; the animal is long and narrow and the head near the mouth is furnished with a pair of elongated lips which may be used as tentacles. The South American species feed on the larger mollusks, as the Bulimus before spoken of, and the aperture of each intended victim's shell is carefully examined before any attempt is made to enter. When our "tiger" is satisfied that its victim is really within, it will enter the aperture and devour the animal. Sometimes it will make a hole for itself in the shell of its victim and will eat the contents through this aperture instead of the natural one. In Florida these animals prey upon the large pulmonates like Lignus and Orthalicus.

Before closing this brief sketch of the Land Mollusks we must not neglect to mention their wonderful protection against the cold of winter and the heat of summer. This is a tough, leathery secretion, which completely covers the aperture, and its formation is thus described by Mr. W. G. Binney in his "Manual of American Land Shells."

"Withdrawing into the shell, it forms over the aperture a membraneous covering, consisting of a thin, semi-transparent mixture of lime, mucus or gelatine, secreted from the collar of the animal. This membrane is called the epiphragm. It is formed in this manner: The animal being withdrawn into the shell, the collar is brought to a level with the aperture, and a quantity of mucus is poured out from it and covers it. A small quantity of air is then emitted from the respiratory foramen, which detaches the mucus from the surface of the collar, and projects it in a convex form, like a bubble. At the same moment the animal retreats farther into the shell, leaving a vacuum between itself and the membrane, which is consequently pressed back by the external air to a level with the aperture, or even farther, so as to form a concave surface, where, having become desiccated and hard, it remains fixed. These operations are nearly simultaneous and occupy but an instant. As the weather becomes colder the animal retires farther into the shell, and makes another septum, and so on, until there are sometimes as many as six of these partitions."

The air-breathing snails which we have so briefly discussed in this article, are but a very limited number of the many thousand species of this very interesting group of animals. Their shells are easily gathered and require but little trouble to prepare for the cabinet and for study. The writer, therefore, trusts that what has been written may act as a stimulus and induce many to take up the collection and study of these beautiful objects.

Frank Collins Baker.

THE GILA MONSTER.

(*Heloderma suspectum*).

The reptile fauna of the North American continent includes a curious lizard known as Gila Monster, in science called Heloderma. It represents a family all to itself, with only two species: Heloderma horridum and Heloderma suspectum.

Francisco Hernandez, a Spanish physician and naturalist, was the first to know of its existence when he found it in Mexico in the year 1651. In an account of his explorations he mentions a lizard three feet long, with a thick-set body, covered with wart-like skin, gaudily colored in orange and black, and generally of such horrid appearance that Wiegmann, another scientist, two hundred years later, called it Heloderma horridum.

For a long time this name was given indiscriminately to all lizards of this kind, living either south or north of the boundary line of Mexico and the United States, till Professor Cope discovered a difference between them and called the variety found in our southwestern territories and states Heloderma suspectum.

Many other naturalists have since taken up the study of this interesting reptile. The result of their observations and experiments was that they all agree in acknowledging the Heloderma as the only poisonous lizard in existence, although their opinions are at variance as to the effect of its venom on the human system. Dr. van Denburgh in his latest researches has found two glands, one on each side of the lower jaw, located between the skin and the bone. Such a venom-producing gland being taken out of its enveloping membrane proves to be not a single body, but an agglomeration of several small ones, differing in size, and each emptying through a separate duct. These glands are not directly communicated to the teeth. When the animal is highly irritated, caused by constant teasing or rough handling or by being trodden upon, the poison is emitted by the glands, gathers on the floor of the mouth, where it mixes with the saliva, and is transmitted through the bite.

A Heloderma has no fangs, but a goodly number of sharp, pointed teeth, both on the upper and lower jaws. They are curved backward and about an eighth of an inch long, or even less than that. The principal characteristic of these teeth is that they are grooved, facilitating thus the flow of the venom into the wound. It bites with an extremely swift dash, directed sideways, and holds on tenaciously to whatever is seized with its powerful jaws. Sumichrast says when the reptile bites it throws itself on its back, but none of the later naturalists makes mention of this peculiarity.

The venom of the Gila Monster injected into the veins and arteries of smaller animals as rats, cavies and rabbits and into the breast of pigeons and chickens, causes death within twenty seconds to seven minutes. Brehm relates that a young Heloderma, and in poor physical condition besides, was induced to bite the leg of a large, well-fed cat, which did not die, but gave signs of prolonged terrible sufferings. It became dull and emaciated and never regained its former good spirits.

Among several cases of Gila Monster bites inflicted on human beings can be quoted that of Dr. Shufeldt, who, in "The AmericanNaturalist," gave an interesting account of the sensations he experienced. It is sufficient to say that the pain, starting from a wound on the right thumb, went like an electric shock through the whole body and was so severe as to cause the victim to faint. Immediate treatment prevented more serious consequences. The Doctor, nevertheless, was a very sick man for several days and began to recover only after a week had elapsed.

The constituents of the venom are as yet not thoroughly known, but it is said to be of an alkaline nature, the opposite

of snake poison, which is acid. It acts upon the heart, the spine and the nerve centers and causes paralysis.

Other scientists claim the saliva of the Heloderma is poisonous only in certain cases and under certain circumstances. It may also depend upon the physical condition of the victim at the time the venom enters into the system. Yet there is little doubt that, if help is not at hand immediately, the bite may prove fatal.

The Apaches stand in dire fear of this animal, so that, at least, with their older people no amount of money seems tempting enough to make them go near it, much less to capture one. A former resident of the territories says both Indians and Mexicans believe firmly that if a Gila Monster only breathes in your face it is quite sufficient to cause immediate death. On an old Indian trail, a good day's journey west from the present site of Phoenix, can be found, crudely outlined on the face of a rock, the picture of two Helodermas pursuing a man who runs to save his life. Numerous hieroglyphic inscriptions tell probably the story of the event and prove not only the prehistoric origin of this primitive piece of art, but also the erroneous ideas which were prevalent in these remote times, for the reptile never attacks and never pursues. It is safe to say that the animal has been vastly misrepresented at all ages.

Nature has kindly provided the Heloderma with a compensation for its partially undeserved bad reputation in giving it beauty. For whosoever looks upon a fine specimen with unprejudiced eyes cannot fail to admire at least the combination of its colors and especially the odd, capriciously disposed markings; the delicately tinted skin, studded in transverse rows with shiny tubercles, like so many beads on strings.

The illustration to this paper is so excellently made that scarcely any description is necessary as to the animal's exterior in color and markings. This Heloderma is a little over nineteen inches in length by ten inches in circumference of the body and five inches at the thickest part of the tail, which makes one-third of the total length of the body. When such a reptile grows to the size of eighteen inches it is called adult. Those growing beyond these figures are unusually large specimens and in very rare instances the species of our illustration reaches the extraordinary length of two feet. An adult Gila Monster weighs about two or three pounds, and in winter less than in summer.

The four short and stubby legs seem quite out of proportion to the massive body, much more so as the two pairs are widely separated lengthwise of the body. When walking the body is elevated, while in rest it lies flat on the ground. Each foot is provided with five digits armed with curved white claws.

The skin has generally the appearance as if covered with rows of uniform beads; but, on closer examination, these beads, or more correctly, tubercles, prove to have different shapes and are differently set, according to the part of the body which they cover. On the head from the nose up to between the eyes they are flat, irregularly cut, closely joined and adhere completely to the skull. Those following form polygonal eminences, each one separated from the other by a circle of tiny dermal granulations, while behind the eyes on both sides of the head they are larger, semi-spherical and stand far apart. The throat and the nape of the neck are studded with very closely set small tubercles, increasing in size only above the forelegs, whence they extend in well-defined, transverse rows along the whole upper side of the body and the tail. The under side of the latter and the abdomen are covered with tessellated scales of a light-brown and dull yellow color arranged in another handsome pattern.

A Heloderma's head, with its triangular shape, is very like that of a venomous snake; it gives the animal—especially when it is raised in anger—a truly awe-inspiring appearance.

The wide-cleft mouth reaches far behind the eyes. These are very small and, like all lizards, provided with eye-lids that close when the animal sleeps. The eye itself has a dark-brown iris, with the round pupil that indicates diurnal or at least semi-nocturnal habits. Between the nostrils, well in front of the blunt nose, is a wide space. The nostrils are so far down as to nearly touch the margin of the supra-labial scales. This position denotes

terrestrial habits in reptiles rather than an all aquatic life. For to most of them water is indispensable to their welfare. Thus the Gila Monster shows this structure as it likes to bathe in shallow water, often for many hours at a time.

The crescent-shaped openings of the ears are situated not far from the edge of the mouth, between the head and the neck, and are partly concealed and also protected by the overlapping gular fold; the tympanum is exposed. The animal sees and hears well. The remaining three senses are more or less concentrated in the tongue which is one of the most remarkable features of the Heloderma. It is slightly forked at the tips, half an inch wide and two to three inches long; it is dark reddish-brown with a shade of purple. When in rest it is drawn together into a small, conical shaped mass, scarcely an inch in length. But as soon as something disturbs the usual quietude of the animal the tongue is thrown out immediately. In fact, it is used for smelling, tasting, feeling. It is used for measuring depth and distance, for expressing desire and satisfaction; and with what rapidity is this instrument of communication projected and retracted!

A Gila Monster may be trusted to some extent as long as the tongue is freely used, but if that is not the case it is wise to be careful in handling it. Fear and hostility are expressed by deep, long-drawn hisses; by opening the mouth to its fullest extent and by quick jerks of the head from one side to the other.

At the present time these reptiles are not so very common. Ever-prevailing superstition among the ignorant and exaggerated bad reputation have brought on a relentless war of extermination against them, so that now in the neighborhood of settlements they are seen seldom if ever. Their center of distribution is more and more confined to the region along the banks of the Gila river in Arizona, although less frequently they may still be found as far west as the Mojave desert in California. But those are wrong who believe that the Heloderma is living only in the most arid portions of the southwest. There are several reasons why the reptile seeks eagerly irrigated places, which are productive of some vegetation, for it needs water, food and shady hiding-places.

In the middle of summer, when even the larger streams are dried up, the Gila Monster retires to some burrow, abandoned by another animal, or to deep crevices in the rocks, and spends there in a torpid state several weeks, until the great rainfalls relieve the country, give fresh plant life and fill again the barren riverbeds. This is the animal's summer retreat. During the course of a year it takes a second and longer one, the regular hibernation, that lasts about from November to the middle of February, when it resumes its outside life again. It loves to bask in the still mild rays of the sun, but as soon as the heat increases the Gila Monster seeks shelter for the day behind stones and bowlders, under clumps of cacti and in small mesquite groves along the river banks. It roams about only after sunset or early in the morning. The idea that this lizard enjoys the quivering heat on an open Arizona plain, while other sun and heat-loving reptiles keep in hiding, is as erroneous as many others. Nothing is so absolutely fatal to the Heloderma as to be exposed only for half an hour to the direct rays of the sun in midsummer. Another reason why it prefers to live in the neighborhood of streams where plant life is more abundant explains itself by the necessity to provide for food.

Whoever has an opportunity to observe reptiles in confinement for an extended period of time can easily draw conclusions as to their mode of living in freedom. A captive Gila Monster is fed on hens' eggs; in summer one each week, in winter one every two or three weeks. It refuses every other kind of food, however temptingly it may be offered, such as mice, frogs, angleworms, mealworms and the like. It is more than probable that in their wild state they live on a similar diet, consisting then of eggs of other lizards, of turtles and of birds. The animal has the reputation of being destructive to the Arizona quail.

Several writers of Natural History add to this a diet of insects, but the embarrassed locomotion of the Heloderma seems to exclude flying and fast-running prey. Nearly all reptiles which feed on eggs climb, as do some snakes, and as

does the slow and clumsy Gila Monster. They are not able to ascend high and straight trees, which, however, are not found in these regions, but they are able to climb bushes and low trees, having somewhat leaning trunks and rough bark. And it is wonderful to see how cleverly it disposes of the sharp claws and the muscular, half-prehensile tail, both in dragging itself up and in retarding an often too rapid descent.

The inquiry may be made: How is it possible that a Heloderma lives on eggs alone when it can find them only during the relatively short time of five or six months? First, it may be remembered that this period corresponds nearly to the active life of the animal before and after estivation. The second and more important reason is its remarkable frugality. The digestive organs are so constructed that they adapt themselves to a fast of many months without injury to the animal.

In captivity the Gila Monster begins to slough about January and continues this process during several months. The epidermis comes off not like a snake's, in a whole piece, but in several, or more frequently in many, fragments.

There is still a wide field open for accurate observation and definite knowledge that we relinquish to the professional naturalist and to those fortunate ones who can study the animal in freedom.

Amelia Walson.

[Editor's Note: The Gila Monster of the illustration is still living and has for some years been the interesting pet of one whose love of nature in all forms has found beauty in the reptile usually shunned alike by the savage and by civilized man.]

BIRD NOTES.

I.

Bit of sunshine taken wings,
Or a spray of golden-rod?
On thistle top he sways and swings,
Or flung high to the sun, he sings—
Perdita—Perdita—Perdita—
'Dita,—Sweet, Sweet—.

II.

Good morning trolled, then all the day,
From thicket hidden bramble bush,
This recluse croons his roundelay.
But startle him,—a flash of gray,
And, Hush—Hush—Hush—Hush—
Go 'way,—Go 'way—.

III.

Wild cherry bough and hanging nest,
And calls amid the apple bloom,
No need to tell whose flaming breast
And fluting note lead all the rest,—
Glory—Glory—Glory—Glory—
Glory,—Come-O, Come-O—.

—Mary Hefferan.

THE POMEGRANATE.

(*Punica granatum.*)

The Pomegranate is tree-like, growing to a height of about fifteen feet and in favorable soil even as high as twenty feet. It is probably native in Persia, though it is found in a wild state in all the countries bordering on the Mediterranean Sea. It is also found in China and Japan and has been brought by man to all of the civilized parts of the globe, where the climate is of a sufficiently high degree of warmth to permit the ripening of its fruit.

This little tree is frequently cultivated not alone for the beauty of its form, but for the beauty of its flowers, which, under cultivation, become doubled and show an increased and striking splendor in the richness of their color.

The etymology of its name is very interesting. The word Pomegranate is from two Latin words, pomum, meaning apple, and granatum, meaning grained or seeded. The former has reference to the shape of the fruit and the latter word to the numerous seeds contained in the pulp. The technical name of the Pomegranate plant is Punica granatum. The generic name Punica is evidently from the Latin word punicus, meaning red, and refers to the red color of the pulp or possibly also to the scarlet flowers. The name Punicus was also used by the Romans with reference to the Carthaginians, and signified untrustworthy or treacherous, this people having such a reputation with them; thus the name may have been applied to this fruit which, though it delights the eye, is disappointing to the taste.

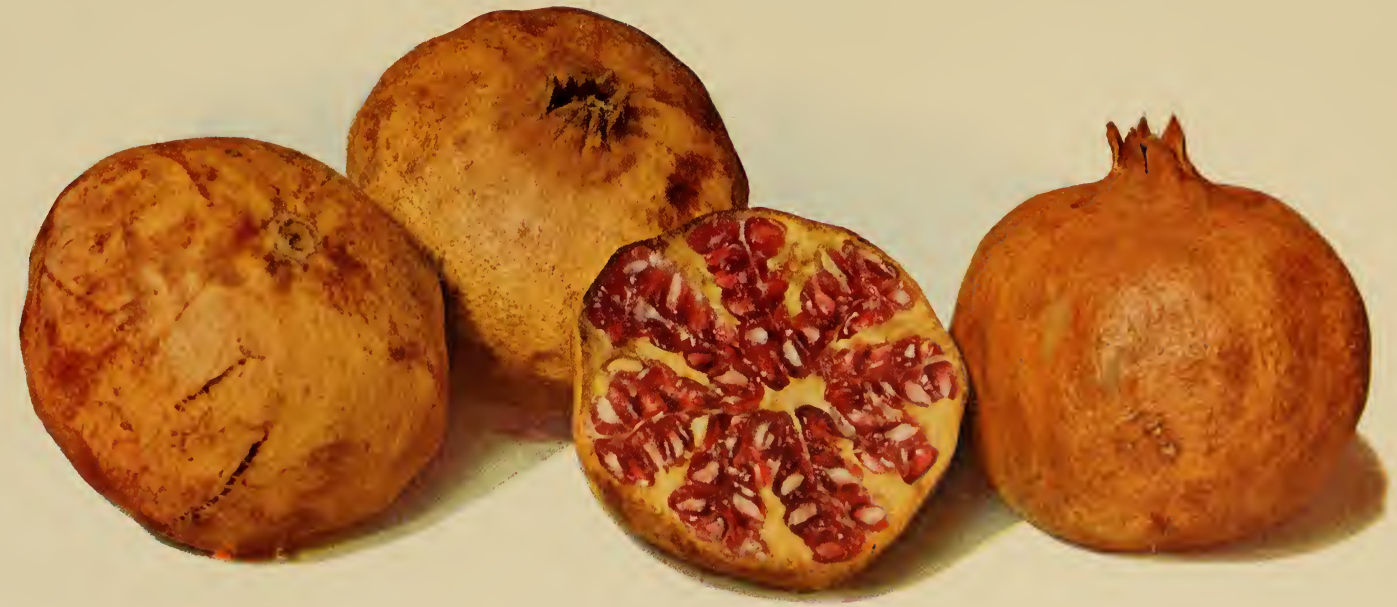
Pliny tells us that the Pomegranate was extensively cultivated by the Carthaginians at their home in Northern Africa. This may have been the reason why the name Punica was selected for the genus by Linnaeus. The Romans also called it "Pomum Punicum," or Carthage apple.

That the knowledge of this tree is of great antiquity is shown in many ways. It is frequently referred to in ancient Sanskrit writings of a time earlier than that of the Christian Era. In this language it was called "Dadimba." Homer, in the Odyssey, speaks of its cultivation in the gardens of the kings of Phrygia and Phaecia. There are frequent references to it in the Old Testament. In the directions for making Aaron's robe we find the following passage: "Upon the skirts of it thou shalt make pomegranates of blue, and of purple, and of scarlet," and again, "They made bells of pure gold, and put the bells between the pomegranates." Hiram, in the building of Solomon's house, used the design of the Pomegranate. In the seventh chapter of the First Book of Kings we find "the pomegranates were two hundred, in rows round about upon the other chapiter," and in another verse we are told that they were of brass.

Moses spoke of the promised land as a land of "wheat, barley and vines, figtrees and pomegranates." Solomon indicates that this fruit was cultivated in his time as he speaks of an "orchard of pomegranates with pleasant fruits."

The Pomegranate is frequently represented in the ancient sculptures of the Assyrians and of the Egyptians.

The Pomegranate belongs to the family of plants called Lythraceae. This family has about three hundred and fifty species which are widely distributed, but are most abundant in tropical regions, especially in America. In discribing the tree Dr. Oliver R. Willis gives the following characteristics: "Branches straight, strong, sub-angular, armed near the ends with spines; young shoots and buds red. Leaves opposite or fascicled, short-stalked, and without stipules. Flowers large, solitary, or two or three together in the axils of the leaves, near



POMEGRANATE.
(Punica granatum.)
⅔ Life-size.

the ends of the branchlets. A beautiful object for planted grounds."

The color of the flowers, which develop on the ends of the younger branches, is a deep and rich scarlet or crimson. Many variations have been produced by growing the plants from seeds and one of these bears white flowers. The petals are rounded and usually crumpled.

The fruit, which is a berry about the size of an ordinary orange, is when fresh usually of a reddish yellow color, becoming brownish in drying. The rind is thick and leathery, and encloses a quantity of pulp which is filled with a refreshing juice that is acid. It is of a pinkish or reddish color, and encloses the numerous angular seeds. Probably the chief value of the plant lies in the use of the fruit as a relish, though the rind of the fruit and the bark of the root are used in medicine.

The bark contains a large amount of tannin and from it there is also obtained a bright yellow dye, which is used to produce the yellow Levant Morocco.

In regions without frost the tree is often grown for ornamental purposes.

FISHES AND FISH-CULTURE AMONG THE GREEKS AND ROMANS.

Greek mythology shows us that for a long time, perhaps many centuries, the ancestors of the Greeks knew but very little about the sea or about rivers. The numerous monsters of the sea, products of the imagination, combined in their forms the parts of marine and land animals, including man. The angry waves suggested to them some creature that was wroth; in the ocean depths what more likely to be found than the caverns empty and dry, the homes of the monsters with which they had peopled it? Their knowledge of the sea was of very slow growth. It was yet a divine thing in Homer's time, who lived just before the dawn of history. Their knowledge of marine life had made but little if any greater advance than their knowledge of the sea itself. The people of Homer make no use whatever of fish. We do not find a word indicating that either noble or slave ate fish, although the bill of fare in the Homeric household is given to us with considerable fullness.

Passing over two centuries or more to the Athens of Pericles' time, we will find that a great change has been wrought. Fish is now the daintiest viand that comes into the Athenian market. The fishing industry has developed and grown to immense proportions. The fishmonger has taken on a character which seems destined to be eternal. Till this day it has suffered no change except that he has transferred to his wife some of the traits that once were his.

The task of supplying the fish-market of Athens and other cities must have required a large number of fishermen. For at this time fish might almost be called the national dish, hence an enormous consumption, whereas the means of capture were far inferior to those of today. As a matter of fact the market was supplied from a very wide area, but chiefly from the seas to the east. Far along the north and south shores of the Black Sea the industry was a flourishing one. Particularly from these regions were salted and dried fish supplied. Here they were prepared in the huts of the individual fisherman and were gathered up by the traders, who sailed their little boats far and wide in search of traffic. The fish were exchanged for merchandise, especially for earthen utensils and for clothing. These salted and dried fish were the staple varieties and were supplied to the

market in great quantities, as they were the principal food of the poorer classes and were sold very cheap.

The hours for the fish market in Athens must have been a time of very great interest, not only to the Athenian householder but to the foreigner sojourning within the city. To preserve order and also to give all customers an equal chance to procure the rare specimens offered for sale, several stringent laws were enacted to govern the market. Among other regulations was one requiring the opening of the market to be announced by the ringing of a bell. Apparently there was no fixed moment of time when this bell should be rung, but the time varied little from day to day. If we can believe our ancient authorities, the ringing of the bell was the occasion for a rush, pellmell, to the market, each seeking to obtain the first choice. Strabo tells us an interesting story anent this custom. On one occasion a musician was performing before a number of invited guests, and when, in the midst of a composition, the bell rang, in a moment the guests were up and away to the market, all except one man, who was deaf. When the lyrist had finished he was very careful to thank his lone auditor for his courtesy in remaining to hear him through, instead of running away when the bell rang, as the rest did. "Oh, has the bell rung?" asked the deaf man. And when informed that it had, he, too, hastened to the market.

The Greek interest in fishes seems never to have gone beyond their utility as an article of food. The building of aquaria and fish-ponds never came to be the sport of the Greeks, although they became extravagant luxuries among the Romans. Likewise fishing never became the sport of a Greek gentleman, unless, perchance, at a rather late period. Plato excludes fishing from the sports of a free-born gentleman. The only sport he would have him engage in was the chase, which, athletic games aside, was about the only outdoor sport a Greek gentleman seems to have indulged in. For instance, there is no mention in Greek literature of horseback riding as a pastime, yet horsemanship was an accomplishment in which every Greek gentleman received special training. Likewise, though fishing was not a recognized sport, yet the science of angling was well understood among them by the third century B. C., and probably much earlier. This we learn from a beautiful poem by the Alexandrian poet Theocritus, entitled "The Fishermen." I will quote a portion of the poem translated into prose, partly because it gives us a picture of some ancient professional fishermen in the camp, partly because it mentions all the ancient instruments of the business.

"Two fishers, on a time, two old men, together lay and slept; they had strown the dry sea-moss for a bed in their wattled cabin, and there they lay against the leafy wall. Beside them were strewn the instruments of their toilsome hands, the fishing-creels, the rods of reed, the hooks, the sails bedraggled with sea-spoil, the lines, the weels, the lobster pots woven of rushes, the seines, two oars, and an old coble upon props. Beneath their heads was a scanty matting, their clothes, their sailor's caps. Here was all their toil, here all their wealth. The threshold no door did guard nor a watch-dog; all these things, all, to them seemed superfluity, for Poverty was their sentinel. They had no neighbor by them, but ever against their narrow cabin gently floated up the sea."

Long before daylight one of them awoke and aroused his companion to tell him the dream he had had. I shall quote the dream, as it graphically describes an ancient angler busy at his task: "As I was sleeping late, amid the labors of the salt sea (and truly not too full-fed, for we supped early, if thou dost remember, and did not overtax our bellies), I saw myself busy on a rock, and there I sat and watched the fishes, and kept spinning the bait with the rods. And one of the fish nibbled, a fat one, for in sleep dogs dream of bread, and of fish dream I. Well, he was tightly hooked, and the blood was running, and the rod I grasped was bent with his struggle. So, with both hands, I strained and had a sore tussle for the monster. How was I ever to land so big a fish with hooks all too slim! Then, just to remind him he was hooked, I gently pricked him, pricked, and slackened, and, as he did not run, I took in line. My toil

was ended with the sight of my prize; I drew up a golden, look you, a fish all plated thick with gold. Gently I unhooked him * * * then I dragged him on shore with the ropes."

I leave to the reader the pleasant task of comparing the ancient tackle with the modern. It must be said, however, that the description is rather ideal for the Mediterranean fisherman displays no science in landing his game, but simply throws it high and dry or breaks his tackle. This fact is well attested for the ancients, by several vase and wall paintings portraying fishermen actually at work. These paintings show us that the ancient outfit included a basket, frequently with a long handle, and a vase painting in Vienna undoubtedly suggests its use. The man has caught a fish which he is lifting straight up out of the water, at the same time he is reaching down with his basket, evidently to scoop up the fish just before it leaves the water, similar to the practice in trout-fishing to-day.

Before passing over the Ionian Sea to observe what the Romans did in this field of activity, the quasi-scientific study of fishes among the Greeks, particularly that of Aristotle, should claim our attention. Compared with the work of the moderns Aristotle's work was crude indeed. Estimated as the first attempts at building up a science his work deserves our admiration and, in view of the fact that his writings were standard for nearly two thousand years, it demands our respect.

Aristotle did his work in natural history under the patronage of King Philip of Macedon, who drew upon the resources of the empire to provide him with rare or little known specimens from far and wide. How some of his conclusions were based on insufficient data and are consequently very inaccurate, or even grotesque, his discussion of the eel will illustrate. It must not be taken as a fair sample of his work in general. In fact, it is very unusual. "Among all the animals," he says, "which have blood, the eel is the only one which is not born of copulation or hatched from eggs. The correctness of this statement is evident from the fact that eels make their appearance in marshy bodies of water, and that, too, after all the water has been drawn off and the mud removed, as soon as the rain-water begins to fill these lakes. They are not produced in dry weather, not even in lakes that never become dry, for they live on the rain-water. It is, therefore, plain that their origin is not due to procreation or to eggs. In spite of this some people think that they are viviparous, because worms have been found in the intestines of some eels, which they believe are the young of the eel. This opinion, however, is erroneous, for they are produced from the so-called 'bowels of the earth' (i. e., the earth-worms), the spontaneous product of mud and moisture."

Turning now to the Romans, we find a somewhat different state of affairs, but different only on the aesthetic side; from a scientific or industrial point of view the Roman, though heir to all the Greek civilization and learning, in this, as in many other lines, made but slight advances.

Fish culture never became a serious occupation among the Romans. It was a pastime, one of the many directions which their senseless luxury took rather than a carefully directed effort to stock ponds and rear fish for food, or as a means of nature study. The immense ponds were stocked with rare fish in preference to useful varieties. Next to the rare species those that could be tamed were in favor. A qualification of the above statements should be made probably, in favor of the Romans who lived during the early Republican period of whom Columella, a Roman writer, has the following to say in his book entitled De Re Rustica: "The descendants of Romulus, although they were country folk, took great pains in having upon their farms a sort of abundance of everything which the inhabitants of the city are wont to enjoy. To this end they did not rest contented with stocking with fish the ponds that had been made for this purpose, but in their foresight went to the extent of supplying the ponds formed by nature with the spawn of fish. By this means the lakes Velinus and Sabitinus, and likewise Vulsmensis and Ciminus have furnished in great abundance not only catfish and goldfish, but also all the other varieties of fish which flourish in fresh water." Such were the practices of the Roman country folk in early times, but, strange as it may

seem in view of the extravagance of which the fish pond became the object in later times, no measures were taken to secure the reproduction and free development of staple food fishes.

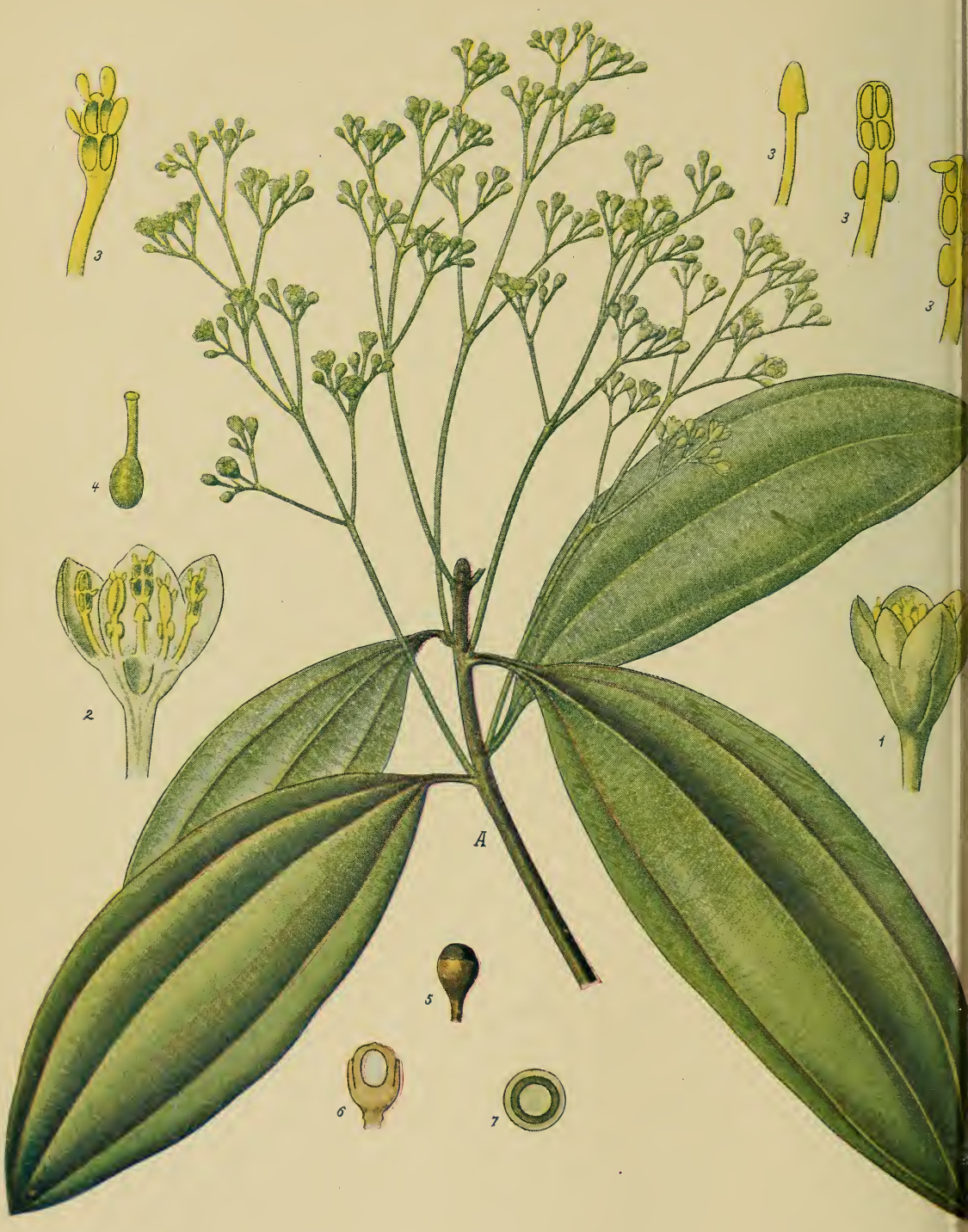
It is well known that the ancients had a remarkable predilection for fish as a food. The principal luxury of the Roman banquets consisted of fish, and the poets speak of sumptuous tables spread with them exclusively. In the period between the taking of Carthage and the reign of Vespasian, this taste became a perfect passion, and for its gratification the senators and patricians, enriched by the spoils of Asia and Africa, incurred the most foolish expense. Thus Licinius Murena, Quintus Hortensius and Lucius Philippus, spent millions on their fish ponds and in stocking them with rare species. Lucullus was by far the most extravagant of these fish fanciers. A fish pond was to him very much what the yacht is to the modern millionaire. It is his name that we find so frequently in Cicero's letters, when he and his set come in for several cleverly-framed rebukes. "No matter," says Cicero, "about the state, if only their fish-ponds escape harm." It was Lucullus who had a channel cut through a mountain at an immense outlay of money, in order to let salt water into his fish-ponds. We are told by Varro that one Hirrius had an income of nearly $700,000 from his Roman real estate, and spent the whole amount on his fish-ponds. Some of these fish-ponds were very elaborate. They were constructed with many compartments, in which they kept the different varieties. The care of these ponds, and the feeding of the animals, required a large force of trained men and assistants who, we can infer, learned a great deal about the habits of fishes, their favorite food, and how to propagate them, but their information was never reduced to anything like a science.

That foolish extravagance of the Roman nobles produced but two results, the less of which was the impoverishment of some of Rome's wealthiest families; the other and more unfortunate result was the destruction of the fishes along the Mediterranean Sea.

Probably the sole contribution to fish-culture resulting from all this extravagance, was the introduction of gold-fish into an artificial habitat and providing them shell-fish for nourishment.

In conclusion, I will note some of the forms that were most popular among the Romans, either for table use or for the aquarium. For these we are indebted to a mosaic discovered in Pompeii. They are formed as they were seen by the artist in an aquarium, but in the mosaic they are supposed to be seen as if in the sea. The varieties found are: They grey mullet, electric ray, gilt-head, muraena, scorpion fish, crawfish, devil-fish, dog-fish, red-mullet, bass, spinola, red gumara, nautis prawn, and from another mosaic may be added the soft prawn, squid and some other species whose English names I do not know.

T. Louis Comparette.



CASSIA CINNAMON.

CHICAGO:
A. W. MUMFORD, PUBLISHER

CINNAMON.

(*Cinnamomum cassia blume.*)

"*Sinament* and ginger, nutmegs and cloves,
And that gave me my jolly red nose."
—*Ravenscroft, Deuteromela, Song 7 (1609).*

The cinnamons of the market are the inner barks obtained from trees of tropical countries and islands. The plants are quite ornamental; twenty to forty feet high; smooth, enduring, green, simple and entire leaves. The flowers are small and very insignificant in appearance.

Cinnamon is an old-time, highly-priced spice. It is mentioned in the herb book of the Chinese emperor Schen-nung (2700 B. C.), where it is described under the name Kwei. From China it was introduced into Egypt about 1600 or 1500 B. C. The cinnamon and cassia mentioned in the Bible were introduced by the Phoenicians. About 400 or 300 B. C. cinnamon still belonged to the rarities of the market and little was known regarding its origin and cultivation. Plinius stated that it was not a native of Arabia, but does not explain what its native country was. About the fourth century of our era cinnamon found its way into Turkey and Asia Minor, where it was employed as incense in church ceremonies. In the sixth century Trallianus recommended the still very expensive spice for medicinal purposes. During the tenth century the price of this article became much reduced and it was used as a spice, principally in the preparation of fish meats. In England it was used in veterinary practice. Although China is undoubtedly the home of the cinnamons they were apparently entirely overlooked by Marco Polo, the eminent traveler and historian, who visited the greater part of China. Oil of cinnamon was prepared as early as 1540.

There are several varieties of cinnamon upon the market. Cassia cinnamon, which is a Chinese variety, is obtained from Cinnamomum cassia. The bark is quite thick and contains only a small amount of volatile or ethereal oil. It is of little value yet it is exported on a large scale. It forms the cheap cinnamon of the market. There are other Chinese cinnamons of good quality which constitute the principal commercial article. The Saigon cinnamon is by far the best article. It also is Chinese, obtained from an undetermined species. It is the strongest and spiciest of the cinnamons and it is the only variety official in the United States Pharmacopoeia. The bark is of medium thickness, deep reddish brown and rich in volatile oil. The Ceylon cinnamon, from India, is noted for the delicacy of its flavor, but it contains comparatively little volatile oil. The bark is very thin and of a lighter brown color than that of the Saigon cinnamon.

Nearly all of the cinnamon of the market is obtained from cultivated plants. There are large plantations in southeastern China, Cochin-China, India, Sunda islands, Sumatra, Java and other tropical countries and islands. In many instances little or nothing is known regarding the cultivation, collecting and curing of cinnamons. As a rule the trees are pruned for convenience in collecting the bark. In the better-grade cinnamons the bark from the younger twigs only (1½ to 2 years old) is collected. This is removed in quills, the outer corky inert layers being discarded and dried. As the drying proceeds the smaller quills are telescoped into the larger for convenience in handling, packing and shipping. The color changes to a reddish brown and the aroma increases. Two crops are collected annually; one, the principal crop, in May and June; the second from November to January. The blossoms are formed during May and June and the fruit ripens in January; these periods correspond to the

periods of collecting. The older, dry, corky bark should not be collected, as it contains little volatile oil. In all carefully prepared cinnamons the outer bark layers are removed by scraping.

Cinnamon is quite frequently adulterated; poor qualities are substituted for good qualities or added to the better qualities. This applies especially to ground cinnamon.

Cinnamon is one of the richest of the spices. Its flavor is quite universally liked. It is employed in pies and other pastry, in drinks, in the preparation of hair oils and hair tonics, in confectionery, with pickles, etc., etc. Medicinally it is employed as a corrective, in dysentery and in coughs. The excessive consumption of spices, cinnamon included, is a pernicious practice, as may be gathered from the opening quotation from Ravenscroft. Spices cause pathological changes in stomach, the liver and other glandular organs in particular. Quite frequently those addicted to the use of spices are also addicted to the use of alcoholic drinks, and it is more than likely that the "jolly red nose" referred to was caused by the alcoholic stimulants rather than the spices.

The not fully matured flowers are known as cassia buds and are used as a spice. They are not unlike cloves in appearance. The roots of the various cinnamon trees yield camphor. The leaves yield volatile oil and the seeds a faintly aromatic fat.

Description of Plate: A, flowering twig; 1, diagram of flower; 2, 3, flower; 4, stamen; 5, pistil; 6, fruit.

Albert Schneider.

AT DUSK.

Dark shadows fall upon the earth,
Cool vapors rise in air,
The screech-owl in the copse is heard,
The bees are freed from care.

The butterfly has closed its wings,
The lark has gone to rest;
The nightingale in tree-top sings;
To sleep the crow thinks best.

The lightning bug glows in the brake;
The cricket chirps beneath the stone;
The whip poor will is yet awake,
The bull-frog calls in deep, low tone.

The flowers droop their weary heads,
The leaves are nodding in the breeze;
Young birdlings sleep in downy beds;
Squirrels are resting in the trees.

The bats are flying low and high;
The fishes rest in waters deep.
The red has gone from western sky,
All nature soon will be asleep.

Albert Schneider.

BIRDS AND NATURE.

ILLUSTRATED BY COLOR PHOTOGRAPHY.

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SPRING.

Gentle Spring! in sunshine clad,
  Well dost thou thy power display!
For Winter maketh the light heart sad,
  And thou, thou makest the sad heart gay.
He sees thee, and calls to his gloomy train,
The sleet, and the snow, and the wind, and the rain;
And they shrink away, and they flee in fear,
  When thy merry step draws near.

Winter giveth the fields and the trees, so old,
  Their beards of icicles and snow;
And the rain, it raineth so fast and cold,
  We must cower over the embers low;
And, snugly housed from the wind and weather,
Mope like birds that are changing feather.
But the storm retires, and the sky grows clear,
  When thy merry step draws near.

Winter maketh the sun in the gloomy sky
  Wrap him around with a mantle of cloud;
But, Heaven be praised, thy step is nigh;
  Thou tearest away the mournful shroud,
And the earth looks bright, and Winter surly,
Who has toiled for naught both late and early,
Is banished afar by the new born year,
  When thy merry step draws near.

—From the French of Charles D'Orleans,
Henry Wadsworth Longfellow.

ABOUT PARROTS.

