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BIRDS AND NATURE.
ILLUSTRATED BY COLOR PHOTOGRAPHY.
VOL. IX. FEBRUARY, 1901. No. 2

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CONTENTS.

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.

YOUNG RED-TAILED HAWK HOLDING A QUAIL.
(Buteo borealis.)
AMERICAN ROUGH-LEGGED HAWK.
(Archibuteo lagopus sancti-johannis.)
About 1/7 Life-size.
FROM COL. JOSEPH STEPPAN.

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 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. 53

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.

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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.

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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,

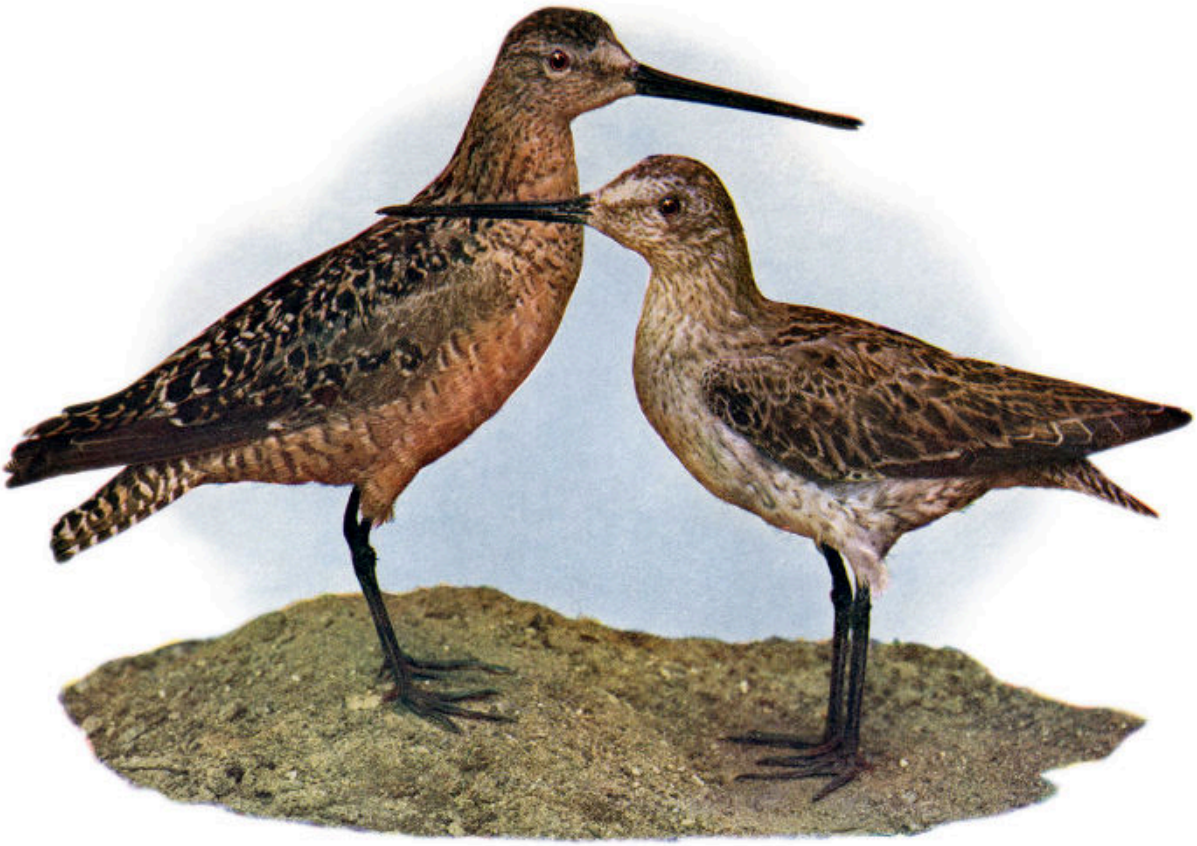
And the cloud and the mountain are one; all unheard
Is the murmur of traffic, the sigh of unrest,

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.



DOWITCHER.
(Macrorhamphus griseus.)
Nearly ⅔ Life-size.
FROM COL. CHI. ACAD. SCIENCES.

