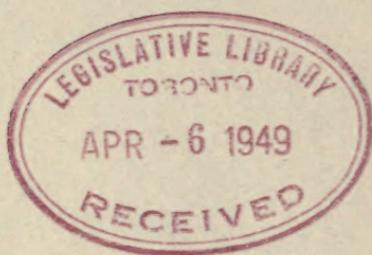


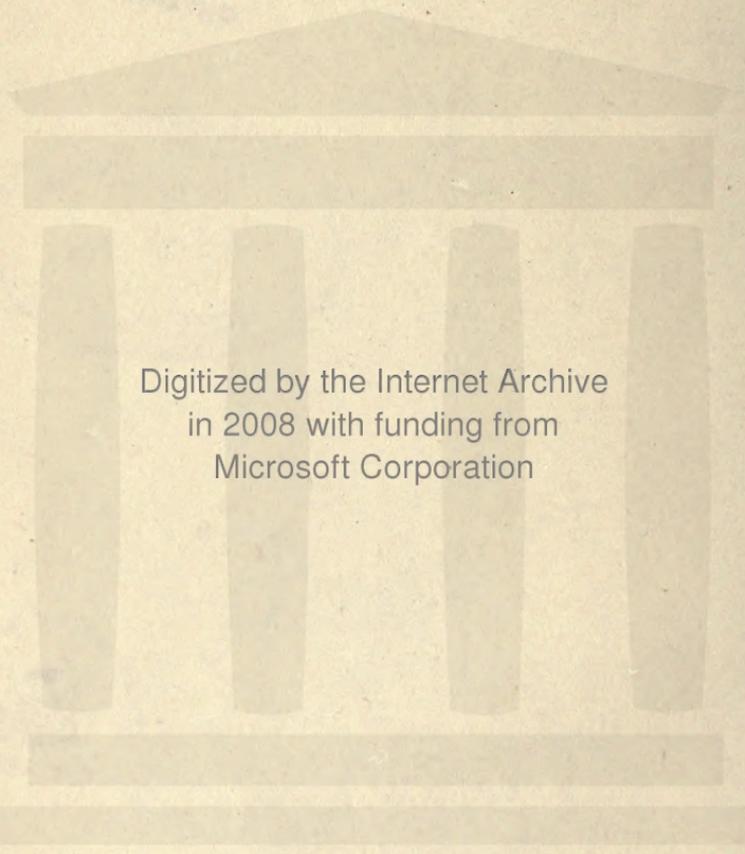
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THE
NATURE-STUDY
REVIEW

Volume XV, 1919

ANNA BOTSFORD COMSTOCK
SECRETARY-EDITOR
CORNELL UNIVERSITY

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No. 1

The Swiss Mountain Pine

P. A. MATTLI
Uri, Switzerland

The *Sylvestris montana*, or Swiss Mountain pine inhabits the mountains of Middle Europe, especially the Northern and Southern Slopes of the Swiss Alps, where it grows on the cliffs and brows of precipices that surround the valley, usually far above the upper region of the tree line.

Its leaves are in twos, short, stiff and somewhat twisted. They are thickly set on branches and are from 2 to 2½ inches long and are surrounded by a long white woolly sheath. Its flowers are monoecious, that is to say both sexes are borne on some plant though separate. The male catkins occur liberally in dense masses.

The mountain pine, although small, is distinctly tree like, and grows to a height of 20 to 30 feet under favorable conditions. In higher regions, however, it assumes more of a bush like appearance, with the branches trailing along the ground or hanging out into space. Ecologically, it is rather interesting since it shows to a remarkable extent a nature adaptive to a cold and unkind clime and the resulting modifications.

Economically it is not of much importance though in certain parts of Europe, not in the Alps, it supplies some kind of resin. In my part of the Alps, it is occasionally used as fire wood. It may be said, however, that the trouble of getting it, does not pay for the gain. In fact I am inclined to believe that it is rather the spirit of daring than the motive of gain, that prompts the mountaineer to dislocate it from its lofty heights.

In appearance, especially in old specimens, it is rather different from the S. M. Pine that we find transplanted in our parks. It is of a more rugged and twisted type and there is something unyielding in its nature. It reminds one of the type of man that is ready to bear any trouble and hardship and it makes one think of somebody who wouldn't "give in" so soon. To my mind, however, when I

think of it, it always suggests its surroundings. It reminds me of the rocks and cliffs upon which it stands, the storms and sunshine of the Alps and the valleys upon which it looks—and surely no description of it would be complete, without casting at least a glance on its setting. Mountains, icefields, valleys and chasms have the same relation to the mountain pine as the desert to the Bedouin or the far North to the Esquimos. The one lends color to the other; let us therefore have a look at any of these valleys:

Imagine yourself to be up in the mountains, on some such beautiful summer day, in which the air is so clean and serene, the glaciers and icefields literally so silver and golden and the valleys below so green and lovely that you actually hope that the day might never end and that it might last forever. Picture yourself as on the top of some such cliff as is occupied by the Pine. You are sitting on its utmost edge, with your feet hanging down, so as to get a full view of the valley below, and not to miss that part of the scenery that otherwise might be concealed below the ledge. You are sitting right next to the pine and you may, in order to feel perfectly secure, put your arm around one of its lower branches.

The sun is just rising. The rocks and ice fields of the higher regions assume a golden brown. The atmosphere is clear and the valleys below silent and calm and the shadows below retreat in measures as the sun line descends from the mountains. The sun shines fully an hour earlier on top of the mountains than in the valley. Now the sun line has reached the mountain pine and everything around it stands in a flood of silvery light. The valleys below now show signs of life, straight columns of smoke rise from the little brown houses and tiny points are seen moving away. These are the mountaineers going to their work. The ear now catches sounds which before escaped its attention. First the murmuring of far off waterfalls, then the chimeing of bells and then all of a sudden you hear a sound so sweet and pure that it cannot be described, and, you must let me digress a moment to tell you of the Yodler. Of all the songs I know, none is sweeter and more harmonious than the song of the Swiss mountaineer. The "yodle," as it is commonly called, has a charm all of its own; a charm that makes it about as much different from our American ragtime and modern songs as the mountains and icefields differentiate the Alps from the empty plains of a desert. The yodle, one might say, is almost inseparable from the mountains. It is a true

child of the Alps; one never finds it a native of the cities and towns, and even if imported there it loses much of its charm. We could not expect to fully appreciate an organ recital in a market place, nor should we expect to fully realize the beauty of a song that by its very nature is made for the wild and glorious mountain valleys, and whose harmonies should mingle with the echoes of the waterfalls and the thundering of mountain streams, in the narrow confines of four stone walls. Truly, one cannot enjoy it under such conditions. But to hear it up in the mountains in its natural surroundings among the peaks and rocks far above the green valleys, to hear it there with the playing echoes of the dales, on a clear, blue summer day when everything laughs and sings is both a pleasure and an inspiration.

The hour has by this time far advanced and the growing day has given to the surroundings many a different aspect. The golden color which first flooded everything has changed to a silvery light, a veil like aspect. This again passed into a stage when the different objects, more and more assumed their individuality and finally there came a point when everything stood forth in glorious clarity.

And you—you are watching these changes with a keenest of interest. Your eyes now glance at the rainbow at your left, now at the sunlight beams that reflect themselves from the clearer parts of the icefield, or perhaps you follow the foamy river which on its downward path break over rocks and cliffs until reaching the valley, it settles down to a dark grey band, which at the far end of the valley floor again meets gorges and chasms through which it descends and so finally becomes lost to your view.