Naturalists place the parrot group at the head of bird creation. This is done, not, of course, because parrots can talk, but because they display, on the whole, a greater amount of intelligence, of cleverness and adaptability to circumstances than other birds, including even their cunning rivals, the ravens and the jackdaws.

It may well be asked what are the causes of the exceptionally high intelligence in parrots. The answer which I suggest is that an intimate connection exists throughout the animal world between mental development and the power of grasping an object all round, so as to know exactly its shape and its tactile properties. The possession of an effective prehensile organ—a hand or its equivalent—seems to be the first great requisite for the evolution of a high order of intellect. Man and the monkeys, for example, have a pair of hands; and in their case one can see at a glance how dependent is their intelligence upon these grasping organs. All human arts base themselves ultimately upon the human hand; and our nearest relatives, the anthropoid apes, approach humanity to some extent by reason of their ever-active and busy little fingers. The elephant, again, has his flexible trunk, which, as we have all heard over and over again, is equally well adapted to pick up a pin or to break the great boughs of tropical forest trees. The squirrel, also, remarkable for his unusual intelligence when judged by a rodent standard, uses his little paws as hands by which he can grasp a nut or fruit all round, and so gain in his small mind a clear conception of its true shape and properties. Throughout the animal kingdom generally, indeed, this chain of causation makes itself everywhere felt; no high intelligence without a highly-developed prehensile and grasping organ.

Perhaps the opossum is the best and most crucial instance that can be found of the intimate connection which exists between touch and intellect. The opossum is a marsupial; it belongs to the same group of lowly-organized, antiquated and pouch-bearing animals as the kangaroo, the wombat, and other Australian mammals. Everybody knows that the marsupials, as a class, are preternaturally dull—are perhaps the least intelligent of all existing quadrupeds. And this is reasonable when one considers the subject, for they represent a very early type, the first "rough sketch" of the mammalian idea, with brains unsharpened as yet by contact with the world in the fierce competition of the struggle for life as it displays itself on the crowded stage of the great continents. They stand, in fact, to the lions and tigers, the elephants and horses, the monkeys and squirrels of America and Europe, as the native Australian stands to the American or the Englishman. They are the last relic of the original secondary quadrupeds, stranded for centuries on a Southern island, and still keeping up among Australian forests the antique type of life that went out of fashion elsewhere a vast number of years ago. Hence they have brains of poor quality, a fact amply demonstrated by the kangaroo when one watches his behavior in the zoological gardens.

Every high-school graduate is well aware that the opossum, though it is a marsupial, differs in psychological development from the kangaroo and the wombat. The opossum is active and highly intelligent. He knows his way about the world in which he lives. "A 'possum up a gum tree" is accepted by observant minds as the very incarnation of animal cunning and duplicity. In negro folklore the resourceful 'possum takes the place of the fox in European stories; he is the Macchiavelli of wild beasts; there is no ruse on earth of which he is not amply capable; and no wily manoeuvre exists which he cannot carry to an end successfully. All guile and intrigue, the

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OWL PARROT (NEW ZEALAND).
(Strigops habroptilus.)
1/3 Life-size.

'possum can circumvent even Uncle Remus himself by his crafty diplomacy. And what is it that makes all the difference between this 'cute marsupial and his backward Australian cousins? It is the possession of a prehensile hand and tail. Therein lies the whole secret. The opossum's hind foot has a genuine apposable thumb; and he also uses his tail in climbing as a supernumerary hand, almost as much as do any of the monkeys. He often suspends himself by it, like an acrobat, swings his body to and fro to obtain speed, then lets go suddenly, and flies away to a distant branch, which he clutches by means of his hand-like hind foot. If the toes make a mistake, he can recover his position by the use of his prehensile tail. The result is that the opossum, being able to form for himself clear and accurate conceptions of the real shapes and relations of things by these two distinct grasping organs, has acquired an unusual amount of general intelligence. And further, in the keen competition for life, he has been forced to develop an amount of cunning which leaves his Australian poor relations far behind in the Middle Ages of psychological evolution.

At the risk of appearing to forsake my ostensible subject altogether, I must pause for a moment to answer a very obvious objection to my argument. How about the dog and the horse? They have no prehensile organ, and yet they are admitted to be the most intelligent of all quadrupeds. The cleverness of the horse and the dog, however, is acquired, not original. It has arisen in the course of long and hereditary association with man, the cleverest and most serviceable individuals having been deliberately selected from generation to generation as dams and sires to breed from. We cannot fairly compare these artificial human products with wild races whose intelligence is entirely self-evolved. In addition, the horse has, to a slight extent, a prehensile organ in his mobile and sensitive lip, which he uses like an undeveloped or rudimentary proboscis with which he can feel things all over. We may conclude, I believe, that touch is "the mother-tongue of the senses;" and that in proportion as animals have or have not highly developed and serviceable tactile organs will they rank high or low in the intellectual hierarchy of nature. It may well be asked how all this concerns the family of parrots. In the first place, anybody who has ever kept a parrot or a macaw in slavery is well aware that in no other birds do the claws so closely resemble a human or simian hand, not indeed in outer form or appearance, but in apposability of the thumbs and in perfection of grasping power. The toes upon each foot are arranged in opposite pairs—two turning in front and two backward, which gives all parrots their peculiar firmness in clinging on a perch or on the branch of a tree with one foot only, while they extend the other to grasp a fruit or to clutch at any object they desire to possess. This peculiarity, it must be admitted, is not confined to the parrots, for they share the division of the foot into two thumbs and two fingers with a large group of allied birds, called, in the exact language of technical ornithology, the Scansorial Picarians, and more generally known by their several names of cockatoos, toucans and wood-peckers. All the members of this great group, of which the parrots proper are only the most advanced and developed family, possess the same arrangement of the digits into front-toes and back-toes, and in none is the power of grasping an object all round so completely developed and so full of intellectual consequences.

All the Scansorial Picarians are essentially tree-haunters; and the tree-haunting and climbing habit seems specially favorable to the growth of intellect. Monkeys, squirrels, opossums, wild cats, are all of them climbers, and all of them, in the act of climbing, jumping, and balancing themselves on boughs, gain such an accurate idea of geometrical figures, distance, perspective and the true nature of space-relations, as could hardly be acquired in any other way. In a few words, they thoroughly understand the tactual realities that answer to and underlie each visible appearance. This is, in my opinion, one of the substrata of all intelligence; and the monkeys, possessing it more profoundly than any other animals, except man, have accordingly reached a very high place in the competitive ex-

amination perpetually taking place under the name of Natural Selection.

So, too, among birds, the parrots and their allies climb trees and rocks with exceptional ease and agility. Even in their own department they are the great feathered acrobats. Anybody who watches a wood-pecker, for example, grasping the bark of a tree with its crooked and powerful toes, while it steadies itself behind by digging its stiff tail-feathers into the crannies of the outer rind, will readily understand how clear a notion the bird must gain into the practical action of the laws of gravity. But the true parrots go a step further in the same direction than the wood-peckers or the toucans; for in addition to prehensile feet, they have also a highly-developed prehensile bill, and within it a tongue which acts in reality as an organ of touch. They use their crooked beaks to help them in climbing from branch to branch; and being thus provided alike with wings, hands, fingers, bill and tongue, they are the most truly arboreal of all known animals, and present in the fullest and highest degree all the peculiar features of the tree-haunting existence.

Nor is this all. Alone among birds or mammals, the parrots have the curious peculiarity of being able to move the upper as well as the lower jaw. It is this strange mobility of both the mandibles together, combined with the crafty effect of the sideways glance from those artful eyes, that gives the characteristic air of intelligence and wisdom to the parrot's face. We naturally expect so clever a bird to speak. And when it turns upon us suddenly with some well-known maxim, we are not astonished at its remarkable intelligence.

Parrots are true vegetarians; with a single degraded exception, to which I shall recur hereafter, they do not touch animal food. They live chiefly upon a diet of fruit and seeds, or upon the abundant nectar of rich tropical flowers. And it is mainly for the purpose of getting at their chosen food that they have developed the large and powerful bills which characterize the family. Most of us have probably noticed that many tropical fruit-eaters, like the hornbills and the toucans, are remarkable for the size and strength of their beaks; and the majority of thinking people are well acquainted with the fact that tropical fruits often have thick or hard or bitter rinds, which must be torn off before the monkeys or birds, for whose use they are intended, can get at them and eat them.

As monkeys use their fingers in place of knives and forks, so birds use their sharp and powerful bills. No better nut-crackers and fruit-parers could possibly be found. The parrot, in particular, has developed for the purpose his curved and inflated beak—a wonderful weapon, keen as a tailor's scissors, and moved by powerful muscles on both sides of the face which bring together the cutting edges with extraordinary energy. The way the bird holds a fruit gingerly in one claw, while he strips off the rind dexterously with his under-hung lower mandible, and keeps a sharp look-out meanwhile for a possible intruder, suggests to the observing mind the whole living drama of his native forest. One sees in that vivid world the watchful monkey ever ready to swoop down upon the tempting tail-feathers of his hereditary foe; one sees the parrot ever prepared for his rapid attack, and eager to make him pay with five joints of his tail for his impertinent interference with an unoffending fellow-citizen of the arboreal community.

Of course there are parrots and parrots. The great black cockatoo, for example, the largest of the tribe, lives almost exclusively upon the central shoot of palm-trees; an expensive kind of food, for when once this so-called "cabbage" has been eaten the tree dies, so that each black cockatoo must have killed in his time whole groves of cabbage-palms. Other parrots live on fruits and seeds; and quite a number are adapted for flower-haunting and honey-sucking.

As a group, the parrots must be comparatively modern birds. Indeed, they could have no place in the world till the big tropical fruits and nuts were beginning to be developed. And it is now generally believed that fruits and nuts are for the most part of recent and special evolution. To put the facts briefly, the monkeys and parrots developed the fruits and nuts, while the fruits and nuts returned the compliment by developing

conversely the monkeys and parrots. In other words, both types grew up side by side in mutual dependence, and evolved themselves pari passu for one another's benefit. Without the fruits there could be no fruit-eaters; and without the fruit-eaters to disperse their seeds, there could not be any great number of fruits.

Most of the parrots very much resemble the monkeys and other tropical fruit-eaters in their habits and manners. They are gregarious, mischievous and noisy. They have no moral sense, and are fond of practical jokes. They move about in flocks, screeching aloud as they go, and alight together on some tree well covered with berries. No doubt they herd together for the sake of protection, and screech both to keep the flock in a body and to strike consternation into the breasts of their enemies. When danger threatens, the first bird that perceives it sounds a note of warning; and in a moment the whole troupe is on the wing at once, vociferous and eager, roaring forth a song in their own tongue, which may be interpreted to mean that they are ready to fight if it is necessary.

The common gray parrot, the best known in confinement of all his kind, and unrivalled as an orator for his graces of speech, is a native of West Africa. He feeds in a general way upon palm-nuts, bananas, mangoes, and guavas, but he is by no means averse, if opportunity offers, to the Indian corn of the industrious native. It is only in confinement that this bird's finer qualities come out, and that it develops into a speechmaker of distinguished attainments.

A peculiar and exceptional offshoot of the parrot group is the brush-tongued lory, several species of which are common in Australia and India. These interesting birds are parrots which have a resemblance to humming birds. Flitting about from tree to tree with great rapidity, they thrust their long extensible tongues, penciled with honey-gathering hairs, into the tubes of many big tropical blossoms. The lories, indeed, live entirely on nectar, and they are so common in the region they have made their own that the larger flowers there present the appearance of having been developed with a special view to their tastes and habits, as well as to the structure of their peculiar brush-like honey-collector. In most parrots the mouth is dry and the tongue horny; but in the lories it is moist and much more like the same organ in the humming-birds and the sun-birds. The prevalence of very large and brilliantly-colored flowers in the Malayan region must be set down for the most part to the selective action of the color-loving, brush-tongued parrots.

The Australian continent and New Zealand, as everybody knows, are the countries where everything goes by contraries. And it is here that the parrot group has developed some of its most curious offshoots. One would imagine beforehand that no two birds could be more unlike in every respect than the gaudy, noisy, gregarious cockatoos and the sombre, nocturnal, solitary owls. Yet the New Zealand owl-parrot is a lory which has assumed all the appearances and habits of an owl. A lurker in the twilight or under the shades of night, burrowing for its nest in holes in the ground, it has dingy brown plumage like the owls, with an undertone of green to bespeak its parrot origin; while its face is entirely made up of two great disks, surrounding the eyes, which succeed in giving it a most marked and unmistakable owl-like appearance.

Why should a parrot so strangly disguise itself and belie its ancestry? The reason is not difficult to discover. It found a place for itself ready made in nature. New Zealand is a remote and sparsely-stocked island, peopled by various forms of life from adjacent but still distant continents. There are no dangerous enemies there. Here, then, was a great opportunity for a nightly prowler. The owl-parrot, with true business instinct, saw the opening thus clearly laid before it, and took to a nocturnal and burrowing life, with the natural consequence that those forms survived which were dingy in color. Unlike the owls, however, the owl-parrot, true to the vegetarian instincts of the whole lory race, lives almost entirely upon sprigs of mosses and other creeping plants. It is thus essentially a ground bird; and as it feeds at night in a country possessing no native beasts of prey, it has almost lost

the power of flight, and uses its wings only as a sort of parachute to break its fall in descending from a rock or a tree to its accustomed feeding-ground. To ascend a steep place or a tree, it climbs, parrot-like, with its hooked claws, up the surface of the trunk or the face of the precipice.

Even more aberrant in its ways, however, than the burrowing owl-parrot, is that other strange and hated New Zealand lory, the kea, which, alone among its kind, has adjured the gentle ancestral vegetarianism of the cockatoos and macaws, in favor of a carnivorous diet of remarkable ferocity. And what is stranger still, this evil habit has been developed in the kea since the colonization of New Zealand by the British, the most demoralizing of new-comers, as far as all aborigines are concerned. The English settlers have taught the Maori to wear silk hats and to drink strong liquors, and they have thrown temptation in the way of even the once innocent native parrot. Before the white man came, the kea was a mild-mannered, fruit-eating or honey-sucking bird. But as soon as sheep-stations were established on the island these degenerate parrots began to acquire a distinct taste for raw mutton. At first they ate only the offal that was thrown out from the slaughter-houses, picking the bones as clean of meat as a dog or a jackal. But in course of time, as the taste for blood grew, a new and debased idea entered their heads. If dead sheep are good to eat, are not living ones? The keas, having pondered deeply over this abstruse problem, solved it in the affirmative. Proceeding to act upon their convictions, they invented a truly hideous mode of procedure. A number of birds hunt out a weakly member of a flock, almost always after dark. The sheep is worried to death by the combined efforts of the parrots, some of whom perch themselves upon the animal's back and tear open the flesh, their object being to reach the kidneys, which they devour at the earliest possible moment. As many as two hundred ewes are said to have been killed in a single night on one "station"—ranch, we should call it. I need hardly say that the New Zealand sheep-farmer resents this irregular procedure, so opposed to all ideas of humanity, to say nothing of good-farming, and, as a result, the existence of the kea is now limited to a few years. But from a purely psychological point of view the case is interesting, as being the best recorded instance of the growth of a new and complex instinct actually under the eyes of human observers.

A few words as to the general coloring of the parrot group. Tropical forestine birds have usually a ground tone of green because that color enables them best to escape notice among the monotonous verdure of equatorial woodland scenery. In the north, it is true, green is a very conspicuous color; but that is only because for half the year our trees are bare, and even during the other half they lack that "breadth of tropic shade" which characterizes the forests of all hot countries. Therefore, in temperate climates, the common ground-tone of birds is brown, to harmonize with the bare boughs and leafless twigs, the dead grass or stubble. But in the ever-green tropics, green is the proper hue for concealment or defense. Therefore the parrots, the most purely tropical family of birds on earth, are chiefly greenish; and among the smaller and more defenceless sorts, like the little love-birds, where the need for protection is greatest, the green of the plumage is almost unbroken. Green, in truth, must be regarded as the basal parrot tint, from which all other colors are special decorative variations.

But fruit-eating and flower-feeding creatures—such as butterflies and humming birds—seeking their food among the brilliant flowers and bright berries, almost invariably acquire a taste for varied coloring, and by the aid of the factor in evolution, known as sexual selection, this taste stereotypes itself at last upon their wings and plumage. They choose their mates for their attractive coloring. As a consequence, all the larger and more gregarious parrots, in which the need for concealment is less, tend to diversify the fundamental green of their coats with red, yellow or blue, which in some cases takes possession of the entire body. The largest kinds of all, like the great blue and yellow or crimson macaws, are as gorgeous as birds well

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GRAY PARROT (AFRICA).
(Psittacus erithacus.)
¾ Life-size.

could be; they are also the species least afraid of enemies. In Brazil, it is said, they may often be seen moving about in pairs in the evening with as little attempt at concealment as storks in Germany.

Even the New Zealand owl-parrot still retains many traces of his original greenness, mixed with the brown and dingy yellow of his nocturnal and burrowing nature.

I now turn to the parrot's power of mimicry in human language. This power is only an incidental result of the general intelligence of parrots, combined with the other peculiarities of their social life and forestine character. Dominant woodland animals, like monkeys and parrots, at least if vegetarian in their habits, are almost always gregarious, noisy, mischievous, and imitative. And the imitation results directly from a somewhat high order of intelligence. The power of intellect, in all except the very highest phases, is merely the ability to accurately imitate another. Monkeys imitate action to a great extent, but their voices are hardly flexible enough for very much mimicry of the human voice. Parrots and some other birds, on the contrary, like the mocking bird, being endowed with considerable flexibility of voice, imitate either songs or spoken words with great distinctness. In the parrot the power of attention is also very considerable, for the bird will often repeat to itself the lesson it has decided to learn. But most of us forget that at best the parrot knows only the general application of a sentence, not the separate meanings of its component words. It knows, for example, that "Polly wants a lump of sugar" is a phrase often followed by a gift of food. But to believe it can understand an exclamation like "What a homely lot of parrots!" is to credit the bird with genuine comprehension. A careful consideration of the evidence has convinced almost all scientific men that, at the most, a parrot knows the meaning of a sentence in the same way as a dog understands the meaning of "Rats" or a horse knows the significance of "Get up."

Lawrence Irwell.

How can our fancies help but go
Out from this realm of mist and rain,
Out from this realm of sleet and snow,
When the first Southern violets blow?

—Thomas Bailey Aldrich, "Spring in New England."

POLLY.

Letty was out under the big elm tree watching the kitten playing with the autumn leaves that were on the ground.

Suddenly something struck Letty on the shoulder. She looked around quickly, thinking that somebody had thrown a stone at her. No one was in sight, though she looked all about and even up in the tree. Then she noticed that the kitten was rolling something with its paws. She stooped and picked up what looked like a little bunch of elm leaves. She thought it strange that they should be stuck together, and when she found that it was quite heavy she was still more surprised.

She carried it into the house to show to her mother. "What is it?" she asked. "It came down off the tree and hit me on my shoulder. Is there a stone inside of it?"

"No," said her mother. "It is a chrysalis. Some worm that lived on the elm tree drew these leaves together and spun a little case inside, and when the leaves were ready to fall, the chrysalis came down with them."

"What kind of a worm do you suppose it was?"

"I do not know, but it must have been a large one, or the chrysalis would not be so heavy. We will keep it, and in the spring when the worm has turned into a butterfly and comes out of the case, perhaps we can learn what its name is."

"But how will it get out?' asked Letty, anxiously. "It is so hard and tough. I tried to pull off one of the leaves and it stuck on tight."

"Yes," said her mother, "it is very tough and you could not tear it open with your fingers even if you tried very hard. But the butterfly throws out some kind of fluid which softens the silk—for it is a kind of silk, you know—and makes a hole large enough to crawl through. It does not have to be very big, as the butterfly's wings are soft and wet. It has to let them dry and grow strong and stiff before it can fly."

The chrysalis was put in a safe place and Letty forgot all about it for many months, which was not strange when there were so many things for her to do all through the winter and early spring.

But her mother did not forget, and one day in June she called Letty in from her play telling her that she had something to show her.

"Do you remember the elm chrysalis?" she asked, and she put it in Letty's hand.

"Why how light it is!" she cried. "The butterfly has come out, oh! where is it?"

Her mother led the way to the plant stand. "See, on that begonia," she said.

"Oh, oh!" cried Letty, "what a beautiful butterfly!"

It was very large, nearly five inches across when its wings were spread. It was dull yellow, with darker shadings, a little red in waving lines, and a gray stripe along the front edge of its outer wings. It was quite furry, especially the large yellow body. Each of the four wings had a transparent eye spot, and the under wings had a good deal of black about these little round windows, as Letty called them.

"And, mamma, see! It has beautiful little dark-blue eyes."

"Yes, it has, but I did not notice them before."

"Well, what kind of a butterfly is it?"

"It is not a butterfly at all."

"Not a butterfly?" said Letty, surprised.

"No; it is a moth. Have you noticed its antennae—the horns on the front of its head?"

"They look like feathers," said Letty; "no, like ferns."

"So they do," said her mother. "Well,

that is how we know it is not a butterfly, for they have thread-like antennae, with a little knob on the end. Moths fly by night and that is probably why this one stays so still now."

"I wish I knew its name," said Letty.

"If you will take my card and run over to the public library and ask the librarian to give you a book that tells about moths and butterflies, we will find out."

Letty came back in a little while with the book and her mother began to look in it.

"Oh!" she said pretty soon, "it has such a long name that I don't believe you can remember it. It is Telea polyphemus."

"I'll call it Polly for short," said Letty.

When they had learned all they could about the moth Letty asked what they should do with it.

"This book says they do no very great harm," said her mother, "and it is so beautiful that I think we will let it have its liberty."

So the Telea polyphemus was carried out and placed on a tree trunk where it stayed all the rest of the day. But the next morning when Letty went to look for it, it was gone.

Susan Brown Robbins.

Hark! 't is the bluebird's venturous strain
High on the old fringed elm at the gate—
Sweet-voiced, valiant on the swaying bough,
Alert, elate,
Dodging the fitful spits of snow,
New England's poet-laureate
Telling us Spring has come again!
—Thomas Bailey Aldrich, "Spring in New England."

THE AMERICAN WHITE PELICAN.

(*Pelecanus erythrorhynchos.*)

In the year 1758 the naturalist Linnaeus gave to the birds called Pelicans the generic name Pelecanus. In this genus he also placed the cormorants and the gannets. These with the snake-birds, the frigate-birds and the tropic-birds were for a long time grouped together under the family name Pelecanidae. This name, however, is now restricted to the various species of the Pelicans which are included in a single genus.

The generic name Pelecanus and the common name Pelican are derived from pelekan, the Greek name for these birds. They were well known to the ancients by whom they were called Ornacrotalus. There is a legend of great antiquity for which there is no foundation in fact, which states that the pelican feeds to her young blood drawn from her own breast, in which she herself has made the incision.

There are about ten species of pelicans distributed throughout the world, mostly confined to those countries having warm climates. Two or three species, however, extend their range into the colder regions during the summer months. Three of the species inhabit North America and two of these are seldom seen except on the sea coasts; the brown pelican (Pelecanus fuscus) on the Atlantic coast and the California brown pelican (Pelecanus californicus) on the Pacific coast. The other species is the bird of our illustration, and is common in the interior as well as on the seaboard of California.

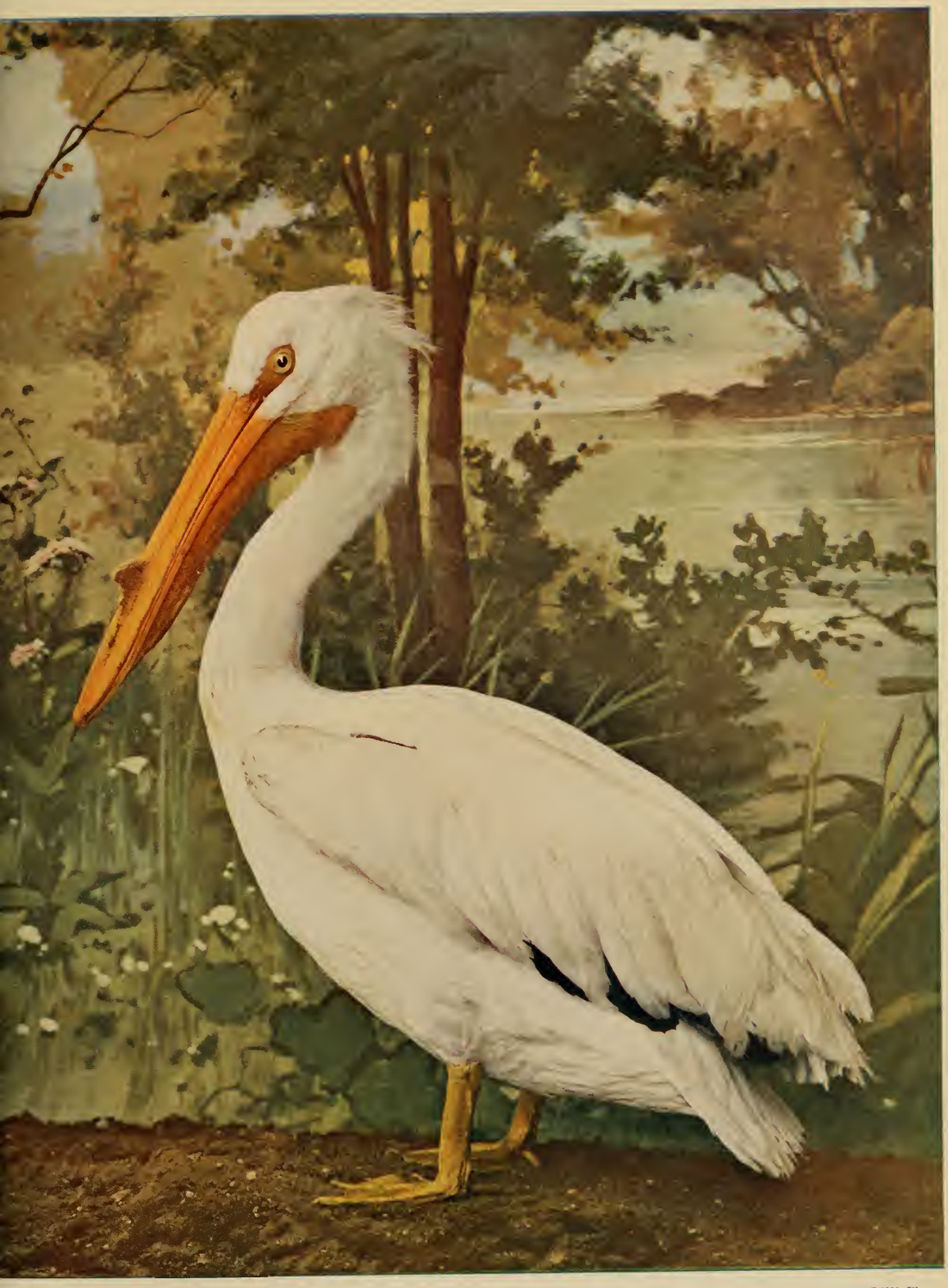
The pelicans are notably social in their habits, a large number nesting together. The flight of a large flock is an attractive sight. Their wings move in unison and apparently without much effort. After a few strokes of the wings they frequently sail, forming graceful circles, often at great elevations.

The most remarkable characteristic of these birds, however, is the large pouch formed by an elastic skin depending from the two sides of the lower mandible and extending nearly the whole length of the bill. This pouch may be greatly distended and will hold a large quantity of either solid or liquid matter. The bills are depressed and strongly hooked.

The American White Pelican ranges throughout the whole of North America as far north, in the interior, as the 61° north latitude, and as far to the southward in winter as Central America. Northward from Florida, along the Atlantic coast, it is now rare.

In the year 1838 Audubon gave this species the specific name Americanus, in view of his discovery that it differed in essential characteristics from the European form, called Ornacrotalus. The most marked difference that he noticed was the crest upon the upper mandible which he supposed was permanent and not, as we now know, a characteristic of this species only during the breeding season. In writing of the naming of this species he uses the following beautiful language: "In consequence of this discovery, I have honored it with the name of my beloved country, over the mighty streams of which may this splendid bird wander free and unmolested to the most distant times, as it has already done in the misty ages of unknown antiquity."

Much as we desire to honor Audubon, who has given us so much of interest concerning the life histories of the birds, yet we are restrained by the rules of scientific naming, which require under ordinary circumstances, the use of the earliest name. Audubon's name was antedated by that of Gmelin, a German Naturalist, who in 1788 noticing the peculiar characteristics of the American White Pelican and that it differed from the European



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AMERICAN WHITE PELICAN.
(Pelecanus erythrorhynchos.)
About 1/5 Life-size.

CHICAGO COLORTYPE CO.

form, gave it the name erythrorhynchos, which is now used by ornithologists. This name has its origin in two Greek words, meaning red and bill.

The peculiar growth or crest on the bill which disappears soon after the breeding season, varies greatly both in size and shape. Dr. Ridgway says: "Frequently it consists of a single piece, nearly as high as long, its vertical outlines almost parallel, and the upper outline quite regularly convex, the largest specimen seen being about three inches high, by as many in length. More frequently, however, it is very irregular in shape, usually less elevated, and not infrequently with ragged anterior, or even posterior continuations." At this time the bill is also more or less orange-red in color.

An excellent narrative of the habits of the White Pelican is given in the Ornithology of Illinois, where Dr. Ridgway quotes the words of Col. N. S. Goss regarding those who "have not seen the White Pelicans upon their feeding grounds, but may have read Audubon's interesting description of the manner in which the birds unite and drive the fishes into shallow water, where they can catch them, which they cannot well do in deep water, as their skins are honeycombed with air cells that buoy them up like cork, and prevent their diving, and they do not plunge for their food when upon the wing, like their cousins, the Brown Pelicans, and therefore have to adopt fishing habits suited to shallow waters. I have often noticed the birds in flocks, in pairs, or alone, swimming on the water with partially opened wings, and head drawn down and back, the bill just clearing the water, ready to strike and gobble up the prey within their reach; when so fishing, if they ran into a shoal of minnows, they would stretch out their necks, drop their heads upon the water, and with open mouths and extended pouches, scoop up the tiny fry. Their favorite time for fishing on the seashore is during the incoming tide, as with it come the small fishes to feed upon the insects caught in the rise, and upon the low form of life in the drift, as it washes shoreward, the larger fishes following in their wake, each, from the smallest to the largest, eagerly engaged in taking life in order to sustain life. All sea-birds know this, and the time of its coming well. The White Pelicans, that have been patiently waiting in line along the beach, quietly move into the water and glide smoothly out so as not to frighten the life beneath. At a suitable distance from the shore they form into line in accordance with the sinuosities of the beach, each facing shoreward and awaiting their leader's signal to start. When this is given, all is commotion; the birds, rapidly striking the water with their wings, throwing it high above them and plunging their heads in and out, fairly make the water foam as they move in an almost unbroken line, filling their pouches as they go. When satisfied with their catch, they wade and waddle into line again upon the beach, where they remain to rest, standing or sitting as suits them best, until they have leisurely swallowed the fishes in their nets; then, if undisturbed, they generally rise in a flock and circle for a long time high in air."

The White Pelicans will consume a large amount of food; in fact, they are gluttonous. It is said that the remains of several hundred minnows have been taken from the stomach of a single pelican. Usually they are the most active in the pursuit of their prey for a short time after sunrise and also before sunset.

The chief breeding grounds of the White Pelican are from Minnesota northwards to the limit of its range. It nests also in isolated and greatly separated localities to the westward. It is said that several thousand permanently breed on the islands of the great Salt Lake. There are reasons for believing that it also breeds in Florida and westward along the Gulf of Mexico as far as Texas.

The White Pelican builds its nest on the ground using small sticks and twigs. They usually select a clump of sage or some other plant that will afford the nest some protection. Frequently sand is heaped around the nest to the depth of about six inches. The nests are about one foot in diameter. The color of the two to four eggs is a chalky white and the surface is quite rough, due to the irregular thickness of the outer coating. The average size of the eggs is about three and one-half by two and one-third inches.

The White Pelican as it calmly floats on the surface of the water, some distance from the shore, has been mistaken for the sail of a boat as the moist white feathers glisten in the sunshine.

Longfellow has beautifully woven this fact into the "Song of Hiawatha."

"O'er the water floating, flying,
Something in the hazy distance,
Something in the mists of morning,
Loomed and lifted from the water,
Now seemed floating, now seemed flying,
Coming nearer, nearer, nearer.

Was it Shingebis the diver?
Or the pelican, the Shada?
Or the heron, the Shuh-shuh-gah?
Or the white-goose, Waw-be-wawa,
With the water dripping, flashing
From its glossy neck and feathers?

It was neither goose nor diver,
Neither pelican nor heron
O'er the water floating, flying,
Through the shining mist of morning,
But a birch canoe with paddles,
Rising, sinking on the water."

Seth Mindwell.

THE SANDPIPER.

The glitter of the sunlit river
In his flashing, fearless eye,
There on his unwearied pinions
See the bird go sailing by!

Slender, sword-like wings, and dainty,
How they cut the thin air now!
And without a trace of languor
Soars he to the mountain's brow.

Back again—for whim has moved him—
And where rippling water lies,
Scanning all the shore line closely,
Light as thistle-down he flies!

On the white sand scarce a footprint
Makes he, touching here and there;
Singing his two notes so gladly,
Ah, this bird is passing fair!

Sweet content in voice and motion;
Following plash of many a wave;
Or o'er pine that faces ocean
Mounts this rover, gay and brave!

—George Bancroft Griffith.

A BIT OF BIRD GOSSIP.

The sun shone brightly through the green leaves of the trees and crowned each tiny ripple on the lake with a glistening diamond. A Robin Redbreast hopped along the shore, picking up a few pebbles, for the poor thing has to wear her false teeth in her stomach, as it were, having no teeth in her head with which to chew her food.

There was a rush of wings above her and she dropped the grain of sand with which she had thought to fill up her gizzard, cocked her smooth black head on one side and watched the approach of another bird. Was it friend or enemy? It proved to belong to the aristocratic family of Thrushes—real high-flyers among birds—who alighted on the same sandy shore and advanced "with many a flirt and flutter" to greet her old friend, for they had been neighbors in the same sunny orchard the year before.

"So glad to meet you again, Mrs. Redbreast," said the gracious Thrush in a most musical voice, "but are you not a long way from the willows on the river bank where I last had the pleasure of seeing you?"

"Oh, we never finished that house among the willows. We became dissatisfied with the neighborhood," answered Mrs. Redbreast, after performing the graceful courtesy of a well-bred bird, as are all Robin Redbreasts.

"Ah, I was afraid of malaria when we looked the ground over together in the spring. It was too low, almost swampy. Mr. Thrush and I went to a little knoll about three miles away and built in the loveliest, the most fragrant wild crabapple tree you ever saw," and Mrs. Thrush smoothed with shining beak a mottled feather on her handsome breast.

"But would not those lovely blossoms tempt those creatures—boys, I think they are called—to climb until they found your home?"

"The thorns stand sentinel and the thick leaves hide it well, and I wanted my children to grow up strong, and swift on the wing. They would never grow up well feathered and beautiful amid those lovely willows on account of the low ground," replied the Thrush.

"It was not malaria that caused us to abandon our half-built nest, but boys, some black as crows and some white as doves, kept coming to get materials for whistles. It seems that the very tree we chose had bark that slipped the easiest, and sometimes a flock of three or four would be perched on the limbs (they always sit astride, so awkwardly, you know), with jack-knives in their hands, and of course we could not stay. Robin wanted to come to the park—it is a lovely place—where those fine big creatures with bright stars on their gray coats are put to take care of us birds. Why," she went on, "they will not let boys stone even an English Sparrow, but I think that is altogether too particular. There comes a party of the little cockneys now," as a handful of winged brown balls came fluttering through the air close to the heads of the larger birds, who could easily have put them to flight if they would but try. However, they ducked their heads and scampered into the weeds, leaving the smooth shore to the new-comers, who dipped and splashed in the shallow edge of the lake as if they enjoyed it mightily.

"Just see the horrid little things washing themselves in water, but they never can get clean. Why, my Robin, who is a very venturesome fellow and sometimes follows the boulevards almost into the heart of the city, says that he has seen them in the dirty city streets washing themselves in the dust like common barnyard fowls."

"Don't let's look at them," exclaimed Mrs. Thrush. "They are doing it just because it looks respectable, and they know that we wash in water;" and the two birds spread their wings and swept disdainfully away from the neighborhood of the Sparrows.

"And where did you finally build, Mrs. Redbreast?" asked the other as they settled gracefully on the shore a half a mile away.

"Well, Robin, as I said, wanted very much to live in the park. He is so fond of company, but I told him there were too

many children on the grass. Why, they are as thick as dandelions any fine day, and in spite of the care of the great gray creatures it would be impossible to safely teach our children to fly. We finally found a lovely suburban place within easy flying distance of the park. An apple tree with perfect branches for a nest grew in the back yard, the cherry trees were white with bloom and the whole place fragrant with the blossoms of the grape. There was a flat jar always kept filled with water for the birds, with a stone in it that reached nearly to the surface on which to stand while bathing. The water made the birds come in flocks, so that the place was gay with songs, and really that yard was a little Eden. But you know," she went on, dropping her voice, "there is a story of something terrible that walked in the garden of Eden, and I think it was a black cat, for that is what walks in our garden. He lies on the back steps in the sunshine pretending to be asleep, but where his eyes ought to be in that big black ball he calls his head I can see a narrow yellow stripe, and out of that stripe of yellow he watches every bird that comes."

"Does he get any birds?" asked the Thrush in an awe-struck whisper.

The Redbreast shook her black head sadly. "Every now and then his mistress finds him with feathers in his whiskers, and she scolds him. But there is a serpent in every Eden," she added philosophically; "if it isn't cats it's boys."

"Did you ever hear what became of the family of Wrens that lived in the honeysuckle over the back door?" asked Mrs. Thrush, who cared more for gossip than moralizing. "They were so pleasant and cheery."

"Oh, yes. We started south before they left and I haven't seen them since. They were a proud little folk, that made believe they were not proud, always wearing the finest clothes, yet in such sober colors. I always called them stuck up."

"Their tails certainly were—he, he, he," giggled Mrs. Thrush.

"Ha, ha, ha," laughed Mrs. Redbreast. "That's pretty good. I must tell that to Robin. But don't you remember," she went on, "the Blue Jays that lived in the elm tree down the lane?"

"I never thought them very well-bred," replied Mrs. Thrush, bridling prettily, for she and her family pride themselves on their correct behavior. "Wonderfully pretty, but too loud."

"Altogether too gay and noisy. Mrs. Jay was a great scold, and Blue almost as bad. You could hear them all over the neighborhood. Well, they lost all their children by a Hawk, though Mrs. Jay fought bravely for her little ones, and Blue proved himself a real hero. She over-exerted herself, however, and died shortly after of nervous prostration. I saw a girl, who had found her body, spreading out her poor dead wings and holding them up against her hat. She finally wrapped Mrs. Jay up in her handkerchief and carried her away."

"If women would only be satisfied with the wings of a bird that had died a natural death we would not complain," said Mrs. Thrush, as she folded her own pretty wings a little closer. "Blue Jay married again right away, of course," she went on, as she dropped a little red ant down among the mill stones of her gizzard to be ground up.

"He did not even wait the conventional two weeks. If I thought Robin Redbreast would be looking out for another housekeeper so soon after my death he would not have such a good wife as he has to-day. He would have to hunt more worms and bugs than he does, instead of just bringing home a little bit of dessert in the shape of cherries or grapes to please the children;" and the mother fluffed up her feathers alarmingly.

"That makes me think," said Mrs. Thrush, "that I promised the children an especially nice supper to-night if they would not chirp or stick up their heads and look over the edge of the nest. They are really getting so big now that Mr. Thrush and I can do nothing with them. Last night when I went home I found my eldest son, Brown Thrush, sitting on the edge of the nest, and he is taller——"

Just then a large shadow wavered over the sunshiny sward, and with a scared exclamation of "Hawk!" the birds flew swiftly in different directions, not waiting to see that the object which cast the shadow was nothing but a harmless paper kite.

S. E. McKee.

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MARBLED MURRELET.

THE MARBLED MURRELET.

(*Brachyramphus marmoratus.*)

This little bird belongs to the family of auks and puffins, the guillemots and the dovekie. It is the sea bird family (Alcidae) for all the species are maritime, spending most of their time on the ocean. Nearly all the species frequent the Pacific coast of North America. A few are, however, found on the Atlantic coast. They seem to frequent the wildest and most rocky shores and generally congregate in large colonies which may include several species. Their structure unfits them for locomotion on the land where they move in an uncouth and awkward manner, but they are agile and quick swimmers and expert divers. It is said that they will remain under water for several minutes, swimming for long distances. They use their wings in diving. The Marbled Murrelet inhabits the coast of the Pacific ocean from San Diego, California, northward, breeding only in the northern part of its range. These birds are seldom found at any great distance inland. It is said that their nests, like those of the petrels, are built in holes in banks or in burrows in the ground. They have also been known to lay their eggs in the open crevices of cliffs where but little effort is made to build a nest other than the gathering together of a few sticks and twigs.