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.

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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.

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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.

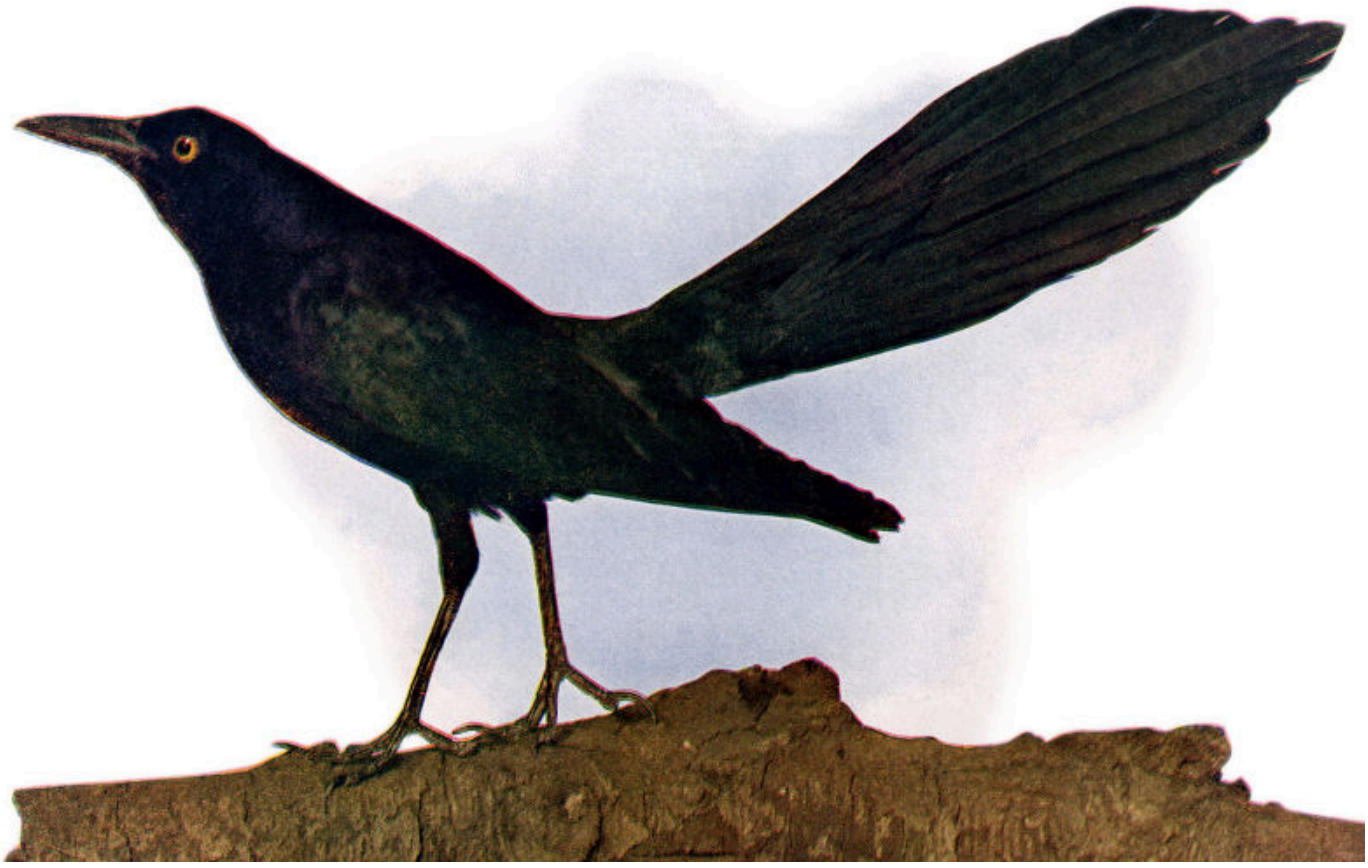
The Great-tailed Grackle, as well as the other species, usually builds rude and bulky nests in trees, sometimes at quite a height from the ground. It will also nest in shrubs and it is said that it will occasionally select holes in large trees. The males are an iridescent black in color and the females 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.