You then perhaps scan the horizon and if you are high enough you may possibly see beyond the lower mountain and peaks, and if you are extremely lucky and if the weather is very clear you may see great broad wide plains lying beyond these peaks, and cities and towns and villages and lakes and streams and your eyes may follow the contour lines until, far beyond the boundaries of Switzerland, they seem to melt into the sky. And now by the way of change you begin to narrow your field of vision and restrict it finally to your very immediate surroundings. The ground is rather barren but there are some very beautiful flowers. There are carpets of little blue gentians and lots of stoneflowers. But suddenly your attention is attracted by some moving object. It is

right behind the nearest ledge. You are surprised, almost disagreeably surprised. You imagined that you were all alone up there. You instinctively felt that you were on soil on which no other living being ever stepped and now your illusion is lost. Of course there is no real excuse for that attitude but yet it is a sort of a subconscious feeling which almost everybody gets when he enters the higher regions of the Alps. But you are not alone. There is some animal. Now you see its head cautiously peeping up behind the ledge; it is a marmot, a woodchuck like animal that often lives in the highest vegetative fringe of the Alps. He gazes at you curiously for some time, eyes you suspiciously, then suddenly disappears in a hole, no doubt to tell his brothers and sisters that he just saw a strange looking animal that was gazing at the world in the most pensive fashion.

All this, then, would have given you an idea of surroundings of the mountain pine. If I had had time, I would portray this tree—this mountain dweller—not only in its peaceful moods but also in those sombre and more moving moments of a storm. I would have shown you that same valley full of whirling seething masses of snow and I would have tried to make you realize that feeling of insignificance and smallness which comes to him who, unused to the mountains, watches them for the first time from that lofty height. This would do much to give meaning to this Pine. You really could not but appreciate it more fully. But knowing how tedious a lengthy description becomes to the reader or listener, I shall pass over this and say a few words about the poetical life of the pine which is that element of interest which the pine gets from the associations which it has for us.

Poets have been rather fond of pines and though they mostly lavished their affection on the whole tribe in general, yet there are certain passages which apply particularly well to the mountain pine. Such as: "Rooted upon a Cape that overhung the entrance to a mountain gorge: whereon the wintry shade of a peak was flung long after rise of sun. There did I clutch the granite with my feet, there shake my boughs above the roaring gulf." or "I felt the mountain wall below me shake, vibrant with sound and through my branches poured the glorious gust."

Surely these passages are very appropriate. They are to my mind real jewels in poetic description. Yet it seems to me that somehow or other, they do not touch that deeper element of

human interest, which we would naturally associate with a tree, which, from its lofty heights, has seen the coming and going of generations of people; for I cannot even imagine the pine without at the same time thinking of the things that it must have witnessed, just as I could not think of the Sphinx without at the same time imagining something of these nameless struggles and bloody battles evidenced by countless bones, which must have been waged in the surrounding plains of the desert.

And so to me, the mountain pine suggests the pleasures and struggles of the people in the valley below. And often did I sit and look at it and wonder and wish to know that which it must have seen.

There are sayings current in our valley, (sayings that are handed down from generation to generation) that tell of strange and eventful things. Of a time in which the glaciers kept on creeping downward upon the peaceful valley, steadily, year after year until they reached the very edge of the green fields and people were filled with awe and fear; and these folks being of a God fearing and religious nature gathered together, one fine summer morning, right at the very base of that glacier, where a little clear brook issues from a yellow granite wall, and there they prayed and prayed that the ice masses that hung towering above their bowed heads, might advance no further. And then they carved their family signs into that yellow granite wall.

Now nobody knows what names they had nor what kind of people they were but the mountaineer looks at this place with reverence and the stranger who today passes that little brook by the yellow wall, gazes at these hieroglyphic signs with a puzzled and curious expression. And there are sayings current also that tell of a wild and terrible storm, that came in the silence of the night and left the green valley a plain of desolation and barrenness.

Yes, mountain pine, thou hast seen many wonderful things. Thou hast watched the people in the valley below, their joys and struggles. Thou hast seen generations of them come and generations go, and if I could write poetry, oh mountain pine, I would write a poem about thee. I would endow thee with feeling and weave thy life together with that of the people below. I would reflect their cares in thy struggles and I would link their sad and joyous moments with thy shadows and thy sunshine.

Yes, Mountain pine if I could write poetry I would write a poem about thee.

A Plan for Studying Pines

ADAPTED TO SEVENTH GRADE

J. ANDREW DRUSHEL

Professor of Nature-Study, Harris Teachers College, St. Louis, Mo.



White pine cone.

I

Pines may be distinguished from other evergreen trees by the fact that their leaves are needle-like, occurring in bundles.

A trip in May when the pines are in bloom should be made to some convenient park to study (1) the character and position of the flowers with reference to pollination, (2) the character and position of the fruiting cones, (3) the nature of the leaves as regards length and number in a bundle.

The knowledge gained from 2 and 3 above will enable the children to distinguish the five pines commonly found in our parks, thus:

1. Needles 5 in a bundle—White Pine.
2. Needles 3 in a bundle cones armed—Pitch Pine.
3. Needles 2 in a bundle.

1. Needles 4 in. to 6 in. long, stiff—Austrian Pine.
2. Needles 4 in. to 6 in. long, not stiff—Red Pine.
3. Needles less than 4 in. long, cones turned back on branch—Scotch Pine.

II

THE PINE TREE

Select a typical Austrian Pine, or if this is not available one of any other species, and confine your notes and sketches to the one tree, though comparing it frequently with other pine trees.

The following outline may be used to good advantage.

1. The Stem.

1. Note the general form of the entire plant.
What is the form of the top?
Sketch the outline of the tree.

2. What is the most conspicuous difference between the framework of the pine and that of the oak.

Sketch the tree framework (trunk and main branches).

3. In what other trees does the stem take the same habit as the Pine? Is there any commercial value in this habit?
4. How does a pine behave when the top part of the trunk is cut away?
5. What is the arrangement of the branches on the stem? Can one tell the age of a pine tree from this arrangement? Note some young pine tree a few years old.
6. Is there any significance to the direction assumed by the different branches?

To the difference in the length of the branches?

2. The Leaf.

1. Find by observation two ways in which the leaves of the pine tree differ from those of the oak or poplar.
2. Find two ways in which the leaves of the pine tree you are observing differ from those of other species of pines.
3. How many kinds of leaves as regards age can you find on your tree?
4. What is the advantage of needle leaves to a tree? Any disadvantage?
5. Without counting all of them, can you determine approximately the number of leaves on your tree?
6. Which grows faster, your pine or the poplar? Do the leaves, number, shape, and size, have anything to do with this answer?

3. The Flowers.

1. Look for the flowers in May.
2. Where do they stand on the tree?
3. How many kinds are there?
4. Note that the flower clusters look like little cones, that some have pollen, and others do not.
5. What is the position of the pollen-bearing flowers (staminate) to those not bearing pollen (pistillate)?
6. How does pollen reach the latter? Any device to hold the pollen after it reaches them?

4. The Fruit.

1. Have the children collect young pine cones, a year or less old, and bring to school.

2. Have them study the structure of the cone by cutting it lengthwise into two equal parts.
3. Determine the position and number of seeds in each half. What is the largest possible number? How are young pine cones pollinated?
4. How are pine seeds disseminated?
5. In some bird book, look up cross bills to learn how they remove pine seeds from the cone.

III

At the close of the pine study go to some reference book to answer the following questions?