The ovate eggs are of a buffy color and are marked with varying shades of brown.

BEFORE THE STORM.

A whir and sweep of snow-white wings,
  Soft brown-flecked breasts, now here, now there
A-sway upon the ragged weeds
  Or darting through the wintry air.
I watch you from the frosted pane
  Beside the glowing hearth-stone warm,
And shudder as I hear the wail
  Of angry winds before the storm.

—Mary Morrison.

BOY-CHICKADEE.

I doubt if any one was ever haunted by a more commonplace object than a fence-post; yet, terminating a fence that borders a little farm, there is a gray old post which has haunted my imagination for several years. The fence has long ceased to fence anything in or out; the uppermost rail is the only one left and that is fastened to my post about five inches from the top. Just under the lee of that rail is a round hole which is rather jagged about the lower edge as if gnawed by sharp little teeth. Every time I travel that road I am impelled to stop and put a finger into that hole. I always expect to discover a secret, yet never do. Still, the post haunts me for once Boy-Chickadee kept house there.

Boy-Chickadee is one of our smallest birds. He wears a dumpy little gray coat surmounted by a pair of bright black eyes under a velvety black cap. Dear to the heart of every bird-lover, he is especially so in winter. It is then that his crystal pendulum of song swings lightly to and fro where other bird-song is rare. It is rather plaintive—two minor notes swing to the left, then two more to the right—and seems to belong only to frosty mornings. Boy-Chickadee stays to wish you "A Merry Christmas" and "A Happy New Year," and comes daily to dine on sunflower seeds stowed in a large gourd for him. I should be ashamed to say how many seeds he consumes at a sitting, or flitting better describes it. He flits in for a seed, then out to the apple-tree to hammer it, uttering gurgles of content all the while. He spends so much time eating them that I eye my store anxiously wondering if it will hold out under such onslaughts. Sometimes he brings a companion and they take turns going into the gourd. His British enemies tag him enviously and hang about the gourd-door; but it is cut too small for them and they can only gaze in. It is Boy-Chickadee's cache.

In summer time Chickadee deserts us and we must seek him in the fields, and that is how we came to find the fence-post. We sat waiting for birds to bathe, but waited in vain. They bathed up-stream and they bathed down-stream. We saw them drying their feathers, but they would not bathe by us. A dripping Chickadee flew overhead and sat preening his feathers in a sweetgum tree. How nearly we had come to seeing that bath! (a thing we had never achieved). In despair we crossed the road and hid behind the sassafras hedge. Presently something strange passed us and there was Dame Chickadee with a very queer burden. Imagine yourself with a mouthful of excelsior larger than your head, and you will have some idea of her comical appearance. She peered at us from behind her treasure first with one eye and then with the other. We were all attention. A dozen times she darted towards the old fence, but we were too alarming and she could not make up her mind to brave us. Each time she retreated to the sweetgum, holding tight to her bundle—it might have been a clematis blossom, I could not say. It was the first time I had ever seen a Chickadee look self-conscious. At the same time we saw that Boy-Chickadee had dipped in once more and was dripping wet. It was maddening. At last she made a wide curve towards us and disappeared. I sprang to the fence-post and discovered the round hole, and with an ecstatic catch of the breath I put one finger in. A bunch of indignant feathers hurled itself against my hand and out came the finger and out came she and whisked away with such lightning rapidity that we barely saw her. The hole was too deep and too well shadowed to tell us anything more than that it had a secret in its keeping and although we should have liked to camp by the post it was not to be.

At our next visit we found Dame Chickadee setting and Boy Chickadee feeding her; again, and the post had become a nursery. It seemed too ludicrous that such babes-in-the-woods should ever attain to the dignity of fatherhood and motherhood; but this time neither parent

was there to be laughed at, and as I tapped at the door a perfectly intelligible "Day-day-day-day" came from the nursery; the babes had already learned to talk!

It was so long before we visited them again that we expected to find the post deserted. There was no sign of occupancy and I felt depressed because it was all over. But a gentle tap brought a tiny, angular cranium and a careworn baby face to the door. It didn't seem possible that Boy Chickadee could have such a homely bairn! We withdrew in haste when he threatened to come out; but we had summoned him and the moment had come to seek his fortune. The youngster stepped into the door and set sail straight across the wide roadway. When we caught a rear view of the tiny sailboat our gravity was undone, for not a vestige of tail adorned it and he was the most unfinished fledgling we had ever seen.

This was the last sign of life the old fence-post yielded, but I canot learn to believe it final. I am constantly expecting to see more Chickadees set sail, and its possibilities still haunt me.

Elizabeth Nunemacher.

THE STORY BIRD.

The parrot has been called the "bird-man" on account of its intelligence; but so many anecdotes are told of it that it might well be styled the Story-bird.

Of the four hundred and thirty different species known, America claims one hundred and twenty-six. Europe is the only large country that does not possess native tribes of parrots.

The parrot is the monkey of the feathered world, because of his imitative powers. He also uses one of his feet as a hand to carry what he eats to his beak.

A parrot possessed of remarkable linguistic powers, being able to speak in Spanish, Portuguese, French, German and English, was accustomed whenever a visitor was at all boisterous to imitate his laugh and then groan in anguish, exclaiming in tones of commiseration, "Poor, poor Polly!"

A cardinal is said to have paid a hundred crowns for a parrot that could recite without a blunder the Apostles' creed and chant the Magnificat correctly.

An attempt was once made to reform a bad parrot which kept saying, in reference to his mistress, "I wish the old lady would die."

The curate sent over his own bird, that had been religiously trained, hoping its influence would have a good effect on the bad bird. But whenever the latter said, "I wish the old lady would die," the clergyman's bird rolled up its eyes and exclaimed, "We beseech Thee to hear us, good Lord."

Belle P. Drury.

THE BEAR.

Though the Bear is classed with the Carnivora, or flesh-eating animals, it is really omnivorous in the best acceptance of that word, for it will thrive on a vegetable diet for many weeks at a time. Bears will devour the various kinds of berries, grains, the succulent leaves of herbs and the fleshy roots, with evident relish. There is, perhaps, no more dainty morsel for them than the young and tender buds of trees and shrubs as they are prepared by Nature, wrapped in their winter covering and containing an abundant food, stored there for the nourishment of the growth of the coming season—a food useful to the animal as well as the plant. The young seem to depend entirely on vegetable food, but as they grow older, though still preferring the products of the plant, they will eat a variety of animal forms, such as insects, mollusks, crustaceans, worms, birds and their eggs. When driven by hunger they will kill and eat larger prey, such as deer and domestic cattle. They will also devour the dead bodies of animals freshly killed, but only before there is any taint or odor. Thus, though Bears have the structural characteristics of the flesh-eating animals, this classification is misleading to the untutored observer who watches them in our menageries or even in their native homes.

The Polar Bears are perhaps the most carnivorous of them all, living almost entirely on animal food, when in their natural homes. The Grizzly Bear is also a flesh-eating species, though it will subsist on a vegetable diet. It is an interesting fact that the nature of their food seems to determine the degree of strength and the ferocity that they possess. The influence of the diet is shown not only on the various species but also upon the individuals of the same species. The Bears fed only upon vegetable foods exhibit a much milder disposition and are less resentful when crossed.

Bears are distributed throughout the world except in Australia. In the words of Brehm, "They inhabit the warmest as well as the coldest of countries, high mountains as well as the coasts of the Arctic Sea. Nearly all species select dense, extensive forests or rocky regions, generally lonely spots. Some delight in watery or damp siutations, streams, rivers, lakes, swamps and the sea, while others prefer stretches of dry land. One species is confined to the sea-coast and seldom penetrates the depths of the continent, but still undertakes more extensive migrations than the others, traversing great distances on drift ice, crossing the northern Arctic Ocean and migrating from one continent to the other."

Besides the bears of the present day there are extinct forms, remains of which occur in the later geologic ages. The Great Cave Bear, remains of which have been found in the caves of Central Europe, indicate that this species was even larger than our Polar Bear, which may measure nine feet in length.

The opinion is prevalent that the movements of the Bear are awkward and slow and that they are neither fleet nor active in locomotion. This is true, to a certain extent, in the case of the larger species, though they are endowed with great endurance. On the other hand the smaller species are notably quick and active in their motions. In fact all species when excited will pass over the ground at a rapid rate, their strides resembling a sort of gallop. All climb, especially when young or until their great weight prevents them from doing so.

A few of the species are excellent swimmers and can remain under water for some time. The Polar Bear well illustrates this characteristic, for it has been seen many miles from the shore, swimming easily and showing a wonderful power of endurance.

We are told that "some species are sensible and sagacious and may be trained

FROM COL. JOSEPH STEPPAN.

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BLACK BEAR.
(Ursus americanus.)
Greatly reduced.

to a certain extent; but they exhibit no high mental development. Some individuals become very tame, though they display no particular affection for their master and keeper. They always revert to their grosser animal instincts in old age, for then they become wicked, intractable and violent. The Bears signify their various moods by modulations of their remarkable voices, finding utterance in dull growling, snorting and murmuring, or grunting, whistling and sometimes barking sounds."

A family of young Bears consists of from one to six, which are fed and protected in the most tender manner by their watchful and careful mother. Born naked and blind, it is usually five or six weeks before they can see and have a seasonable coat of hair. After this, they are full of life and very playful, and their antics are very amusing.

Bears may be classed under three groups; the Sea Bears, the Land Bears and the Honey Bears.

The Polar or White Bear is the only representative of the first class. This species has been wonderfully provided for by Nature. Living as it does in the regions of perpetual ice and snow, the pure white color of its fur becomes a protection, as it is less easily observed. It also, unlike the other species, has the soles of its feet covered with hair which enables it to move more freely and safely on the ice. They have been noted at a distance of fully fifty miles from the nearest shore, swimming without effort and showing no fatigue.

One of the best known of the Land Bears is the Brown Bear of Northern Europe and Asia. It varies greatly and some authorities divide it into several distinct species. It is easily tamed and because of the ease with which it supports itself on its hind feet it is often taught to step to the sound of music. Here also is classed the Grizzly Bear, which is nearly as large as the Polar Bear and much more ferocious. It has been known to attack the bison and carry a body weighing one thousand pounds or more to its den some distance away.

The Black Bear of our illustration is also a member of this class. It is a native of the wooded parts of North America. This species is timid though agile, strong and is of great endurance. Its fur is soft and even and shining black in color. It can run more swiftly than can a man and will escape in this manner if possible.

Though it principally feeds on herbs, fruits and grains, it will also devour live stock of the smaller kinds and may even attack cattle. In captivity they are much better natured than the other species. "They never make hostile use of their strength in their relations with their keepers, but completely acknowledge human supremacy and present no difficulties in their training. At any rate, they fear their keeper more than he does them."

The third class is illustrated by a single species, the Sloth, or Honey Bear, also called the Aswal. It is a native of India and frequents hilly localities. It feeds upon fruits, honey and the lower animals, such as ants and the grubs of various insects. It also enjoys the comb and honey of bees. With its large and scythe-shaped claws it will destroy the strongly built homes of the white ants. In its native country the Sloth is trained by jugglers to perform many tricks and in captivity it is docile and comparatively good-natured.

BIRD INCIDENTS.

Wrens versus Sparrows: Some time since in the early spring, a pair of English Sparrows made up their minds to take possession of a bird house in our garden which a pair of Wrens had occupied for two previous years.

Mr. and Mrs. Wren had not yet arrived, so there was none to dispute the sparrows' right or suspend operations. All went well and the nest was nearing completion, when one bright sunny morning, the former occupants arrived on the scene and trouble at once began. They evidently resented the action of the sparrows in taking the house which they anticipated using for a summer residence. An indictment of evacuation was at once served and being met by a show of sparrow impudence, forcible expulsion was next in order.

Mr. Wren took up his position on the front porch of the little house, and by a series of savage attacks and much loud scolding, succeeded in keeping the pair of sparrows off, while Mrs. Wren, working with desperate determination, proceeded to tear the nest apart and carrying the materials out the little back door, scattered them in all directions. My! what a shower of hay, straw, feathers, sticks, etc. This was continued until the house was entirely cleared. Then, without delay, began the process of reconstruction. During this time the sparrows did not sit idly by and see their work destroyed, but there was a continuous battle between them, and when the action became too pressing, both Wrens would make a grand charge which invariably resulted in driving the enemy back. By and by the new nest was finished, and although bad feeling existed for several days afterward, with frequent passages at arms, the sparrows finally gave up the fight as hopeless, and Mr. Wren mounted the chimney, standing guard, and at the same time giving vent to his feelings in loud and spirited song. Of course, our sympathies were with the victors.

Cat Bird and Cherry Stone: During one of my many rambles through the woods, I discovered the nest of a Cat Bird in a thick clump of briars and upon drawing near found it contained four little ones. Retreating for a short distance, I stopped and watched the mother bird who was greatly excited at first, but seeing that I meant no harm to her little family, she proceeded with household matters.

After giving the young ones two or three worms and other choice morsels, she brought a good-size red cherry and offered it to one of the nestlings. The little bird could not swallow it, so what did the mother do but take the cherry out of its mouth, remove the stone with her beak and feet, and then give it back to the nestling in a crushed state. This time it disappeared in a trice. The incident impressed me as being not only amusing but an excellent illustration of "bird sense."

Chippies Dividing Crumbs: While sitting under a shade tree in the yard, I observed a pair of Chippies eating two crumbs of bread. One crumb was much larger than the other, and of course the bird having the smaller one finished first. Then what! Simply this, the other Chippy at once broke his crumb in half and proceeded to place a portion of it within reach of his mate. In this way each had nearly an equal amount. Beautiful incident; well might man take this lesson home to himself; what an exhibition of love and generosity; what a different world this would be if people acted more on the principle of these innocent little birds!

Berton Mercer.

SEA-MEWS IN WINTER TIME.

I walked beside a dark gray sea,
And said, "O world, how cold thou art!
Thou poor white world, I pity thee,
For joy and warmth from thee depart.

"Yon rising wave licks off the snow,
Winds on the crag each other chase,
In little powdery whirls they blow
The misty fragments down its face.

"The sea is cold, and dark its rim,
Winter sits cowering on the world,
And I, besides this watery brim,
Am also lonely, also cold."

I spoke, and drew toward a rock,
Where many mews made twittering sweet;
Their wings upreared, the clustering flock
Did pat the sea-grass with their feet.

A rock but half submerged, the sea
Ran up and washed it while they fed;
Their fond and foolish ecstasy
A wondering in my fancy bred.

Joy companied with every cry,
Joy in their food, in that keen wind,
That heaving sea, that shaded sky,
And in themselves, and in their kind.

The phantoms of the deep at play!
What idless graced the twittering things;
Luxurious paddlings in the spray,
And delicate lifting up of wings.

Then all at once a flight, and fast
The lovely crowd flew out to sea;
If mine own life had been recast,
Earth had not looked more changed to me.

"Where is the cold? Yon clouded skies
Have only dropped their curtains low
To shade the old mother when she lies,
Sleeping a little, 'neath the snow.

"The cold is not in crag, nor scar,
Not in the snows that lap the lea,
Not in yon wings that beat afar,
Delighting, on the crested sea;

"No, nor in yon exultant wind
That shakes the oak and bends the pine.
Look near, look in, and thou shalt find
No sense of cold, fond fool, but thine!"

With that I felt the gloom depart,
And thoughts within me did unfold,
Whose sunshine warmed me to the heart:
I walked in joy, and was not cold.

—Jean Ingelow.

SNAILS OF POND, RIVER AND BROOK.

Many of my readers have doubtless kept an aquarium at some time in their life and have stocked it with several gold-fish, a small turtle and some fresh water snails. They have also, without doubt, stood in front of the aquarium and watched the strange antics of each of the three kinds of animals and have wondered at the swiftness with which the little snails progressed about the glass sides of the artificial pond. It is of these molluscan denizens of fresh water that I shall write in this article.

In the fresh-water species the shell is not often rounded like that of the land snails, but is more frequently long and pointed, the spire resembling a church steeple. The animal, too, differs very greatly, the tentacles being either flat and triangular or long and very tapering. The eyes are not placed at the end of the eye-peduncles, as in the land shells, but are generally situated on little swellings at the base of the tentacles. They may be found in almost any body of water, adhering to stones, sticks, and other submerged objects, or crawling over the sandy or muddy bottom.

Our fresh-water snails may be divided into two classes; first, those which breathe by means of a lung and which must come to the surface at regular intervals to take in a supply of air, and, second, those which breathe by means of plume-like gills which take the oxygen directly from the water.

One of the most common and best known of the first class is the Limnaeidae, comprising the pond snails. These animals have generally a long, graceful shell, horn-colored for the most part, but sometimes greenish without and reddish within the aperture. The animal has a broad, flat foot, an auriculate or eared head, and flat, triangular tentacles. The habits of these animals are very interesting. They will wander about the sides of an aquarium, eating the growths of green scum which have collected. At this time the mouth may be seen to open, exposing the radula and the operation of eating is not unlike the motions of a cat lapping milk. They are such voracious eaters that the dirtiest aquarium will be cleansed by them in a very short time. It is interesting to note that the young animals breathe air through the water for a long time, and finally acquire the normal characteristic of the family of breathing the air directly. While submerged, the mantle chamber containing the "lung" is tightly closed so that no water can possibly get in. It is thought by some that the species of Limnaea living at great depths retain the early habit of allowing the water to fill the mantle cavity and so breathe oxygen through the water and are not, therefore, compelled to come to the surface for air.

Limnaea lives under many varying conditions, being found in the arctic regions of Greenland and Iceland as well as in the tropics, in thermal springs and those containing mineral matter, as sulphur, as well as in brackish and fresh water. They have been found at a height of over fourteen thousand feet in Thibet and at a depth of eight hundred feet in Lake Geneva, Switzerland. During times of drought when the streams are dried up and the surface of the mud is sun-cracked, the species of this family bury themselves deeply in the mud and cover the aperture with an epiphragm, in much the same manner as the land shells. This fact accounts for the apparent disappearance of all life from a pond when it dries up, and its sudden and seemingly unaccountable reappearance when the pond is again filled with water.

A genus of pond snails closely allied to Limnaea, but having discoidal or spiral shells, is Planorbis, the flat-orb shells. Instead of dragging their shells after them, as in the last genus, they carry them perfectly perpendicular, or perhaps tilted a little to one side. The animals are very rapid in movement, more so than Limnaea, which are rather sluggish. They delight in gliding rapidly about,

FROM COL. CHI. ACAD. SCIENCES.

LAND AND RIVER SHELLS.

Physa gyrina (U. S.)

Pleurocera elevatum (U. S.)
Vivipara contectoides (U. S.)

Melania tetrica (Viti Islands.)
Planorbis trivolvis (U. S.)
Ampullaria depressa (U. S.)
Campeloma subsolidum (U. S.)

Angitrema verrucosa (U. S.)

Limnaea stagnalis (U. S.)
Limnaea megasoma (U. S.)

their long, filiform tentacles waving about like a whip in the hands of an impatient driver.

The Limnaeas of which we have been speaking have mostly dextral or right-handed shells, that is, have the aperture on the right side when you hold the shell in the position pictured on our plate. In the family Physidae the shell is left-hand or sinistral. The members of this family have shining, horn-colored shells, more or less fusiform. The tentacles are long and filiform and are constantly moving about as in the allied genus Planorbis. The animal is very active and moves about with a steady, gliding motion. It is very interesting to watch a number of Physae in an aquarium; as they are crawling along the bottom, one will be seen to rise suddenly to the top of the water and move along with the foot applied to the surface, the shell hanging down. Again, they may be seen descending, suspended by a thin thread of mucus. When the animal rises suddenly, the branchial cavity which contains the lung is heard to open with a faint, clicking sound, which is probably due to the pressure of air in the lung being suddenly liberated. Several of the species of Physa inhabit water as cold as the freezing point and they may be frequently seen in winter gliding over the bottom of a stream or pond when the surface is frozen. The little glairy, transparent masses of jelly-like matter which are seen attached to stones and the under side of sticks, are the eggs of Physa or Limnaea.

Not all of the fresh-water pulmonates have spiral shells. A whole family, the Ancylidae, have a conical shell formed like a rounded shield, and resembling the limpets, hence called the river limpets. They are generally quite small and live attached to the interior of dead river shells and to submerged plants and to rocks. They are very interesting, but hard to find on account of their small size and inconspicuous habitat.

The second class of mollusks or those that breathe air through the water, have a respiratory cavity instead of a lung, in which is placed a series of leaflets, arranged like the teeth of a comb in two series of lines, forming the so-called gills. The mouth, also, is placed at the end of a long rostrum, or proboscis, and not in the lower plane of the head, as in the first class. Among the most common of this class are the river snails, known as Strepomatids. There are about three hundred species in this family, and with two or three exceptions they are confined entirely to the United States in geographical distribution. The shells are more or less graceful, having long, turreted spires and small apertures. The color of the shells is generally a uniform greenish or yellowish, although some species have color bands, and the aperture is frequently tinged with purple or reddish.

The animal is very interesting in captivity. It is not very bold and will lie on the bottom of an aquarium with its head and foot half protruding from its shell, and its rostrum and tentacles slowly moving about. Frequently it may be seen moving along with its head and rostrum bent down and moving about like a hound on the scent.

A family closely allied to the last is the Melaniidae, the animals of which inhabit the entire world, except North America. They may be distinguished from the last family by the presence of little finger-like digitations on the edge of the mantle. The shells are generally larger and more highly colored than those of the last family, many of them being of a dark chocolate color and some are of a beautiful glossy black; some shells are smooth, while others are ornamented by knobs and spines. The genus Melania, a species of which is illustrated on the plate accompanying this article, is the most characteristic form.

The largest and handsomest of the fresh-water snails belong to the two families Viviparidae and Ampullariidae, the shells of the latter family frequently attaining a length of three inches. The animals of the first family prefer a sandy beach in a large lake or river, while those of the second generally live in more or less muddy rivers, ponds and creeks. A single genus of Viviparidae (Campelona) is confined solely to the United States, east of the Rocky Mountains. Their shells are generally of a rich grass green and in certain localities they may be collected by the thousands. Unlike many of the snails of which we have been writing,

this family is viviparous, that is, brings forth its young alive, instead of laying eggs, as in the family Limnaeidae. This character has given the family its name, which is certainly well chosen. When born the shell is about one-sixteenth of an inch in length and is perfectly transparent. The animal is very active and eats voraciously of any vegetation within reach. Another handsome shell belonging to this group is the Vivipara contectoides, which is about an inch in length and is encircled by several color bands. It is a common shell in many of our ponds.

Somewhat larger and handsomer than the Viviparas are the Ampullarias, or apple-shells (also called idol-shells and pond snails). These animals live mostly in tropical and subtropical regions and are noted for the tenacity with which they retain their hold on life. So tenacious of life are they that instances are known of their living for several years away from the water, in this respect resembling some of the land snails. It is also recorded that hollow pieces of logwood from Honduras have frequently contained specimens of this family alive after a journey of thousands of miles. They may be said to be truly amphibious.

The writer has collected in Florida the large Ampullaria depressa in considerable numbers. It was noted particularly that this species furnished the principal food of the Everglade Kite, a bird inhabiting the southern part of Florida. Large quantities of these shells were found about the nesting places of these birds, from which the animal had been neatly extracted without damaging the shell in the least. The bird is, curiously enough, provided with a curved bill which easily fits into the aperture of the mollusk and extracts the animal with little difficulty, and the feet and claws are so constructed that the shell may be firmly held during the operation. This shell is figured on the plate.

In Central Africa there is a lake, Tanganyika, having a length of four hundred miles and a width of from ten to fifty miles, and at an elevation of twenty-seven hundred feet above sea level, which has one of the most interesting and peculiar fresh-water molluscan faunas known. It is thought that at some remote period in geological history this lake formed a part of the ocean and that in the course of time it was cut off from the sea, gradually became fresh and was finally raised to its present elevation. The reason for such a theory is the presence in the lake of certain molluscan organisms whose shells closely resemble those of the salt water family, Littorinidae (Periwinkles). The fact that certain species of the family inhabit brackish water and are even subject to the influence of fresh water, adds additional weight to this theory. The shell of this species (Limnotrochus thomasi) also resembles certain of the top-shells (Trochus), which are marine in habitat. Most of the other species inhabiting this lake are like the fresh water Viviparas in form.

The animal of Ampullaria depressa is very curious and interesting when studied alive. The foot is very wide, almost square in some positions; the head is narrow, separated from the body by a neck and the region of the mouth is produced into two long, cylindrical, tapering, tentacular processes, which are probably tactile organs like the elongated lips of Glandina, described in the last article. On the top of the head are placed the two whip-like tentacles, which are longer than the length of the whole animal and are always waving about when the animal is in motion. Just back of the tentacles the eyes are placed at the end of two short, rounded prominences or peduncles. From the left edge of the aperture extends the long, hollow, cylindrical siphon formed by two extensions of the mantle. On the upper side of the posterior end of the foot is placed the horny, concentric operculum or door. When the animal withdraws into its shell the head first disappears with its appendages and the siphon, and the foot is doubled up in the middle, the operculum shutting in last and closing the interior against all enemies.

All of the different groups of the mollusca have their giants and their pigmies and the fresh-water mollusks are no exception to the rule. We have thus far studied the animals of normal size and the giants. Let us now turn our attention to some of the pigmies among the fresh-

water snails. One of the commonest of these small mollusks is the Bythinia tentaculata, the shell of which does not exceed half an inch in length, and is formed in a graceful, tapering turret. This species, like many other European animals, has been introduced into this country and bids fair to eclipse many of the native species in the number of individuals. It probably first came over with some merchandise, which was shipped west by the way of the Erie canal. The snail, once established in the canal, has had every opportunity to spread over the entire United States. The canal is emptied every year and cleaned and the water, with its organisms, is allowed to flow into the little streams and the larger rivers and thence into Lake Ontario. From this lake this species has spread so that it is also found in Lakes Erie and Michigan, and will eventually spread over the entire northern portion of the United States. This is but one of the many examples of different species being carried by human agencies from one part of the world to another.

But there are many species of these smaller fresh-water snails that are pigmies, indeed, whose tiny shells do not exceed an eight of an inch in length and which require the aid of a microscope to adequately study their delicate organisms. These minute animals live on water plants and on any submerged object. They vary from long, pointed, steeple-like shells to those which are perfectly rounded like a miniature apple. In our own country these little creatures may be found in any of our ponds or streams, and the lively little animals are well worth a closer acquaintance. They are known scientifically under the difficult names of Paludinella, Amnicola, Somatogyrus, Fluminicola, with many others, and do not bear any specific English titles.

Much more might be written concerning the habits and variations of the fresh-water snails. The best way to become acquainted with these interesting animals is to collect them alive and study their various modes of life in an aquarium. This receptacle need not be an elaborate or expensive affair. A fish globe six or eight inches in diameter makes an admirable aquarium and even a quart Mason fruit jar has been successfully used by the writer. The bottom should be covered to a depth of an inch or more with clean, fine sand and several stones should be introduced for the snails to "roost" upon. If the aquarium is large enough a few water plants like water cress might be introduced to assist in purifying the water.

The best Mollusks for this purpose are the Limnaea, the Planorbis, the Physa, the Vivipara and some of the "pigmies" just mentioned. Much can be learned concerning the habits of our common snails if a record is kept of everything the animal does, such as its mode of eating, what it will eat and the increase in size from day to day of the little snails after they are hatched from the egg. If these creatures could be considered by the majority of people as living, breathing animals, performing many of the functions carried on by our own bodies they would be regarded with more favor and hence aquaria would become more numerous and they would also be studied more intelligently. The writer has been frequently amused (and sometimes pained) by the careless question of some otherwise intelligent person, when he has been exhibiting the shell of some interesting mollusk, "Well, really, now, was that thing ever alive?" It is to be earnestly hoped that this series of articles will reach many of this class of people and lead them to a better understanding of these lowly creatures.

Frank Collins Baker.

THE ORANGE.

(*Citrus aurantium.*)

The tree which produces the well-known Orange of commerce is closely related to the lemon, the citron and the lime, and with them belongs to the genus Citrus.

By some it is supposed that Linnaeus selected this name, deriving it from a corruption of the Greek word meaning cedar-tree, because, like the cedar, it is an evergreen. By others it is held that the name was chosen in honor of the city of Citron in Judea. In ordinary language the name citron is applied to another species of the genus, the fruit of which is oblong, about six inches in length and with a thick rind.

Many consider that the name Orange is a direct corruption of the Latin word aureum, meaning golden; but our best authorities on the derivation of words believe that the name, though a corruption, reached its present form in the following manner: "The Sanskrit designation nagrungo, becoming narungle in Hindustani, and corrupted by the Arabs into naranj (Spanish naranja), passed by easy transitions into the Italian arancia (Latinized aurantium), the Roman arangi, and the later Provincial Orange."

In regard to the original home of the Orange there is a great diversity of opinion, yet there is little doubt that it was in some portion of southern Asia. Both the Orange and the lemon were unknown to the Romans, hence they must have been indigenous in a country not visited by this people. The region traversed by them was great and they even penetrated India. They were a people who were inclined to please the palate and would surely have used the Orange and taken it home with them if discovered and would doubtless have recorded the finding of so important a fruit. These facts tend to prove that the Orange was not then cultivated in India unless in the remoter parts. Other portions of Asia were unknown to the Romans but, with the exception of the southeastern portion, climatic conditions would not have permitted the growth of the Orange.

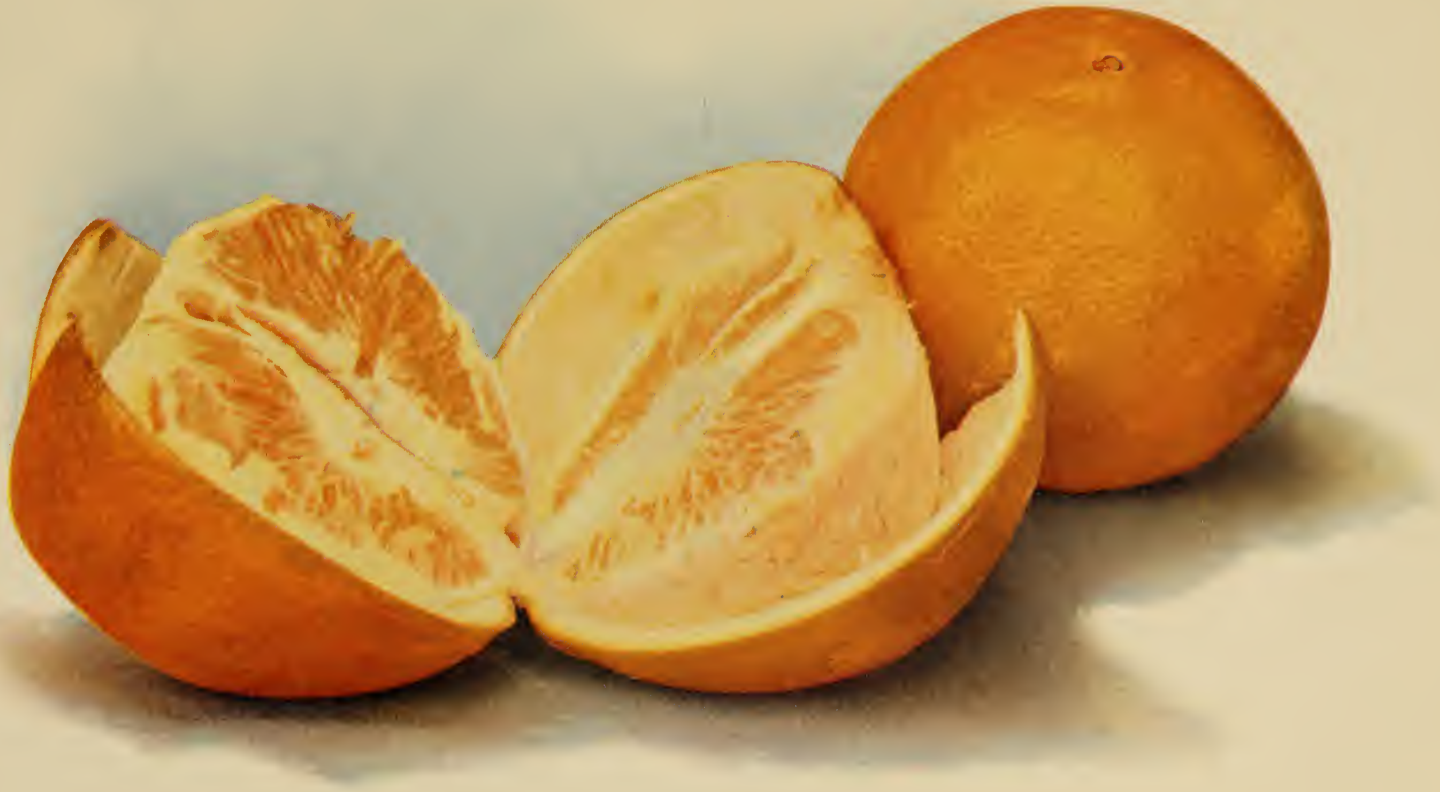
De Candolle, an eminent botanist and one the truthfulness of whose investigations cannot be questioned, held that the original home of the Orange was the Burmese peninsula and southern China. Throughout both China and Japan this fruit has been cultivated from very ancient times.

Though not found by the Romans in India it was later cultivated there and without doubt it was carried from there by the Arabs to southwestern Asia previous to the ninth century and from there into Africa and to some of the European islands. The Arabian physicians were familiar with the medicinal virtues of the Orange and have spoken of it in their writings. It was probably afterwards introduced into Spain and possibly to other portions of southern Europe by the same agency as it seemed to follow the spread of Mohammedan conquest and civilization. Thus in the twelfth century we find that the bitter Orange was a commonly cultivated tree in all the Levant countries. There is no reference to the sweet Orange in the literature of this time and it must have been introduced at a later period. It was certainly cultivated in Italy as early as the sixteenth century.

In more recent years the cultivation of the various varieties has spread throughout the world wherever the climate and the conditions of the soil will permit the ripening of the fruit.

Risso, in his valuable history of the Orange family, enumerates one hundred and sixty-nine varieties with distinct characteristics. Of these he classes forty-three under the Citrus aurantium.

Besides the sweet and bitter varieties the more common ones are the Mandarin Orange of China, a flat and spheroidal fruit the rind of which easily separates from the pulp; the Tangerine, which is



PRESENTED BY LOUIS KUNZE.

399

ORANGES (NAVEL).
(Citrus aurantium.)

very fragrant and originally derived from the Mandarin, and the Maltese or Blood Orange, commonly grown in southern Italy and notable for its deep red pulp. There are many other varieties that bear geographical or local names.

Few forms of plant life present to the beholder more beautiful characteristics than an Orange tree in full bearing. Such a tree, in addition to the unripe and ripe yellow fruit has also numerous white flowers, which give off their wonderful perfume, and its symmetrically arranged branches are covered with rich dark green leaves. It is a tree that appeals not alone to the sense of taste but to the esthetic nature as well.

THE MUSICAL SWAN.

(*Cygnus musicus.*)

"What moonlit glades, what seas,
Foam-edged, have I not known!
Through ages hath not flown
Mine ancient song with gathered music sweet—
By fanes o'erthrown,
By cities known of old, and classic woods,
And, strangely sad, in deep-leaved northern solitudes?"

If those living Avian gems aglow amid the trees that form Earth's emerald diadem, are the jewels of Nature's crown, then is the great white swan afloat upon the ripples of her glistening lakes and seas, a shimmering pearl amid the chasing of her silver breastplate.

Yet it was not the beautiful Mute Swan, most beautiful, most stately, and most silent of all created beings, that typified to the men of old the reincarnation of the poet's soul; neither the Trumpeter, with its loud clarion, but the more slender Singing Swan of song and story, that "thro' its deathless music sent a dying moan." It was to this swan alone that the ancients could attribute the power of melody—the singular faculty of tuning its dying dirge from among the reedy marshes of its final retreat, where "in a low, plaintive and stridulous voice, in the moment of death, it murmured forth its last prophetic sigh;" and it was this swan, too, that inspired the philosopher Pythagoras to teach that the souls of poets passed at death into swans and retained the powers of harmony they had possessed in their human forms.

M. Antoine thinks that it is not improbable that the popular and poetical notion of the singing of the swan was derived from the doctrine of the transmigration of souls; yet the traveler Pausanius, who spake as one having authority, affirmed the swan to be "the glory of music," at the same time preserving the following testimony to the repute of the swan as a bird of prophecy: "In the night before Plato was to become the pupil of Sokrates, the latter in a dream saw a swan take refuge in his bosom. Now the swan has a reputation for music, because a man who loved music very much, Kuknos, the king of the Ligyes beyond the Eridanus, is said to have ruled the land of the Kelts. People relate concerning him that, through the will of Apollo, he was changed after his death into a swan." From this evidence Pausanius thus subtracts the weight of his private opinion: "I am willing to believe that a man who loved music may have ruled over the Ligyes, but that a human being was turned into a bird is a thing impossible for me to believe."

Mr. Rennie cites, also: "In his Phaedro, Plato makes Socrates thus expresses himself: 'When swans perceive ap-

proaching death, they sing more merrily than before because of the joy they have in going to the God they serve; but men, through fear of death, reproach the swans, saying that they lament their death and sing their grief in sorrowful tones.' After digressing to assert that no bird sings when either hungry or sorrowful, he resumes, 'Far less do the swans sing out of grief, which, by reason of their belonging to Apollo, are diviners, and sing more joyfully on the day of their death than ever before, as foreseeing the good that awaits them in the other world.'"

Charles de Kay wrote: "Not the magnificence merely, but the element of superstitious reverence accounts for the frequency of the swan as a crest and charge of coats of arms," stating that in heraldry the swan runs back through heraldic devices to totemism, and that among the "oath-birds" which wizards of Lapland called upon in their incantations, the swan often figured.

It is also asserted that German local legends retain the idea of the swan as an uncanny bird, prophetic of death or the under world, and that the Klagesee, or Lake of Complaining, near Liban, was so named from the numbers of musical swans that congregated there.

Pliny says, "Some affirm that swans sing lamentably a little before death, but untruly, I suppose, for experience of many has shown the contrary." But Aristotle says, "Swans are wont to sing, particularly when about to die, and mariners in African seas have observed many of them singing with a mournful voice, and expiring with the notes of their dying hymn."

Cicero affirmed that Lucius Crassus spoke with the divine voice of a swan about to die; while Homer makes no allusion to their singing, but mentions their "flying round the springs of Cayster, clanging on sounding pinions." Oppian asserts, "They sing at dawn before the rising of the day as if to be heard more clearly through the still air. They also sing on the sea-beach, unless prevented by the sounds of storms and boisterous weather, which would not permit them to enjoy the music of their own songs. Even in old age, when about to die, they do not forget their songs, though they are more feeble than in youth, because they cannot so well erect their necks and expand their wings. * * *

"They are invited to sing by Favonius, and as their limbs become sluggish and their members deficient in strength when death approaches, they withdraw to some place where no bird can hear them sing, and no other swans, impelled by the same cause, may interrupt their requiem."

While on the one hand Julius Scaliger vituperates Cardan for "lauding the nonsense of the poets, and the mendacity of the Greeks about the singing of the swan," Aldrovand cites on their behalf the testimony of one Frederico Pendasio, a celebrated professor of philosophy and a person worthy of credit, who told him that he had frequently heard swans singing melodiously while he was sailing on the Mantuan Lake; also that one George Braun had heard the swans near London "sing festal songs."

Besides this, Mr. Rennie says, Olius Wormius professed that many of his friends and scholars had heard them singing, and proceeded to give the experience of one John Rostorph, a student in divinity, and a Norwegian by nation. "This man did, upon his credit, and with the interposition of an oath, solemnly affirm, that once in the territory of Dronten, as he was standing on the seashore early in the morning, he heard an unusual and sweet murmur, composed of the most pleasant whistlings and sounds; he knew not at first whence they came, or how they were made, for he saw no man near to produce them; but looking round about him, and climbing to the top of a certain promontory, he there espied an infinite number of swans gathered together in a bay, and making the most delightful harmony—a sweeter in all his life-time he had never heard."