GREAT-TAILED GRACKLE.
(Quiscalus macrourus.)
½ Life-size.
FROM COL. CHI. ACAD. SCIENCES

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 logical, 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. 68

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 Vancouver 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.

HOODED WARBLER.
(Silvania mitrata.)
Life-size.
FROM COL. CHI. ACAD. SCIENCES.

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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 hole 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.

73

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 silhouettes 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.

74

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.

LAND SHELLS.
FROM COL. CHI. ACAD. SCIENCES.

First row:
Helix fidelis (California)
Helix pomatia (Europe)
Liguus fasciatus (Florida)
Second row:
Cyclophorus appendiculatus (Philippines)
Bulimus chiliensis (South America)
Third row:
Helix albolabris (U. S.)
Helix haemastoma (India)
Fourth row:
Helix profunda (U. S.)
Nanina lamarkiana (Philippines)
Glandina truncata (Florida)
Fifth row:
Zonites fuliginosus (U. S.)
Achatinella (Sandwich Islands)
Helix intorta (Philippines)
Bottom row:
Cerion microstoma (Cuba)
Clausilia macarana (Dalmatia)
Bulimulus multilineatus (Florida)

Helix nemoralis (Europe)

One of the most wonderful and interesting facts connected with the radula is the large number of teeth on each membrane. 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! 77

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. 78

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 digested 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 American Naturalist,” 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.

GILA MONSTER.
(Heloderma suspectum.)
About ⅓ Life-size.
TAKEN FROM LIFE BY HARRIET E. HIGLEY AND FRANK M. WOODRUFF.

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. 83

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. 84

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. 85

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.

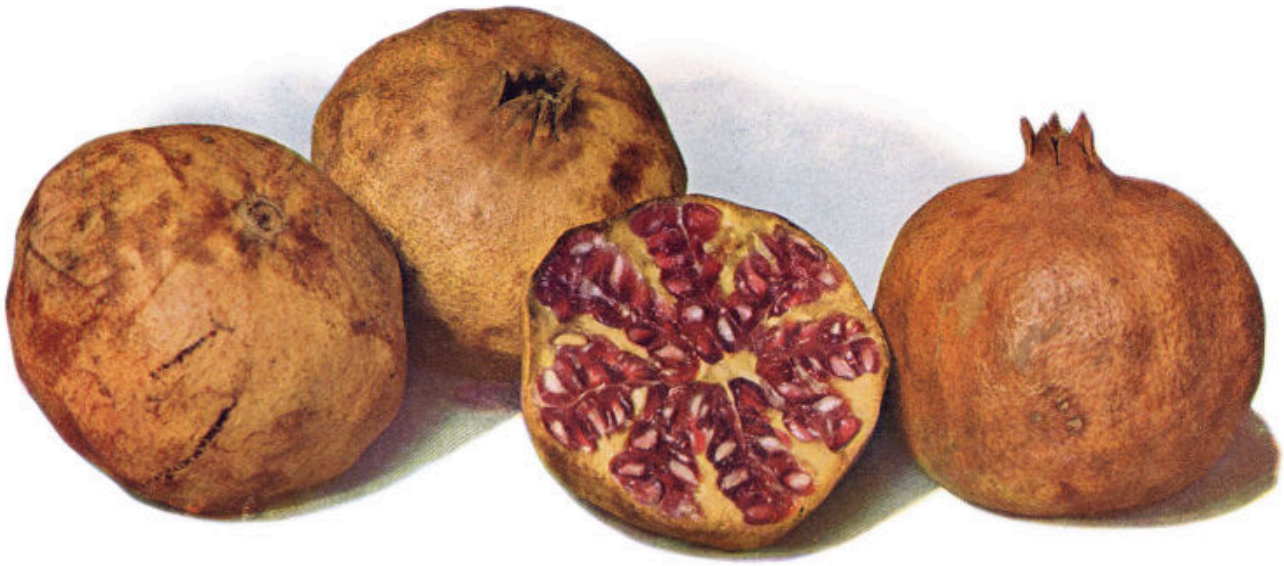
Pliny tells us that the Pomegranate was extensively cultivated by the Carthaginians at their home in Northern Africa. This may have been the reason why the name Punica was selected for the genus by Linnaeus. The Romans also called it “Pomum Punicum,” or Carthage apple.