1. Where are the large pine forests of the United States?
2. Which species prevails in each area?
3. What uses are made of pine lumber?
4. What products other than lumber are derived from pine trees?
5. Read about the turpentine industry.
6. Are there any large areas of evergreen forests other than pines? If so, where are they, what are the prevailing species, and what use is made of them?
7. Read about the wood-pulp industry.
8. Look up California Redwoods.

References.

1. Rogers: Tree Book.
2. Dorrance: Story of the Forest.
3. Hough: Trees of the Northern United States.
4. Keeler: Our Native Trees.

The Bagworm

J. ANDREW DRUSHEL



Bagworms may be known by the large, oval cases hanging from twigs of shrubs and trees from September to May. Have the children ascertain to what extent this pest occurs in their district. Several profitable lessons can be given using the following outline:

- 1-1 Problem. Why is the bagworm a dangerous pest?
 - 1-2 What trees does it attack? Have pupils answer this question by bringing twigs with bagworm cases from as many different trees as possible.
- 2-2 Are there many cases on the trees in your district? Have each pupil select a certain tree and determine how many cases it carries.
- 3-2 Do bagworms increase rapidly?
 - 1-3 Open carefully several of the larger closed cases, remove and examine contents. Count the eggs in one case. Does this work help you answer question 3?
 - 2-3 How are bagworms protected from their winter enemies?
- 4-2 Are the cases capable of doing harm to the trees? Find your answer from the trees. How can you tell whether a case has hung on a given twig one, two, or three years?
- 5-2 Bring some cases containing eggs into the school room early in April and watch for young bagworms. This observation should tell how they move, how they protect themselves against their summer enemies, and why they are called bagworms.
- 6-2 How are bagworms harmful to trees in summer? In May have the children examine trees for young bagworms. At this point have the children find and read a reference describing the life history of the bagworm.

- 7-2 How do bagworms migrate? Ask the children to make this observation late in July and August and report result at the opening of school in September.
- 2-1 Problem. How can the trees be protected against bagworms?
- 1-2 What can the children do?
- 2-2 What should the city forester do?

References.

1. Farmer's Bulletin: No. 701.
2. Von Schrenk: Bagworm Twig Constriction.
3. Riley: First Annual Report.
4. Holland: Moth Book, pp. 262-263.
5. Schmucker: The Study of Nature, pp. 282, 283.

On Meeting a Migrating Swallow in the Desert

JOHN KENDALL

In "Songs of Aztec Land"

Whither so swiftly, tiny swallow,
 Blown like a leaf through the windy sky?
 What feathered comrade dost thou follow
 Far to the south, where the sweet winds die?
 Wert thou weary with thy long flying,
 Here by my side couldst't thou find a nest,
 Where, when the night on the world is lying
 Safe and secure thou mightest rest.

Bird of the tender summer, fleeting
 I know not whither over land and sea,
 Thou and I, in this wide waste meeting,
 Are wanderers, both of us, you and me!
 Come to me then, thou tiny stranger,
 Here on my heart thou mayest rest
 While the falling darkness threatens danger:
 Exile and exile, breast to breast.



French War Dogs

This photograph shows the war dogs with their burdens of munitions and lunches crossing a trench on their way to deliver their loads to the fighting soldiers of the first line.

The Dogs of War

AMERICAN RED CROSS ASSOCIATION

Dogs, since the days of Attila, King of the Huns, who taught his spoked-teeth canines to tear down the enemy from the rear, have been a familiar sight upon the battlefields. The Germans are still training him upon the lines of their distinguished war idol, while the Allies are employing him by the tens of thousands in most of the ways in which they use their human soldiers. In this war, however, the most essential part of the work of the

dog is not to kill but to save. As a Red Cross worker he is daily doing stunts that if he were human would bring him medals and promotion, performing these tasks even when dying like a soldier, if needs be.

As there are men and men, in the very nature of things there are dogs and dogs. Not every man is equipped by nature to be a warrior, nor is every dog. They have to be disciplined, drilled and taught as much as any rookie, and in selecting them especial attention has to be paid to the branch of the service for which they are needed. This is necessary for the reason that an excellent watch dog may never be a good retriever, etc. However, the ordinary war dog once thoroughly broken in is usually exceedingly versatile. Also, there is one quality possessed by all of them and that is unwavering loyalty. Once taught the color of the enemy's uniform and the dog will hearken to no peace drive from him. "Fight," his master has commanded him, and to the war dog orders are orders.

Briefly, some of the duties to which he is assigned are as follows:

He may be set to watch the sky with his keen eyes and give tongue upon the appearance of an enemy plane. He may be used as a guard for captured property such as ammunition, put in command of prisoners, used to track fugitives or arrest anyone who falls under suspicion. He may be set as an alarm clock to warn off the stealthy approach of the foe; trained to give notice of the presence of poison gas when the human nose cannot scent it; employed to haul light ordnance or carry ammunition. He is also an excellent message carrier, scout or listening post assistant, and is even entrusted with the extremely hazardous duty of carrying timed explosives, placing them upon the right spot and then scampering away before they explode. But more than anywhere else is he of value upon the battlefield in the succor of the wounded.

In this work the Red Cross was quick to recognize his great value and adopt him into its service. For Red Cross work he receives not only the regular military dog's training, but gets additional instruction in his particular line of work. A part of this consists in teaching him to give first aid to the injured, and having done this to return to headquarters and report his case, thereafter leading the surgeons and stretchers to the sufferer or sufferers. In nosing out injured men who have fallen in inaccessible and out of the way places his aid is invaluable. Hundreds

of men are alive today who, had it not been for some keen scented Red Cross dog would have been overlooked by their companions and died where they fell.

If a man is dead upon the field the dog pays no attention to him, but if alive he stands over him that the wounded one may remove the first aid package which he carries about his neck, and this having been done he hastens back to headquarters regardless of the thickness of machine gun or shell fire and reports to his superior officer. Having indicated to him by a series of barks that he has found someone who needs assistance, he turns about and guides his human comrades back to where he left his man; and with his duty done here goes sniffing away in search of the next unfortunate. There is said to be a record of three thousand men having been located by Red Cross dogs at one hospital alone.

He is given credit for having saved Verdun by carrying messages when the wires were all shot away and communication cut off. Be that as it may, there are thousands of dog heroes working upon the front today, many of whom have been wounded a number of times. But so far as known, "Baldy" is the only dog who has a service flag of his own. "Baldy" was the leader of the famous dog team of "Scotty" Allen, who drove his dogs from Nome, Alaska, to San Francisco on a tour for the American Red Cross, and he has twenty-six stars in his flag. Each of these stars represents a son or grandson who has enlisted for active service "over there", and that they have done their duty like loyal American dogs is proven by the fact that more than one of the stars that greet Baldy's now age dimmed eyes upon his flag are of gold.

To My Dog, Blanco

J. G. HOLLAND

My dear, dumb friend, low lying there, a willing vassal at my feet;
Glad partner of my home and fare, my shadow in the street.
I look into your great brown eyes, where love and loyal homage shine,
And wonder where the difference lies between your soul and mine.
I scan the whole, broad earth around, for that one heart which, leal and true,
Bears friendship without end or bound, and find the prize in you.

The Tamarack

AMERICAN LARCH

WILLIAM PRINDLE ALEXANDER



Tamarack in winter.

There are certain trees that have such perverse growth habits,—that do things so contrary to the best usage of their kinds,—are so conspicuously freakish in their seeming unnaturalness, that we deem it altogether right to dub them eccentric. To this category we unhesitatingly relegate the larch.