To this testimony Goldsmith appends his personal opinion in the following words: "Thus it appears that our modern authorities in favour of the singing of swans are rather suspicious, since they are reduced to this Mr. George Braun and John Rostorph, the native of a country remarkable for ignorance and credul-

ity." Goldsmith's own belief was that the ancients had some mythological meaning in ascribing melody to the swan, "and as for the moderns, they scarcely deserve our regard. The swan must, therefore, be content with that share of fame that it possesses on the score of its beauty, since the melody of its voice, without better testimony, will scarcely be admitted by even the credulous."

This better testimony is furnished by Charles de Kay, who says that modern bird-lovers have heard the swans of Russia singing their own dirge in the North, when, having lingered too long before migration, reduced in strength by lack of food, and frozen fast to the ice where they have rested over night, they clang their lives out, even as the ancients said.

Inasmuch as we have record of the Singing, or Whistling Swan from Egypt to Alaska and the Aleutian Isles, with testimony of modern scientists as well as ancient poets in proof of the vocality of this, the largest of singing birds, the question becomes one of quality of song rather than of the actuality of the song itself. M. Montbeillard's opinion of the whistler's vocal exertions is thus expressed: "The bursts of its voice form a sort of modulated song, yet the shrill and scarcely diversified notes of its loud clarion sounds differ widely from the tender melody, the sweet, brilliant variety of our birds of song." And M. Morin even composed a memoir, entitled "Why swans that sang so well in ancient times now sing so badly." It is probable that the ancients, with due consideration for the difference in size between the swan and all other songsters, may have also given consideration in the same ratio to the theory of the enchantment that distance lends; and it is more than probable that all of this confusion of testimony resulted from confusion of species; for, as Charles de Kay explains, observations of the Mute Swan caused people to assign the song of the dying swan to the most fabulous of fables; while Hearne, who observed the Trumpeter, makes the following vigorous statement: "I have heard them in serene evenings, after sunset, make a noise not very unlike that of a French horn, but entirely divested of every note that constituted melody, and have often been sorry that it did not forebode their death."

Aldrovand, referring to the structure of the organs of voice as countenancing the poetical creed of the singing swan, says, "For when we observe the great variety of modulations which can be produced from a military trumpet, and, going upon the axiom that Nature does nothing in vain, compare the form of such a trumpet with the more ingenious mechanism of a swan's windpipe, we cannot but conclude that this instrument is at least capable of producing the sounds which have been described by the ancient authors."

In distinguishing between the Whistling and Tame or Mute Swans, Bingley describes this strange form of windpipe, "Which falls into the chest, then turns back like a trumpet, and afterwards makes a second bend to join the lungs. The curve being inside the neck of the Whistler or Hooper, instead of being an external adornment, as in the case of the graceful Mute, in whom

'Behold! The mantling spirit of reserve
Fashions his neck into a goodly curve,
An arch thrown back between luxuriant wings
Of whitest garniture, like fir-tree boughs,
To which, on some unruffled morning, clings
A dusky weight of winter's purest snows——'

while with the Musical Swan the gift of voice is balanced by a corresponding detraction from personal appearance; for the straight neck and smaller stature impart, we are told (alas!), a certain goose-like suggestion."

This aesthetic obstacle is, however, successfully surmounted by the fact that their songs are uttered mostly at night, when flying far overhead in the darkness; but there is no help for the statement of Albertus Magnus, which must needs be taken for better or for worse, that "When swans fight, they hiss and emit a sort of bombilation, not unlike the braying of an ass, but not so much prolonged."

The Abbe Arnaud, whose observations were said to be very minute, completes the list of odious comparisons as follows: "One can hardly say that the swans of Chantilly sing; they cry, but their cries are truly and constantly modulated; their

voice is not sweet; on the contrary, it is shrill, piercing, and rather disagreeable. I could compare it to nothing better than the sound of a clarionet winded by a person unacquainted with the instrument."

Proceeding then to depict the manner of their dual concerts, he continues: "The swan, with his wings expanded, his neck stretched and his head erect, comes to place himself opposite to his mate, and utters a cry to which she replies by another which is lower by half a tone. The voice of the male passes from A to B flat; that the female from G sharp to A. The first note is short and transient, and has the effect which our musicians call sensible, so that it is not detached from the second, but seems to slip into it. This dialogue is subjected to a constant and regular rhythm, with the measure of two times. Observe that, fortunately for the ear, they do not both sing at once!"

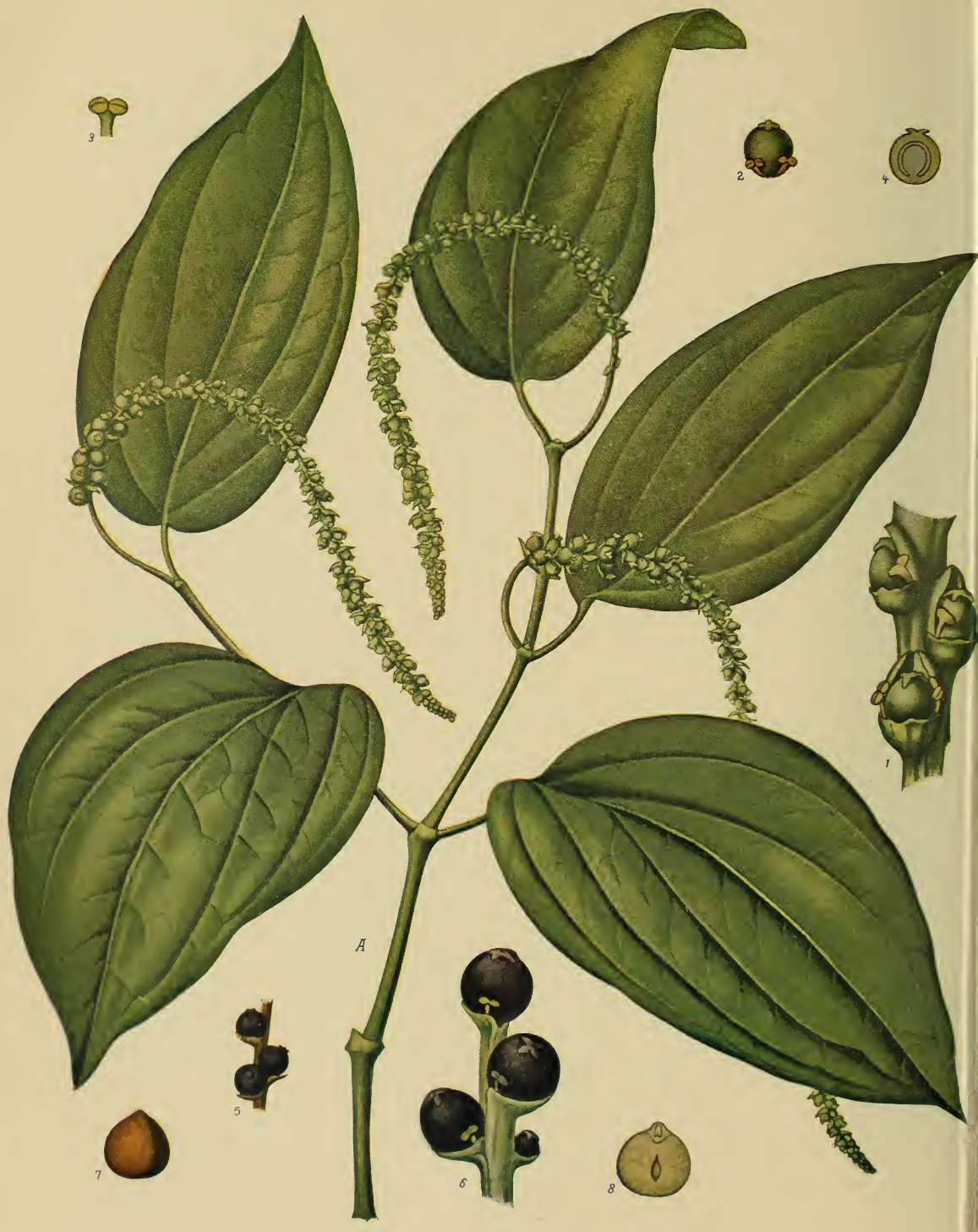
Nuttall is likewise arrayed with the witnesses for quantity rather than quality of sound. Of the dying song, he says, "These doleful strains were heard at the dawn of day or when the winds and waves were still, and, like the syrinx of Pan, were in all probability nothing more than the murmurs and sighs of the wind through the marshes and forests graced and frequented by these elegant aquatic birds." Speaking of the natives of Iceland comparing their notes, "very flatteringly," to those of a violin, he suggests that "allowance be made for this predilection, when it is remembered that they hear this cheerful clarion at the close of a long and gloomy winter, and when, at the return of the swan, they listen to the harbinger of approaching summer; every note must be, therefore, melodious, which presages the speedy thaw and return of life and verdure to that gelid coast." He adds that it emits its notes only when flying or calling on its companions—the sound being very loud and shrill, but by no means disagreeable when heard high in the air and modulated by the winds."

Of the "Peaceful Monarch of the Lake," Thomas Bewick wrote: "Much has been said, in ancient times, of the singing of the Swan, and many beautiful and poetical descriptions have been given of its dying song. 'No fiction of natural history, no fable of antiquity, was ever more celebrated, oftener repeated, or better received; it occupied the soft and lively imagination of the Greeks; poets, orators, and even philosophers, adopted it as a truth too pleasing to be doubted.' 'The dull, insipid truth,' however, is very different from such amiable and affecting fables, for the voice of the swan, singly, is shrill, piercing and harsh, not unlike the sound of a clarionet when blown by a novice in music. It is, however, asserted by those who have heard the united and varied voices of a numerous assemblage of them, that they produce a more harmonious effect, particularly when softened by the murmur of the waters."

To Cassell the voice of the swan "is low, soft and musical, and when heard from multitudes congregated together has a very pleasing effect." Shakespeare repeatedly alludes to the music of the swan with manifest confidence in its melody; Pallas, the ornithologist, likens their notes to silver bells; and Olaffson says that in the long Polar night it is delightful to hear a flock passing overhead, the mixture of sounds resembling trumpets and violins.

So now, though we no longer know that the soul of the poet returns to float, the embodiment of rhythmic grace, before our mortal eyes as in the years so long gone by, there yet remains to us the splendid imagery of that stately form in spotless plumage against the setting of the darkening sea, the wonder of that solemn requiem, and the prophecy and the mystery of the shadowy orchestra passing onward in the depths of the midnight sky.

Juliette A. Owen.



FROM KŒHLER'S MEDICINAL-PFLANZEN.

BLACK PEPPER.

CHICAGO:
A. W. MUMFORD, PUBLISHER.

PEPPER.

(*Piper nigrum* L.)

The pepperer formed an important member of the community in England during the Middle Ages, when a large proportion of food consumed was salted meat, and pepper was in high request as a seasoner.—S. Dowell, Taxes in England, IV. 35.

The plants yielding the black and white pepper of the market are climbing or trailing shrubs. The stem attains a length of from 15 to 25 feet. The climbing portions cling to the support (usually large trees) by means of aerial roots similar to the ivy. The leaves are entire, simple, alternate, without stipules. The flowers are very insignificant in appearance, sessile upon a long, slender, pendulous spadix. They are mostly unisexual, either monoecious or dioecious, that is the staminate (male) flowers and pistillate (female) flowers are separate, either upon different branches of the same plant (monoecious) or upon different plants (dioecious). The fruit is berry-like, with a thin, fleshy pericarp enclosing a single seed. The young fruit is grass-green, then changes to red and finally to yellowish when ripe. In southern India the flowers mature in May and June and the seeds ripen five or six months later.

Piper nigrum is a native of southern India, growing abundantly along the Malabar coast. It thrives best in rich soil in the shade of trees to which it clings. It also grows in Ceylon, Singapore, Penang, Borneo, Luzon, Java, Sumatra and the Philippines. It is cultivated in all of the countries named, especially in southwestern India. Attempts at its cultivation have been made in the West Indies.

In India the natives simplify the cultivation of pepper by tying the wild-growing vines to a height of six feet to neighboring trees and clearing away the underwood, leaving just enough trees to provide shade. The roots are covered with heaps of leaves and the shoots are trimmed or clipped twice a year. In localities where the pepper does not grow wild, well drained but not very dry soil not liable to inundations is selected. During the rainy season or during the dry season in February cuttings are planted about a foot from the trees which are to serve as support. The plants are manured and frequently watered during the dry season. They begin to yield about the fourth or fifth year and continue to yield for eight or nine years. The methods of cultivation differ somewhat in different countries. The harvest begins as soon as one or two berries of the base of the spike begin to turn red, which is before the fruit is mature. Two crops are collected each year, the principal one in December and January, the second in July and August. The spikes are collected in bags or baskets and dried in the sun on mats or on the ground. Ripe berries lose in pungency and also fall off and are lost.

Pepper is of extreme antiquity. It received mention in the epic poems of the ancient Hindoos. Theophrastus differentiated between round and long pepper, the latter undoubtedly P. longum. Dioscorides and Plinius mention long, white and black pepper and dwell upon the medicinal virtues of spices. Tribute has been levied in pepper. In 408, Alaric the daring ruler of the barbaric Visigoths, compelled the conquered and greatly humiliated Romans to pay as part of the ransom 3,000 pounds of pepper. During the Dark and Middle Ages pepper was a very costly article, as is evidenced by the fact that it was frequently found among royal presents. The pepper-corn rents, which prevailed during the Middle Ages, consisted in supplying a certain quantity of pepper at stated times, usually one pound each month. The high price of pepper was the prime motive to induce the Portuguese to seek a sea-route to India, the land of pepper. The route via the Cape of Good Hope led to a considerable re-

duction in price. About this time, also, began the extensive cultivation of pepper in the Malay peninsula.

The black pepper is the unripe, dried fruit of the pepper plant. The white pepper consists of the ripened fruits from which the pulpy pericarp has been removed. It is not nearly as pungent as the black pepper, but it has a more delicate aroma. Occasionally the dried black pepper is "decorticated" by blowing, thus giving the "corns" a smooth appearance resembling the white pepper. This is a very absurd proceeding, as by this process the most spicy portions are removed. The quality of the pepper is almost proportionate to the weight of the corns; the lighter the poorer the quality. After the fruits are dried they should be carefully winnowed to remove light grains and all refuse. Very frequently these winnowings are ground and placed on the market. Adulteration of pepper is quite common, especially when ground. A wise plan is never to purchase ground spices. Buy them whole and grind them at home or have them ground before your eyes. Good whole peppers should sink in water and should not crumble between the fingers.

There are several commercial varieties of pepper, as Malabar, Penang, Batavia, etc., differing considerable in quality.

The pungent taste of pepper is due to a resin and the odor is due to an ethereal oil. Besides these there is present an alkaloid known as piperin.

The chief use of pepper is that of a spice, added principally to meats, but also to other food substances. Its use is, however, less now than it was during the latter part of the Middle Ages. So extensive was the dealing in pepper that the English grocers of the time were known as pepperers. It was very liberally used with all meats, especially chopped or sausage meats. It was used as snuff or added to snuff tobacco to increase its effectiveness. It is still highly prized as an aid to digestion. Applied externally it is used as a counterirritant in skin diseases. Italian physicians recommend it highly in malarial diseases.

Description of Plate—A, flowering twig; 1, portion of spike; 2, ovary with stamens; 3, stamens; 4, young fruit; 5, 6, portions of spike (colors are wrong, 5 should be red and 6 should be green); 7, 8, fruit. Albert Schneider.

MARCH.

March, thou bully grim and gruff,
Ever grumbling, hoarse, and rough!
Always howling at the door
Of the rich man or the poor;
Screaming words that do not reach—
Words unlike our human speech.
Down the hollow chimney-bore,
Hark the raging tyrant's roar!
Beat not with thy sleety flail,
Or the keen lash of thy hail,
Infant Spring, that tender child,
Frightened when thou even smiled.
Cruel March, Sir!

—Walter Thornbury.

BIRDS AND NATURE.

ILLUSTRATED BY COLOR PHOTOGRAPHY.

VOL. IX. APRIL, 1901. No. 4

APRIL.

No days such honored days as these! While yet
Fair Aphrodite reigned, men seeking wide
For some fair thing which should forever bide
On earth, her beauteous memory to set
In fitting frame that no age could forget,
Her name in lovely April's name did hide,
And leave it there, eternally allied
To all the fairest flowers Spring did beget.
And when fair Aphrodite passed from earth,
Her shrines forgotten and her feasts of mirth,
A holier symbol still in seal and sign,
Sweet April took, of kingdom most divine,
When Christ ascended, in the time of birth
Of spring anemones, in Palestine.

—Helen Hunt Jackson.

I come, like a hope to a gloomy breast,
With comforting smiles, and tears
Of sympathy for the earth's unrest;
And news that the summer nears,
For the feet of the young year every day
Patter and patter and patter away.

I thrill the world with a strange delight;
The birds sing out with a will,
And the herb-lorn lea is swift bedight
With cowslip and daffodil;
While the rain for an hour or two every day
Patters and patters and patters away.

—Bernard Malcolm Ramsay, in the Pall Mall Magazine.

THE CURASSOW.

An interesting race of birds, known as the Curassows, has its range throughout that part of South America, east of the Andes Mountain range and north of Paraguay. All the species are confined to this region except one, which is found in Central America and Mexico. This is the bird of our illustration (Crax globicera).

The Curassows belong to the order of Gallinaceous birds and bear the same relation to South America that the pheasants and grouse bear to the Old World. They are in every respect the most important and the most perfect game birds of the district which they inhabit. In all there are twelve species placed under four genera. As the hind toes of the feet are placed on a level with the others they resemble the pigeon and are unlike many of the other gallinaceous birds.

The Curassows are very large and rather heavy birds and some of them are larger than our turkey. They have short wings and a strong bill. At the base of the upper mandible and on the upper side there is a large tubercle-like excrescence which is of a yellow color and quite hard. Upon the head there is a gracefully arched crest of feathers which is made of curled feathers, the tips of which are white in some of the species. This crest can be lowered or raised at the will of the bird. The plumage of the species illustrated is a beautiful and velvety black, except the white on the lower portion of the body. It is said that their motions are much more graceful than are those of our common domestic turkey. "They live in small flocks, and are arboreal in their habits, only occasionally descending to the ground, while roosting and building their nests on the branches of trees." The nests are large and made of twigs and willowy branches held in place by the stems of grasses, which are neatly interwoven between them. The nest is lined with down, feathers and leaves.

It is said that they are easily domesticated and that in some parts of South America they may be found in tame flocks around the homes of the planters. One authority states that at about the beginning of the present century a large number of Curassows were taken from Dutch Guiana to Holland, where they became thoroughly domesticated, breeding as readily as any other kind of domestic poultry. Though a tropical bird, it would seem that they might be acclimatized. They would certainly form a valuable addition to the list of our farm fowls, for their flesh is said to be "exceedingly white and delicate."

The female is not as large as the male and is usually reddish in color. Their food consists almost entirely of fruit and insects.

About the middle of the eighteenth century Eleazar Albin wrote "A Natural History of Birds," in which he gives a very interesting account of the Curassow and an excellent illustration of the bird. He says: "I took a pourtray of this bird at Chelmsford in Essex; it was very tame and sociable, eating and drinking with any company. The Cock I had of a man from the West Indies. They are generally brought from Carasow, from whence they take their Name. They are called by the Indians Tecuecholi, Mountain-Bird or American Pheasant."

FROM COL. CHI. ACAD. SCIENCES.
01

CRESTED CURASSOW.
(Crax globicera.)
1/5 Life-size.

SOME NOTABLE NESTS.

The Clymer boys and girls, of Cloverdale, New England, belonged to a Bird Club; they were proposed to membership by their neighbors, the Walkers; in fact, the two families composed the club, and it partook of the nature of a secret society.

All this was before the young people of Cloverdale knew of Clark University, and Dr. Hodges' "Ten to One Clubs," wherein the members pledged themselves to strive by all imaginable means—provided they were also practical—to induce ten song birds to live and sing each year, where only one was found the year before.

It was not necessary for the Cloverdale Club to put up carefully constructed and artistic bird houses, or to hang cotton and the like fine nest-building materials in choicest ornamental shade trees—not at all. The English Sparrow had not found the village in those days; the song birds were there, they knew all the good locations and just where to find the best stuffs for constructing, furnishing and decorating their homes; the work of the club was to find these homes, to study them, with the ways and habits of their occupants, and to record their discoveries in a big book labeled, "Things Not Generally Known."

Many of the statements in this book were as broad and conclusive as scientific dogmas, but the Cloverdale Club did not waste its time searching for hundreds of instances to establish a single truth; one was enough to be worthy of record; then, if some time the big book should be given to the public, and some naturalist or investigator should choose to confirm its statements by patient research, of course he would be welcome so to do. The club had the distinction of discovery, that was enough.

One interesting item recorded was this: "Birds—such as Orioles—who build in conspicuous places, like to decorate the outside of their nests, and in so doing are known to use manufactured materials and patterns." Strange statement, but of course thereby hangs a tale, and here it is.

At the spring house-cleaning time, Mrs. Clymer had the big, bright sitting-room carpet taken out under one of the old colonial elms, at the east of the house, to be cleaned. Mrs. Baltimore Oriole was up in the elm that morning looking for a building spot that should be a bit superior to the old one; she had spent three summers in that tree, was familiar with the ways of the club, and habits of the family; like the birds of Eugene Field's boyhood, "she knew her business when she built the old fire-hang-bird's nest."

No one was near when Mrs. Oriole fixed her eyes on the great red, green and white ingrain carpet, and admired it; what she thought we know not, but when she glanced at the hitching post under the tree, she instantly descended from high, waving branch, to lowly square post, for exactly covering the top of the same was a miniature carpet, a piece just six by six inches which Patrick should have left indoors; not having done so, he laid it on the inviting post for safe-keeping. That bit of wool fabric was very valuable, it exactly filled a jog right by the fireplace, in which, alas! ever after was seen an ugly piece of oil cloth!

All summer long the club girls and boys gazed with wonder at the gay nest in the elm, hanging like a solitary blossom among the leaves; their speculations about it would fill a long chapter; but after the birds were flown far to the south, and the leaves were gone, that nest was finally cut down and told its story: thread by thread, just as pulled from the bit of carpet, had been woven into a decoration for the outer wall of that hanging house, till a rude reproduction of the original tiny rug was under the feet of the birdlings, and over the heads of the boys.

The club held a special exhibition of

that nest, and at Thanksgiving time one of the home-coming guests, who was an enthusiastic kindergartener in the city, persuaded those generous nature students to let her take their treasure to the poor children who seldom saw the commonest kind of a hang-bird's nest, and in that kindergarten it may be seen today.

Another entry in the club book was this: "Birds building on the ground, especially Vesper Sparrows, locate if possible where they have a fine outlook, and give great attention to the arrangement of the front yard."

This was discovered when Emily Clymer took her small brother Jo up in the "side hill pasture" to see the finest mountain view in all the county, and to find wild strawberries; while picking the berries they found what was afterward called the juniper house; this was a Vesper Sparrow's home, roofed by green growing juniper.

Everybody knows that the prophet Elijah could never have sat and wept under a New England juniper tree; no tree is less high or more nearly horizontal than this; in fact, we call it a bush—where it is big—this one was not larger than Emily Clymer's two hands, and growing straight out from descending ground, it formed a flat, green roof to the Sparrow homestead; then, while my lady sat upon her nest, she looked out of her tiny front door, across a gently sloping lawn, upon a whole range of mountains. But most remarkable of all were the ornamental shade trees, for just ten inches from the door, on either side, waved two big brakes, symmetrical in size and shape; they gracefully arched across the entrance, and were to the Sparrow domicile as the giant elms to the big Clymer homestead. A sketch of this beautiful residence was made by a member of the club —for cameras were not common in Cloverdale then—the picture cannot be taken from the club book, but I think we can see it all with our mind's eye.

Here is one of the most astounding statements in that book of many observations: "Some Phoebes are like the Golden Eagle in three ways—first, they build on rocky and inaccessible cliffs, second, they build in the same place for one hundred years; and, third, when the young are big enough to fly, they know how, and just go up without any practicing." All this can be proved to any one who will go in nesting time to a cliff overhanging the river just below Cloverdale, and who will accept the testimony of some of the most reliable and respectable men who have honored that place in the past century.

You must go in a boat and hug the shore; of course you need a member of the club for guide; at an unexpected moment you are told to look over your head, and there, glued to a shelf of rock so small as to be entirely covered by the same, is the nest! No porch, or even doorstep, beyond its wall—an overhanging roof of rock above, a shoreless expanse of water below; now, if some one can keep the boat steady, and you have the nerve to stand at the highest point of the bow, then by reaching over your head you can gently touch some fuzzy bits of life in the nest. Now you know the first and last of the facts recorded are correct: there is the nest on the inaccessible cliff; there are the birds, and if they did not fly up and out into the world the first time they stood on the edge of the nest, would they not be in the dark water below, instead of coming back to the old home for a hundred years?

The evidence of successive occupation for a century is this: The present family of Walkers—father and children—have watched that nest, never finding it empty a summer for twenty years. Old Deacon Walker, grandfather of our club members—who, of course, initiated their father—proved that Phoebes had hatched in the cliff nest during eighty years previous, in this wise: After he had stood guard forty years, as the deacon loved to relate, didn't his Uncle Israel—who had been spending just those two-score years in the South—come home one spring evening, and the very next morning that ancient worthy demanded a boat and a boy to take him under the old Phoebe's nest on the ledge, which he affirmed had never been without tenants during the forty years before he left Cloverdale?

So there are the figures and facts showing how not only the nest, but bird love and bird lore had come down through the

century, and with such an inheritance, no wonder the Walkers are on the best of terms with feathered folk, or that they, with their confidential friends, the Clymers, are still adding to their bird book things not generally known.

Elizabeth Reed Brownell.

THE BLACKBIRD'S SONG.

The bee is asleep in the heart of the rose,
The lark's nestled soft in the cloud,
The swallow lies snug close under the eaves—
But the blackbird's fluting is loud;
He pipes as no hermit would or should,
Half a mile deep in the heart of the wood,
In the green dark heart of the wood.

The raven's asleep in the thick of the oak,
His head close under his wing;
The lark's come down to his home on the earth—
But the blackbird still will sing,
Making the heart of the dark wood thrill
With the notes that come from his golden bill,
That flow from his golden bill.

—Walter Thornbury.

A GOLDEN EAGLE.

In January, 1900, I had given me a Golden Eagle. He had been picked up in a stunned condition in the foot-hills, having received a shock from the electric wires, on which he had probably alighted for a moment or struck in his flight. There is an electric power-house in the Sierras opposite Fresno, from which pole lines carry the strong current down to be used for power and light in the valley, and this was by no means the first record of eagles and other large birds being stunned or killed by them.

The person who found him had brought him down with the idea of having him stuffed, but as he showed a good deal of life, I begged to keep him alive, and he was handed over to me. He was evidently a young bird of the previous season, though nearly full grown. From tip to tip of his wings he was over five feet, and his wonderful black talons measured one and one-half to two inches beyond the feathers. His legs were handsomely feathered down to the claws, and his proud head, with its strong beak, large, piercing eyes, and red and yellow-brown feathers, was a thing of beauty. The rest of his body was dark, almost black, with the exception of three or four white diamonds showing on the upper tail feathers.

I kept him in a big box open on one side. When I first brought him home and had put him into the box, a neighbor's poodle came sniffing around for the meat I had brought for the eagle. He was on the back side of the box, and so could not see that there was anything in it, nor did he hear anything, but all at once the scent of the bird must have struck his nostrils, for with a squall of fear he disappeared from the yard and never afterward would venture near the cage.

During the time I kept the eagle, some two months, he never showed any desire to attack me, though his claws would have gone through my hand like a knife, nor did he display any fear of me. He never made any attempt to get out while anyone was in sight of him, nor did I catch him in any such attempt, but sometimes at night I would hear him, and every morning his wings, beak and feathers showed he never gave up the hope of getting free.

I never fed him to the full extent of capacity, but gave him from a pound to a pound and a half of meat daily at noon, which he devoured in a very short time, sticking his claws through the toughest beef and tearing it like ribbons with his beak. It was wonderful to see how clean he could pick a bone with his clumsy-looking great beak. I never knew him to touch any kind of food but raw meat. When anything was handed in to him, no matter how high up, he never accepted it in his bill, but struck at it with a lightning-like movement of his claws, scarcely ever missing it.

One day he snapped in two one of the bars across his cage, pried off another and got out. I was telephoned that my eagle was out, and hurried home to find all the children in the neighborhood blockaded indoors. The eagle was perched on the grape-arbor easily surveying the lay of things. A cat had crawled into the wood-pile and under the door-steps the venerable cock of the yard was congratulating himself on his safety, but feeling rather undignified. I procured a rope and took my first lessons in lassoing. The eagle had been so closely confined that he had not been able to gain the full use of his wings, and so could only run or flutter a few feet from the ground. I finally recaptured him and brought him back. He showed no fear and offered little resistance.

About the middle of March the weather became very hot, and it was really cruel to keep the bird penned up in such close quarters in such weather, so I took him out to the plains and set him free. He could not use his wings much, and it is very doubtful if he escaped the shot-gun or rifle of some predatory small boy, but it was the best I could do for him. He was a beautiful specimen of a bird, and I only wish I could have kept him.

Charles Elmer Jenney.

FROM COL. CHI. ACAD. SCIENCES.

HARLEQUIN DUCK.
(Histrionicus histrionicus.

THE HARLEQUIN DUCK.

(*Histrionicus histrionicus*)

The Harlequin Duck is the sole representative of the genus to which it belongs. The generic and the specific names (Histrionicus), which unfortunately the strict rules of scientific naming require in the case of this bird to be the same, are from the Latin word meaning harlequin. This word, meaning a buffoon, is especially appropriate, for the arrangement of the colors on its head, neck and back give the bird a peculiar appearance, especially during the mating season. At this time, too, the drollery of their actions is very noticeable.

Harlequin is not the only name by which this bird is known. In the New England States and northward along the Atlantic coast it is frequently called the "Lord and Lady," because of the white crescents and spots of its plumage and the proud bearing of the male. It is also called the Rock Duck, the Mountain Duck and the Squealer.

Its range covers the northern portion of North America, Europe and Asia. "It is not common wherever found. In many parts of the Old World it is only a rare or occasional visitor; this is the case in Great Britain, France and Germany." In the United States, during the winter, it passes southward into Illinois, Missouri and California. It breeds only in the northern part of its range.

It is a mountain duck and "frequents swiftly running streams, where it delights to sport among the eddies below water falls or in the brawling rapids." It is not only an adept in the art of swimming and diving, but it also flies swiftly and to a great height. During the winter it frequents northern sea coasts and exhibits the characteristics of other sea ducks, and is occasionally found far out at sea. It is known that the Harlequin will lead a solitary life, and it is sometimes observed in pairs or even alone on streams of remote and unfrequented localities.

The sexes vary greatly. While the male, which is the sex of the bird of our illustration, is brightly colored, the female is much more somber. The young resemble the adult female.

The food of the Harlequin consists almost entirely of the parts of aquatic plants and the smaller crustaceans and mollusks. The food is obtained by diving, frequently through several feet of water. Mr. Chapman tells us that the sea ducks in diving to obtain food, will "sometimes descend one hundred and fifty feet or more."

Its nest, though usually placed on the ground, is sometimes built in the hollow of a tree or a hollow stump, though always near a body of water. The nest is usually a simple structure made of the stems of water plants, twigs and grass thickly lined with the downy feathers from the breast of the duck. The eggs are occasionally laid on the grass, and no effort is made to build a nest. The female thoroughly covers the eggs when she leaves the nest.

The number of eggs varies from six to eight, though ten have been recorded. They are of a "yellowish buff or greenish yellow" color.

This duck is considered an excellent food and is much sought for by the natives of those regions which it frequents.

AN ORCHARD BIRD-WAY.

"A rodless Walton of the brooks,
A bloodless sportsman I;
I hunt for the thoughts that throng the woods,
The dreams that haunt the sky."

—*Samuel Walter Foss.*

An isolated orchard certainly comes very near being an inner sanctuary of bird life. For some reason or other, the gnarled old trees and matted June grass touch either the practical or artistic sense of bird nature very closely, and appeal strongly to many a bird heart, for therein do congregate all sorts and conditions of feathered life. Probably it is an exceptional feeding-ground, for the curled and misshapen leaves testify to the abundance of the hairy caterpillar and leaf-worm supply, which proves such delectable tidbit to the bird palate. When I see the birds feasting upon these unsavory looking morsels, I can but wonder at the unregenerate farmer who so loudly decries the bird as a fruit-destroyer, when a few hours' observation will teach him that to one cherry stolen there are a hundred tree destroyers gobbled up, and a thousand weed seeds devoured. It is Wilson Flagg who so curtly says:

"The fact, not yet understood in America, that the birds which are the most mischievous as consumers of fruit are the most useful as destroyers of insects, is well known by all the farmers of Europe; and while we destroy the birds to save the fruit, and sometimes cut down the fruit trees to starve the birds, the Europeans more wisely plant them for their sustenance and accommodation."

Our orchard is surrounded by a fence of weather-stained chestnut rails, whose punctured surface has been the scene of many a worm tragedy resulting in the survival of the fittest. We enter through a pair of lichen-covered bars, grey-tinted and sobered by age. How far less picturesque is our field and hedgerow when inclosed by that inhuman human invention, a barbed-wire fence, and trim sw[illegible]te. To be neat and up to date, is r[illegible]e picturesque, and seldom to be artistic. But our quiet entrance into the orchard has caused something of a disturbance among the inhabitants, if no great alarm. Fluttering hastily to a convenient tree top goes a dainty red-eyed vireo, who seems to me to have more of a grey than olive gleam to his shining back. As he alights upon the topmost bough—

"A bird's bright gleam on me he bent,
A bird's glance, fearless, yet discreet,"

but to show that he is in no way seriously alarmed he flings down to us some sweet notes of liquid song. It is Wilson Flagg, I believe, that has dubbed him the Preacher, but to me he seems more correctly termed the Lover, for I can but interpret his accentuated notes into "Sweet Spirit, Sweet—Sweet—Spirit," a continuous cry, as it were, of loving eulogy to the devoted little wife who is so carefully hidden in her pocket nest in a distant thorn tree. But all of this time we understand his clever machinations, as he carefully leads us in an opposite direction by his song allurements. He flits from tree to tree with a naive turn and flutter, keeping upon us all the time, an eye alert and keen, until he deems us at a safe distance enough to be left to our own clumsy device, when, with a quick turn, he wheels backward to the starting-point, and we hear a triumphant praise call to the beloved "Sweet Spirit." Near a corner of the old orchard where there are great bunches of Elder and Sumach, we hear vehemently stitching, a busy little Maryland yellow throat, doing up his summer song work with an energetic "Stitch-a-wiggle, Stitch-a-wiggle, Stitch-a-wiggle, stitch 'em," the "stitch 'em" brought out with such emphatic force that it seems the last satisfactory utterance of a work accomplished. His pert vivacity has been most delightfully illustrated by Ernest Seton-Thompson, in Frank Chapman's "Bird Life," and I am sure the snap-shot caught him on his last accentuated "stitch [illegible]" Dr. Abbot tells us that these busy

little people usually build their nests in the skunk cabbage plants, indicating that they must have an abnormal odor sense, but perhaps they allow their sense of safety to overcome their sense of smell. However, this pair of yellow-throats have built instead, among some thickly matted Elders, just above the ground.

Another fact that favors our orchard in bird minds, is its close proximity to a thickly foliaged ravine which affords such delightful security to feathered people. It is also a charming background for our sunny orchard, filled in below, as it is, with tall, ghostly stalks of black cohosh gleaming white in the shadows.

Near by, upon a bit of high ground, quivers a group of prim American aspens, the pale green of their bark gleaming against the dark shadows of a hemlock hedge. As we look at them, not a leaf is in motion, when all of a sudden one little leaf begins to gesticulate frantically, throwing itself about with violent wildness, then another leaf catches the enthusiasm of the soft summer air, then another, and another until all of the trees are a mass of gesticulating, seething little serrated atoms, for all the world like a congregation of human beings, vociferating, demonstrating, or contradicting some poor little human leaf that has dared to be moved by some passing thought in advance of his fellow kind. Darting through the quivering foliage comes a gleam of fire, which resolves itself into a scarlet tanager who calls to us, "look-see," demanding our attention to his bright beauty, remembering possibly that his brilliant coloring is but a thing of short duration, for too soon will come winter and plain clothes. Perched upon a fence rail, but somewhat out of place in this shady corner, sits a blatant meadow lark, about whose golden breast is hung a gleaming neck chain and locket of shining black feathers, of which, from the pert poise of his head, we deem him justly proud, and he is at least a conspicuous spot of color against the green of the hillside. He eyes us impertinently as he inconsistently but musically calls to us, "You-can't-see-me, You-can't-see-me," in the face of the most contradictory evidence of his own conspicuousness, varying his song to "Erie-lake-Erie," with every other breath. As a child I used to wonder who taught him the name of the great lake on whose borders he makes his summer home. But to other people, other interpretations, for to Neltje Blanchan he says "Spring-o'-the-year, spring-o'-the-year," and to Frank Chapman his song is a bar of high, trilling notes. Sing on, you wary warbler, for we have not time to search out your carefully hidden nest among the timothy grasses of the distant meadow, for we know that it would be like looking for the pearl in the oyster, so carefully is it concealed among the dried grasses, but which snakes and field mice depredate so effectually. In the distant valley we hear the soft echo of the Italian liquids of the wood thrush's "A-o-le-le, a-oa-o-le." Shy little songster, who so sweetly trills to us long after his feathered kind have tucked their busy little bills away in soft wings. Across the orchard comes the romantic "Coo-coo-coo-coo," sometimes interpreted into "I-thou-thou-thou," of the purple plumaged mourning dove, starting out on a high minor and softly falling to a low contralto. There are no more delightful representatives of romantic bird love, than these birds illustrate. More frequently than in any other species you see the devoted pair going about together, on the telegraph wire, on the tree top, on the wing, always together, undulating their graceful necks with marked devotion. Many a bird lover has criticised Mr. Dove for his remarkable fondness for a lady who is a so decidedly slack housekeeper, and who is satisfied with so shiftless a nest in which to deposit the two white eggs, for the few carelessly thrown together sticks can prove anything but a bed of down to the tender bird babies. However, perhaps these romantic birds consider that "love is enough" as they follow Le Gallienne's refrain of:

"The bird of life is singing on the bough,
His two eternal notes of 'I and Thou'—
Oh, hearken well, for soon the song sings
rough
ould we hear it, we must hear it

Alberta A. Field.

THE CANADA GROUSE.

(*Dendragapus canadensis*)

The Canada Grouse, also called the Spruce Partridge, frequents the evergreen forests and swamps and the shrubby areas of British America east of the Rocky Mountains, and in Alaska it is a resident of the Pacific coast. In its southern flights it seldom passes beyond the latitude of the northern portion of New England and Minnesota.

This bird is an interesting member of the bird family Tetraonidae, which also includes the birds variously called bob-white, quail and partridge, the ptarmigans and the prairie hen. The family includes about two hundred species, about one-half of which belong to the Old World. There are twenty-five distinct species of the subfamily of grouse. These are practically confined to the higher latitudes of the northern hemisphere and are strictly speaking non-migratory. In fact, nearly all the birds of this family are resident throughout the year in the localities where they are found.

They are terrestrial in their habits, and when frightened they usually depend on hiding in places where their dull colors will least attract attention, but they will, occasionally, fly into trees when flushed.

The Canada Grouse, like all the related species, is a bird of rapid flight. The feathers of their small wings are stiff, causing a whirring sound during flight. The male during the mating season gives a great deal of attention to his appearance. He is quite black in general color and more or less barred with white underneath and above with gray or reddish brown. The female is not quite as large as the male, and is not as dark in color. Above the eye of the male there is a small area of bare skin, which is a bright vermilion color.

These gentle and retiring birds mate in the early spring and remain together through the breeding season. Captain Bendire states that he has good reason for believing that the mating may last for more than one season, as he has frequently found a pair, in the depth of winter, when no other individuals of the same species were near. The nest, consisting of loosely arranged blades of grass and a few stalks and twigs, is built by the hen on a slight elevation of ground, usually under the low branches of a spruce tree.

The number of eggs varies greatly. Mr. Ridgway says that they vary in number from nine to sixteen. The eggs also vary greatly in color from a pale, creamy buff through various shades to brownish buff, and are irregularly spotted with a deeper brown, though occasionally they are spotless.

During the spring and summer months the food of the Canada Grouse consists very largely of the berries of plants belonging to the Heath family, such as the blueberry, the huckleberry and the bearberry, as well as the tender buds of the spruce. In the winter it feeds almost entirely on these buds, and the needle-like leaves of the spruce, the fir or the tamarack trees. At times they seem to show a preference for certain trees, and will nearly strip the foliage from them.