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, fig-trees 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 describing 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 the ends of the branchlets. A beautiful object for planted grounds.”



POMEGRANATE.
(Punica granatum)
⅔ Life-size.

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. 89

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 to-day. 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. 90

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." 91

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. 92

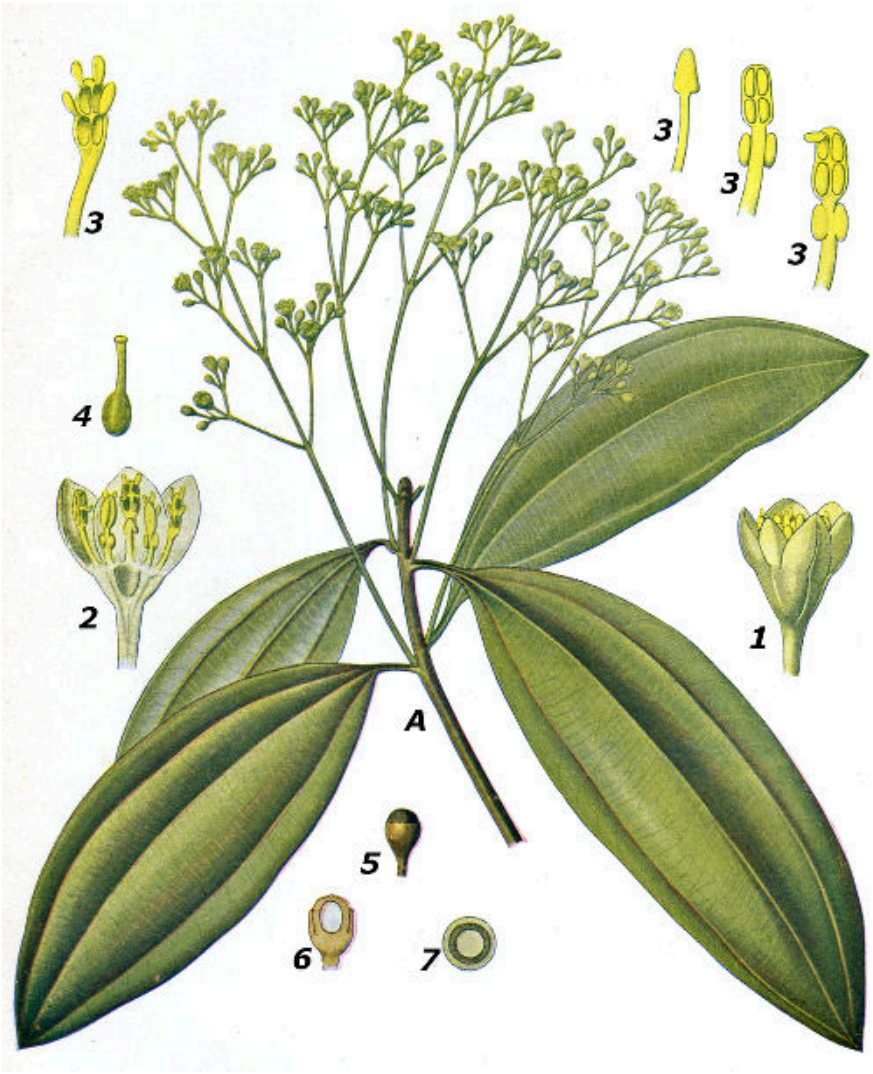
It is well known that the ancients had a remarkable predilection for fish as a food. The principal luxury of the Roman banquets consisted of fish, and the poets speak of sumptuous tables spread with them exclusively. In the period between the taking of Carthage and the reign of Vespasian, this taste 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: The 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.
FROM KŒHLER'S MEDICINAL-PFLANZEN.

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

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.

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.

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- Silently corrected a few palpable typos.
- "Vulsmensis", an error for "Vulsinensis", was retained because the typo may have originated in the secondary source consulted by the author.

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