Here is a capricious and wilful fellow in the pleasant realm of Freedom; it bears a cone, has needle-like leaves, a resinous wood and other habits common to the great family of Pine, and then like the crow that would be a peacock, it becomes dissatisfied with the ways of the noble evergreens and affects the habits of its betters, the true deciduous trees, and like them sheds its leaves, come autumn and cheerless weather. The Larch is a handsome tree if you know it in its native wilds, it is] also strong and strangely

brave; for it has taken the cold way northward till we find it

flourishing where no other tree has dared to come, in the frigid and cheerless swamps of Labrador, and standing erect and unafraid on the very edge of the Arctic tundas.

"In the first mild day of March
Each minute sweeter than before,
The redbreast sings from the tall larch
That stands beside the door."

—*The Spirit of the Season.*

When Wordsworth speaks of the larch standing beside the door, in the verse cited from his "Spirit of the Season," it is the European larch to which he refers, *Larix europæa*; this tree differs in some respects from an American species, and there are those that will claim for it greater beauty and finer proportions; but the writer feels that the sentiment is over wrought in the case of the European species. It is not a finer tree than the product of our own native mountains. The writer dwelt in a house for many years, that had beside its front door a tall American larch, a noble tree, picturesquely pyramidal and faultlessly symmetrical, and in its branches the first robin sang in the spring and the first glad green appeared; a happy combination and one to which the maples and the elms could lay no claim; the larch carried high the first banners of returning life, while the other trees were winter bare and still asleep.

Then who has not seen the larch flowering in the first warm days of spring, those unforgettable days in late March, when the masterful Sun is mustering out the black crew of cold uneasy clouds?

Hang out your flags birch and willows
Shake out your red tassels larch,
Up blades of grass from your pillows,
Hear who is calling you,—March!—*Lucy Larcom.*

Yes, that describes it; March is calling, and out comes the red tassels of the ever-ready, quick to respond to the call larch. The flowers come a long while before the leaves have made up their minds to slip out at the ends of their high pedicels, and freshen up the old grey world. Their tiny blossoms are described as being solitary, monocious and naked. But where many are seen together the sight is grateful and colorful too, and we can not help the feeling of joy that abounds within us as we contemplate this promise of the teeming month to come. The Tamarack is a well-

known tree and a description of it seems hardly necessary; its tall excurrent trunk, soft pendulous branches, small linear leaves in tufts like small brushes are familiar sights to the eye of one who knows the North of our country anywhere, except in the treeless streets of our largest cities.

Tamaracks are everywhere in the North where the soil is suitable for their development. The writer knows a forest of larch trees situated in the northeastern part of New York State, that is impressive beyond his power of words to adequately describe it. This forest is some five miles long by more than a mile in width and is in Fulton Co. a part of which is spired by the chain of lower Adirondacks known as "The Mayfields;" skirting the base of this fine range is the great swamp that bears the name of "Tamarack." The tree has given the name to the swamp, for Larch, Tamarack and Hackmatac are all local names for one and the same tree. Out of the swamp on its western border, Mt. Jackson, the colossus of the Mayfields rises abruptly; and the writer doubts if another scene of such rich and pleasing beauty can be witnessed anywhere as is presented by the great Tamarack Swamp with its countless green spires larches, seen from the summit of this towering mass of world, old Mt. Jackson.

The criticism of Wordsworth in regard to the larch is incomprehensible. He seems to regard it as a tree that would disorganize the beauty of the lake country of England entirely if it were introduced. It was suggested at one time during his lifetime, to plant the European larch extensively along certain stretches of some of the lakes that Wordsworth seemed to consider his own property, largely acquired by virtue of his exalted admiration. The suggestion brought a characteristic outburst of indignation from his pen in which he sums up the value of the larch in these words "As a tree it is less than any other pleasing; its branches (for boughs it has none) have no variety in the youth of the tree, and little dignity when it attains full growth. Leaves it can not be said to have, consequently it affords neither shade nor shelter. In the spring the larch becomes green long before the native trees and its green is so peculiar and vivid that finding nothing to harmonize with it; whenever it comes forth a disagreeable speck is produced." Some of the statements in this criticism are undoubtedly correct, That the tree gives neither shade nor shelter no one will deny, but again who would plant this tree for shade or shelter? No rational-

minded person we feel sure. It is when Wordsworth speaks unkindly of the boughs and leaves that we take exception to his criticism. Plantings of the larch in a massed effect are both beautiful and picturesque. The long "pendant branchets," the soft downy leaves, delicately green, furnish wonderful banks of woodland opulence that hardly another tree could give, if suitably grouped and arranged.

As a wood the larch is very nearly unique. It is hard, resinous, and unbelievably durable. The roots are long and of a tough fibrous character. They were well known by the North American Indian and used by him in the building of his birch canoe.

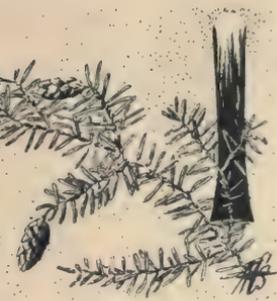
"Give me of your roots O Tamarack.
Of your fibrous roots O Larch tree
My canoe to bind together."

So sang Hiawatha. A western larch (*Larix occidentalis*) is today of importance to various tribes of Indians. They extract from it a sweet substance resembling dextrine which is used by them as a food.

While the wood is rich in resin it is still extremely tough and difficult to ignite; it does not splinter easily and was therefore much used in earlier times, in the construction of battleships; and it might be of interest to cite the fact that in France many of the oldest castles were built with much larch wood; and today the timbers hewn from this remarkable tree are sound and firm, while the stones that support them are crumbling. A number of interesting stories might be gathered concerning the remarkable character of this, incombustible and well-nigh indestructable wood, and I will mention two of these to illustrate: It is said that Julius Caesar once tried to force the gates of an old Alpine castle, and hit upon the idea of building a huge tower of logs before it, which were to be ignited and the gates to be destroyed in this manner. The logs he used, however, were those found in the vicinity, and happened to be larch; the attempt was a complete failure, for they failed absolutely to burn. Caesar in the Commentary says of this episode "Robusta larix igni impenetrabile lignum." (the stout larch wood was impervious to ignition). Again Evelyn, an early English writer on plants and trees tells of an ancient ship that was found in the Numidian sea, twelve fathoms deep. It was constructed of larch and cypress wood and tho fourteen hundred years old was, when found, still in a good state of preservation.

A Card of Greeting from Enos Mills

A Little Tree



I never see a little tree peeping confidently up among the withered leaves without wondering what trials and triumphs it will have. I hope it will live with rapture in the flower opening days of spring; that it will be a home for birds and hear their low, sweet mating-songs; and that it will find life worth living and live long to better and to beautify the earth. If it is cut down may it become the ridge-log of a cabin where love will abide; or if it must be burnt, I hope it will blaze on the hearthstone of a home where children play in the firelight on the floor.

Enos A. Mills.



Let the children themselves study the trees.

Some Reasons for the Study of Trees in Nature-Study in the Elementary Schools

FRED T. ULLRICH

Director of Agricultural Education, State Normal School, Platteville, Wis.

If Nature-Study is to attain its object in the Elementary Schools, it should have as one of its aims, the development of the attitude of open-mindedness. The tendency to suspend judgment until the solutions to problems, or the answers to questions, are in harmony with experiences should be one of the inevitable results. On the other hand, the stamp of approval should be accorded without reservation, to all generalizations and conclusions evolved through reason from reliable data. It is in this spirit, that the reader is invited to a consideration of some reasons for the study of trees in Nature-Study.