As a food for man their flesh is far from satisfactory. It is dark-colored and strongly flavored with the odor of their natural food. However, certain Indian tribes are said to relish them and hunt them extensively.

Mr. Bishop, in "Forest and Stream," relates the following very interesting account of the strutting of the male Canada Grouse while in captivity. He says, "I will describe as nearly as I can his conduct and attitude while strutting: The tail stands almost erect, the wings are slightly raised from the body and a little drooped, the head is still well up, and the feathers of breast and throat are raised

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CANADA GROUSE.
(Dendragapus canadensis.)

and standing out in regular rows, which press the feathers of the nape and hind neck well back, forming a smooth kind of cape on the back of the neck. This smooth cape contrasts beautifully with the ruffled black and white feathers of the throat and fore breast. The red comb over each eye is enlarged until the two nearly meet over the top of the head. This comb the bird is able to enlarge or reduce at will, and while he is strutting the expanded tail is moved from side to side. The two center feathers do not move, but each side expands and contracts alternately with each step the bird walks. The movement of the tail produces a peculiar rustling, like that of silk. This attitude gives him a very dignified and even conceited air. He tries to attract attention in every possible way, by flying from the ground up on a perch, and back to the ground, making all the noise he can in so doing. Then he will thump some hard substance with his bill. I have had him fly up on my shoulder and thump my collar. At this season he is very bold, and will scarcely keep enough out of the way to avoid being stepped on. He will sometimes sit with his breast almost touching the earth, his feathers erect as in strutting, and making peculiar nodding and circular motions of the head from side to side; he will remain in this position two or three minutes at a time. He is a most beautiful bird, and shows by his actions that he is perfectly aware of the fact."

There seems to be a diversity of opinion regarding the method followed by this grouse to produce the drumming sound. Mr. Everett Smith, as quoted by Captain Bendire, says, "The Canada Grouse performs its drumming upon the trunk of a standing tree of rather small size, preferably one that is inclined from the perpendicular, and in the following manner: Commencing near the base of the tree selected, the bird flutters upward with somewhat slow progress, but rapidly beating wings, which produce the drumming sound. Having thus ascended fifteen or twenty feet it glides quietly on the wing to the ground and repeats the maneuver." According to this and other authorities a tree, usually spruce, having a diameter of about six inches and inclining at an angle of about fifteen degrees, is selected. Frequently these trees are used so extensively and for so long a time that the bark on the upper side will be much worn. Other authorities, and among them Indians, who live in the regions frequented by this grouse, claim that the drumming is produced while flying from the branches of a tree to the ground, repeating the operation several times in succession. Another authority describes the drumming of the male as follows, "After strutting back and forth for a few minutes, the male flew straight up, as high as the surrounding trees, about fourteen feet; here he remained stationary an instant, and while on suspended wing did the drumming with the wings, resembling distant thunder, meanwhile dropping down slowly to the spot from where he started, to repeat the same thing over and over again."

The Canada Grouse is easily domesticated and would make an interesting and amiable bird pet, because of their peculiar habits. Seth Mindwell.

DO PLANTS HAVE INSTINCT.

Instinct has been defined as a sponteneous impulse, especially in the lower animals—that moves them, without reasoning, toward actions that are essential to their existence, preservation and development. Instinct, imbedded in their organic structure, is the guide of animal life as reason is the guide of rational life. Instinct is said to be incapable of development and progress.

It is instinct that guides the wild goose in his long flight to meet the changing requirements of food and nesting. It is instinct that enables the carrier pigeon, though taken hoodwinked and by night to distant points, to wing his way unerringly homeward. Instinct leads the thrifty squirrel to stock his larder with nuts in anticipation of the period that must pass ere nuts are ripe again, and teaches him to destroy the embryo plant by biting out the germ so that his chestnuts will not sprout and thus be spoiled for food. The same wonderful power enables the bee to build her comb upon the strictest mathematical principles so as to obtain the greatest storage capacity and strength of structure with smallest consumption of wax, and then to store it with one of the most perfect and concentrated of foods. These and many other well-known cases of animal instinct will occur to the reader, but the object of this article is to mention a few phenomena of plant life, whereby they make, what we should designate in human beings, an intelligent adjustment to environment or provision for their future life and development.

As autumn approaches, even before Jack Frost strikes the first rude signal for winter quarters for insect and plant, or the wintry blasts compel the trees to furl sail and scud under bare poles, the forest trees begin to prepare for unfavorable conditions by forming and securely tucking away the bud that is next year to develop into leaf and flower. Before the leaf drops off, a substantial layer of cork is made to close up the pores through which the sap had so freely flowed during the growing season.

My older readers know, of course, that the green color of the leaf is due to the numerous corpuscles of chlorophyll which fill the cells. This same chlorophyll has an important mission to fulfill. These little green bodies are the only real food-making machines in nature. Upon the product of these tiny mills all animate nature depends for food. Their motive power is light, and their raw material the inorganic fluids absorbed by the roots from the soil, and their product is sugars and starches. It will be seen that chlorophyll is one of the most precious, as well as one of the rarest of substances, for while there may appear a great quantity it is superficial, never entering deeply into the substance of the plant.

The trees, by a sort of instinct, shall we say, withdraw their cohorts of green-liveried workers from the front as autumn approaches and deck themselves in the more gaudy but less wholesome colors of declining life. It is after the chlorophyll is withdrawn that the layer of cork is formed. The sturdy oak usually holds his brown leaves until they are whipped off by the wind.

The plants have been using light as a motive power for ages, while man, with his much-vaunted reason, is just beginning to utilize the kindred force, electricity, in arts and sciences. Man makes light draw a few pictures in sombre black and white, while nature flings broadcast landscape and life scenes in varied tints and shades.

In the process of photosynthesis much more energy is received than is necessary to run the machinery, so the plant, with commendable frugality, uses it in laying on what botanists call warming-up colors. If you will notice the peach twigs the next

time you take a walk, you will see that the more tender shoots and the buds are decked in rich reds and browns. That this is not for mere ornament may be practically demonstrated by wrapping the bulbs of two similar thermometers, the one with a green leaf, the other with a brown or red leaf, say of begonia or beet. Then put the two in the sunlight and you will soon find a difference of from six to ten degrees in favor of the warming-up color. Speaking of buds, have you examined the horse chestnut bud? It is prepared for the winter in the most substantial manner. The future leaf is first wrapped in a quantity of finest silky wool, then a number of tough light green cases are put on, and this is followed by compact brown scales neatly overlapping, with a complete coating of wax, so that the interior is effectively protected from the cold and moisture. The use of the warming-up colors is quite common with plants.

In the far north the same plant that requires the whole long growing season to mature its seed, will crowd the whole process into a few weeks. It will suspend growth and all other processes, or run them on short time and devote itself almost entirely to producing seed, and the seed itself will have much thicker shell.

I was interested last autumn in the pathetic struggle of a humble little Chenopodium album that had started life late and under unfavorable circumstances. It came up in September under the north piazza near the beaten foot path; close up to the building. I was first attracted by the fact that, though it was not over a foot high, it had bloomed and was making seed at a desperate rate, while its sisters earlier in the season reached several feet in height before blooming. But, alas! for the vanity of the poor little creature, the cold weather during the Christmas holidays came on, and the steam being shut off, the side of the building grew cold and my struggling little friend was frozen, and soon its lifeless remains were the sport and derision of the rude January winds. I pitied the poor little vagabond despite the bad record of her family. Indeed plants, like people, must suffer sometimes because of an evil ancestry. In this case I was touched by the pathos of the situation, and really hoped the pertinacious little wretch might proudly scatter her well-matured seed upon the hard-beaten path as an inspiration to the many boys that passed daily, grumbling because of the hardness of their lot. But the only moral I can now draw is the foolishness of delaying in the right start.

Sometimes the supply of light-energy is so great that the little chlorophyll machines cannot use it in their legitimate work, nor does the plant use it in preparing the warming-up color. Then the disc-shaped corpuscles turn their edges instead of their flat surfaces to the light, or sometimes move deeper down into the leaf. In some cases the leaf itself turns edgewise instead of broadside to the sun.

There are many plants so constituted that they cannot live from year to year in our northern climate, and they must make some provision for preserving their species, and right cunningly do they do this. At a certain period of its growth the potato, for example, puts its starch-making machinery to work on full time, and hurries the starch down below the surface of the ground, and stores it up in what we call a tuber. These tubers have stored in them a number of embryo potato plants, whose lack-luster eyes we see peeping out on all sides. When the time for growth comes, the young plant starts with a reserve-food supply sufficient to keep it growing for some time. We have all noticed, no doubt, how large a plant will grow from a potato, even in a comparatively dark cellar. We must not think that tuber-bearing vines and nut-producing trees are actuated entirely by philanthropic motives. Each nut is the young tree sent forth with his patrimony strapped to his back, ready to make a good start in the world as soon as the favorable time comes.

There are many devices for spending the winter that limits of time and space will prevent me writing about. Many of them more curious than the simple examples I have cited.

Plants are themselves generally unable to move from their fixed positions, so if they are to become prominent in the world they must send out their children—and many and ingenious are their devices for accomplishing this end. Most of my

readers are familiar with the parachutes of the silk weed, dandelion and various members of the Compositae family. How they sail through the air. A walk through the autumn forests will make one the unconscious, perhaps unwilling, carrier of numerous Spanish needles, stick tights, burrs and seeds of various plants who have taught their children to steal rides in all sorts of provoking ways. I imagine the wicked old mother laughs as her ugly baby clings to your clothing, sure of a safe ride to a more favorable place for growing. Many plants achieve the same end in a more pleasant way. They produce fruits and berries so luscious that some bird or animal will carry it some distance for the sake of the pulp. Man himself, philanthropist as he is, when he finds that a plant has produced a luscious fruit or palatable seed, will help the distribution and growth, and bring his superior intelligence to the assistance of the plant's slow instinct to improve its product. A book might be written upon the methods of seed dissemination. In fact, there is a very interesting book upon the subject.

We will just notice briefly the marvelous adaptation of plants to their environment. In the dry plains of Arizona grows a peculiar thick-leaved, stunted, cactus-like plant, suited to withstand the drouth. In the forests of Central South America a great vine climbs to the tops of the tallest trees and there flaunts its gay colors to the breeze. In Damara Land, southwest tropical Africa, upon a small upland section, and nowhere else in the world, grows the marvelous Welwitschea mirabilis, with no real leaves, but with its two cotyledons, persistent and growing to enormous length, living a century and acquiring a great trunk, the flower-stalk growing up from the bare trunk while the two great leaves, if I may so designate them, whip about in the breezes for a century without change, except as they fray out at the ends. These three so dissimilar plants all had a common, not so remote, ancestor, but have grown so unlike in their effort to adapt themselves to their environment, that no casual observer would suspect they were akin.

There is so much to say about the wonderful intelligence displayed by plants in their various activities, that a volume could not do the subject justice. We started with the question, Do plants have instinct? We end with the question, Have they? Rowland Watts.

Still winter holds the frozen ground and fast the streams with ice are bound,
There's many a dreary week to come before the flowers bloom;
Though everything were lost in snow yet Nature's heart beats warm below
And Spring will build her palace gay on hoary Winter's tomb.

—George Gee.

THE DOVEKIE.

(*Alle alle.*)

This little bird, often called the Sea Dove, belongs to the family of auks (Alcidæ). The range of the Dovekie is quite limited. While the marble murrelet, a related bird, is confined to the northern Pacific coast of North America, this little bird frequents only the "coast and islands of the north Atlantic and eastern Arctic Oceans; in North America south in winter to New Jersey." It breeds only in the northern part of its range. It has been observed as far west as the state of Michigan, but its appearance there was, without doubt, accidental, for it prefers the wild sea coast, where the storm and waves bring to it an abundant supply of food.

It is said to be a rare visitor on the coasts of the British Islands and it has been reported as common as far to the northward as Spitzbergen. In Greenland, where it is commonly found a close companion of the black-billed auk, the native Greenlanders call the Dovekie the Ice Bird, as they consider it a harbinger of ice.

Though the wings of the Dovekie are small in proport on to the size of its body it flies well and rapidly. One writer states that it will move its wings almost as rapidly as will a hummingbird. It is an expert diver and while swimming or resting on the water it will frequently dip its bill into the water. On the land it is much more graceful and walks better than nearly all the other members of the family of auks.

It feeds chiefly on small fish, crustacea and mollusks and will become very fat during a prolonged stormy season when the waves wash up an abundant supply of crabs and fish.

The Dovekie builds a simple nest usually in the crevices of rocky cliffs bordering the sea coast. It lays one or two bluish white eggs which are about the size of the pigeon's.

Mr. Saunders in speaking of the habits of the Dovekie says: "On the approach of a vessel this bird has a peculiar way of splashing along the surface of the water, as if unable to fly, and then diving through the crest of an advancing wave; it swims rather deep and very much by the stern."

The Dovekie is sometimes called a little auk to distinguish it from the larger species of the family. The flightless great auk, which at one time was common along the north Atlantic coast, belongs to this family. No living representative of the great auk has been reported since the year 1842. Unable to protect itself by flight it was ruthlessly exterminated by the zeal of hunters and fishermen who sought it for food, for its feathers and for the oil that could be extracted from its flesh.

As flying ever westward Night's shadows swiftly glide,
The sunrise at the dawning illumes the countryside.
The stars in quick succession in ether melt away,
Until the brightest planet is lost in glowing day.

—George Gee.

THE SONG SPARROW'S APPEAL.

Naturalists tell us that of all creatures below man, the largest animal brain in proportion to the size of the body is found in horses and song-birds. Whatever sense beyond instinct the little creature of whom we write may have had, something, at least, told it that it could obtain help at human hands.

A little sparrow the past season entered the kitchen of one of our country homes, and perched upon the window-sill in evident distress. Its feathers were ruffled, and its head ever and anon turned curiously around and up, as if looking at something out of the house and above the window.

In and out it continued to hop, without intermission, regardless of all offers of food, until the shutters were closed at twilight, and various were the surmises as to the cause of its strange conduct.

Through the course of the following day the same scene was enacted, without any clue appearing as to the cause of its distress.

At length, on the third morning, the mute petition for aid still continuing, one of the family, bethinking herself of the bird's curious upturning of the head, caught a new idea from it. Perhaps she might have a nest in the ivy that encircled the window, and something might be amiss with its little household.

Going to the second story and looking down, the cause of the trouble was at once manifest. A thick limb of the ivy had become loosened by the wind, and fallen directly across the petitioner's nest. It was too heavy for the bird to remove, and offered an insuperable difficulty in the way of her getting in to feed her young—now almost lifeless.

The branch was quickly removed, when the mother-bird, pausing only for a brief inspection of her brood, was on the wing in search of food. Her mate soon joined her, and both were busy as quick wings, worked by hearty good will, could make them.

Once only did the mother pause in her work—as if desirous to give expression to her gratitude, she reappeared upon the window-seat, and poured forth a sweet and touching song, as of thankfulness to her benefactors.

She returned three successive seasons, to be noticed and fed at the same spot where her acquaintance and familiarity with man first commenced.

We will add another similar incident, which is also absolutely true.

The correctness is vouched for by Mr. George Babbitt, late captain on Gen. Gresham's staff, of which he himself was a witness.

During the fierce cannonading in one of the battles of the Civil War, a small bird came and perched upon the shoulder of an artilleryman—the man designated, we believe, as "No. 1," whose duty it is to force down the charge after the ammunition is put in the gun. The piece was a "Napoleon," which makes a very loud report, and the exact scene of this occurrence was at a place called "Nickajack." The bird perched itself upon this man's shoulder and could not be driven from its position by the violent motions of the gunner. When the piece was discharged, the poor little thing would run its beak and head up under the man's hair at the back of the neck, and when the report died away would resume its place upon his shoulder. Captain Babbitt took the bird in his hand, but when released it immediately resumed its place on the shoulder of the smoke-begrimed gunner. The singular and touching scene was witnessed by a large number of officers and men. It may be a subject of curious inquiry, what instinct led this bird to thus place itself. Possibly, frightened at the violent commotion caused by the battle, and not knowing how to escape or where to go, some instinct led it to throw itself upon the gunner as a protector. But, whatever the cause, the incident was a most beautiful and pleasing one to all who witnessed it.

George Bancroft Griffith.

THE WITCH IN THE CREAM.

A TRUE STORY.

The old stone farm-house in which my grandmother lived had beneath it what I thought a very interesting cellar. The floor was plastered and whitewashed like the walls, to ensure the place from rats and other intruders, as well as to keep it cool. From the walls, flat stones projected, serving as shelves on which the butter and milk were kept. For years the milk had had a shelf to itself near the window.

One summer morning, while Grandma and I were sitting on the porch waiting for breakfast, the little colored servant came to us with wide-open eyes, saying: "La, Missy, jes look at dis milk-pan!" We looked, and saw, to our disgust, that the inside of the pan was covered with sand and grime, while the milk, which usually was coated with rich, thick cream, was thin and poor. "Why, Janey," said Grandma, "you didn't put milk away in a pan like that, did you?" "La, no, Missy," said Janey, "nobody wouldn't nebber put milk away in a dirty pan." "This is very strange," said Grandma. "You will have to throw the milk away, Janey, and be especially careful to have the pan clean this evening." "Yes'm," said Janey, "I will."

The following morning, however, the milk had to be thrown away again, as the pan was in a worse condition than on the preceding morning. "I don't understand it," said Grandma. "It can't be rats, nor mice, for there is no way for them to come in." "They couldn't climb into a tin pan eight inches high, at any rate," I said, "and if they jumped in they would drown." Janey shook her head knowingly and said, "It's witches, Missy, dat's jes what it is." A light board was placed over the milk that evening, but we found that the marauder pushed it off in the night. We felt that we must come to Janey's conclusion about the witches, if the mystery were not solved soon.

In the afternoon of the third day of these experiences we were sitting on the back porch with our sewing, both of us half asleep, when chancing to look up I saw a rat go scudding across the yard. Straight to the cellar window he went, and, approaching one corner, thrust his nose under the sash. He gave a mighty tug, pushed one paw under, and soon, by pushing and pulling with nose and with paws, he crept through the window. From my position on the porch I could see all that was happening in the cellar. He jumped to the milk shelf, turned around, raised himself on his forepaws, and clasped the edge of the milk pan with his hind ones.

He then threw his tail into the pan, whisked it rapidly over the milk, coating it with cream, and licked it. This he repeated until he had a full meal, or at least until he had skimmed all the cream.

He started homeward then, and I was so much amazed that I didn't attempt to stop him. On the following morning he was caught in the steel trap set just inside the window for him.

Elizabeth Roberts Burton.

THE BEAVER.

The genus of Beavers (Castor) is apparently represented by a single living species. By some authorities the American form is considered a distinct species and is given the technical name Castor canadensis, while the European form is called Castor fiber. In external characteristics the two resemble each other very closely, and it is in the study of the structure of the skeleton that the differences appear. However, though there is this diversity of opinion, it is sufficient for the reader to look upon the two forms as merely geographical races of the same species, and that the Beaver is a native of the greater part of the northern hemisphere. Though its home covered this extensive area, it has disappeared from the larger number of localities that it once frequented. Speaking of its range as a whole, it may now be considered rare except in certain isolated localities. This extermination is due to the advance of civilization upon its natural haunts, and the commercial zeal that has stimulated the hunter to greater efforts to effect its capture. Within recent years the Beaver was common in some of the Gulf States. In 1876 it was reported as abundant in Virginia. It is evident from an examination of the numerous writings regarding its distribution that the Beaver formerly existed in great numbers not only in the Atlantic States, but also to the westward as far as the Pacific coast.

The Beaver is a member of that large order of gnawing mammals called the Rodentia, from the Latin word meaning to gnaw. In this order are classed all those animals that have those peculiar long incisor teeth which are constantly renewed by growth from the roots and as constantly worn to a chisel edge, at the outer end, by gnawing. Such animals are squirrels, the gophers, the mice, the rats, the muskrats, the porcupines, the hares and the rabbits.

The habits of the Beaver are very interesting. Several years are required before its growth is fully attained, and it will increase in size after the teeth are fully mature. "Two-year-old Beavers generally weigh about thirty-five to forty pounds, while very old ones occasionally attain a weight of upwards of sixty. Morgan records the capture of one which weighed sixty-three pounds. The increase in the size of the skull seems to continue nearly through life; in old age the skull not only acquires larger dimensions, but the weight is relatively greater in consequence of the increased thickness and density of the bones. The ridges for the attachment of muscles also become more strongly developed in old age."

The general color of the back of the Beaver is a reddish brown. The shade varies both with the seasons and with the geographical location. Those found farther to the northward are usually darker. Albinos, either pure white, nearly white or with white blotches, have been observed.

"The fur consists of an exceedingly thick, flaky, woolly coat of silky softness and a thin, long outer coat composed of strong, stiff, shining hair, short on the head and rear part of the back and over two inches long on the rest of the body." The tail, which is rounded at the base, much flattened and very broad, bears horny, dark-colored scales.

The fore legs are short and the feet are unwebbed. The hind legs are much stronger, the feet are fully webbed and they, alone, are used, with the aid of the tail, to propel the Beaver through the water. In the water it is graceful in its motions, but on the land, like nearly all animals that are fitted for a partially aquatic life, it is clumsy and awkward and its motions are neither rapid nor uniform.

Usually it is only in those districts that are remote from the habitations of man

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BEAVER.
(Castor fiber.)
1/5 Life-size.

that the Beaver lives in colonies, consisting of several families, and builds its "lodges." Nearer civilization it lives in burrows or tunnels. In the building of their homes, as well as in the storing of a supply of food, the female is the most active and is the practical builder, while the male assists.

Brehm writes interestingly regarding the Beaver. He says: "After mature deliberation the animals select a stream or pool, the banks of which afford them ample provender and seem specially adapted for the construction of their 'lodges.' Those which live singly dwell in simple subterranean burrows, after the manner of otters; societies, which generally consist of families, as a rule construct houses and, if there should be a necessity for it, dams, in order to hold back the water and preserve it at a uniform height. Some of these dams are from four hundred and fifty to six hundred feet long, from six to nine feet high, from twelve to eighteen feet thick at the base and from three to six feet at the top. They consist of logs varying in size from the thickness of an arm to that of a thigh and from three to six feet long. One end of the log or stake is thrust in the ground, the other stands upright in the water; the logs are fastened together by means of thin twigs and made tight with reeds, mud and earth, in such a way that one side presents a nearly vertical, firm wall to the stream, while the other side is sloped. From the ponds rising above the dams, canals are constructed to facilitate the carrying or floating of the necessary construction materials and food. Beavers do not forsake a settlement they have founded unless the direst necessity compels them to do so. Beavers' lodges, the origin of which dates very far back, are often found in lonely woods."

The Beaver usually feeds upon the bark of the younger branches of trees and shrubs and upon their leaves. It will also strip the older branches, in a very skillful manner, and eat the inner tender portion of the bark. During the fall and early winter months they work constantly in preparing and storing, in the neighborhood of their lodges, the winter's supply of food. "Each cabin has its own magazine, proportioned to the number of its inhabitants, who have all a common right to the store and never pillage their neighbors."

The American Indians look upon the Beaver with great respect. They believe that it is possessed of a degree of intelligence second only to that of man. Some Indians even assert that it possesses an immortal soul. Its sagacity is certainly very strong and it will easily adapt itself to changed environments. Unlike the other rodents, it seems to reason before acting and will build its habitations in the form that the surrounding conditions demand for the construction of the most durable home.

The Beaver, especially when young, is quite easily domesticated. Various writers speak of finding tame Beavers in Indian villages, where they seemed to be perfectly at home and contented. They were allowed full liberty. "They seemed to feel quite comfortable in the society of the Indian women and children; they grew restless in their absence and showed much pleasure on their return."

The young, which number from two to three, are born blind, but are covered with fur. They usually obtain their sight in from eight to ten days, and are then led to the water by the mother.

Early in the nineteenth century Dr. George Shaw wrote as follows regarding the habits of the Beaver: "They collect in September their provisions of bark and wood; after which they enjoy the fruits of their labors, and taste the sweets of domestic happiness. Knowing and loving one another from habit, from the pleasures and fatigues of a common labor, each couple join not by chance, nor by the pressing necessities of nature, but unite from choice and from taste. They pass together the autumn and the winter. Perfectly satisfied with each other, they never separate. At ease in their cabins, they go not out but upon agreeable or useful excursions, to bring in supplies of fresh bark, which they prefer to what is too dry or too much moistened with water."

PAU-PUK-KEEWIS AND THE BEAVERS.

Over rock and over river,
Through bush, and brake, and forest,
Ran the cunning Pau-Puk-Keewis;
Like an antelope he bounded,
Till he came unto a streamlet
In the middle of the forest,
To a streamlet still and tranquil,
That had overflowed its margin,
To a dam made by the beavers,
To a pond of quiet water,
Where knee-deep the trees were standing,
Where the water-lilies floated,
Where the rushes waved and whispered.
On the dam stood Pau-Puk-Keewis,
On the dam of trunks and branches,
Through whose chinks the water spouted,
O'er whose summit flowed the streamlet.
From the bottom rose the beaver,
Looked with two great eyes of wonder,
Eyes that seemed to ask a question,
At the stranger, Pau-Puk-Keewis.
On the dam stook Pau-Puk-Keewis,
O'er his ankles flowed the streamlet,
Flowed the bright and silvery water,
And he spake unto the beaver,
With a smile he spake in this wise:
"O my friend Ahmeek, the beaver,
Cool and pleasant is the water;
Let me dive into the water,
Let me rest there in your lodges;
Change me, too, into a beaver!"
Cautiously replied the beaver,
With reserve he thus made answer:
"Let me first consult the others,
Let me ask the other beavers."
Down he sank into the water,
Heavily sank he, as a stone sinks,
Down among the leaves and branches,
Brown and matted at the bottom.
On the dam stood Pau-Puk-Keewis,
O'er his ankles flowed the streamlet,
Spouted through the chinks below him
Dashed upon the stones beneath him

Spread serene and calm before him,
And the sunshine and the shadows
Fell in flecks and gleams upon him,
Fell in little shining patches,
Through the waving, rustling branches.
From the bottom rose the beavers,
Silently above the surface
Rose one head and then another,
Till the pond seemed full of beavers,
Full of black and shining faces.
To the beavers Pau-Puk-Keewis
Spake entreating, said in this wise:
'Very pleasant is your dwelling,
O my friends! and safe from danger;
Can you not with all your cunning,
All your wisdom and contrivance,
Change me, too, into a beaver?"
"Yes!" replied Ahmeek, the beaver,
He the king of all the beavers,
"Let yourself slide down among us,
Down into the tranquil water."
Down into the pond among them
Silently sank Pau-Puk-Keewis;
Black became his shirt of deer-skin,
Black his moccasins and leggins,
In a broad black tail behind him
Spread his fox-tails and his fringes;
He was changed into a beaver.

—Henry Wadsworth Longfellow, "The Song of Hiawatha."

What rosy pearls, bright-zoned or striped!
What freckled surface, iris-dyed!
Fluted and grooved, with iv'ry lips,
Spotted like panthers, peacock-eyed!

Look closer, as the angels can,
And you will see the fairy work—
The ruby specks, the azure veins,
That in the tiniest hollow lurk.

—Walter Thornbury, "Shells."

SNAILS OF THE OCEAN.

Many of my readers have doubtless spent some of the vacation months at the sea shore and have wandered over the beach at low tide picking up shells and other objects left by the receding ocean. They have also, I am sure, peered into the little pools of water left on the beach and have watched with interest the captives imprisoned therein, hermit crabs, fiddler crabs, sea anemones, sea worms and snail shells. It is with the latter that the present article will deal.

The stretch of beach which is uncovered twice a day by the receding of the water is called "between tides," and is inhabited by a host of animate creatures, chief among which are the mollusks. The marine snails outnumber all of those which we discussed in the last article, and their shells are far more beautiful, those found in the tropics having the most gaudy colors imaginable. The animals are formed on the same plan as those of the fresh-water snails, although each family has some peculiarity not shared by its relatives. All live in the water and breathe air through that medium by means of gills, similar to the second class of fresh water snails mentioned in the last number. They are found in all parts of the world, those of the tropics, however, being the most brilliantly colored. While the majority of species live either between tides or near low water, there are not a few which live in the abysses of the ocean, and have been dredged from the bottom of the sea at a depth of two thousand, seven hundred and forty fathoms, or, to put it more plainly, over three miles. The average depth at which mollusks are found in any number is about one thousand fathoms. The variability of marine snails is so great that we shall be able to call attention to but a limited number of typical forms.

Among the best known of the marine snails are the Tritons, a family of mollusks living in tropical seas. Their shells are generally large and highly-colored and variously ornamented with short spines and knobs. One species, the Triton tritonis, is among the largest of mollusks, measuring eighteen inches in length. One of the smaller Tritons is pictured on the plate. Another shell familiar to those who have visited Florida is the Fasciolaria or banded snail, which attains a length of three inches and is very prettily banded and dashed with color. A near relative of this species is the giant banded shell (Fasciolaria gigantea), which is the largest of all marine snails, growing to a length of nearly two feet. This species is found plentifully on the southern Atlantic coast of the United States, being particularly abundant about the coral reefs of the Florida Keys.

A genus of mollusks with light horn colored shells, and inhabiting the cold waters of the Arctic seas, is the Buccinum, or whelk. In various parts of Great Britain it is known as "buckie" and "mutlog." The Buccinum delights to burrow in the sand, like the moon shells (Natica), and frequently nothing but the end of the siphon can be seen, the latter protruding from the sand to enable the water to enter the animal to furnish the necessary oxygen. The whelk is used economically, both for food and bait. One ingenious method of catching them is to fasten a dead fish of good size in a wire basket and to allow it to rest on the bottom for a short time; when taken up it is covered with large, fat whelks. This fishery in Great Britain is fully as valuable as our oyster fishery, the annual income from this industry reaching to thousands of pounds sterling. The animal is also one of the principal baits used in cod fishing. A related genus, the neptune shells (Neptunea), is also eaten by the poorer people and makes a good codfish bait. The two kinds of whelk (Buccinum and Neptunea), are termed, the first the white whelk and the second the red or almond whelk, probably on account of the colors of the two shells. In the Shetland Islands the red whelk is used as a lamp, being suspended by strings from a nail, the mouth placed uppermost and filled with oil.

The basket shells or dog-whelks are among the most numerous in individuals

FROM COL. CHI. ACAD. SCIENCES.

MARINE SHELLS.

Cyprœa pantherina (Red Sea) — Cassis flammea (Bahamas) — Conus marmoreus (Polynesia)

Buccinum undatum (U. S.) — Fasciolaria distans (U. S.)

Tritonium olearium (Naples) — Oliva irisans (Amboina) — Voluta musica (West Indies)

Ianthina communis (Atlantic Ocean) — Chiton squamosus (Jamaica) — Lottia gigantea (California) — Nassa glans (Amboina)

of all the marine snail shells, the common black whelk (Nassa obsoleta) being the most common of all the mollusks. The writer has seen a mud flat at low water literally paved with the shells of this snail, there being millions of the little creatures crawling about. The shells of this family are frequently very handsome, being latticed by the crossing of lateral and longitudinal lines. They are mostly of small size, scarcely exceeding an inch in length, many of them being much under these dimensions. The animal is very rapid in movement and leaves a distinct track in the mud, which will frequently end at a little pellet of mud, which, upon examination, will disclose the little animal nicely concealed beneath.

The Nassas of France are very destructive to the oyster beds of that nation, an adult "borer" being able to perforate the shell of a large oyster in a single night. So numerous are these pests that a single acre has yielded over a thousand individuals. As a result of these depredations the French oystermen carry on a relentless war against the Nassa, destroying thousands of animals annually. With all this persecution the mollusk still exists and even increases in numbers. The dead shells of this genus are a favorite home for the hermit crabs of small size, and it is to be suspected sometimes that other than dead shells are appropriated. We fear that a sort of piracy is resorted to by the hermit crab, resulting in a kind of "walk-the-plank" end for the mollusk, before the new tenant takes possession of the "home."

Of the many varieties of tropical shells, few exceed the Volutes, or bat shells, in beauty or variety of coloration. They are found in most parts of the world, although strangely enough none are now living in the seas of Europe, but they are most abundant and more highly colored in the tropics and subtropics. The animal is carnivorous, and the long, fang-shaped teeth are certainly suggestive of predaceous habits. The shells are variously colored, some being mottled, some with zigzag or lightning-like markings, while others have spirally arranged dots and lines. One species (Voluta musica, figured on the plate), has received its name from a more or less fanciful resemblance of the surface of the shell to a musical staff, the spiral lines being grouped in sets of four or five and the dots being arranged as notes. In some specimens this resemblance is quite close. The smooth and polished shell of some volutes is due to the fact that the greater portion is covered by a reflected part of the large foot.

On the sandy shores of subtropical beaches certain graceful and polished animals bury themselves from sight in the sand. These are the olive shells (Oliva) whose bright colors and highly polished surfaces rival even the gaudy Volute in beauty. The foot may be described as plough-shaped and is admirably adapted for digging rapidly in the sand, so that the shell may be hidden from sight on the approach of enemies. The long siphon is thrust up through the canal in the anterior part of the shell and its end protrudes above the sand. The high polish of the surface is due to the shell being enveloped in the voluminous foot; hence it has no epidermis. The aperture is so narrow that it is difficult to understand how the animal gets in and out. The olives are very numerous in individuals; when one is found hundreds are sure to reward a patient search.

Probably no more distinct family of mollusks exists than the Conidae, the family of cones, their beautifully decorated shells and the large number of species making them a favorite with collectors. The shell is in the form of an inverted cone, gracefully rounded, the aperture being but a narrow slit extending nearly the whole length of the shell. The colors of the cones are always very brilliant, although when they are alive the shell is not brilliantly polished as the olives, on account of the presence of an epidermis. About three hundred species are known, living principally in tropical seas. They love to conceal themselves in holes in the rocks and among the branches of corals. The animal is predaceous, boring into the shells of other mollusks and extracting the juices from the bodies. The teeth of Conus are hollow and very sharp and have a barb on the end. A poison gland is said to be present in this genus and bites from the animal are very painful, although not

dangerous, the large Conus marmoreus being able to inflict a severe wound. The cone is quite pugnacious and will immediately bite the hand when picked up, a veritable reptile of the ocean.

The ne plus ultra of mollusks to the collector is without doubt the genus Cypraea, comprising the cowry shells. So eagerly have they been sought by wealthy collectors that the price of rarities has gone up to an astonishing degree, some specimens being sold at several hundred dollars each. The shell is highly polished, owing to the fact that two lobes of the voluminous mantle are turned back over the shell and meet in the middle of the back. The foot is very large and spreading, the mantle beset with curious little tentacular-like organs and the eyes are placed on small swellings near the base of the long, cylindrical tentacles. The color-patterns of the shell vary to a wonderful degree. The young shell has a thin epidermis, a sharp lip to the aperture and a more or less prominent spire, the rolled over and toothed lip and polished surface not being acquired until fully adult. No more beautiful sight can be imagined than one of these gorgeous animals, as seen through the clear water, crawling over the sandy bottom or on the branch of some coral.

Several of the cowries have a curious economic value. Thus, Cypraea aurantia, the orange cowry, was used as an insignia of royalty by the chiefs of the Friendly Islands, and for a long time the only specimens obtainable were those which had been bored and used. The money cowry (Cypraea moneta) has been used as money by the natives of Western Africa, and many tons of this small shell were annually imported to England to be used in barter by the African traders. The shell is of a yellowish or whitish color, does not exceed an inch in length, and is very common in the Pacific and Indian Oceans. It is still used as a medium of barter in parts of Africa, although other things have pretty generally taken its place.

Cameos were at one time quite in the fashion, both as ornaments for the person in the way of brooches, and as bric-a-brac about the room. These shell-cameos are made from the genus Cassis, the helmet shells. These are well adapted for this purpose, as the shell is made up of several differently colored layers, making a bas relief figure not only possible but very effective. The black helmet (Cassis madagascariensis) is one of the best for this purpose, the figure being carved from the white, outer layer of shell, which stands out very clearly against the black background of the second layer. When a cameo is desired simply as a brooch or for any other form of personal adornment, a piece of the shell is cut out and shaped into the required form and size—oval, square or other shape—and cemented to a block of wood. The figure is then traced on the shell with a pencil and finally carefully worked out with sharp, pointed steel instruments, of delicate size and form. The same process is resorted to in working out a bas relief on the entire shell, only the latter is placed in a vice or other object to hold it firmly. The home of this industry is Genoa and Rome, Italy, although some are produced in France; these latter, however, are of a poorer quality. Several thousand people are employed in this trade. Many beautiful examples of this work were exhibited at the World's Columbian Exposition, in Chicago, in 1893.

The cameo shells are among the largest of sea snails, several of them measuring eight or ten inches in length and weighing several pounds. They are found only in tropical and subtropical seas, living in comparatively shallow waters on a sandy bottom. They are voracious eaters, living principally on bivalve mollusks.

One of the most abundant of mollusks is the violet sea snail (Ianthinia communis), which spends its life floating in the waters of the Atlantic Ocean. The shell is very delicate, resembling in form some of the land snails, and has but two colors, both shades of violet, a deep color on the under side (which, by the way, is always turned upward when the animal is floating in the water), and a lighter shade on the upper side. So fragile is the shell that it seems as if a breath would break it. The most interesting fact in connection with this mollusk is the wonderful float or "raft" which is secreted by the foot, and to the under side of which the

eggs are attached. The latter are not all in the same condition. Nearest to the animal they are more or less fresh; those in the middle of the float contain embryos and fully formed young, while those on the outer end are empty, the young having escaped into the water. The genus is gregarious and may be found in almost countless numbers. After a severe storm they are sometimes cast upon the beaches in vast numbers, where they soon die under the fierce rays of the sun.

We have thus far been dealing with snails whose shells were formed in a spiral coil. Quite a number of mollusks are not protected by such a shell, its place being taken by a flat, shield-like disk, or several distinct plates placed side by side. The most familiar of the first is the limpet or Patella, which is a depressed, conical, oval disk, looking not unlike a miniature shield. They live on rocks, to which they cling with great tenacity. The animal seems to have a pretty clear idea of local geography, for it invariably returns to the same place after its excursions for food and the rock in some localities has been hollowed out to a considerable depth by the continuous dwelling thereon of the limpet. The large foot is very strong and it is almost impossible to dislodge the shell from the rock when the animal becomes alarmed and is aware that danger is near. While grazing along the sides of a rock covered with fine seaweed, it will leave a track like a worm and will clean off quite an area in a very short space of time.

Another species is the key-hole limpet (Fissurella), distinguished by having a slit or foramen in the apex of the shell. The shells of Fissurella are generally rougher than those of Patella, and as a rule they live in warmer seas. In the limpet we find a departure from the general form of both animal and shell, both being bilaterally symmetrical, that is, having both sides alike. In the mollusks which have been presented thus far, the body has been twisted in the form of a spiral, making one side different from the other and causing the organs of one side to become atrophied. In the limpets the organs are paired, as they are supposed to have been in the ancestors of the living mollusks.

The most peculiar of all the mollusks, so peculiar, indeed, that they constitute a separate order (Polyplacophora) are the Chitons, or coat-of-mail shells. The shell is made up of eight separate pieces or plates, each locking with the other, the whole supported by and buried in a coriaceous mantle which forms a margin all the way around. This must not be confounded with the true mantle of the animal, for it is only a part of the shell. It is beset with bristles, spines or hairs, which add much to the peculiar appearance of this mollusk.

The Chitons live for the most part on rocks at low water and are said to be nocturnal in habit, feeding only at night. Their movements are slow and they appear to be very sluggish in all their actions. When detached and taken from their rocky homes they have the provoking (to the collector) habit of rolling up and are sometimes very difficult to straighten out again. There are about two hundred and fifty living species, found in all parts of the world.

In the foregoing pages we have called attention to a few types of marine snails, and what has been written has hardly more than touched upon this vast field. There are thousands of different species even more interesting than those which have been mentioned. There are the beautiful ear shells, or Abalones, the little periwinkle, so largely used as an article of food in Europe, besides a host of others too numerous to mention. The brief notes and the figures on the plate will convince the reader, it is hoped, that these inhabitants of the deep are not only beautiful and worthy of our attention and study, but are also of much practical and economical use to man.

Frank Collins Baker.

THE LEMON.