It is inadvisable to devote much space to a discussion of the proposition, why study trees in nature-study in the Elementary Schools, rather than in Botany in the High Schools. In fact, all of the reasons in this article for the study of trees hold true practically as well for the High as for the Elementary Schools. However, since available statistics show that only about one-fourth of the pupils who enter the first grade of our Elementary Schools pursue any studies in the High Schools, it follows that if the great mass of our American children shall receive the benefits from this type of instruction, the study of trees must be presented in nature-study in the Elementary Schools.

The trees in mind in this discussion are those of the immediate surroundings, the shade trees that line the streets and public highways, the trees in the village and city parks and those on the private and public grounds, rather than those in the extensive forests, more or less remote, from the centers of instruction. Notwithstanding this statement, one of the chief reasons for the study of local trees is to interest our boys and girls, the future citizens, in the forested areas of our country. In other words, the study of local trees should lay the basis for an appreciation of the dependence of human welfare, in no small measure, upon the proper management and extension of forests.

If students in their nature-study lessons, for instance, learn that, the hickory tree along the public highway, not only produces nuts for enjoyment about the family hearth on cold winter evenings, but also possesses a wood with strength, toughness, resiliency, and shocking qualities that is second to none for handles of axes, hammers, mattocks, and other hand tools; and for parts of vehicles of conveyance, such as axles of wagons, spokes and rims of wheels; that the wood of the aspen, down by the brook, whose leaves tremble with slightest atmospheric disturbance, is utilized for fuel, and the manufacture of charcoal, paper pulp, excelsior; that the hard maple in the front yard in addition to its value for shade, is in great demand for its lumber in the cabinet industry and for ornamental and serviceable floors in dwellings; that the catalpa, in the woodlot, with its conspicuous flowers, unique fruits, and winged seeds is grown extensively for railroad ties; the students will accumulate funds of experiences and associations, without which, the idea of the importance of the lumber from the forests would be more or less vague.

Similarly, if the students in nature-study make observations of the injury to local trees by the wind, ice, snow, extreme heat or cold, excessive drought or moisture, insects, and fungi; of the formation of humus by the decomposition of the fallen leaves; and of the soil binding qualities of the extensive root systems; they receive the best possible preparation for intelligent coöperation with local, state, and national organizations for the preservation of our forests, by checking the agencies operative in forest destruction. Through this type of instruction, as a part of the study of local trees, the articles in the daily press, in the bulletins issued by the conservation commissions, and other publications on the importance of forests in the prevention of destructive erosion and floods, and in the establishment of permanent irrigation projects in certain localities, become meaningful. Likewise, the discussions of forestry benefits in the classroom or from the public forum will not fall on barren soil.

Another economic motive for the study of trees about us is the value of trees in the maintenance of the health of the community. It is common experience, after work in the open under the hot rays of the sun, to receive new vigor and energy from rest in the cooling shade of some tree or trees. It has been estimated that the annual loss in the United States from unnecessary illness, medical attendance and loss of wages amounts to nearly \$1,000,000,000, about two times the total expenditure for public education in this country. Without trees, the most conspicuous portion of the vegetation, at least, in the villages and smaller cities, there is reason to believe the loss from ill-health might be greater than it is. If it is accepted without question, that the physical well-being of the people of a community is improved through the shade of trees, a study of one of the life processes of trees may suggest some other relation of trees to public health. As all students of plants know, the chlorophyll in the leaves and other green parts of the tree, "con-jures with the sunbeams" in the union of the water from the soil, and the carbon dioxide from the air, into some form of carbohydrate. In this process oxygen, an element absolutely essential for the sustenance of life in either plant or animal, is set free into the air. An attempt at a mathematical statement of the amount of benefit in terms of health, from the introduction of oxygen into the air by the green cells of trees would be foolhardy, because as yet no method for computation has been devised. As a cumulative

factor in all past time, it may be of the utmost significance. It is worth while, to say the least, to see the possible importance.

Other economic values of local trees, will be mentioned and not fully discussed. Without trees in the community, a scarcity of certain birds would follow for the want of food and nesting places. The bees might experience a deficiency in nectar for honey. The squirrels would leave for the forests for homes and food. The absence of some of the birds, the bees, and the squirrels from our villages and small cities, would deprive these places of much charm, richness, sweetness, and enjoyment.

Besides these material reasons, a true lover of trees will see other reasons for the study of local trees. Some of the finest ethical lessons can come from meditation on trees. Not until a person establishes an intimate acquaintancé with a tree or trees, will inspirations arouse responses from the inner man. Permit an illustration to show the thing in mind. Many a tree in the temperate latitudes is injured, in a greater or less degree, by the severity of winter weather. Many a bud of a summer's growth is nipped by the winter's freezes, and dies without notice. Also many a spray and branch are broken by the weight of the snow and sleet on them, and by the force of the winter storms. In spite of the rebuffs of winter weather, with the advent of higher temperature, and the relatively warm rains of the spring, a change begins in the tree. The new green from the unfolding buds transforms the austerity of the tree. The application to human life is easy. At times, all forces seems far-fetched to weigh down the soul of man. But the lesson from the tree teaches that under the spell of the soft rays of the sun and the gentle rain, namely, the kindness and appreciation of friends, the sorrows and disappointments should be forgotten, and the new green, that is, the good cheer of the soul, should have its way. Such may be the ethical instruction of the person whose heart strings are set into vibration by God's creations, the noble trees. The individuality and sacredness of the souls of men, suggest the inadvisability of numerous specific prescriptions for ethical responses from reflections on trees. The record of another fancy can be justified only on the basis of illustrative value. The bare spray, branches, and the sturdy trunk of the hard maple in the winter may suggest *power* or *possibility*; the unfolding of the leaves and flowers from the buds in the spring may intimate *activity*; and the development of the fruit from the

flowers in the summer may teach *productivity*. After the maturity of the fruit, in the autumn, the cycle of the year's period of vegetation and reproduction is complete. After this a period of rest ensues, a time for the gathering of strength for the new issues of life. What is the ethical lesson for application to human life? Success in life may be insured by the acceptance in good faith of a program of life with the elements of *power* or *possibility*, *activity*, *productivity*, and *leisure*, as cardinal principles. A matter of fact scientist may say "This is not science. It is not Botany." The answer is "Correct, but it is good nature-study."

A common reason for nature-study instruction in the grades is to develop the aesthetic sense in boys and girls. It is only too true, that quite frequently the sense of the beautiful is starved and atrophied in those who live in the midst of nature's art. It is not fiction but fact, to say that many times the beautiful sunset is not an inspiration to the highest impulses of the farmer boy and girl, but suggests a task, namely, "milking time." Although the ethical lessons and aesthetic responses from the study of trees are largely incidental, an awakening of the sense of the beautiful may come from an appreciation of art in trees. A just valuation of the practical value of beauty in every day affairs, is one of the needs of the present age. An illustration of the influence of beauty in the every day tasks of folks, may be helpful to understand just how beauty assists in the development of a race of efficient and cultured folks. The city of Paris is famous for its numerous skilled workmen. A natural query is, how did Paris develop this reputation? An attempt to offer an explanation on economic grounds proves unsatisfactory. The city is not situated in the center of a great supply of raw materials or in a good harbor. The city is located some distance up the Seine Rivér. What then, is the explanation of the large number of skilled workmen in Paris? An investigation shows that the city is noted for its beautiful architectural buildings for business and residence. The city is also noted for its art galleries. These are thrown open to the public on Sunday afternoons, and are visited at these times by hundreds of people, among them a large number of industrial workers of the city. Is it visionary to believe that the architectural buildings, and the master paintings and statuary of the art galleries exert a stimulating and uplifting influence on those who look on them? Is it illogical to infer, that the industrial workers of Paris, as they behold and

meditate on some master-piece of art, conclude that the achievements of man are remarkable when his heart and soul are in his work? Is it unscientific to consent to the notion that this stimulus from the beautiful and masterful asserts itself in the daily tasks of these workmen? If the answers to these questions are in the negative, the conclusion that the beauty of Paris is a fundamental cause for its large number of artisans is warranted. In many of the rural communities, hamlets, and small cities of any country it is not possible, for financial and other reasons, to furnish a stimulation of the sense of the beautiful through architectural buildings and art institutes. However, any intimations of despair vanish with a realization that the best in the inhabitants in these places may be touched by nature, God's handiwork, among which not the least in attractiveness are the trees. Our nature poets have caught the spirit of the open country. The task that remains is to make this uplift universal, the enjoyment and inspiration of the common folk. If this aesthetic appreciation and subsequent influence is to be shared by the masses, the stimulation in this direction can not be deferred to the middle of life or old age, the twilight and eve of existence, but must have its beginning in youth, the morn of life. This statement rests on psychological grounds, and is a most direct argument for the study of trees in nature-study. Youth is the period of mental plasticity, the opportune time for the formation of attitudes. Wordsworth must have had this truth in mind when he wrote:

"My heart leaps up when I behold
A Rainbow in the sky:
So was it when my life began;
So is it now I am a Man;
So be it when I shall grow old,
Or let me die!
The child is Father of the Man;
And I could wish my days to be
Bound each to each by natural piety."

Not only may a study of trees give valuable economic instruction, excellent ethical lessons, and aesthetic inspiration, but also a strengthening in religious faith. The religious faith in mind does not rest on the pantheist's conception of unity with nature, but on the soul's endeavor of harmony with its Maker, through the exercise of the powers of mind. One of the difficulties in much religious thinking is a reluctance to accord the same fairness in

thought on spiritual matters that is granted in reasoning about material things. A reflection on some of the life processes in trees and their explanations, may aid in the development of a sane perspective. Scientists, for instance, have discovered that the food materials essential for the life of the tree are absorbed in part from the soil, principally by the root hairs, the finest divisions of the root system of the plant. The force which operates in the intake of materials is osmosis. Various explanations are offered to explain this phenomenon, but many of the details in the different explanations are conflicting. Very few scientists are willing to accept any of the explanations of osmosis without reservation. Therefore, osmosis is a riddle similar to the problem of eternal life. In a like manner, other life processes in trees suggest mystery, a challenge for further thought and investigation. Can we account for the rise of sap in trees? Again, the theories are manifold. Not one of these theories, makes the objections for its rejection unreasonable. The manufacture of the carbohydrates in the green tissues of trees under the influence of light with the present status of knowledge defies full understanding. If the facts of this process were clearly and definitely known, the chemist in his laboratory could combine water and carbon dioxide into any form of carbohydrate, and thus deprive the disproportion of increase in food supply to population of much of its alarming features. Through observations under the microscope, the steps in fertilization, the happenings after the pollen grain from the anther has fallen on the stigma of the carpel, have been observed, but still the nature of fertilization is a miracle. A full comprehension of other processes in a tree is just as unattainable as in the instances that have been cited. A student who appreciates the difficulties in the analyses of the life processes in a tree, has excellent preparation for a similar attitude in his religious problems. Will it not teach him to feel that it is not sufficient cause to throw aside a tenet of religious faith simply because the human mind with the present light can not fathom the same? This discussion does not imply that the student should not seek for a full interpretation of phenomena. Indeed, it should lead to the thought, that some day, especially with the present growth of scientific knowledge, not only will come a better understanding of the life processes in a tree, but a discovery of the meaning of the principle of life itself. Such an attitude is essential for the production of a race of men and women with hopeful and optimistic

hearts and minds, instead of those with remorseful and fatalistic conceptions.

Undoubtedly the query has come to the reader, why not get these ethical, aesthetic, and religious values from the other forms of animate life, the flowers in the garden, the grass of the lawn, the crops in the field, the birds in the air, the sheep in the fold, the beasts of the forests, or the fishes in the stream? Without question, all or any one of these can impart these inspirations, but the longevity of trees, their abundance, their conspicuousness, their changeableness, and their utility and comfort fit them particularly for the production of these responses. A further reason is the special need at the present time for interest in trees.

It is a matter of regret, to note the attitude of neglect and indifference toward the local trees, that as has been suggested, might mean so much in the development of an abundant life. The development of boys and girls amidst the trees in itself may not produce a transformation in interest. Charles Dudley Warner, the nature-student, said that he never appreciated the beauty of the waters of the Potomac River, until he beheld the slimy bottom of the stream, after a disappearance of the water, with the ebb of the tide. No one would be foolish enough to advise the destruction of our trees, to give a realization of their worth. A better alternative is the positive method of instruction in the value of trees. After this instruction has been presented in the nature-study courses in the schools in this country, let us hope an aroused public will put a stop to the tree butchery by electric light and telephone companies that suffer no compunction of conscience when they destroy the symmetry of trees, and induce rot by the mutilations, all for the purpose of open spaces for the stringing of wires. It is also hoped, that this instruction will lead to the selection of trained men, whose function is the care of the trees of the community. The more or less isolated instances of rural and urban communities with ordinances for the planting, care, and protection of trees will cease to be isolated and unusual instances, but will be commonplace.

Humility

To practice humility look into the sky and remember what thou knowest not.—*A Chinese proverb.*

The Balsam Fir

ADENA K. BURT

Lake George, N. Y.

The fir holds an unique position among the evergreens in the minds of most people who have lived for a time in the region where it grows. Probably on account of the interesting psychological fact of the curious association of the sense of smell together with the memory of former experiences. The delightful odor of the leaves is sure to recall to these fortunate persons, experiences of outings in the forests and camping trips, or of balsam pillows carried to village and city homes.

When we stand a short ways off and look at the balsam fir, we see an extremely beautiful myrtle green, slender, symmetrical cone of shining dark foliage, almost black, resembling a spruce tree more than any other in form. Spruce and balsam are always associated together in the forest. And who shall describe the inexpressible tenderness and immortal life of such an evergreen forest? We can walk along on a carpet of soft needles noiselessly in this forest of fir and spruce and no matter what time of year, the trees will ever be in their "spring"—and enjoying a perpetual youth.

The fir is not a tree for warm climates, it likes snow, ice and high mountains. *Abies balsamea* is distributed from Labrador through Canada and New England to Minnesota south along mountains to S. W. Virginia. It is a native American and has served for many centuries as a Christmas tree. How many times has it been chosen from the forest to be the central figure of gay and human scene. But who that has read Anderson's story, "Der Tannenbaum" can help sympathizing with the little stranger as it stands alone amid its new and untried surroundings? Although it had ardently longed to grow and to leave the quietude of the forest, and see something of the world without, it had been hurt by the axeman and it found almost stifling the air of the brilliantly lighted room. It bled at its base and suffered.

The stranger often asks when visiting the mountains, "which is the Balsam?" The aromatic perfume should be a sufficient means of identification for anyone after the first whiff; but if this is not enough it can be distinguished from the spruce at first glance by the flattened appearance of the horizontal branches, an appearance which is due to the usually horizontal position of the leaves. If

one takes the trouble to compare the branches, with the spruce, they will see that they are flat and the needles do not project from them in all directions as they do on the spruce, but are conventionally arranged at an angle of 45° with the larger ones. The bark, too is quite different, being smooth, thin and marked by swollen blisters until quite old; in older trees it becomes a reddish brown, broken into small, irregular scaly plates. The young branchlets are pale yellow, green and pubescent or hairy. One could surely have no better distinguishing features.