In 1636 an English report on the affairs of the navy gravely remarked that "the use of lemon is a precious medicine and well tried. Take two or three spoonfuls each morning and fast after it two hours." The value of the fruit for certain disorders of the system seems to have received an early recognition. This was especially true with regard to scurvy, which in earlier days caused widespread mortality among seafaring men. Hawkins, in 1593, made the statement that more than ten thousand men had succumbed to the malady within the limits of his naval experience. The Crusaders under Louis IX. were severely attacked by scurvy, owing to their abstinence from fresh meat during Lent, and the history of the disease shows that it is occasioned by a lack of fresh meat and fruits. The efficacy of lemon juice was recognized by Drake, Davy, Cavendish, Dampier and many others years ago, and time has but added to the value of the fruit, while it has made it accessible to everyone. While Pomona is generally credited with having devoted her entire attention to the cultivation of the apple, it is stated on authority of an old Greek myth, that she gave considerable thought to the development of the Lemon and the orange. It appears that Pomona inclined not her ear to the supplications of her many admirers until Vertumnus, discerning her vulnerable point, presented the fair gardener with a grafting, which, under her skillful cultivation, developed into a lemon tree, and, as a reward, the favor of the wood-nymph was bestowed upon the youth.

Whether or not such was the origin of the Lemon, the fact remains that the fruit is most useful and the tree exceedingly attractive. Originally a native of Asia, it has become widely distributed in Europe, Africa and America, and although far more susceptible to injury from frosts than the orange, the trees are successfully cultivated under many conditions. Doubtless the best results in this country have been obtained in California. Thousands of acres around San Diego are planted with lemon trees while large districts in the Ojai Valley, Ventura, Santa Barbara, Pomona and Los Angeles counties are devoted to its cultivation. The tree is remarkable for beauty, and while it seldom attains large proportions, its pale green leaves, loosely-hanging branches, showy and fragrant flowers, together with the fruit that is found in all stages of development, produce a pleasing and highly ornamental effect. While the best crop of Lemons is generally gathered between December and April, the fruit should be picked every month for ten months of the year, in order to retain the best results. As a rule, the trees yield from one hundred and twenty-five to one hundred and forty boxes of the fruit to the acre, about the sixth year, but this number is increased to four hundred boxes when the groves reach an age of ten years.

The varieties of Lemons are distinguished chiefly by their size and form, and may be roughly classified as egg-shaped with blunt nipples and oblong lemons with large nipples. The sweet lemon and thin-rind Poncine and Naples belong to the firstclass, while the second includes such forms as the imperial, the Gaëta and the wax. The principal varieties grown in California are the Lisbon, Eureka and the Villa-Franca. Of these, the Eureka originated in California, while the Villa-Franca was imported from Europe. Besides the grateful quality of the juice, the expressed oil of the rind is used in the arts and has an intense odor of lemon, and the Pundits of Benares, quote a Sanskrit work, written about 1354, in which the oil is described as a valuable medicine. The acid pulp of the Lemon, after rasping off the rind, is pressed for citric acid, while the ottos of the Lemon, orange and bergamot, the preparation of which forms the chief industry of Sicily, are leading ingredients in the preparation of "Lisbon Water" and "Eau de Portugal."

—Charles S. Raddin.

LEMON.
(Citrus limonum.)

TWO WRENS.

The house wren is one of Nature's illuminated successes. It has been said that there is no second spring, yet to-day (July 20th) this bird is in the full glory of spring-time melody. He sings from the top of a telegraph pole, the song caught up and repeated by some country cousin in the grove, a musical argument carried on all day long and left at night in the same unsettled state in which morning found it. Whether they are discussing the relative merit of their respective claims, a town residence or a country seat, I am unable to decide; it is certain, however, that the concessions of neither party infringe upon domestic dignity.

Their speech is a revelation of supreme content, a liquid, flexible measure with ripples and cascades bubbling through and over, a dash of pure color amid July's neutral tinted emotions.

The day may be dark and threatening, the sun concealed in gloomy banks of cloud, rain falling, or thick mists obscuring the valley; each and all are powerless to dampen his ardor or to effect his extreme optimism. He clings to his creed with persistent closeness, asserting valiantly the ecstasy of finding one's self alive and emphasizing the statement by a perfect wave of melodious argument.

There are hours when he sings with such force that his whole little body catches the key-note and natural rhythm; the melody becomes compounded of his very substance, body of his body and soul of his soul. It is an inundation of musical notes, cascadic, cataclysmic, the tide of song rising till it drowns his personality; he is no longer a bird but an animated song.

My little neighbor is a pattern of husbandly devotion, a lover-husband over whom coming events are already casting tender shadows before, the special event in this instance being located in a crevice beneath the eaves of the house.

Wren babies had not left the first nest when Jenny Wren's husband was hard at work upon a second house, which was ready for occupancy before the first family were self-supporting. This was an admirable arrangement in the way of time-saving, as eggs are often laid in the second nest before the first is vacated.

Though the new house lacked the freshness of coloring and the picturesqueness of the swing of a nest in the sunshine, Jenny Wren made no complaint of being cooped up in the darkness, and as to her husband, he was quite as well pleased with the glamor and wonder of its art as if it had been wound with blossoms and sprinkled with star-dust. A bird with different tastes might have urged that it was only a little hole in the house-jet, yet everything in life depends upon the point of view from which you regard it. Judged from the wren standpoint, it was considered admirably adapted to the family needs, nor could the most critical observer fail to see here a literal illustration of that familiar truth: Happiness is from within.

Standing upon a ladder I counted eight eggs as my eyes became gradually accustomed to the partial darkness within the nest; the dark, vinaceous spots laid on so thickly as to conceal or obliterate the original color, thus helping to hide them more securely. In the long brooding days, when Jenny's little answering heart is preoccupied and silent, the hours are sometimes long and lonely to her mate. At these times he has been known to devote his spare moments to building a nest simply for his own pleasure. Many instances of this remarkable habit are recorded of the English wren, the explanation offered being that the odd nests are

for the purpose of deceiving the parasitical cuckoo.

There is also a supposition that the bird's active nature finds relief in work, being urged on by the increasing lonesomeness. This wren-trait reaches a climax in the marsh wrens, with whom the building habit becomes a passion.

Nor is it restricted to the wren family, many instances being recorded where other species have beguiled the waiting days by an imitative housekeeping.

The house phoebe has been known to build a second nest while its mate was brooding. To all appearances this was an instance of over-developed domestic tastes. Nor did the experiment end with the completion of the duplicate nest upon which the male bird sat regularly for several hours daily.

Wrens do not take kindly to double houses, their warlike nature seeming to revolt against living friendly with near neighbors. A pair of wrens that was well established in an unoccupied martin house made it very uncomfortable for the later arrivals. While the martins were abroad after material for the nest the wrens sallied forth in an utterly vindictive spirit and scratched out all their neighbors had constructed. After singing a triumphant song with much parade they wisely retired to their own domicile to be on the defensive.

Wiser wrens, with an instinctive knowledge that an ounce of prevention is worth a pound of cure, are known to have the forethought when the box in which they build contains two compartments, to fill up one of them, thus avoiding the risk of troublesome neighbors. Wrens have been known to nest in a human skull. Others with less questionable taste, have gone to housekeeping in an old boot, a watering pot, a coat sleeve; in gourds and baskets, jars and water pipes, while another pair made a nest in the lower part of a stone vase in the garden. There was a hole for drainage in the bottom of the vase, and through this hole they found, beneath some shavings, a circular space just suited for a nest. The vase was not filled with plants until the domestic affairs of the wren family were happily concluded.

The delicate swaying hammock of the oriole is sometimes used for a second nesting.

There was bitter disappointment in wren circles earlier in the season when, with the presumption of inexperience, the pump was filled regularly with coarse twigs, which were promptly dislodged at nightfall. Undiscouraged at this defeat, the morning hours were utilized for rebuilding with a persistency well worthy a more intelligent effort; they worked and sang, sang and worked, until a cigar box was nailed to a tree for their special accommodation. This was nearly full of twigs when they decided that the building-site was ineligible, a decision hastened by the fact that just at this opportune time a glass fruit can was left upon the piazza shelf. No sooner was this glass house seen than its possibilities were realized and plans were quickly made for a kind of crystal palace experiment. Under other circumstances this might have been a dangerous precedent, as certain unneighborly conduct toward their little brothers of the air had at various times fairly invited the throwing of stones. The can was half full of tiny fagots, and Jenny was thinking of settling upon the mattress of wood fibre when the thrifty housewife turned them adrift summarily, well aware that this kind of housekeeping, within easy range of neighboring cats, would not be successful. Before such supreme content, who could have the heart to undeceive them? And yet, the can was turned upside down before they could be made to understand the situation. Like Thoreau, they did not wish to practice self-denial unless it was quite necessary!

After the failure of this crystal scheme, it was a difficult matter for Jenny to make up her mind as to a further preference, but when she really decided it was with such entire good faith as left no doubt in her lover's mind as to her judgment. This was more flattering as it was his own choice, their last year's home thoroughly remodeled, to which he had repeatedly called her attention, vainly. So the hole in the house jet at least answered the question, "Where are the birds in last year's nests?" for the wrens moved in regularly, the tenor having a perch upon a projecting bracket where Jenny joined

him, a regular little termagant, scolding with all her might whenever the kittens looked that way.

Marsh wrens, small brown birds, with barred wings and tail, breed in or about the swamps and marshes of Lake Champlain.

They are intensely interesting from their habit of constructing several nests but one of which is utilized for housekeeping. After the real nest is made and the first egg laid, the male stays closely at home busying itself with building several nests, which are to all appearances entirely superfluous. In locating these he does not go beyond the immediate neighborhood of the true nest.

Some have thought that these sham nests are used as hiding places for the male, a Lilliputian watch tower or guard house, from which close watch is kept over the home property. Whether Mrs. Marsh Wren really needs such close watching, being more inclined to flirt than the ordinary feathered spouse, or because she is a better wife, so infinitely precious that she must be guarded from every side, is, as yet, an unsolved question. "Love holds the key to all unknown," and though there is little to admire in a deportment made fine by compulsory measures, no doubt both parties understand the situation, which is quite enough for practical purposes. These nests, conspicuous from their size and exposed position, are securely attached to the upright swaying reeds, some of which penetrate their substance. They are lined with soft grasses and have an entrance at one side, often nearer the bottom than the top. Mr. Burroughs, who has found the marsh wren's nest surrounded by half a dozen make-believes, says the gushing, ecstatic nature of the bird expresses itself in this way. It is simply so full of life and joy and of parental instinct that it gives vent to itself in constructing sham nests; the generous-hearted creature being willing to build and support more homes than can be furnished or utilized.

Entering the Lake Shore drive at St. Albans Bay, where dense tangles border the swamp beyond, you are sure to hear a song that is unmistakably wrennish. You have glimpses also of a small brown bird bubbling over with a nervous energy that betrays itself in every note he utters. Wait quietly and he approaches, but go one step in his direction and he recedes to the swamp where human foot may not follow.

Push your boat up the creek, the only avenue leading to his abode, that tantalizing song leading on meanwhile like the Pied Piper of Hamelin, though unlike the latter there is no disillusioning at the end. Red-winged blackbirds take wing as you enter the twilight of soft green and amber shade and the far-off music of their jangle-bells becomes less musical, the males striving "to recommend themselves by music, like some awkward youth who serenades his mistress with a jewsharp," and using the air or the alder tops as a parade ground upon which to exhibit their musical evolutions. And yet you are witness to many a voluntary bit of sentiment that will increase your interest in this scarlet epauletted regiment, descendants of the dusky tribe that anchored long ago in this peaceful haven, going out and coming in with the tide until the legend of their coming is as vague and shadowy and misty as that of the golden-fleece voyageurs—the Argonauts. They ebbed and flowed with the stream; came at the proper time and season without knowing why; anchored and launched their ebony ships when it was time for sailing.

Here and there along this waterway the branches clasp hands above the creek, forming an arch of green within which vines sufficiently elegant to warrant exclusiveness cling in unaffected grace to the alders, without inquiring or caring as to the pedigree of their support. It is sufficient for them that the support is there.

A whole half mile along the stream and trees and bushes disappear, leaving a dense mass of reeds, the marsh wren's "ain countrie," out of which he is never at his best and to which he gives you no welcome.

Birds, like persons, have wonderful powers of concentration upon one topic, woe be to you if that topic happens to be yourself!

Every denizen of the swamp regards you with suspicion, watching each move-

ment as closely as if you were a dangerous character traveling under an alias, and could not be trusted to sail upon this ruddy ocean in which their lordships have anchored their private yachts. Push your boat far in among the reeds and cattails, into the sea of shadows over which no sluggish current sends a ripple, and certain globular nests in the tangled reeds reward your search. Push your fingers within these nests and in one only, here and there, will you find from five to ten dark eggs, a rich reward for all your trouble.

Meanwhile the "neighbors, and the marsh wren generally has numbers of them, have doubtless been charming you with their bubbling, gurgling song, always half the colony singing at once, or, one bird rising above the reeds gives the order, as it were, and the whole colony joins in the chorus. The song is quite beyond their control; they seem filled to overflowing with an inexhaustible supply of music, which trickles down the reeds, like gathered-up drops of water charged with music.

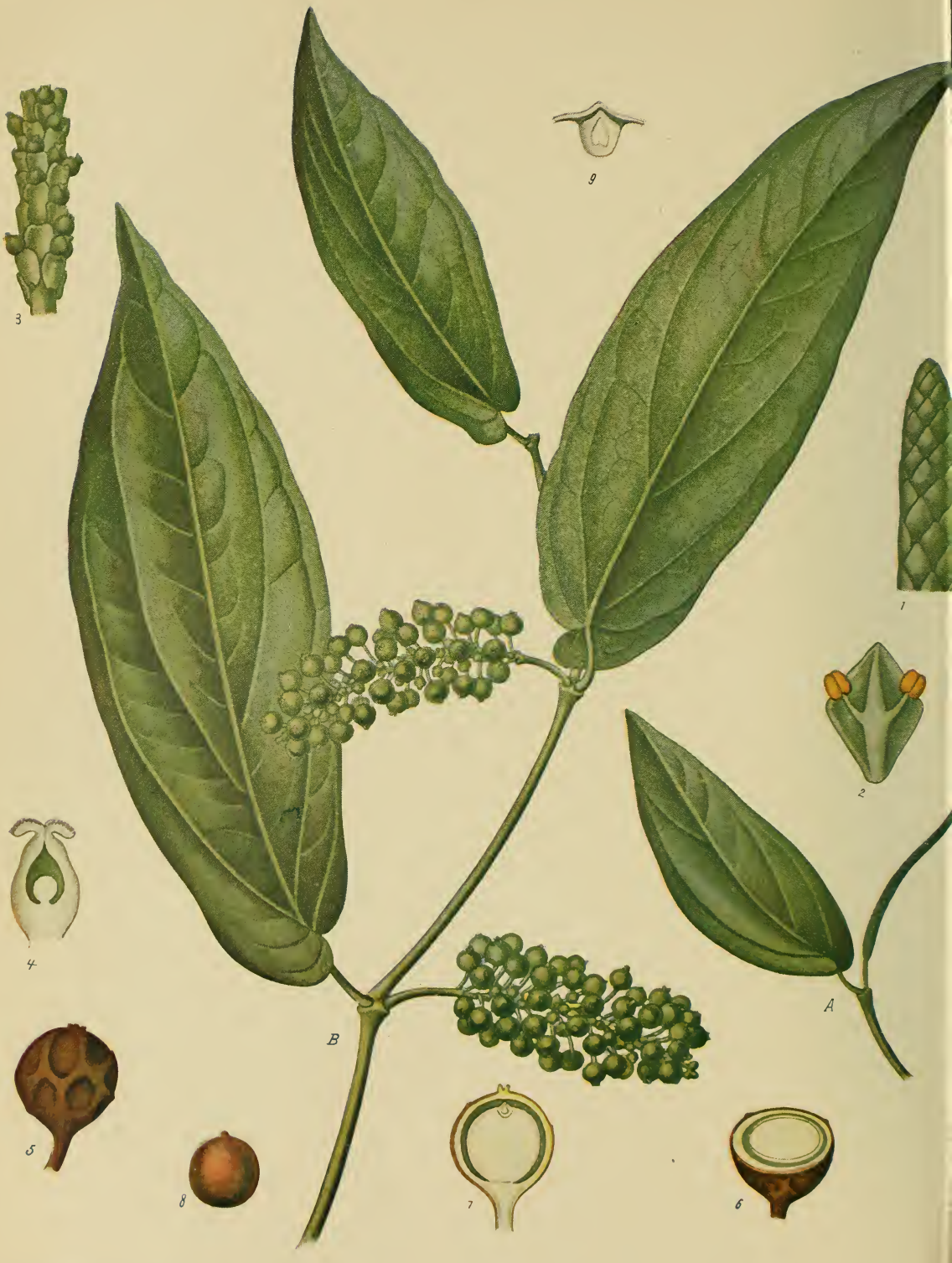
"Sometimes, like a mine of melody, it explodes within them and lifts them from the dark recesses of the flags into the air above." Nelly Hart Woodworth.

WHEN SPRING COMES.

Again the birds will weave their nests,
And come and go on airy wing;
And one will nurse her little guests
And one will watch and sweetly sing.

The bushes small and towering trees
Their leaves of living green will don,
And, swaying in the restless breeze,
Will laugh because old Winter's gone.

—George Gee.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CUBEBS.

(*Piper cubeba* L.)

Aromatics, as cubebs, cinnamons and nutmegs, are usually put into crude poor wines to give them more oily spirits.—Floyer, "The Humors."

The cubeb-yielding plant is not unlike the pepper plant and belongs to the same family (Piperaceae). The two resemble each other in general habits in the form of inflorescence and in the fruiting.

Cubebs were known to Arabian physicians as early as the ninth century, who employed them as a diuretic in kidney troubles. It was also known at that time that Java was the home of the plant. At one time it was believed that the Carpesium of ancient writers was cubebs, but this is now generally disbelieved. Edrisi states that cubeb found its way to Aden about 1153. During the twelfth and thirteenth centuries it was employed medicinally in Spain. Originally it was doubtless employed as a spice, similar to pepper. Mariano Sanudo (1306) classed it among the rare and costly spices. Hildegard referred to the soothing properties of cubeb. In the thirteenth century cubeb is mentioned among the import articles of London. About the same time it found its way into other European countries, notably Germany. At the beginning of the nineteenth century cubeb disappeared almost entirely from medical practice. About 1820 English physicians of Java again began to employ it quite extensively.

As in the case of black pepper, the fruit is collected before maturity and dried. The fruit is about the size of the pepper, but has a stalk-like prolongation which distinguishes it. The pericarp becomes much shriveled and wrinkled on drying.

Cubebs are cultivated in special plantations or with coffee for which they provide shade by spreading from the trees which serve as their support. Their cultivation is said to be easy.

Cubebs have a pungent, bitter taste and a characteristic aromatic odor. It cannot readily be confounded with any of the other more common spices. Its use as a spice is almost wholly discontinued. Its use in medicine is also waning, since it evidently has only slight medicinal properties. It is used in nasal and other catarrhal affections. Cubeb cigarettes are used in the treatment of nasal catarrh. It has a marked influence upon the kidneys, causing irritation and increased activity, and as already indicated it is therefore a diurectic. It is, however, harmful, rather than beneficial, in acute inflammatory conditions of these organs.

Description of Plate—A, twig with staminate flowers; B, fruit-bearing twig; 1, upper portion of staminate inflorescence; 2, staminate flower; 3, fruit; 4, 5, 6, 7, ovary; 8, 9, seed.

Albert Schneider.

A TREE-TOP TOWN.

Before the cradled violets awake beneath the grass,
Or any but the crocuses and catkins have come back,
Always 'tis then the loveliest thing of all things comes to pass,—
A twit-twit-twitter on the mild spring breeze,
A twit-twit-twitter in the leafing trees,
Through which small sky-blue wings flash out a sky-blue track—
For blue-birds, first adventurous house-builders of the year,
Are at their old, wise tricks again of settling far and near.

Not long, 'tis when the hyacinths and tulips bloom in rows,
And lilies-of-the-valley start to whitening on their stems,
And woodsy things are opening fast to make a new out'-doors,
Then robin-redbreast on a sunny day
Comes taking life his usual charming way,
With a blithe and merry Che-che-chem-chem-chems!
While yet dry leaves and building twigs are left upon the ground
"I thought I'd come to the old place and take a look around."

Then later, when the grasses curl, a-tilt in taller growth,
And nooks for snuggeries are made by grape and ivy-vines,
When lilacs stand in purple, and the plum-trees blossom forth,
Comes here a lilting, gay, and gaudy troop,
Tits, thrushes, bobolinks, blue-jays with noisy whoop,
Kingbirds, wild tumblers in the air, drunk with ethereal wines;
Then cardinals, and indigoes, and finches find the place,
And so the town-site in the trees grows populous apace.

One waiting for the apple-blooms is he who's always late,
The oriole: his building-site none e'er disputes with him.
Though last to come he has full leave to settle, with his mate,
And hang his hammock up to rock and swing,
To flout the town on breezy, orange wing
From where his house sways airily adown a pendant limb.
And now the high, green tree-top town, which welcomes ev'ry comer,
Has settled to the business of singing out the summer.

—Austin Arnold McCausland.

BIRDS AND NATURE.

ILLUSTRATED BY COLOR PHOTOGRAPHY.

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MAY.

May brings all the flowers at once,
Teased by rains and kissed by suns;
Now the meadows white and gold;
Now the lambs leap in the fold.
May is wreathed with virgin white;
Glad May dances all the night;
May laughs, rolling 'mong the flowers,
Careless of the wintry hours.
May's storms turn to sunny rain,
And, when Iris springs again,
All the angels clap their hands,
Singing in their seraph bands.
—Walter Thornbury, "The Twelve Brothers."

Now, shrilleth clear each several bird his note,
The Halcyon charms the wave that knows no gale,
About our eaves the swallow tells her tale,
Along the river banks the swan, afloat,
And down the woodland glades the nightingale.

Now tendrils curl and earth bursts forth anew—
Now shepherds pipe and fleecy flocks are gay—
Now sailors sail, and Bacchus gets his due—
Now wild birds chirp and bees their toil pursue—
Sing, poet, thou—and sing thy best for May!
—William M. Hardinge, "Spring."

AUDUBON'S ORIOLE.

(*Icterus audubonii*)

The name oriole is from the French word oriol, which is a corruption of the Latin word aureolus, meaning golden. The name was originally applied to a vire, but is now used in a much wider sense and includes a number of birds.

The true orioles are birds of the Old World and are closely related to the thrushes. It is said that no fewer than twenty species from Asia and Africa have been described.

The orioles of America belong to a very different group of birds and are related to our blackbirds, the bobolink and the meadowlark. All these birds belong to the family Icteridae, the representatives of which are confined to the New World.

The genus of orioles (Icterus) contains about forty species, chiefly natives of Central and South America. The plumage of nearly all the species is more or less colored with shades of yellow, orange and black.

Audubon's Oriole, the male of which we illustrate, has a very limited range, including the "valley of the Lower Rio Grande in Texas and southward in Mexico to Oaxaca." It is more common in central and eastern Mexico than in any other part of its range. In the summer, it only frequents the denser forests of its Texas home, but during the winter months it will approach the inhabited regions.

The Mexicans capture these Orioles and offer them for sale. In captivity, however, they seem to lose their vivacity and will not sing. "When free their usual song is a prolonged and repeated whistle of extraordinary mellowness and sweetness, each note varying in pitch from the preceding."

It is said that this beautiful bird is frequently called upon to become the foster parents of the offspring of some of those birds that have neither the inclination to build their own nests or to raise their own families. The ingenious nests of the orioles seem to be especially attractive to these tramp birds which possess parasitic tastes.

The red-eyed cowbird (Collothrus robustus), of the Southern United States and Central America, seems to be the pest that infests the homes of Audubon's Oriole. It has been stated that the majority of the sets of eggs collected from the nests of this Oriole contain one or more of the cowbird's eggs. It is also probable that many of the Oriole's eggs are destroyed by the cowbirds as well as by other agencies, and thus, though the raising of two broods the same season is frequently attempted, the species is far from abundant.

Regarding the nesting habits of the Audubon's Oriole, Captain Charles Bendire says, "The nest of this Oriole is usually placed in mesquite trees, in thickets and open woods, from six to fourteen feet from the ground. It is a semipensile structure, woven of fine, wire-like grass used while still green and resembles those of the hooded and orchard orioles, which are much better known. The nest is firmly attached, both on the top and sides, to small branches and growing twigs and, for the size of the bird, it appears rather small. One now before me measures three inches in depth inside by about the same in inner diameter. The rim of the nest is somewhat contracted to prevent the eggs from being thrown out during high winds. The inner lining consists of somewhat finer grass tops, which still retain considerable strength and are even now, when perfectly dry, difficult to break. Only a single nest of those found was placed in a bunch of Spanish moss and this was suspended within reach of the ground; the others were attached to small twigs."

FROM COL. CHI. ACAD. SCIENCES.
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AUDUBON'S ORIOLE.
(Icterus audubonii).
⅔ Life-size.

The number of eggs vary from two to five and "sets of one or two eggs of this Oriole, with two or three cowbird's eggs, seem to be most frequently found, some of the first named eggs being thrown out to make room." The eggs are ovate in form and the general color varies from white with a bluish cast to white with a grayish cast and in some instances a purple shade predominates. The markings vary greatly both in color and form. They may be either thread-like, in streaks or in blotches. In color they may be various shades of either brown, purple or lavender.

The food of Audubon's Oriole consists of insects and, to some extent, of berries and other fruits. Mr. Chark, who studied the habits of this species in Texas, says that he observed it frequently feeding on the fruit of the hackberry. He also states that these birds were usually in pairs and exhibited a retiring disposition, preferring the thick foliage of the margins of streams rather than that of more open and exposed places.

Seth Mindwell.

TO A SEA-BIRD.

Sauntering hither on listless wings,
Careless vagabond of the sea,
Little thou heedest the surf that sings,
The bar that thunders, the shale that rings,—
Give me to keep thy company.

Little thou hast, old friend, that's new,
Storms and wrecks are old things to thee;
Sick am I of these changes, too;
Little to care for, little to rue,—
I on the shore, and thou on the sea,

All of thy wanderings, far and near,
Bring thee at last to shore and me;
All of my journeyings end them here,
This our tether must be our cheer,—
I on the shore and thou on the sea.

Lazily rocking on ocean's breast,
Something in common, old friend, have we;
Thou on the shingle seek'st thy nest,
I to the waters look for rest,—
I on the shore, and thou on the sea.

—Bret Harte.

FROM AN ORNITHOLOGIST'S YEAR BOOK.

THE HEART OF A DRYAD.

I.

It was an oak wood. A few hickories and chestnuts grew there, but the oaks ruled; great of girth, brawny of limb, with knotted muscles like the figures of Michael Angelo or Tintoretto's workmen in his painting of the Forge of Vulcan. As to coloring, the oaks were of the Venetian painter's following, every oak of them! In summer they were "men in green," rich, vigorous green, with blue shadows between the rustling boughs; in early autumn, though russet in the shadow, the sunshine showed them a deep and splendid crimson, pouring through them like a libation to the gods of the lower earth, and to the noble dead, for the Dryad had a heart for heroes and all oak-like men.

Immediately before the great winds came, stripping them bare, and dashing silver cymbals to wild airs of triumph, they wore a sober brown, but it put on a glow, as of bronze or heated metal after a rain, when the sun's rays smote them with shining spears smiting aslant with unwonted glittering. Under the moon or after a freeze they were all clad in steel, armor of proof, and mighty was the tumult, as of meeting swords, when the great boughs swung, and the long icicles fell upon ice below.

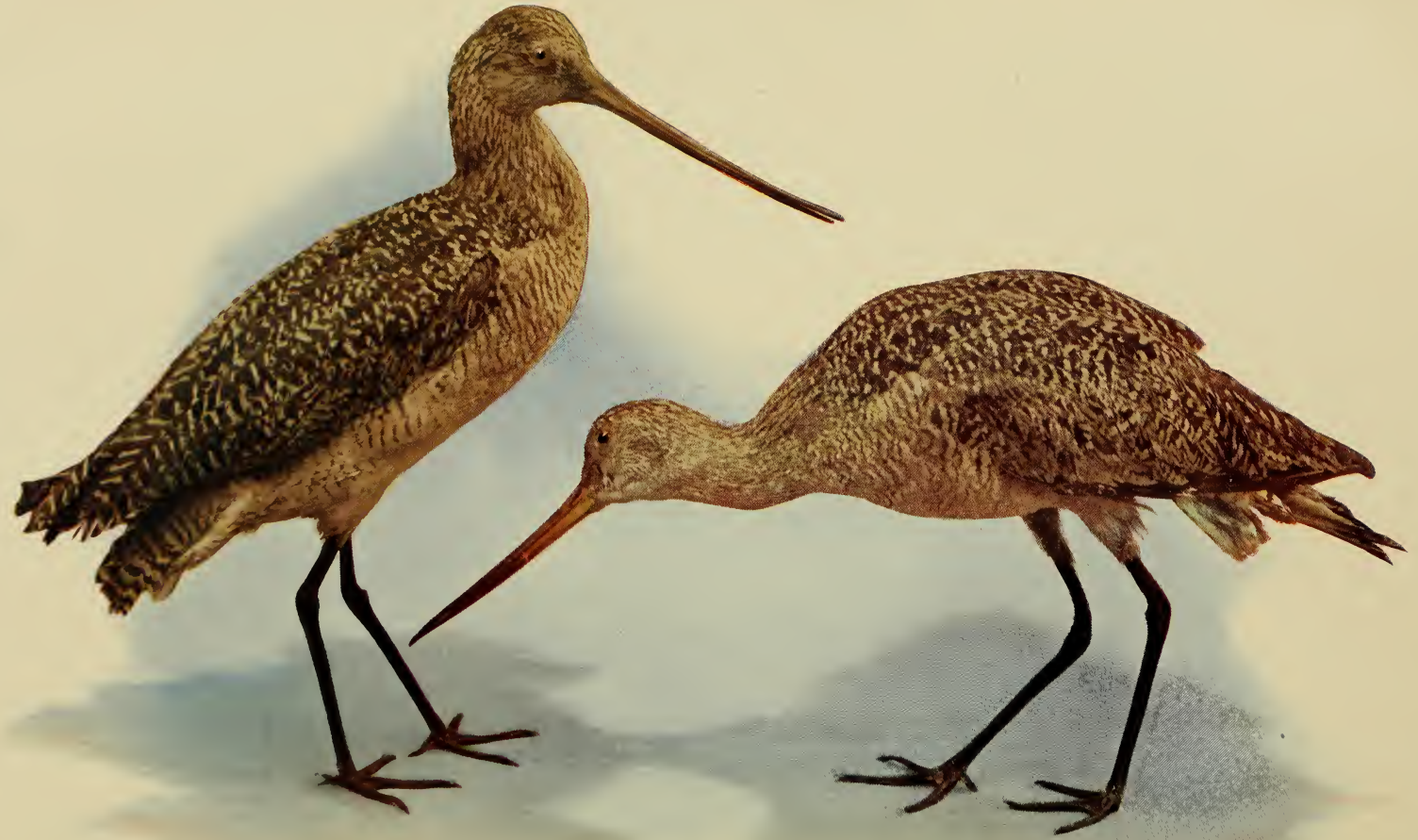
But these days were far off. It was summer, and a crystal brook slipped from level to level, singing its sweet water-song, and bringing cool water to bathe the feet of the oak which the Dryad loved and decked with green garlands. The orioles loved it, flashing here and there with rich red gold or flame-like orange on breast and wings and soft, velvety black on head and shoulders, splendidly beautiful as some tropic flower, they chose the end of an oak bough to hang their pensile nest. The male oriole shone in the sun, but his mate glowed with a duller hue, an orange veiled with gray, and mottled and spotted or splashed with white and fuscous and black, as a brooding creature should be that sits all day long amid the play of fleeting light and shade upon constant color. But both were beautiful in their strong and darting flight, and their labors of love.

The mother alone fashioned the nest, weaving it strongly of grasses and bark, of fibre, hair and string, and lashing it firmly near the end, a hanging cradle for the wind to rock at will and safely, and beautifully adorned with a fantastic pattern of green oak leaves, woven across, and aiding to conceal the nest itself. The eggs, four to six, were white, but marked with strange characters, sometimes distinct, sometimes obscure, a hieroglyphic of black or fuscous lines, over which the mother brooded patiently for many days. But the male oriole was not indifferent, even while the young were in the egg. He did not fear to expose himself upon an upper branch, where he could watch untiringly over the safety of the beloved nest and all day long, in bright or cloudy weather, floated down to his silent mate a song of courage and tenderness.

Ah, no shepherds in far-off Arcady ever piped more sweetly to their beloved than this winged lover! His note is wild and free, a touch of anxious pleading perhaps in the brooding song that one does not catch in the first triumphant cry of joy with which he flashes upon our sight in April, but inexpressibly sweet and liquid. It is essentially music of the pipes, like the soft airs blown by lips of happy children upon reeds cut from the brookside in the first joyous days of spring, but it is different in its airy quality, as if a melody, unfinished, were floating far above our heads! They are loving householders, and, if undisturbed, will return, year after year, to the same next.

Happy is the Dryad that dwells in an oak where the orioles build and sing!

Ella F. Mosby.



MARBLED GODWIT.
(Limosa fedoa).
About ⅔ Life-size.

THE MARBLED GODWIT.

(*Limosa fedoa.*)

—I behold
The godwits running by the water edge,
The mossy bridges mirrored as of old;
The little curlews creeping from the sedge.
—Jean Ingelow, "The Four Bridges."

The Godwits form an interesting group of the shore birds (Limicolae) and belong in the same family as the snipes and sandpipers. They command attention not alone because of their habits, but also because they have for centuries been considered a delicate food for man, and much has been written in praise of their flesh.

Early in the sixteenth century one of the European species was rated as "worth three times as much as the snipe," and was considered a delicacy of the French epicure. We are told that the black-tailed Godwit in the year 1766 was sold in England for half-a-crown. Ben Jonson speaks enthusiastically of this bird as a delicate morsel for the appetite.

The origin of the name Godwit is veiled in obscurity. It has been suggested that it may be a corruption of the two words good and the antiquated word wight, the latter meaning swift, though the Godwits are not birds of very rapid flight.

The Marbled Godwit belongs to a genus (Limosa) which, though not rich in the number of species, has representatives throughout the Northern Hemisphere. This bird frequents muddy pools and marshes and wet, sandy shores. It is this habit that suggested to the naturalist the generic name, which is derived from the Latin word limosus, meaning muddy.

As is the case with many of our game birds, this species bears a number of common names, such as the Straight-Billed Curlew, the Marbled or Brown Marlin, the Red Curlew and, among sportsmen, the Dough and the Doe Bird.

With the exception of the long-billed curlew the Marbled Godwit is the largest of the "Bay Birds." These two birds closely resemble each other in coloration, but may be easily distinguished by the characteristics of the bills, which are very long. The terminal half of the bill of the curlew is curved downward, while that of the Godwit is either straight or slightly curved upward.

The geographical distribution of the Marbled Godwit includes the whole of North America, though it is infrequent on the Atlantic coast. Its nesting range is chiefly limited to the interior from Iowa and Nebraska northward to the Saskatchewan. In winter it migrates to Central America, Cuba and the northern part of South America.

In company with the long-billed curlew and some species of sandpipers it builds its nest on the grassy banks of rivers and ponds, usually in some natural depression. Occasionally, however, the nests are found on moist prairies some distance from a stream. In these grass-lined nests are laid the three or four bright olivaceous, drab or creamy buff eggs that are variously spotted or blotched with varying shades of brown. They are domestic and seemingly devoted to their fellows. When one of their number is wounded and unable to fly they will frequently remain in the vicinity, flying around the spot where lies their wounded comrade.

Dr. Coues tells us that "on intrusion near the nest the birds mount in the air with loud, piercing cries, hovering slowly around with labored flight, in evident distress and approaching sometimes within a few feet of the observer."

Its food consists of the smaller

crustaceans, worms, snails, insects and their larvae. These are captured from the surface of the water, on the shore or are probed for, with the long, sensitive bills, in the soft soil of the banks or under shallow water. When feeding it moves in an easy and graceful manner. Its grace and dignity well merit the saying that "it is one of the most beautiful of the birds sought by the sportsman.

Neltje Blanchan has very aptly described the habits of this bird. She says: "It is not the intention of the Godwit to give anyone a near view of either plumage or bill. The most stealthy intruder on its domains—salt or fresh water shores, marshes or prairie lands—startles it to wing; its loud, whistled notes sound the alarm to other marlins hidden among the tall sedges, and the entire flock flies off at an easy, steady pace, not rapid, yet not to be overtaken afoot. A beautiful posture, common to the plovers, curlews, terns and some other birds, is struck just as they alight. Raising the tips of the wings till they meet high above the back, the marlins suggest the favorite attitude of angels shown by the early Italian painters."

A BIRD-JOKE AT LEAFY LAWN.

In early spring Robin Redbreast returned to Leafy Lawn and selected a new site for his nest in the same apple tree his father and grandfather had occupied during preceding summers. No other birds had yet arrived and Robin jumped about on the sprouting lawn master of all he surveyed.

He soon discovered to his sorrow that those selfish, quarrelsome sparrows who tormented the birds last summer and drove away the wrens, had gone no farther during the winter than to the eaves of a near barn, and were already back to their nest in the tall poplar, scolding and threatening as disagreeably as ever. But Robin noticed that the limb which held their nest so high was dead and he hoped a strong wind would dash limb, nest and ugly sparrows all to the ground.

Robin looked very handsome in his crimson vest, hopping over the grass in a scalloped path, with his modest little mate following in a similar path beside him. Suddenly they stopped and listened.

"Surely that is Mr. Woodpecker pounding on the tin roof-drain," said Robin; and Mrs. Robin looked about curiously and spied Mrs. Woodpecker on a near tree listening to her husband's wonderful drumming. Mrs. Woodpecker was thinking what a fine nest such a strong husband could cut out and what quantities of corn and nuts he could hammer into the bark of the trees for an extra food supply. In a very short time the woodpeckers selected the balm-of-Gilead tree by the gate for their home and the work began of cutting and tossing the tiny shavings and so making a hole large enough to accommodate Mrs. Woodpecker while she sat over the ivory eggs waiting the day of their hatching.

Mr. Woodpecker was recognized as king of Leafy Lawn, perhaps because of his lordly manner and fine clothes. He always wore a jet black coat and white satin vest, and what was queer on a king, a large scarlet bonnet.

A few days after the arrival of the Woodpeckers, Robin saw Mr. Blue Jay making a circuitous route to the tall pine

and he knew the Jays had located there. Though Mr. Blue Jay was always cautious, trying to deceive every one concerning the whereabouts of his home, he himself knew every other nest in the yard.

So persistent was he in patrolling Leafy Lawn, jumping from tree to tree and from branch to branch, reporting his presence, and in case of danger threatening, squawking so loudly and repeatedly, that it was agreed, as he already had a blue uniform, that he should be the policeman for this precinct.

There came a day early in the season when Mr. Woodpecker, Robin Redbreast and Mr. Blue Jay all asembled within speaking distance on the lower branches of a silver maple tree and excitedly discussed the arrival of a number of birds which they had heard early that morning but had been unable to find.

"My wife," said Robin, "awakened me from the twig near her nest, where I usually sleep and keep guard, and she said that one of our kin had arrived for she had heard a voice exactly like mine from the plum tree. Hoping it was one of my brothers I searched eagerly until sunrise, and though I heard him twice I could not find him."

Mr. Blue Jay was more excited than before and turned about, twitched his tail violently, scolded and sputtered that he had had just such an experience and he believed the sparrows had added witchcraft to their other sins and were trying to hoodoo the birds of Leafy Lawn.

A frightened sparrow overheard this accusation and came near enough to protest that they were not guilty and had been themselves trying in vain to find their newly-arrived English relatives, whom they had believed they heard that morning.

Mr. Woodpecker said it might be no personal affair of his as he had heard no drumming nor mocking of his song, but if Leafy Lawn were to be occupied by kildares, bobolinks, meadow larks and blackbirds he thought there would be scarce picking of worms, bugs or seeds for the old settlers who were the rightful possessors of these premises and it was a serious condition of things. In closing his pompous speech he shook his scarlet bonnet furiously, smoothed his waistcoat and jumped upon a higher limp and called off his "chit-it-it-it-it-it" so shrill and high that his companions were for the moment alarmed lest he should split his throat. But he stopped as suddenly as he had begun, and upon the silence that followed the birds heard, as surely as they saw the blossoms on the apple trees, the song of the thrush.

"It is undoubtedly a hobgoblin," hoarsely whispered Mr. Woodpecker, "for Mr. Blue Jay swore to me this morning that during the seasons he and his ancestors have patrolled this lawn never have they seen a thrush even alight here."

It was decided that the three birds make one more immediate and thorough search for the monster hobgoblin which infested the Lawn.

Imagine their chagrin when they saw tilting upon the unleaved twig of a late catalpa tree a modest little gray bird with keen, bright eyes, who commenced a garble of all their songs called off in such merriment that the birds could not but appreciate the sport. Then the stranger, who was no other than Mr. Cat-bird, a cousin to the brown mocking-bird of the south, gave a weird cry exactly like a cat's meow which so frightened the birds they flew hastily away to their several homes.

Mr. Cat-bird was welcomed to Leafy Lawn, for his beautiful voice was an esteemed acquisition to the morning chorus, but he could not deceive the birds again with his imitative songs.

Many a time, however, he would sit upon the corner of the house roof and perpetrate his joke on the boy in the hammock below, who thought he knew much about birds, but who could not understand why, when he heard so many different voices, there was only a little gray cat-bird within sight.

Gertrude Southwick Kingsland.

THE RUSTY BLACKBIRD OR GRACKLE.

(*Scolecophagus carolinus.*)

Unlike the other blackbirds and our common orioles the Rusty Blackbird must not be sought in the orchards and fields of our farms and waysides, but in our forests and the heavily wooded banks of mountain streams and lakes. In such places this retiring bird passes the breeding season and raises its family in quiet solitude. It even seems to shun the company of its own kind and, unlike the red-winged blackbird, is seldom seen in large flocks. It is only in the spring that we may observe even small flocks from "whence issues a confused medley of whistles, sweeter and higher-pitched than the best efforts of the redwings." Captain Charles Bendire says: "The ordinary call note sounds like 'tehack, tehack,' several times repeated; another like 'turnlee, turnlee, turnlee,' uttered in a clear tone and varied occasionally to 'trallahee, trallahee.'"

Few birds exhibit a more happy disposition. They seem always to be perfectly satisfied with their surroundings. One writer, quietly watching them, gathered in the trees about him, says that "The wind whistled loudly through the branches above, but these lively fellows began a serenade so joyous and full of gleeful abandon that I lingered long to hear them. In singing they opened the bill widely and the throat swelled with melody. Their notes are rich, varied and energetic. They are almost constantly in motion, chasing each other or flying from perch to perch, singing merrily most of the time."

The Rusty Blackbird has a wide range. It is more common in the eastern portion of North America from Florida and the Gulf of Mexico northward to the northern limit of the forests. Westward, though constantly decreasing in numbers as the distance increases from the Atlantic coast, it is found as far as the great plains and very rarely on the eastern slopes of the Rocky Mountains. It frequents practically the whole forest area of British America from the Atlantic to the Pacific ocean. Mr. E. W. Nelson says: "I found it abundant at the Yukon mouth, where the widely extended areas of bush grown country offered suitable shelter and where it consequently nested in considerable numbers."

Their nesting range covers the whole of British America, but in the United States it is restricted to a comparatively small area. Its nests have only been reported as occurring in portions of New England and in the wild Adirondack forests. In winter it makes its home in the Middle and Southern States. At this time, from necessity, it is often seen around barn and stock yards, feeding on the grain that has been dropped by the cattle.

During the summer season the Rusty Blackbird depends almost entirely on animal life for its food, eating caterpillars, moths and other insects, worms, snails and spiders, also eating, to a limited extent, wild berries.

The nest of the Rusty Blackbird is large and substantially constructed. It is generally placed in cone-bearing trees and is seldom more than ten feet from the ground. As a rule, trees growing in swampy and rather inaccessible places are selected. The base of the nest "is principally composed of sphagnum moss and earth, forming a firm, hard platform on which the nest proper is built. This is thickly covered on the outside with small tamarack and spruce twigs, mixed with a few blades of grass, pieces of fern and long green moss, especially at the base. The inner cup is thickly and neatly lined with fine bright green grass." These blackbirds are not quarrelsome and are devoted parents, both sexes assisting in the care of the young, which are able to leave the nest in about fifteen or sixteen days. Our illustration shows the fall and winter plumage of the male. During the breeding season the plumage is a glossy bluish black.

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RUSTY BLACKBIRD OR GRACKLE.
(Scolecophagus carolinus).
¾ Life-size

WHAT EVOLUTION MEANS.

If any person devoted his time to the correction of popular errors, there is no probability that he would have any spare moments for eating or sleeping. The serious aspect of the present condition of popular knowledge, however, is the apparent absence of desire upon the part of many young people to grasp the principles of natural science. I am not exaggerating when I say that there are plenty of fairly educated persons in every large city who deny that man is an animal, and who insist that a whale must be a fish, because it lives in the sea.

Everybody professes to be aware in a sort of unconscious way that the theory of Evolution was invented by Mr. Darwin, and patented by Mr. Spencer, the most important points in the doctrine being that all men are descended from monkeys which had lost their tails, that the fittest survived, and that there is a "missing link" between man and his ancestors.

These ideas have little foundation in fact. Darwin no more discovered Evolution than Edison discovered electricity; we are not descended from any existing ape, with or without a tail, and no competent person ever asserted that we were; and there are good reasons for saying that such palaeontological "links" as are missing are not of the greatest possible importance. In short, whatever is evolutionary in the popular mind, is a burlesque upon the evolutionist's true opinions.

Charles Darwin was born in 1809, on the same day as Lincoln, but, long before Darwin's time, evolution had become a recognized force in science. Kant, who lived from 1724 to 1804, and Laplace (1749-1827) had worked out the development of the sun and the planets from white-hot gas. Lyell (1797-1875) had worked out the evolution of the earth's surface to its present condition; and Lamarck (1744-1829) had shown that there is evidence of the descent of all animals, as well as all plants, from a few ancestors by gradual modification. Again, Herbert Spencer, during Darwin's lifetime, began to work out the growth of mind from the most simple beginnings to the highest development of human thought.

The philosophies of the ancients were all of them founded upon limited observation; they were merely speculative fancy-pictures evolved from the author's own consciousness. Modern science, however, is of quite a different character. It has relegated certain fundamental propositions to a region called "the Unknowable" (this means at present unknowable), and it permits everybody to explain these propositions by means of any hypotheses which may occur to him. In other words, modern science does not deal with such phenomena as are at the present day outside the range of the human intellect; and I venture to warn the reader that speculation concerning matters upon which we have as yet no scientific data is waste of time. Modern science is founded upon investigation and observation, and the evidence is always weighed as carefully and as impartially as are the statements of witnesses in a law court.

One naturally asks: "What is Evolution?" "Continuous change according to certain fixed laws," is a reply which may have some value, although it is quite insufficient. A technical definition, given by Mr. Spencer, is as follows:

"An integration of matter and concomitant dissipation of motion, during which the matter passes from an indefinite, incoherent heterogeneity, to a definite, coherent homogeneity, and during which the retained motion undergoes a parallel transformation." Anybody who will think about this definition will be able to appreciate its meaning, provided a good dictionary is at hand.

Evolution is not another word for Development, and Mr. Spencer has carefully distinguished the one from the other; but the details are too technical for notice in this paper. Evolution may be regarded as "a general term for the history of the steps by which any living be-

ing has acquired the morphological and physiological characters which distinguish it." Development is "the process of differentiation by which the primitively similar parts of a living body become more and more unlike one another." Both definitions are Huxley's.

The evolution of organic matter now claims attention in detail. Of the origin of first life, we know absolutely nothing. The doctrine of Evolution does not deal with that. There are, however, many hypotheses upon the subject. Lord Kelvin, the eminent physicist, has suggested that unicellular life may have been transferred to this globe from a wrecked planet. This hypothesis obviously aids us very little, for it merely transfers the original scene of action to some other world. Personally, I prefer the idea that the first protoplasm was produced by the action of the sun upon inorganic matter not unlike the colloids, and that it "fed upon the previous steps in its own evolution." In this connection, I may say that two points are certain—viz., that vegetable life preceded animal life, and that the first forms of life were mere specks of jelly, without organs. Can these primitive specks be created at the present time? Or, in other words, can protoplasm be manufactured by artificial processes? The answer must be No; not by any process now known, although a great number of experiments have been made with the object of manufacturing unicellular vegetable life. During the years between 1870 and 1880, this question was thoroughly thrashed out, and at first the balance seemed to be very evenly held between the supporters and the opponents of spontaneous generation. The investigations of the late Professor Tyndall, however, conclusively proved that biogenesis, that is, all life from previous life, is the condition at the present day. But I must add Huxley's words of warning, viz., "that with organic chemistry, molecular physics, and physiology yet in their infancy, and every day making prodigious strides, it would be the height of presumption for any man to say that the conditions under which matter assumes the qualities called vital, may not some day be artificially brought together." And further, "that as a matter not of proof but of probability, if it were given me to look beyond the abyss of geologically recorded time, to the still more remote period when the earth was passing through chemical and physical conditions which it can never see again, I should expect to be a witness of the evolution of living protoplasm from non-living matter."

The first protoplasm must be extremely ancient, for the remains of sea-weeds are found in the oldest strata, and vegetation implies the manufacture of protoplasm from inorganic matter.

When the earth was in the condition to which Huxley referred, the constantly decreasing heat, and the recurrence of the seasons produced, by slow degrees, changes in the congenital character of the forms of life. Every individual varied somewhat from its predecessors, and those forms which possessed variations most suitable to the environment were the ones which eventually survived. The transition from the protophyta, the lowest class of vegetable life, to the protozoa, the lowest class of animal life, must have been a very simple matter in the condition in which the earth then was. Indeed, today the difference between the lowest microscopic animals and the lowest microscopic plants is by no means clearly defined.

Innumerable hosts of life made their appearance upon our planet while the surface was going through the cooling process, and they were, at first, of course, of the most primitive kind. But the same laws were always at work, viz., no two living things were exactly alike when they made their appearance upon this earth, although the differences between several forms might be very slight. Variation was, and is, the order of the day.

The individuals which possessed variations in accordance with the environment persisted, while those having injurious variations had a tendency to disappear. Congenital variations were (and are) transmitted with great certainty. This is Mr. Darwin's "Process of Natural Selection," called by Mr. Spencer "The Survival of the Fittest."

The other Darwinian factor in evolution is Sexual Selection. It is that department of Natural Selection in which sex is especially concerned. Anything which

exhibits the prowess or beauty of the one sex attracts the other, and decides the preference for one individual over another, with the result that those individuals which are unattractive to the opposite sex are unable to reproduce their kind. The importance of this factor will be appreciated if I give an extract from Darwin's "Descent of Man" (Vol. II., p. 367). "For my own part," wrote our great master, "I conclude that of all the causes which have led to the differences in external appearance between the races of men, and to a great extent between man and the lower animals, sexual selection must have been by far the most efficient."

As I have already said, Darwin neither invented nor discovered the doctrine of Evolution. But he placed it upon a firm foundation by the discovery of the two great factors to which I have referred, and, by incessant observation and indomitable energy, he demonstrated the truth of them beyond any reasonable doubt.

The proofs of the truth of Evolution are of two kinds—palaeontological and embryological. The palaeontological evidence has found its way into popular books, and even into some of the literary newspapers. The history of the horses, of the crocodiles, of the rhinoceros is known in detail. All the stages have been found which intervene between the four-toed Eohippos of the Lower Eocene and the zebra and horse of the present day. Thanks to the late Professor Marsh, of Yale, not only are the successive steps in the evolution of the foot-structure preserved, but so also are the various stages in the evolution of the teeth. The occasional appearance of a three-toed horse points very plainly to a three-toed progenitor, a striking example of atavism, that is, the reappearance of a characteristic which has "skipped" one or more generations.

If the principle of heredity be true, one would expect to find in the development of animals, and plants traces of the line of descent. "If Evolution be true, one ought to find, following back the development of the egg, that specific details would vanish and give rise to more generalized features; that the earlier the stages, the more the embryos of related forms would resemble each other." This is exactly what is found, there being, in a vast number of instances, a remarkable parallel between the palaeontological record and the embryological evidence. A detailed examination of the facts would not be intelligible to anybody who is not a practical biologist; but I am fully warranted in asserting that every organism in the course of its life-history (technically called ontogeny) is a recapitulation of the history of the race—technically known as phylogeny.

There is other evidence in abundance. The phenomena named atavism is a part of that evidence. Almost everybody has seen well-defined and regular stripes upon horses, and nobody doubts that they indicate a zebra-like ancestor, Again, in the inner side of the human eye is a little red fold, known as the plica semilunaris, the remnant of an ancestor which possessed a third eyelid, similar to that possessed by some reptiles and birds of to-day.

Who are the supporters of the doctrine of Evolution? Practically the whole scientific world. The late Professor Marsh, the distinguished palaeontologist, when president of the American Association for the Advance of Science in 1878, said:

"I need offer no argument for Evolution, since to doubt evolution is to doubt science, and science is only another name for the truth." Professor Marsh meant, of course, not that evolution is to be taken "on trust," but that it has been so thoroughly proved that new arguments in support of it are unnecessary.

Concerning Natural Selection, sometimes called Darwinism, the late Professor Huxley said (quotation from Darwin's "Life"): "I venture to affirm that so far as all my knowledge goes, all the ingenuity and all the learning of the hostile critics have not enabled them to adduce a single fact of which it can be said this is irreconcilable with the Darwinian theory."

I occasionally hear the old argument that species are immutable—that a species is something which never changes. It seems a little late in the day to revive this contention, but it is necessary to be prepared with a reply. The critics of Dar-

win's theory of "the Origin of Species by Natural Selection" have always refused to give a tangible definition of the word "species," and, as a result, the real difficulty turns upon that point. What is a species? Linnaeus said: "There are as many species as an infinite Being created at the beginning," a statement which is a confession of faith, and not a scientific definition. We must remember, of course, that Linnaeus died as long ago as 1778. The truth is that all the various tests for species have proved faulty, that of the fertility of hybrids having little more value than many of the other so-called "tests." In classification, the word "species" means the lowest subdivision to which a name is usually applied, and to aid the zoologist's or botanist's memory, some system of classification is, I need not say, an absolute necessity.

According to the view of the anti-evolutionists, most of whom are not scientific men, descendants of a common ancestor must belong to the same species. Nevertheless, the late Mr. Romanes has shown that the rabbits of Porto Santo, an island in the Atlantic, about twenty-five miles from Madeira, descended from the European stock of nearly 500 years ago, will no longer breed with their continental cousins.

When we remember that some wild animals will not breed in captivity, the idea of sterility as a test of species seems utterly unscientific. I venture to say that there can be no accurate definition of species in terms of physiology, for every individual has its peculiarities, chemical as well as physical, and the real difficulty is to decide when these peculiarities are important enough to make it useful to give a precise name to their possessors. Assume for a moment that a species is a group of individuals agreeing in essential characters which remain constant from one generation to another. But what are essential characters and how much constancy is demonstrated? Upon these points no two biologists are likely to agree. For example, taking the birds of Germany, Bechstein says there are 367 species; Brehm says there are 900. According to Reichenbach there are 379, and Meyer and Wolf tell us there are 406.

The idea of a species is based upon structural resemblances between individuals, and the degree of importance attached to these depends upon the mind of the particular observer.

There are two reasons why nobody has seen one species turn into another. The first is that until the word "species" is satisfactorily defined, instances of the evolution of new forms cannot be supplied. Secondly, as nobody lives much beyond a hundred years at the most—a mere moment in Nature—our ability to witness marked changes in animals or plants is extremely limited. Minor changes, of course, are frequently noticed. I ask the reader to remember, however, that the flower-garden and the farm-yard are in an artificial condition, Natural Selection having ceased. For instance, the duck which has defective wings when hatched has as good a chance of surviving as the duck with powerful wings.

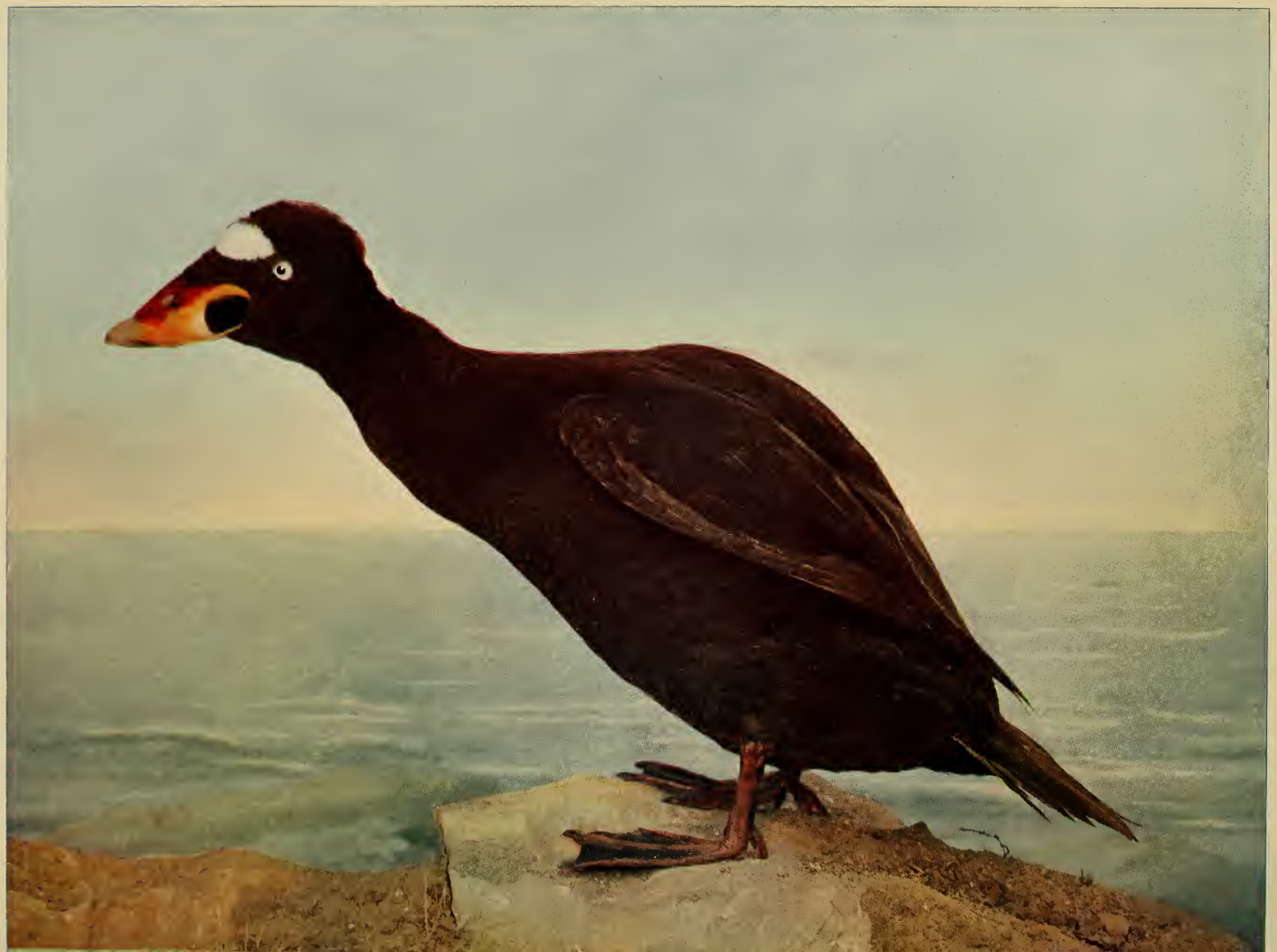
Who are the opponents of the doctrine of Evolution? In the scientific world they are difficult to find. Professor Virchow, of Berlin, the distinguished pathologist must, I think, be classed as one, although his verdict is really "not proven." Professor Haeckel, however, has pointed out that the opinion of a pathologist, no matter how eminent, upon the subject of evolution cannot carry much weight.

Until recently we had with us two men of science whose opposition to some portion of the doctrine of evolution was of importance. These men were Sir William Dawson, the Canadian geologist, and Mr. Mivart, the English anatomist. Both of these gentlemen have died within the past two years.

Having now written a brief outline of the doctrine of Evolution, I believe that I cannot do better than conclude this very imperfect sketch with a quotation from the immortal Shakespeare:

"The truth can never be confirmed enough.
Though doubts did ever sleep."

Lawrence Irwell.



THE SURF SCOTER.

(*Oidemia perspicillata.*)

The Surf Scoter is also known by several other popular names, such as the Surf Duck, the Surf or Sea Coot and, not infrequently, the Booby. The name Velvet Duck, though more commonly applied to the white-winged scoter, is also sometimes used to designate this species.

This Scoter is an American species and is only an accidental visitor to European coasts. Its range includes the "coasts and larger inland waters of northern North America; in winter, south to Florida, to the Ohio River and to San Quentin Bay, Lower California."

Our illustration is that of a male bird. The female is a sooty brown, silvery gray below and with much white on the sides of the head.

Immense flocks of the young of this species winter on San Diego Bay, California. Here the adult birds are of rather rare occurrence for they are able to withstand the rigors of an arctic winter and stay far to the northward where they are a common resident. In the vicinity of San Diego there was about one adult to every seventy-five or one hundred juvenile birds. The former may be easily distinguished by their very striking velvety black plumage, the white markings on the nape and forehead standing out in bold contrast. These white markings remind one of the white bull's eye on a target. Because of this striking color characteristic the Surf Scoter is frequently called the Target Head, by the California hunters.

They are wary birds and it is often necessary to make a long detour in order to reach a spot near to a flock, without attracting their attention, as they ride the crest of the waves in a heavy surf. The younger birds will remain in the surf so close to the shore that frequently they are cast high and dry upon the beach. When this happens it is very amusing to watch them awkwardly scramble back and enter the water again. The older birds are usually much more shy, remaining far out on the water where they congregate in pairs, though sometimes there may be six or eight together.

As the tides enter San Diego Bay they carry in the loose seaweeds in which are entangled numerous dead starfish and other forms of marine life. These form the principal food not only of the Scoters but also of all the water fowls, such as other species of ducks, the cormorant, the pelican and the beautiful California gull.

The note of the Surf Scoter is to me the most pleasing of all the ducks. It is a soft, mellow whistle ending in a cluck! cluck!

Mr. Nelson states that the Surf Scoter appears in the vicinity of St. Michaels, Alaska, about the middle of May and nests commonly in the marshes of the delta of the Yukon river. It also nests in large numbers on the Atlantic coast from Labrador northward.

Dr. Coues, speaking of these birds as he observed them in Labrador, says, "They are tough birds and remarkably tenacious of life and require a heavy charge to kill them. They are known as Bottle-nosed Coots, a name given in allusion to the very peculiar shape and color of the bill."

Its nest, usually placed on grassy knolls, in fresh-water marshes near the sea, is made of dried weeds and grasses and lined with the down of the bird. It is evident that the female performs all the duties of incubating the eggs and carrying for the young, for during the nesting period large flocks are observable that consist entirely of males, constantly feeding in their accustomed haunts.

This ocean duck feeds "on small mollusks and fishes, for which it dives almost constantly, both in the sandy bays and amidst the tumbling surf, sometimes fishing at the depth of several fathoms and floating buoyantly among the surf of the raging billows, where it seems as unconcerned as if it were on the most tranquil waters."

Frank M. Woodruff.

A BACK-YARD CLASS.

The Farnum's back-yard was something disagreeable. Still it didn't matter much, thought the children, as long as the front yard was nicely kept and there was a high fence all around the back. Besides, Mr. Farnum was away from home traveling all the week; Mrs. Farnum was so busy that she hardly ever saw the disreputable yard, and the children, Rob, Lora and Baby Jim, liked best to play away from home.

At last it dawned on the mother's mind that they were hardly ever at home except to eat and to sleep and to get ready to go away again and she began to worry about it and wonder what she should do.

That very day Rob came running in to show a bug which he had in a bottle. It was such a queer looking specimen that all became interested in it at once.

"I'll keep it till papa comes back, he'll be sure to know!" exclaimed Rob proudly.

"But this is only Tuesday, my boy. You can't keep it in that bottle all the week without food or drink. It must not be left to starve," Mrs. Farnum replied.

"We'll find it something to eat," cried the children, and off they ran.

But this was not such an easy matter. Mr. Bug would not touch any of the back-yard "vegetables," as Rob called the variety of weeds that clung to the rotten fence boards or matted the ground of the large garden. In spite of their efforts the bug stuck to the corner of the bottle and refused to be comforted, with food, at least. At last, in despair, Rob ran to the drug store and asked what he could give the bug to "make it die a peaceful death."

"Just put a layer of pyrethrum in the bottom of your bottle," answered the druggist, "keep it corked tight, and you can make every bug in your yard die happy. Pyrethum is a powder that is harmless to people (though of course you must not eat it), but the least smell of it kills insects."

Rob went home delighted. "I'll make a collection of bugs, as Sam Ward does of butterflies," he declared.

"I'd help you if it wasn't for those horrid spiders," said Lora. "I'm afraid as death of them ever since I read about a baby dying from a spider-bite."

"Pshaw! Only a few spiders are poisonous, that is, I think so. Let's get a library book about them and find out; then may be we'll have a spider collection, too," answered the practical brother.

While Rob was getting his bottles ready in which to "electrocute" the bugs and Lora was going to the library after the books, Mrs. Farnum was rummaging in the attic. At last she came down bearing triumphantly aloft a big old-fashioned work-box.

"This you may have for a specimen case," she said. "If you'll fit some little drawers in it, Rob, I'll line them with scraps of velvet and have a glass top put on."

The children set to work at once, and in vain the neighbors' children whistled for them on the other side of the high board fence. Lora took the hammock from the front lawn to swing beneath the old apple tree. But the tall weeds reached up to the hammock, so Rob had to go for the old scythe rusting in the fence corner and Baby Jim came dragging a hoe with which to cut them down. Soon they had a large space cleared under and around the apple trees, and when it was carefully raked and swept they ran in to beg their mother for some porch chairs for their "summer parlor."

Then Rob made for himself a camp-stool that he could carry around and plant among the bushes where he would sit watching for certain bugs to appear and trying to catch them in his bottle. Such patience as it took at first! And how little Rob had of it! But Lora read long, interesting chapters to him out of "The Insect World," and the specimen case grew so fast and became so fascinating that he found the patience quite worth while.

Whatever Rob did, of course, Baby Jim wanted to do.

"The ant-hill's mine! I 'scovered it!" he announced at supper one evening. "I'll make a fence wound it to keep the

wolves out, and I'll have the ants for my sheepses."

Mrs. Farnum did not look as pleased as the rest.

"I don't want the ants crawling all over you," she said.

"No, they won't; I'll take my red chair out and sit on it, like Rob does," he answered, solemnly.

The next day he set to work to build a big circular fence around his ant hill, working as perseveringly as ever any real shepherd did to get his fold ready, and accepting no help from Rob except allowing him to shave up a board to furnish the "palings." Then, day after day, while Lora swung in the hammock reading aloud to Rob, little Jim sat perched on his red chair herding his ant-flock.

"I feed them and they eat, but they never drink a tiny bit," he said.

"The ants find their drink away down in the ground, dear," replied his mother. "Now tell me what you have learned about your sheep."

"I learned a greedy lesson to-day," said Baby Jim. "One ant had some food and he met an ant who hadn't any, and he divided; then he went on some more and met another ant with not any, and he told him to come over to my chair-leg where the cookie was."

The family all laughed, and still more at Rob, who asked, "Is Jim going to be an ant-hropologist, papa?"

"Perhaps," answered Mr. Farnum. "Now, children, I have something nice to tell you. I have hired a man to come and help us improve the back-yard. He will cut the weeds and trim up the trees and bushes, and we can plan the walks and flower-beds for next spring."

"How lovely!" cried Lora.

"I don't know about that," said Rob, with an ugly pucker in his forehead. "It will scare all my bugs away. They like weeds and dirty places."

"Yes," admitted his papa, "but next spring you will have to go to the woods for new specimens."

"It won't scare my specimens away," laughed Lora. "I've been studying birds lately. You see when I become tired of reading I just lie back in the hammock and watch the birds in the tree-tops. They are so very smart, and they do the queerest things!"

So the plan to improve the yard suited all but Baby Jim, who wailed long and loud because his ant city would be destroyed. In vain did the family try to comfort him. He could not be persuaded to abandon his flock.

That night, to Jim's distress, a cold rainfall set in. "My sheeps will all be dwounded," he wailed! "I meant to make a 'bwella over them!"

"Look here," said Lora, drawing him up to the sofa beside her. "This is the picture of the inside of an ant-hill. Here is the top door where you see the ants go in, then they go down to this large room, then sideways to this one, then down, down, down."

Baby Jim's eyes opened very wide. He seized the book and studied the drawing long and earnestly.

"Your sheep are all down in the rooms now, having a nice Sunday, I think," continued Lora. "When winter comes and the snow is all over the ground they won't come up at all. Haven't you seen them carrying food in to pile up in one of their rooms?"

"O, and my cookies are all down there!" he cried in great delight.

When the man appeared in the morning Baby Jim marched out with an air of importance, and, after surveying the deserted ant-hill, he turned to the man and said, "My sheeps are all gone into the house to bed, so you can clean up their meadow if you want to."

And thus it was that the Farnum children began a study which will interest them as long as they live. There is no longer any need to worry about their living at the neighbors; and at last the Farnum back-yard has become not only respectable, but actually a "thing of beauty and joy forever."

Lee McCrae.

THE AMERICAN ELK OR WAPITI.

(*Cervus canadensis.*)

Centuries ago, before Columbus sailed the unknown seas which divided him from the New World of his dreams and ambitions, before the birth of De Soto, that adventurer whose discoveries and conquests were to unfold to the Old World the mysteries and fascinations of the new land, through the virgin forest and over the broad plains as yet unknown to the white race, roamed many animals which were widely distributed throughout North America.

They fearlessly sought those localities which would furnish them the most abundant supply of food and water. Unmolested except by their natural enemies, they multiplied and lived a free and untrammeled life.

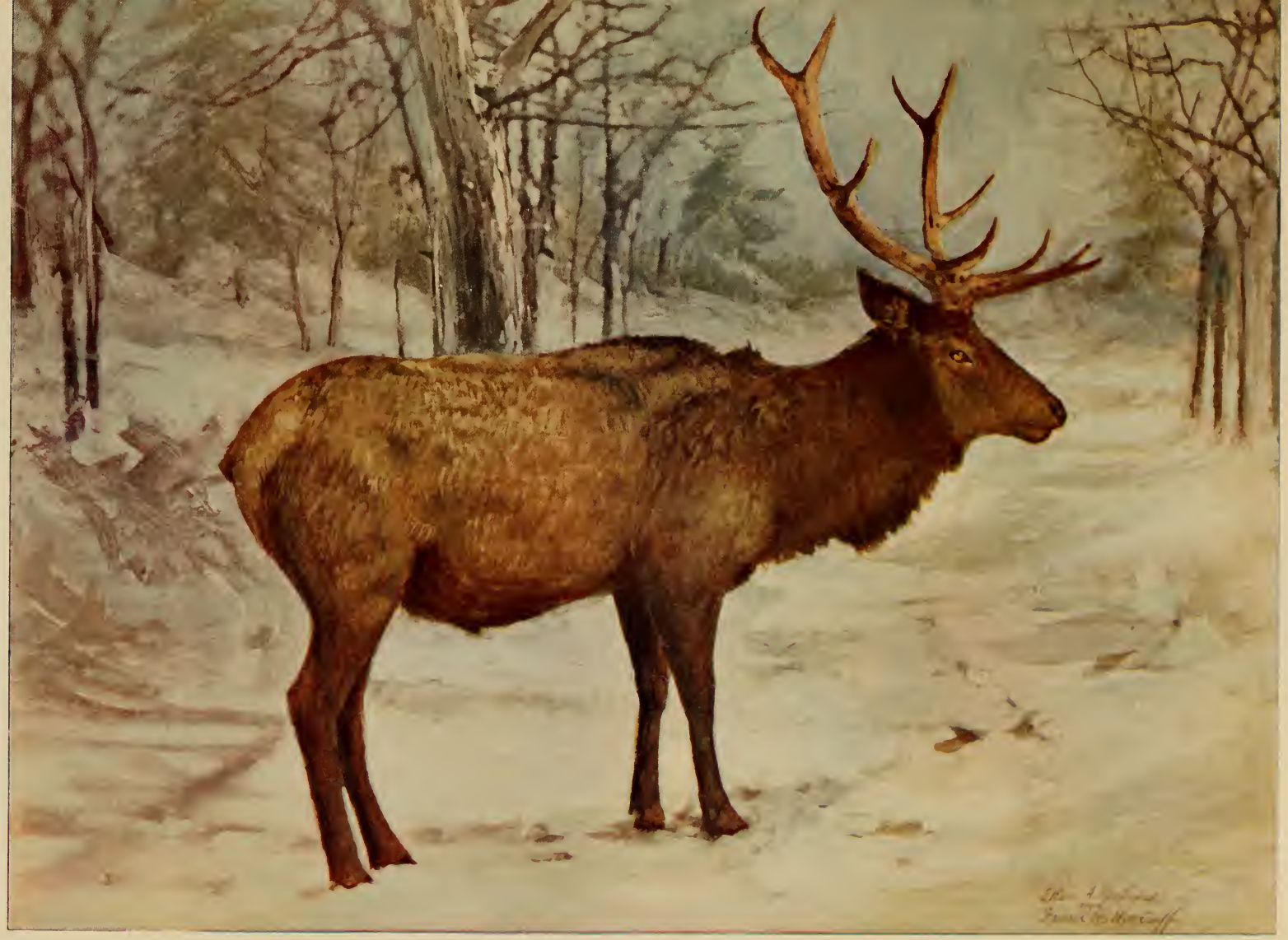
In these early times the Wapiti or the American Elk, as it is commonly though erroneously called, was probably the most widely distributed quadruped in North America. Its range extended from the northern part of Mexico northward to Hudson's Bay and from the Atlantic to the Pacific Ocean. At the present time, however, but a few wild individuals are left in the United States east of the Mississippi and lower Missouri Rivers. They are occasionally met with in the wilder regions bordering Lake Superior, and it is reported that they are still living in the mountainous regions of Pennsylvania and Virginia. The advance of civilization, causing the cultivation of the lands and the destruction of the forests, has gradually driven this noble animal to the westward and into the wilds of British America. In the states bordering the Pacific Ocean and along the western tributaries of the Mississippi and the Missouri rivers it is still quite common. One writer tells us that "in the rich pasture lands of the San Joaquin and Sacramento it formerly was to be seen in immense droves and with the antelope, the black-tailed deer, the wild cattle and mustangs covered those plains with herds rivalling those of the bison east of the mountains or of the antelope in South Africa."

The name Wapiti is of Indian origin, and in their language is used to designate a Rock Mountain goat. The name elk so commonly applied to this animal should properly be limited to the moose.

The Wapiti is closely related and belongs to the same genus as the famous stag or red deer (Cervus elaphas) of Europe. This animal, which is smaller than the Wapiti, inhabits the forests of mountainous regions.

In both the Wapiti and the stag the senses of sight, hearing and smell are well developed. They will detect a human being or other animal when some distance away. Though their acute senses protect them, they are said to have poor memories as well as weak powers of comprehension. The Wapiti when listening raises its head and throws forward its erected ears. When entering the forest it will examine the surrounding open country and sniff the wind, seeking possible danger.

The antlers of both Wapiti and stag are much alike, though those of the former are longer and heavier, corresponding to its larger size. The full growth of the horns is attained about the seventh year. The perfect horns are slightly oval in transverse section and thickly covered with warts or slight elevations, which are arranged in longitudinal lines. All the branches or prongs are situated on the front side of the main trunk. "The general color is a light chestnut red, which deepens into a brownish hue on the neck and legs and almost into a black on the throat and along the median line of the under surface of the body. The buttocks are yellowish white, bordered by a dusky band which extends down the posterior surface of the hind legs." In winter the fur is much thicker and finer and the general color is more gray than in summer. "During the mating season the males have fierce combats, and at this time the male Wapiti emits a peculiar noise, resembling the braying of an ass, beginning with a loud shrill tone and ending in a



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AMERICAN ELK WAPITI.
(Cervus canadensis).

deep guttural note." At this time, even when kept in confinement, the male is easily irritated and may attack people. Old males will frequently wage persistent and long battles for supremacy. The antlers are used as the weapons in these duels, and cases have been recorded where these have become so firmly interlocked that they could not be separated, resulting in the death of both individuals.

When food is plentiful and the Wapiti is not constantly disturbed, it will remain in the same region, only straying away during the mating season. They assemble in herds of a greater or less number of individuals. The females and fawns usually remain together; the older females without fawns form another herd and the old males, as a rule, lead a more or less solitary life, except during the mating season.

The Wapiti is more common in low grounds in the vicinity of marshes and well wooded tracts, where it feeds on grasses and the young branches and leaves of the willows and allied trees.

The Wapiti is graceful and proud in its bearing and very light in its movements. This is especially true of the male, which may be described as an animal of "noble carriage." When moving from place to place it walks rapidly and runs with remarkable swiftness.

A FRIENDLY FIELD MOUSE.

Many stories have been told in the past, tending to show that wild animals when in trouble will display surprising confidence in man, in fact will often seek his assistance when sore beset. The writer, when a boy upon a farm in Minnesota, had an experience with a field mouse which prettily illustrates this trait in wild creatures. It was stacking time and the men were all busy in the fields lifting the shocks of cured grain and stacking them in hive-shaped stacks in the barnyard. The writer, a barefoot boy at that time, had been following the wagons in the field all the morning in a vain endeavor to capture some field mice to take home as pets. He had seen a number of the drab little creatures with their short tails, but had failed to lay his hands upon any of them, owing to the thick stubble and the nimbleness of the mice. At last, as a particularly large shock was lifted, a broken nest was disclosed and the youthful mouser was put upon the qui vive by the slender squeaks of seven or eight hairless little beings that were so young as not to have opened their eyes as yet. The mother disappeared with a whisk, whereupon the young hunter sat down in a critical attitude beside the nest and began to examine his find. He had already put one of the young mice in his trousers pocket when the mother reappeared out of the stubble beside the nest. The boy held his breath and awaited developments. Much to his surprise, the mouse-mother, after carefully examining the ruined nest, entered his pocket, which, as he sat, opened very near to the nest. She seemed to come to the conclusion very quickly that her lost little one had found a very good home, and in about two minutes had transferred the remainder of her offspring from the nest to the pocket, carrying them one at a time in her mouth.

The writer has had many varied experiences with wild animals, but none of them impressed him so strongly as the episode of the mouse-mother in the wheat stubble. J. Clyde Hayden.

THE OPENING OF WINTER BUDS.

In our cold temperate zone spring means chiefly the changing of the trees from their naked winter condition to the beautiful green leafy appearance of early summer. When stripped of their foliage, trees present to the observant eye a great variety of form. The tall, slender poplar can easily be distinguished from the spreading elm as far as it is seen; as, also, can the rough-barked hickory, with its clinging strips of bark, from the smooth beech.

Usually, the opening of buds seems to take place almost in a single night, but they really open very gradually. Now, these buds are all formed the summer before, but they are so small that they are scarcely noticed in the midst of the many leaves. In the winter, however, they are readily seen; and, then, when the first warm rains fall in the spring they start to swell, and gradually grow larger until, suddenly, they burst through their snug winter coats, and show the tiny, green leaves that have been concealed in the thick, dark, outer covering.

The buckeye bud is one of the largest of the winter buds. It is covered with small, pointed, brown scales, which overlap each other, thus keeping the cold from the more delicate parts within. Underneath these hard outer scales are thinner, half-transparent ones. Their color is a delicate pink, and fine veins line them. Snugly wrapped inside these dainty coats are tiny woolly objects, and when the wool is removed they are found to be miniature leaves folded together so compactly that they occupy very little room. If the bud has grown on the end of the twig a very small flower bud will be enclosed within the leaves; but if it has grown on the side there will be no flower bud. Since these leaves and flowers have all been formed the summer before, it is easy to understand that a few warm days will cause them to grow so that they soon become too large for their winter covering, and suddenly burst it open.

The trees are forced into a period of inactivity by the cold, so, if a twig is broken off, and placed in moderately warm water, in a warm, light place, the buds on it will open just as they do in the spring and their development may be easily watched.

Often a tree will have a countless number of buds; and since growing buds need much light and nourishment only the stronger ones will grow, the weaker ones remaining in a resting state. These resting buds are called dormant buds, the word dormant coming from the Latin word "dormio," which means "to sleep." The buds often continue in this dormant state for several years, becoming weaker and weaker all the time, until finally they die. If, however, the stronger buds are killed at any time, as by a late frost, the dormant ones suddenly become active, and grow to take the place of the ones that were destroyed. This shows us how cleverly trees provide substitutes for cases of emergency. These dormant buds then might even be compared to the understudies of the stage.