Let us examine some branches closely; we find the leaves rather flat and bluntly pointed. A beautiful dark green shining color above with a pale silver below. Fir leaves are also stemless while hemlock leaves have minute petioles. They are persistent eight to ten years. The pointed buds are a rich reddish brown color, with scales covered by a transparent, shining varnish to protect from winter's ice and snow.

The fir doesn't sleep all the year under its coating of snow and ice, but when the sun's warm rays have penetrated the cold, the little buds begin their work in May and June. The pistillate flowers are borne in axillary, scaly cones on the upper branches and are a rich purple color; the staminate flowers are borne on the under side of the branches, lower down on the tree. The anthers are yellow, tinged with purple.

The fruit of the fir is in the form of a cone about four inches long. The most noticeable thing about them is that they stand erect on the tree. Each scale of the cone is broad and rounded and falls off at maturity, shedding seeds at same time; this leaves the central axis standing. The cones are often so numerous that they give a purple hue to the top of the tree.

How does a tree living in situations where there is warm weather for such a short time maintain itself? It seems as if the seeds would just get started to germinate when they would freeze. Dame Nature provides for this lack and protects her young seedlings by a thick mass of snow. Yes, snow is warm; if you don't believe it, cover yourself all up in it sometime. Snow in the Adirondacks often falls so early in the year that the soil never freezes throughout the winter. The more adverse the conditions up to a certain limit, of course the stronger the effort on the part of the tree to reproduce its kind. On high mountains where the season is so short that there is insufficient warmth for seed produc-

tion, except at rare intervals, balsam and spruce reproduce themselves by shoots from the lower branches which have become covered with moss. This is a process of natural layering. The farther north and the higher the altitude the smaller the seed and smaller the percentage of germination, although the quantity produced is often immense.

The odor of balsam leaves is one of the most refreshing odors in Nature's pharmacy. Such an appetite as it gives the camper for that bacon and coffee over the fire! And long after we get home fresh leaves which were cut and twigs industriously sheared have a tempting way of reminding one of those camp fires, particularly on a damp dismal day, when reminiscences are very acceptable. What better bed does the northern hunter, fisherman or tourist want than these fragrant boughs! They possess an elastic quality which fits them admirably for the purpose. I have walked miles to secure these boughs for a bed and have never been sorry.

In more than one way can we consider the Balsam in nature's pharmacy. Atmosphere which is laden with the odors is remarkable for its qualities beneficial to invalids. Asheville, North Carolina is situated on a high plateau surrounded by a balsam range of Alleghany Mts. In this town pure air, sifted thru the balsam firs has a wonderful power of healing lung diseases. The late Dr. A. L. Loomis of New York testified to the fact that the firs and pines which abounded in the Adirondack region ladened the atmosphere heavily with ozone; and the resinous odors of these trees were the most beneficial of all tonics for a patient suffering with pulmonary diseases.

It seems as if these dark forests with their pyramidal trees have a mission all their own in life, and they seem to realize it with their sharp pointed spires swaying in the breezes and the pendulous lower branches sweeping to the ground. From the healthful fragrance, this tree has earned the name "Balm of Gilead Fir."

The blisters on the bark of the tree are a whole department store in themselves. These blisters are where the fir carries its resin; they are not scattered through the bark and under the wood as in the pines, flowing freely with gashes, but are superficial blisters on the bark itself. So characteristic is this that the N. Y. Indians named the tree,—"*Cho—koh—tung*," "*Blisters*." Who ever played as a child in the northern woods remembers with what delight he punctured these blisters in order to see the clear, liquid

stream of resin flow out, and how "stuck up" hands, face and clothes would become? As it comes from the tree it is a gum as clear as water and the consistency of glycerine. On exposure to the air it hardens and becomes amber in color.

The natives in Canada and Maine find it profitable to collect the liquid balsam by draining the white resin blisters that occur plentifully on the trees. Whole families are often employed in this enterprise. Oleoresin is the substance which collects in these vesicles; the bark is punctured with a tube, through which the balsam flows into a vessel which is attached to the tree.

If your emergency kit is not at hand, apply this balsam freely as an external application for cuts and bruises, and you will find it antiseptic and almost as good as liquid court plaster. One of the most important commercial uses of Canada balsam is its employment in every laboratory for mounting and preserving microscopic specimens upon plates. It is also used in medicine, together with "oil of fir" obtained from the bark. If your canoe leaks or springs apart what is better mucilage than Balsam?

"Give me of your balm, O Fir Tree,
Of your balsam and your resin,
So to close the seams together
That the water may not enter
That the river may not wet me!
And the Fir Tree, tall and somber,
Sobbed through all its robes of darkness,
Rattled like a shore with pebbles,
Answered waiting, answered weeping,
"Take my balm, O Hiawatha!"

—*Longfellow.*

Is this balsam only for mankind and his needs? Oh no, the tree is generous enough to make us gifts, but it is also very useful to it. When the tree is wounded even slightly there is an increased flow of this resin, which covers the wounds and thus keeps out spores of fungi which would otherwise creep in and destroy it.

Although this tree can withstand many hardships, cold, ice and snow, things other trees can not endure, it has light, soft, weak wood not at all durable and very coarse grained, of a pale, brown color, often streaked with yellow. It is used for cheap lumber, especially box material.

The forest has many enemies but fire and reckless lumbering are among the most important to evergreens. Animals seldom eat

conifers when they can get other things. Landslides, floods and fungi also, all play their part in destroying our forests and insects are quite as likely to attack conifers as deciduous trees—in 1876 all the spruces in the Adirondacks were nearly killed by insects. Snow often does great harm, and slim, tall trees suffer more than those whose growth in diameter and height have kept better pace with each other. Of all the foes which attack the woodlands of North America, no other is more terrible than fire. It does more damage in the shortest length of time than any other one thing, and so often could it be avoided with a little thought on the part of the hunter, or camper. I have seen whole mountains in one blazing mass, with the wind tearing the fire along at such a speed, it seemed as if it would go on forever. In such cases all the male inhabitants from numerous towns around would be fighting the fire, in both a night and day shifts. The most effective means of fighting the fire is to confine it by digging trenches on all sides which it can't get across.

Of all the wonderful aspects which our trees assume, I can conceive of nothing more solemn and impressive than the fir tree in moonlight; although it never attains an altitude of more than 45 ft, it certainly reveals in the light of the moon, a figure of vague and stately proportions.

And who wonders that this "never fading evergreen" is often taken from its cold mountain region and planted as shade trees around farm houses, in village yards and parks?

"Yon household fir,
A guardian planted to fence off the beast,
But towering high the roof above, as if
Its humble destination were forgot."

—Wordsworth.

Interesting Weather Charts

The keeping of weather records is a valuable experience for the pupil from several points of view. It makes him observing, it teaches carefulness in recording observations; he will surely attain a certain amount of weather wisdom, and he will become familiar with the movements of the sun and moon and of the earth movements in relation to them.