The regular places for buds to grow are in the axes of the leaves or on the end of the twigs. Buds, however, can be made to grow on unusual places. If the tops of the tree are cut off, as we often see them in the maple, buds will grow on the trunks. Then, if trees are cut down or blown over, buds will grow on the stumps or from the roots.

Thus, we can see by watching the formation and development of buds, and the growth of branches, that trees follow certain fixed laws of nature, modifying these laws only on account of some peculiar external conditions as, for example, nourishment, light, heat or moisture.

Roberta Irvine Brotherson.

THE CHAMBERED NAUTILUS.

This is the ship of pearl, which, poets feign,
Sails the unshadowed main,
The venturous bark that flings
On the sweet summer wind its purpled wings
In gulfs enchanted, where the Siren sings,
And coral reefs lie bare,
Where the cold sea maids rise to sun their streaming hair.

Its webs of living gauze no more unfurl!
Wrecked is the ship of pearl!
And every chambered cell,
Where its dim dreaming life was wont to dwell,
As the frail tenant shaped his growing shell,
Before thee lies revealed,—
Its irised ceiling rent, its sunless crypt unsealed!

Year after year beheld the silent toil
That spread his lustrous coil;
Still, as the spiral grew,
He left the past year's dwelling for the new,
Stole with soft step his shining archway through,
Built up its idle door,
Stretched in his last-found home, and knew the old no more.

Thanks for the heavenly message brought by thee,
Child of the wandering sea,
Cast from her lap, forlorn!
From thy dead lips a clearer note is born,
Than ever Triton blew from wreathéd horn!
While on mine ear it rings,
Through the deep caves of thought I hear a voice that sings:

Build thee more stately mansions, O my soul,
As the swift seasons roll!
Leave thy low-vaulted past!
Let each new temple, nobler than the last,
Shut thee from heaven with a dome more vast,
Till thou at length art free,
Leaving thine outgrown shell by life's unresting sea!

Oliver Wendell Holmes.

THE NAUTILUS AND OTHER CEPHALOPODS.

The highest group of mollusks belongs to the class Cephalopoda, which signifies head-footed, the name being given to them because the head is surrounded by a circle of eight or ten arms, which act both as arms and feet. Let us take as an example of this class the common squid of the Atlantic coast (Ommastrephes illecebrosa), and see how it is formed. The body is long and cylindrical and ends at the tail in a point; the dorsal side of the tail end has a pair of triangular fins. The body is practically a hollow cylinder or sac which contains the vital organs of the animal. The neck is in many genera fastened to this cylinder or mantle by an apparatus which may be likened to a button and button-hole. The head is rounded, has on either side the large, round eyes, and at the end it is split up into ten arms, two of which are longer than the others and are called the tentacular arms. On the inner side, the arms are provided with two rows of suckers, which are little, rounded cups placed on pedicels or stems and which form a vacuum when they touch an object and so cling to it. The two long arms are expanded and club-shaped at the end, each club being armed with four rows of suckers. Directly in the center of the circle of arms the mouth is placed and is provided with two sharp beaks like those of a parrot, only inverted. In addition to these organs there is a large siphon or tube on the ventral side, which is really an organ of locomotion, for it expels water from the mantle cavity with great force, thus rapidly sending the animal backward, its usual direction of propulsion. The body has no shell for protection, but in its place there is a long rod called a pen, which acts as a backbone to support the body of the animal, although of course not in the same sense as the backbone of vertebrated animals. In some cephalopods this pen is hard and stiff but in Ommastrephes it is thin and soft. Such is the general form of a cephalopod, familiar names of which are the Octopus, Squid, Nautilus, Paper-nautilus and Devil-fish. In this class, also, the majority of the shelled species are extinct, only a few living at the present time. The Ammonite is an example of the extinct cephalopods.

The most familiar member of this class to the layman is the Pearly Nautilus, the shell of which may be found on the mantel shelf or what-not of very many dwellings. The shell of the Nautilus is formed in a spiral and is made up of many chambers, all connected by a tube called a siphuncle, the outer chamber containing the animal and hence called the living chamber. The shell is called the "Pearly Nautilus," but the pearly tints cannot be seen until the outer layer—which is yellowish-white with brown markings—is taken off, when the exquisite, rainbow-like colors may be observed.

While the shell of Nautilus is well known the animal is very rare in our museums, although the natives of the Fiji Islands, New Hebrides and New Caledonia are able to obtain it in large quantities for food and it is highly esteemed by them. During the voyage of H. M. S. Challenger around the world, a living Nautilus was captured by dredging in some three hundred and twenty fathoms near Mateeka Island, one of the Fiji group. This was placed in a tub and it swam about in a lively manner by ejecting water from its funnel. The tentacles, of which there are a larger number than in the other cephalopods, were spread out radially, like those of the sea anemone. The Nautilus lives among the coral reefs, at depths varying from three to three hundred fathoms or more.

The Fijian's method of capturing the Nautilus for food is thus described (Tryon,—Structural and Systematic Conchology): "When the water is smooth so that the bottom, at several fathoms' depth, near the border of the reef, may be distinctly seen, the fisherman in his little, frail canoe scrutinizes the sands and the coral

FROM COL. CHI. ACAD. SCIENCES.

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BEAK OF OCTOPUS.

PEARLY NAUTILUS.
(Nautilus umbilicatus).

PAPER NAUTILUS.
(Argonauta tuberculata).

masses below, to discover the animal in its favorite haunts. The experienced eye of the native may probably encounter it in its usual position, clinging to some prominent ledge, with the shell turned downwards. The tackle consists first, of a large, round, wicker-work basket, shaped very much like a cage rat-trap, having an opening above, with a circlet of points directed inward, so as to permit of entry but to preclude escape; secondly, a rough piece of rope of sufficient length to reach the bottom; and lastly, a small piece of branched wood, with the branches sharpened to form a sort of grapnel, to which a perforated stone is attached, answering the purpose of a sinker. The basket is now weighted with stones, well baited with boiled cray-fish (the principal food of the Nautilus is crabs of different species), and then dropped gently down near the victim. The trap is now either closely watched or a mark is placed upon the spot, and the fisherman pursues his avocation upon other parts of the reef until a certain period has elapsed, when he returns and in all probability finds the Nautilus in his cage, feeding upon the bait. The grapnel is now carefully let down, and having entered the basket through the opening on top, a dextrous movement of the hand fixes one or more of the points or hooks and the prize is safely hoisted into the canoe."

The animal is made into soup by some of the natives while others boil it in a pot. The shells are used by the natives to make beautifully carved figures, the contrast of the dark outer coating against the light, pearly, inner coating producing a striking effect. The shell is also used in England and on the Continent to produce elegant cameos.

The Argonaut," or "Paper Sailor," is no less beautiful and interesting than the Pearly Nautilus. The thin and fragile shell cannot be compared with that of the Nautilus nor with the pen, or internal support, of the squid, for it is attached to the animal by no muscles, and is only kept in position by the broad webs on the upper arms of the female (which alone possesses a shell), its function being simply to protect the eggs. The male is very much smaller than the female and is exceedingly rare. The natural position of the female is with its arms spread out and hanging about the shell, four in front and four behind, the two broad arms supporting the shell being spread out and closely embracing the latter. The siphon is turned toward the ridged part of the shell and the animal progresses in a backward direction by forcibly ejecting water through this organ. It crawls with the shell on its back, like a snail.

The poets have given us many beautiful writings detailing the vices and virtues of the lower forms of life and among these the Pearly Nautilus and Paper Sailor have received a goodly share of the muse's attention. But, alas! for the poet, who, not being a conchologist, has sadly misused and misjudged these helpless and harmless creatures. Thus we are told how the paper nautilus sails over the ocean with his "sails" (meaning the two expanded arms) spread out to catch the breeze, and how, when the storm approaches, it folds its sails and disappears beneath the waters of the ocean. Alas for the poet! he puts the most beautiful ideas together in verse, ideas and themes which we would fain believe; but along comes cold, calculating science, and at one fell stroke sweeps away all that the poet has done, for in the poem on the Argonaut all is wrong, the animal does not and could not sail, for were it to do so the shell would fall and become lost in the bottom of the ocean.

A mollusk whose shell is cast upon the shore by thousands, but the animal of which is very rare, is the Spirula. The shell is less than an inch in diameter, is made in the form of a loose spiral and is divided into little chambers connected by a siphuncle. The shell of this genus does not contain the animal, as in Nautilus, but it is enveloped in two flaps of the mantle, at the posterior part of the animal, the shell being concealed with the exception of a part of the edge on each side. The body of the animal is long and cylindrical and the arms are quite short, more nearly resembling those of the Nautilus than those of the Octopus or squid. The body ends in a disk which is supposed to be a kind of sucker, by which the animal can adhere to rocks, thus enabling it to freely use its arms in obtaining food. It has

been supposed by some anatomists that the shells of the fossil Ammonites were attached to the animal in a similar manner, and if this should be true these small mollusks would assume a new meaning as being the last survivors of a large group of animals of which all except Spirula are extinct.

Probably the best known of the shellless cephalopods is the octopus, with its rounded body, large eyes and long arms. Almost everybody has read Victor Hugo's weird account of the octopus in his "Toilers of the Sea," and the animal has thus been rendered more or less familiar, although it was made to do several things by the author that it would not do in nature, as, for example, "drinking" a man alive. The Octopus is found abundantly throughout temperate and tropical seas, generally on the coast among rocks, but frequently on the sandy bottom in water of moderate depth. Here it may occasionally be seen "walking" clumsily along on its eight long arms, its little round body being balanced above the arms. Its favorite position, however, is among the rocks. In such a locality it will squeeze its body into some crevice and spread out its arms until they form a sort of web, resembling in this position a huge spider waiting for its prey. And it may well be likened to a spider for from this web there is no escape if once a hapless fish has come in contact with the powerful suckers on the long arms. The poor fish is paralyzed when seized by the octopus and is drawn towards the mouth, where it is torn to pieces by the beak-like jaws, and swallowed.

Like many of the mollusks of which we have written the octopus is esteemed as a valuable article of food by several savage tribes as well as by some civilized people. The native of the Pacific coast catches the Octopus (Octopus punctatus) by a very ingenious method. Providing himself with a spear twelve or fourteen feet long which has four or five barbed pieces of hard wood some fourteen inches long attached to the end, he paddles his canoe to the feeding-ground of the mollusk. One is soon found in ten or twelve feet of water and the Indian carefully lets down his spear until within a few inches of the center of the animal, when he quickly plunges it into the soft mass. Instantly the water is in commotion, the eight long arms writhing about in an endeavor to reach the boat. The Indian knows that should this happen his chances for life would be slim indeed. But he is prepared, and carefully lifting up the octopus with his barbed spear until it is above the surface of the water, he plunges a long, sharp spear, with which he is provided, into each arm where it joins the body. At each plunge of the spear, an arm becomes helpless and in a short time the animal, which but a few moments before had the power of a score of men, lies in the canoe, a shapeless, helpless mass.

That the octopus is good eating the writer can attest from experience, for during a visit to Yucatan some years ago this mollusk was served as a meat dish and was very palatable, the flesh being firm and tender and much resembling chicken. The portion which fell to the writer was the head, with a part of the arms attached.

One of the most interesting characteristics of the Octopi and allied cephalopods is their facility for changing color when danger is near. These changes are caused by little pigment cells just beneath the skin, which expand and contract. Thus, if a person is looking at an octopus in captivity and the animal is so placed that it cannot escape, the observer will be astonished to see the body of the animal suddenly assume a deep pinkish color which in turn is succeeded by a blue and then by a green, and finally a return to pink. The body is covered with these little pigment cells, the different colors—pink, blue and green—being so evenly scattered over the surface than when each color cell is expanded the whole body assumes that tinge. This is one of the most wonderful characteristics of the Mollusca.

Another cephalopod closely related to the Octopus is the Squid, several species of which are found on the Atlantic coast of the United States. In this genus the body is long and cylindrical, ends in two fins, has a prominent head terminating in eight short and two long arms and is supported by a long, cartilaginous, internal pen, which is made up of a central shaft with expansions on each side like a quill,

hence the name "pen." These animals are very numerous in individuals and form a large part of the food of fishes, like the blue-fish, black bass, etc., and have even been found in the stomach of jelly-fishes. Besides being eaten by the fish the squid furnishes a large part of the food of some whales, the former occurring frequently in shoals and falling ready victims to the huge monster.

In Norway and Sweden the people have a legend of a peculiar sea-monster, called the Kraken, which was probably founded on some of the enormous squids discovered during the past thirty years. Many of these mollusks are found off the coasts of Norway, Scotland and Ireland, and not a few have been recorded from the coasts of Nova Scotia and New England. In the larger of these animals the body is eight or ten feet long, the short arms eight feet and the long, tentacular arms thirty feet in length, making in all an animal nearly forty feet long when fully stretched out! The squid is greatly prized as bait and frequently a royal battle will take place between one of these gigantic creatures and a boat's crew. Sad indeed is the fate of the latter if the mollusk once gets a firm hold of the boat. Care is used, however, to guard against such a result, and the animal is gradually deprived of its strength by making a sudden dash, cutting off an arm and as quickly retreating. These large squids are not as common as the smaller ones and they are rarely captured.

An ingenious method of capturing a species of the smaller squids (Ommastrephes illecebrosa) in use by the fishermen of the New England coast is as follows: The squid has the habit of swimming in an opposite direction to a light, as the full moon, so the fishermen go out to sea in boats, light a large torch in each boat and slowly row toward the shore, driving the squid, which of course swim backward in an opposite direction from the light, upon the beach, where they may be gathered by thousands after such an expedition. Another method of capture is by jigging; the jig is made of a piece of lead some two inches in length which is armed with a circle of sharp, unbarbed wires pointing upward and curving outward. The process of jigging is accomplished as follows: the jig is attached to twelve or fifteen feet of stout line and is lowered into the water, which is generally chosen of a depth of ten feet from the side of a small boat. When near the bottom it is kept moving slowly up and down until a squid is felt upon it, when it is suddenly drawn to the surface with the squid attached. These squid, when caught, are used for bait, a single fishing smack being known to use as many as eighty thousand squids in a single season.

A familiar object to most canary-bird fanciers is the cuttle-bone placed in the cages of these birds for them to sharpen their beaks upon. This "cuttle-bone" is the internal support of the Cuttle-fish (Sepia officinalis) and is homologous with the pen of the squid, mentioned above. The animal of Sepia is short and rounded, with a large head surrounded by a row of eight short arms and two very long tentacular arms, ending in expanded clubs armed with powerful suckers. Like the Octopus and Squid, the Cuttle-fish is capable of many changes of colors by the contraction and expansion of its pigment cells. They are found throughout the world, living near the shore, but the species found about European shores are the best known.

Frank Collins Baker.

God made all the creatures and gave them
Our love and our fear,
To give sign we and they are His children,
One family here.

—Robert Browning.

THE TRAILING ARBUTUS.

(*Epigaea repens.*)

Many years ago, before the Mayflower had cast anchor in Plymouth Bay or Columbus had landed at San Salvador, an aged indian sat shivering in his wigwam. Vainly had he sought for fuel and in his extremity he called upon the Great Spirit, that he might not perish with the cold. Crouching over the dying embers of his fire he stoically awaited the end, when suddenly there appeared before him a beautiful maiden wreathed with wild flowers and carrying in her hands, buds of the willow. Ferns and grasses draped her form and her moccasins were fashioned from pure white lilies. When she breathed the landscape suddenly blossomed with the thousand hues of nature and the warm rains fell in obedience to her will.

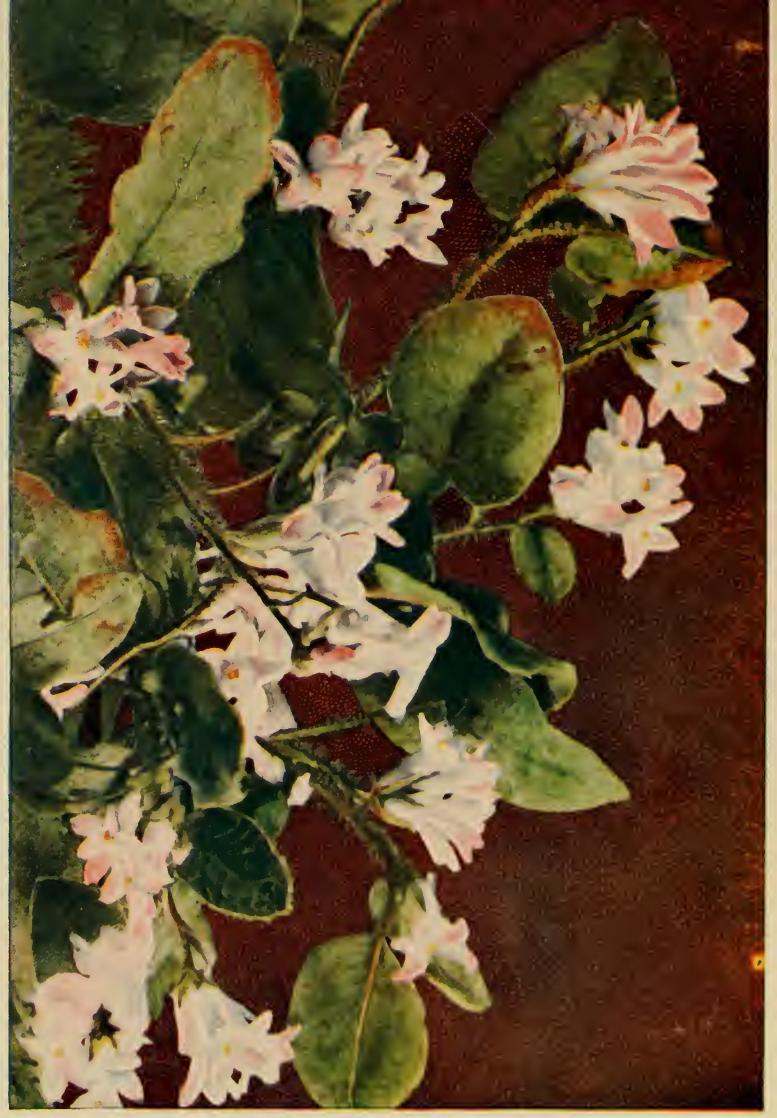
Under the influence of this spirit of the springtime the aged red man slumbered and, as his head sank upon his breast, the sunshine came out in all its splendor and a blue bird alighted upon the top of the wigwam. Slowly the maiden passed her hand above the old indian and gradually he shrank away until nothing remained but a cluster of green leaves. Then taking from her bosom a cluster of rosy blossoms, she concealed them among the leaves, bestowing upon them her own sweetness and fragrance and telling them that as the harbingers of spring, all who would inhale their fragrance, must bow the knee in honor of the vernal goddess. The maiden then passed away through the woods and over the prairies and wherever her footsteps lingered, there grows today the sweet-breathed mayflower.

Whether or not this fanciful story relates the real origin of the Trailing Arbutus, Ground Laurel or Mayflower, as it is variously called in different sections of the country, the fact remains that it follows closely in the footsteps of spring, often pushing up its dainty blossoms through the leaves and snow. It is always known as the Mayflower throughout New England and the old story of its being Flora's first offering to the ocean-tossed pilgrims as they landed at Plymouth, in appreciation of which they named it the Mayflower in memory of their vessel, has endeared the beautiful plant to every New England heart and has caused it to be placed in Cupid's keeping, along with the Scotch blue bell, the German corn flower and the Swiss edelweiss.

The Trailing Arbutus (Epigaea repens) belongs to the Heath family or Ericaceæ and constitutes the only species of the genus. Like the partridge berry which is often associated with it in pine woods and sandy soils, it is still in a state of transition, although it has been developing for centuries. As a rule, plants have the stamens and pistils in the same blossom or part in one and part in another. The Mayflower, however, does not carry out this arrangement. Either the anthers or the stigmas are abortive or partially so, or in other words, the perfect stigmas are usually associated with abortive anthers and vice versa. In this manner, nature has wisely provided for cross fertilization which is accomplished largely by insects, as the structure of the plant is not adapted to wind fertilization. The chosen agents for this process are honey bees, and a few early moths and butterflies, to which the nectar is served by this beautiful Hebe of the spring and who carry the pollen from one flower to another.

A wise provision of nature has been pointed out whereby ants are kept away from the nectar which they would devour without accomplishing the purposes for which it was created. Every

415 MOUNTAIN LAUREL OR CALICO-BUSH.
(Kalmia latifolia).



TRAILING ARBUTUS OR MAYFLOWER.
(Epigaea repens).

rocky hillside on which the Trailing Arbutus is frequently found, swarms with ants which are debarred from the blossoms by hairs which project upward from the inner surfaces of the corolla and the outer surfaces of the ovary and style and effectually prevent the ants from entering but are not sufficiently rigid to keep out the larger insects.

As a rule, the pollen bearing flowers are larger and whiter than the others. The stigma bearing blossoms, while small, more than offset their defect by a rosy color which makes the flowers far more attractive than their larger but paler rivals.

Very little success has been achieved in domesticating the Trailing Arbutus. It is essentially a wild creature and prefers to waste its fragrance on the desert air. Success may be had, however, if the conditions under which the plants are found growing are preserved as nearly as possible. Yearling plants should be selected and plenty of roots taken or results can be obtained from planting seeds, but as these are difficult to obtain, the other method is the more satisfactory.

Charles S. Raddin.

TRAILING ARBUTUS.

Ah, quite alone these April days
It blossoms to evoke my praise;
And hyacinthine scents are shed
To bless and cheer me, hither led.

Upon this sheltered, upland knoll,
At early dawn I often stroll;
White clusters edged with crimson hue
Lie here, impearled with crystal dew.

The leaves, like memories, evergreen,
The blooms, like truth, of purest sheen;
The cup within, like some fair breast
Where holy thoughts can surely rest.

How worthy of its meek renown!
Delightful gem for beauty's crown.
O'er it with joy can poet brood;
It breathes of God in solitude.

—George Bancroft Griffith.

THE MOUNTAIN LAUREL.

(*Kalmia latifolia.*)

About the middle of the eighteenth century an enthusiastic botanist and collector, Peter Kalm, gathered specimens in America of a beautiful plant which he carried back to the gardens of Europe and also to his preceptor, the naturalist Linnaeus. In the year 1753 Linnaeus named the plant, honoring his pupil by giving to the plant the generic name Kalmia. He also gave it the specific name latifolia, referring to its broad leaves.

The genus Kalmia includes six known species, five of which are natives of eastern North America and one a native of Cuba. They are all beautiful shrubs, varying in height from a few inches to several feet.

The plant of our illustration is a native of the eastern portion of the United States, where it grows in sandy or rocky woods and is more abundant in mountainous regions. This shrub, which grows to a maximum height of twenty feet, is a superb object early in June, when it is covered with corymbs of rather large pink or pinkish-white flowers and numerous evergreen leaves.

Easily cultivated and highly ornamental, it has been introduced into the greenhouses and gardens of this and European countries.

In spite of the beauty of this plant, it has a bad reputation, for its leaves are narcotic and poisonous to some animals. "Even the intelligent grouse, hard pressed with hunger when deep snow covers much of their chosen food, are sometimes found dead and their crops distended by these leaves."

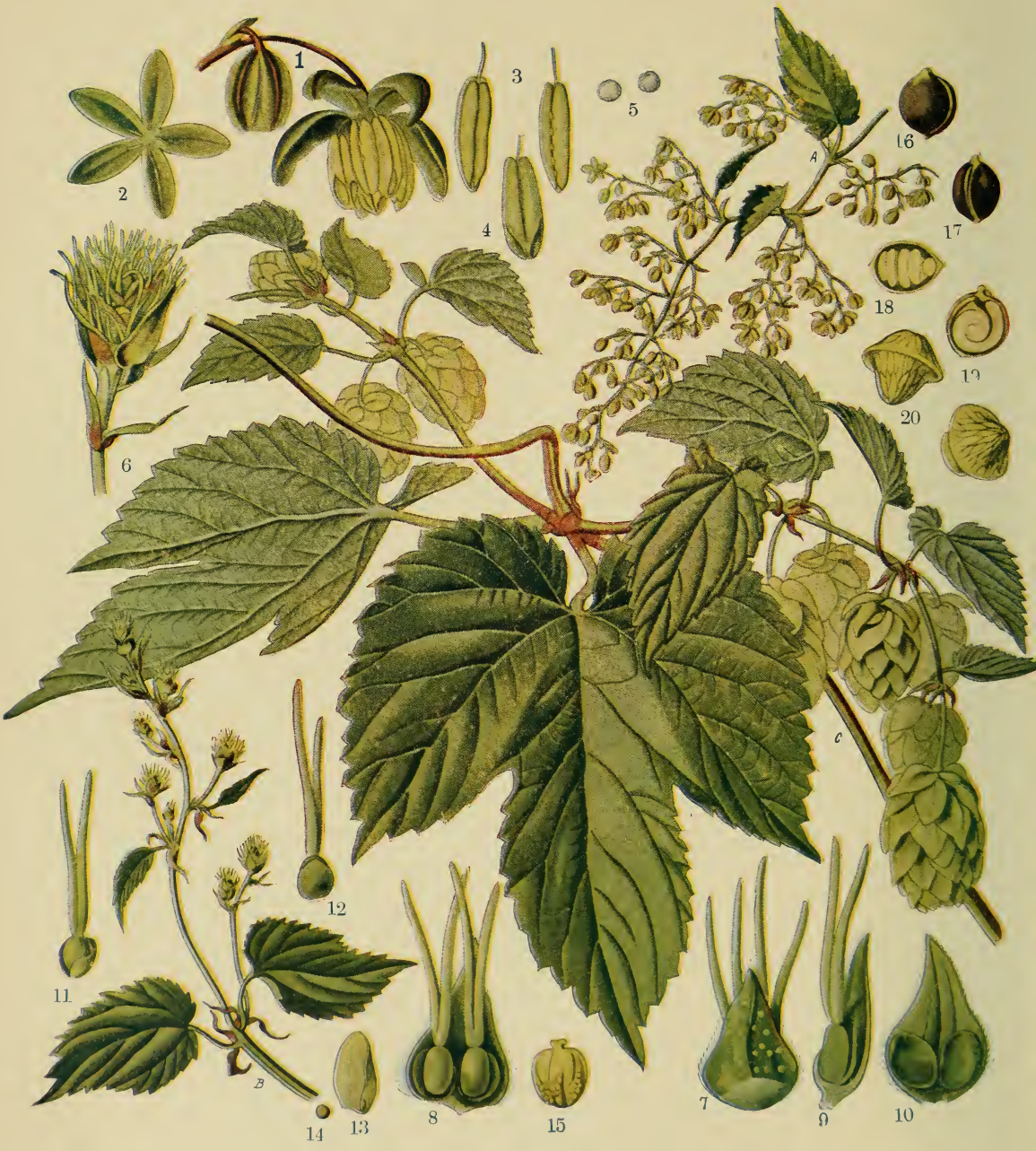
We cannot show the characteristics of this plant in any better way than to quote from "Nature's Garden," where we find the following passage:

"All the Kalmias resort to a most ingenious device for compelling insect visitors to carry their pollen from blossom to blossom. A newly opened flower has its stigma erected where the incoming bee must leave on its sticky surface the four minute orange-like grains carried from the anther of another flower on the hairy underside of her body. Now, each anther is tucked away in one of the ten little pockets of the saucer-shaped blossom and the elastic filaments are strained upward like a bow. After hovering above the nectary, the bee has only to descend towards it, when her leg, touching against one of the hair-triggers of the spring trap, pop! goes the little anther-gun, discharging pollen from its bores as it flies upward. So delicately is the mechanism adjusted, the slightest jar or rough handling releases the anthers; but, on the other hand, should insects be excluded by a net stretched over the plant, the flowers will fall off and wither without firing off their pollen-charged guns. At least this is true in the great majority of tests. As in the case of hot-house flowers, no fertile seed is set when nets keep away the laurel's benefactors."

Many of our readers reside near the home of the Mountain Laurel and can examine the interesting features of this beautiful plant in Nature's own garden. Those that do this will be well repaid.

Violets stir and arbutus waits,
  Claytonia's rosy bells unfold;
Dandelion through the meadow makes
  A royal road, with seals of gold.

—Helen Hunt Jackson.



HOPS.

CHICAGO:
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HOPS.

(*Humulus lupulus* L.)

"A land of hops and poppy-mingled fields."
—Tennyson: Aylmer's Field.

The hop plant is a creeping perennial with several stems or branches attaining a length of fifteen to twenty-five feet. It has numerous opposite three to five lobed, palmately veined, coarsely toothed leaves with long leaf stalks (petioles). Flowers unisexual, that is staminate and pistillate flowers separate, either on separate plants (dioecious) or upon different branches of the same plant (monoecious). Flowers insignificant in loose, drooping axillary panicles. Fruit a cone-like catkin usually designated a strobile.

The hop has been called the northern vine. It is found in a wild state throughout Europe, excepting the extreme north, and extends east to the Caucasus and through central Asia. It is a handsome plant and not infrequently used as an arbor plant. The lower or basal leaves are very large, gradually decreasing in size toward the apex. H. lupulus is the only representative of the genus.

It is rather remarkable that a plant so widely distributed and familiar should not have been known to the Greeks and Romans. Its cultivation in Europe dates back to the eighth and ninth centuries. It was, however, not extensively cultivated until about the sixteenth and seventeenth centuries.

The word hop (German, Hopfen) is of very uncertain origin. According to some authorities it is traceable to the old English, hoppan, in reference to the habit of the plant in climbing over hedges and fences. Humulus is said to refer to its habit of creeping over the soil. Lupulus (diminutive of lupus, wolf) is said to refer to the pernicious and destructive influence the hop plant has upon plants which it uses as a support, especially the willows. Plinius named it Lupus salictarius, that is, the willow wolf or willow destroyer.

Beside the countries above named hops is also cultivated in Brazil and other South American countries, Australia and India. There are several cultivated varieties. According to most authorities it is not supposed to be indigenous to North America, but Millspaugh expresses it as his opinion that it is indigenous northward and westward, growing in alluvial soil, blossoming in July and fruiting in September.

The plants are planted in rows and the rapidly growing branches trained upon poles stuck into the soil. Three or four male plants (with staminate flowers) are grown in an acre patch to supply the necessary pollen. Some authorities state, however, that the female plants develop enough staminate flowers to effect pollination. It is extensively cultivated in England, Germany and France. Also in New England, New York, Michigan, and in fact nearly every State in the Union.

In Belgium the young, tender tops of the plants are cut off in the spring and eaten like asparagus, especially recommended to the pale and anaemic and those with scrofulous taints.

The peculiar hop-like fruiting known as strobiles are collected in the fall of the year (September to October), dried and tightly packed into bales. The base of the scales of the strobile are covered with a yellowish powder, consisting of resin-bearing glands, known as lupulin. One pound of hops yields about one ounce of lupulin. Since the medicinal virtues of hops reside in the lupulin it will be readily understood that the hops from which the glands have been removed is of little or no medicinal value. Lupulin as well as

the hops have a faint, peculiar, somewhat yeasty odor, which increases with age due to the development of valerianic acid. For medicinal purposes only fresh hops should be used.

The principal use of hops is in the manufacture of beer, to which it imparts the peculiarly bitter taste, and its repute as a tonic. For this purpose enormous quantities are consumed in Germany and England. The exhausted hops from the breweries form an excellent fertilizer for light soils. The leaves have been used as fodder for cows. Leaves, stems and roots possess astringent properties and have been used in tanning. In Sweden the fibre of the stems is used in manufacturing a very durable white cloth, not unlike the cloth made from hemp and flax.

Hops is used medicinally. It at first causes a very slight excitation of brain and heart, followed by a rather pronounced disposition to sleep. Pillows stuffed with hops form a very popular domestic remedy for wakefulness. Hop bags dipped in hot water form a very soothing external application in painful inflammatory conditions, especially of the abdominal organs. It has undoubted value as a bitter tonic in dyspepsia and in undue cerebral excitation. Tincture of lupulin and red pepper (capsicum) enjoys the reputation of being a very efficient substitute for alcoholic stimulants when their use is to be discontinued. Earlier physicians recommended hops very highly in kidney and liver complaints, as a "blood purifier" and to cure eruptive skin troubles. It is recommended in nervous troubles and in delirium tremens. The roots were formerly employed as a substitute for sarsaparilla.

Hops contains an etherial oil, resin and tannic acid. The oil and the resin are important constituents in the manufacture of beer. The young shoots contain asparagin, etherial oil, resin and sugar.

Description of Plate.—A, staminate (male) inflorescence; B, pistillate (female) inflorescence; C, fruiting branch; 1, staminate flower; 2, perigone; 3, stamen; 4, open anther; 5, pollen; 6, pistillate catkin; 7, 8, 9, pistillate flowers; 10, scales; 11, 12, 13 scales and flowers; 14, 15, fruit; 16, 17, 19, seed; 20, resin gland (lupulin). Albert Schneider.

AWAKENING.

Never yet was a springtime,
  Late though lingered the snow,
That the sap stirred not at the whisper
  Of the south wind sweet and low;
Never yet was a springtime
  When the buds forgot to blow.

—Margaret E. Sangster.

Vol. IX. JANUARY, 1901. No. 1.

The beautiful is as useful as the useful.—*Victor Hugo.*

BIRDS AND NATURE

CONTENTS.

EDITED BY WILLIAM KERR HIGLEY.

ILLUSTRATED BY COLOR PHOTOGRAPHY.

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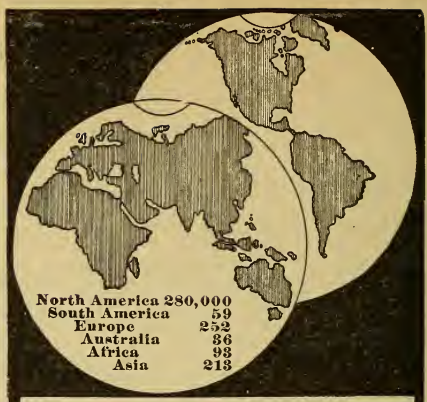

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215 American Goldeneye.
216 Skunk.

JANUARY, 1899.

217 Chimpanzee.
218 Puma.
219 Lemon.
220 American Mistletoe.
221 Nuts.
222 Whippoorwill.
223 Snapping Turtle.
224 Sandhill Crane.

FEBRUARY, 1899.

225 Ginger.
226 Crab-eating Opossum.
227 Geographic Turtle.
228 White Ibis.
229 Iris
230 Duck-billed Platypus.
231 Cape May Warbler.
232 The Cocoanut.

MARCH, 1899.

233 Tufted Titmouse.
234 Northern Hare.
235 Pineapple.
236 Hooded Merganser.
237 Cloves.
238 Common Ground Hog.
239 Common Mole.
240 Azalea.

APRIL, 1899.

241 Nutmeg.
242 American Barn Owl.
243 Kangaroo.
244 Hoary Bat.
245 Nashville Warbler.
246 English Grapes.
247 Swift Fox.
248 Hyacinth.

MAY, 1899.

249 Cedar Waxwing.
250 Hyrax.
251 Coffee.
252 Bonaparte's Gull.
253 Common Baboon.
254 Grinnell's Water Thrush.
255 Hairy-Tailed Mole.
256 Cineraria.

JUNE, 1899.

257 A Feather Changing from Green to Yellow.
258 Western Yellow-Throat.
259 Myrtle Warbler.
260 Blue-winged Yellow Warbler.
261 Golden-winged Warbler.
262 Mourning Warbler.
263 Chestnut-side Warbler.
264 Black-throated Blue Warbler.

SEPTEMBER, 1899.

265 Pointer Dog.
266 Shells.
267 Marbles.
268 Ores.
269 Minerals.
270 Water Lilies.
271 Yellow Perch.
272 Beetles.

OCTOBER, 1899.

273 Forests.
274 Grand Cañon.
275 Terraced Rocks, Yellowstone Park.
276 Rooster and Hen.
277 Oil Well.
278 Polished Woods.
279 Brook Trout.
280 Niagara Falls.

NOVEMBER, 1899.

281 Lady-Slipper.
282 Tea.
283 Towhee.
284 Canary.
285 Carolina Paroquet.
286 Chipmunk.
287 Peach.
288 Common Minerals and Valuable Ores.

DECEMBER, 1899.

289 Narcissus.
290 Coca.
291 Red-tailed Hawk.
292 Maryland Yellow-Throat.
293 Lyre Bird.
294 Cow Bird.
295 Wild Cat.
296 European Squirrel.

JANUARY, 1900.

297 Virginia Rail.
298 Blue-winged Teal.
299 Yellow-headed Blackbird.
300 Black Squirrel.
301 Weasel (Ermine).
302 Quince.
303 Quartz.
304 Lily of the Valley.

FEBRUARY, 1900.

305 Killdeer.
306 Cinnamon Teal.
307 Clapper Rail.
308 Gopher.
309 Mink.
310 Carbons.
311 Licorice.
312 Yellow Lady-Slipper and Painted Cup.

MARCH, 1900.

313 Peacock.
314 Willow Ptarmigan.
315 Stellar's Jay.
316 Ruddy Duck.
317 Muskrat.
318 Poppy
319 Primrose.
320 Copper and Lead.

APRIL, 1900.

321 American Bittern.
322 Scarlet Ibis.
323 Massena Partridge.
324 Ring-billed Duck.
325 Thyme.
326 Bloodroot.
327 Western Blue Grosbeak.
328 Shells.

MAY, 1900.

329 Magpie.
330 Red-breasted Nut-hatch
331 Purple Martin.
332 Ring-necked Dove.
333 Opossum.
334 Genista.
335 Digitalis.
336 Raven.

JUNE, 1900.

337 Wilson's Thrush.
338 Red or Wood Lily.
339 Common Sunfish.
340 A Mountain River.
341 Insects.
342 Brittany—(Cows).
343 Harvesting in the Great Northwest.
344 Homing Pigeon.

SEPTEMBER, 1900.

345 Swamp Rose Mallow.
346 Yellow Ladies' Slipper.
347 { New England Aster. / Late Purple Aster.
348 Wild Yellow or Canadian Lily.
349 Vesper Sparrow.
350 Calico Bass.
351 Mountain Lake.
352 Banana.

OCTOBER, 1900.

353 Oswego Tea or Bee Balm.
354 { Fringed Gentian. / Closed or Blind Gentian.
355 { Tall or Giant Sunflower. / Black-eyed Susan or Ox-eye Daisy.
356 Wild Columbine.
357 American Redstart.
358 Trout.
359 Ocean Waves.
360 Domestic Fowls.

NOVEMBER, 1900.

361 Western Willett.
362 Buffle-Head.
363 American Eared Grebe.
364 Louisiana Tanager.
365 Luna and Polyphemus Moths.
366 Prong-Horned Antelope.
367 Sensitive Plant.
368 Almond (Leaf, Flower and Fruit).

DECEMBER, 1900.

369 Western Horned Owl.
370 Long-crested Jay.
371 Fulvous Tree-duck.
372 Red-breasted Sapsucker.
373 Promethean and Cecropian Moths.
374 Irish Setter.
375 Pitcher Plant (Nepenthes).
376 Mandrake (Rhizome, Leaf, Flower and Fruit).

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JANUARY, 1901.

377 Hawk Owl.
378 Knot or Robin Snipe.
379 White-winged Crossbill.
380 Townsend's Warbler.
381 Water Shells.
382 Collared Lizard.
383 Fruit: Apple.
384 Vanilla Plant.

FEBRUARY, 1901.

385 American Rough-legged and Young Red-tailed Hawks.
386 Short-billed Dowitcher.
387 Great-tailed Grackle.
388 Hooded Warbler.
389 Land Shells.
390 Gila Monster.
391 Cassia Cinnamon Plant.
392 Fruit: Pomegranate.

MARCH.

393 Owl Parliament.
394 Gray Parrot.
395 White Pelican.
396 Marbled Godwit.
397 Black Bear.
398 Pond and River Shells.
399 Fruit: Orange.
400 Medicinal Plant: Pepper.

APRIL.

401 Crested Carrasaw.
402 Harlequin Duck.
403 Canada Grouse.
404 Dovekie.
405 Beaver.
406 Marine Shells.
407 Fruit: Lemon.
408 Medicinal Plant: Cubebs.

MAY, 1901.

409 Audubon's Oriole.
410 Marbled Godwit.
411 Rusty Blackbird or Grackle.
412 Surf Scoter.
413 American Elk.
414 Nautilus Shells.
415 Flowers: Mountain Laurel, Trailing Arbutus.
416 Medicinal Plant: Hops.

JUNE, 1901.

417 Bullock's Oriole.
418 Sanderling.
419 Great Northern Shrike.
420 Brandt's Cormorant.
421 Buffalo.
422 Agates.
423 Flowers: Great Mullein, Moth Mullein.
424 Medicinal Plant: Cocoa Fruit

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