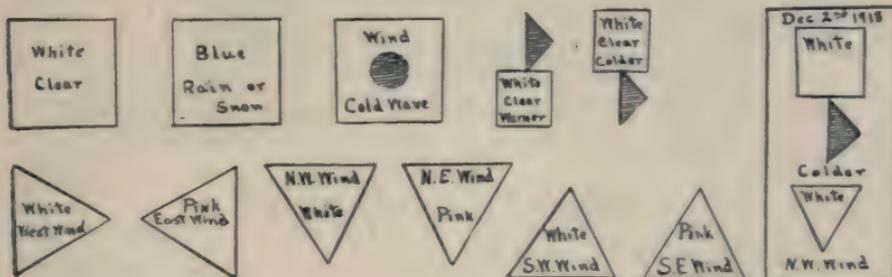
A daily weather record should be kept, for at least six months, and the observations should be made twice a day, always at the same hours. These records should include, the temperature, a barometric record, if the school is fortunate enough to possess such an instrument, the direction of the wind, the cloudiness or clearness of the skies, dew or frost, rain or snow. It would also be a good plan to add the time of the rising and setting of the sun and moon.

Last winter in the exhibit of New York Rural School work, during Farmers' Week at the Cornell College of Agriculture, there were many pleasing and interesting weather records shown. The most simple and elementary were those done by the young children, simply showing the weather by an umbrella; an umbrella shut with handle up meant sunny weather; half open with handle down meant cloudy weather; wholly open and ready for business meant rain or snow. Sometimes it was a little boy or girl holding the umbrella.

One very attractive record was made on sheets of pale gray paper, a sheet for every month; and at the top of each was a water color sketch, appropriate to that month. The one for March was a cottontail rabbit, sitting up with lifted ears, amid dry bare stalks of weeds and grass, his body partly outlined against a rising full moon. The record for each day was a circle divided by radii into six parts, each part colored to represent the weather for the day. Warm and sunny was represented by yellow; sunny by orange; cloudy by green; rain by black; snow by white; and windy by blue.

Another record was made by representing each day as a square—divided into four smaller squares; in these snow was represented by white, cloudy by pale gray, rain by dark gray, and sunny by yellow. If it was sunny all day, the whole square was yellow, etc.

Another more elaborate record was made by the following symbols—sketched in each day. These were combined with a sketch for each day—as follows:



One of the most attractive of all—was really very elaborate—there was a standard picture of a thermometer for each day—and a picture in water color representing the weather—as follows:



The most complete of the records was one which had a column for each of the following: Date, Temperature, Wind, Weather, Sun, Roads, Moon, Sky, Remarks. In this record the remarks were most enlightening, such as "Trees and bushes covered with ice," "An all day blizzard—but not much snow." "Played out of doors without coats," "Broad bright cross over sun at sunset," "Mailman has missed a good many days,"—

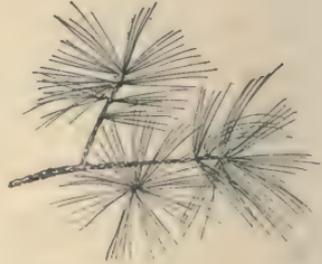
A weather record, begun in December or January and kept until June, has certainly proven to be a great help and constant inspiration to the kind of observation, which is most useful in Nature-Study.

A Simple Key to the Evergreens

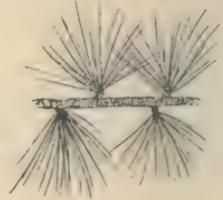
a. Foliage needle-like.

b. Leaves arranged in bundles or tufts.

c. Leaves arranged in bundles or two to six with a sheath at base. PINES

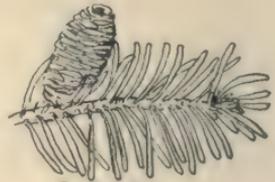


cc. Many leaves arranged in tufts without sheaths at base and shed in winter. LARCHES



bb. Leaves set singly and scattered along the branch.

c. Leaves flat, blunt at tip, pale beneath and two-ranked on twig, cones standing erect. FIRS



cc. Cones drooping and the leaves with little stalks. HEMLOCKS

HEMLOCKS



ccc. Leaves four-sided in cross section, sharp at tip, not pale beneath. SPRUCES



aa. Foliage scale-like or spiny.

b. Foliage scale-like small, flattened, close pressed to the twig, fruit very small cone. WHITE CEDAR OR ARBORVITAE

WHITE CEDAR OR ARBORVITAE

bb. Foliage scale-like—not flattened in four rows—Fruit a woody globular cone.

WHITE CEDAR

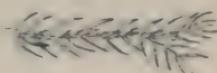


bb. Foliage spiny or scale-like or both, fruit a blue berry.

JUNIPER OR RED CEDAR

c. Foliage very spiny, white below—A low shrub.

GROUND JUNIPER



Flowers of the Trenches

Translated from the French for THE NATURE-STUDY REVIEW by H. G. B.

Close to my trench
I have picked for you
These pretty blue flowers,
Love's forget-me-nots,
To which April gave rebirth.
In offering you them
I think I see
The pretty color
Of your sweet eyes,
(Close to my trench
I have picked for you
These pretty flowers
Love's for-get-me-nots.)

And when May comes,
Oh my trench friend,
I shall offer you,
The lily-of-the-valley, all white,
Picked I in Flanders
In those great woods
Where—since September,
We've been fighting for freedom
Gay and confident.
(And when May comes,
Oh my tender friend,
I shall offer you
The lily-of-the-valley, all white.)

If I see July,
Bathed in light,
My gift shall be
Poppies,
With red petals,—
The flowers of midsummer—
Picked under flying bullets
And colored by the blood
Of all the heroes.
(If I see July,
Bathed in light,
My gift shall be
Red poppies.)

Then all these flowers—
The colors of France—
Shall make the boquet
A holy remembrance.
And if, some day,
In the wild tempest,
Brutal death carries me away,
Thinking of you
I shall close my eyes.
(Then all these flowers—
The colors of France,
Shall make the bouquet
A holy remembrance.)

(Written by a Belgian soldier in France and sung to the tune "The Time of Cherries.")

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN
ELEMENTARY SCHOOLS

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Editorial

“Peace on earth and good will to men.”

The first day of January, 1919, is more than welcome. For four years the New Year has brought more of foreboding than of happiness to the world; but this year free from the terrible anxiety which has overshadowed us, we may wish each other “Happy New Year!” honestly and whole-heartedly. We may even wish for happiness to come to those hearts made desolate through the supreme sacrifice, for time, sacred memories and pride in the unselfish devotion of the lost heroes will surely bring comfort and resignation.

For the rest of us, what vistas open up through the days of 1919! Time to take up again social interests that have been neglected or relegated to limbo in order that our activities might be of some use to our Country! Time to cultivate friendships! Time to read literature instead of news, supposing that our literary tastes have not atrophied! Time when we may hope for enough fuel to keep us warm! A fair assurance that the time may again come when we may dare to be fastidious about breadstuffs without guiltily thinking of starving nations! Mornings when we may drop two lumps of sugar into our coffee without a qualm! Evenings when we may sit before the fire with folded hands and give the knitting needles a rest!

However, there are many things which the war has eliminated that we hope may never return. No one mentions nine-course dinners as one of the functions we may resume in the future. Our war experience has given us a new set of values by which to

shape our lives. We have discovered that we are far more comfortable without many things which we had regarded as necessities; only after we had given them up did we realize what useless burdens they were. Let our foremost New Year's resolution be to keep the freedom, so dearly won, by guarding jealously against those things which fetter and load us down.

Meanwhile, we have made the wonderful discovery that we can accomplish a great work at any time that we have the will and the determination to undertake it; and we can do it without interfering in any disastrous manner with our regular daily duties. This is especially so of women. When we come to fully realize all that we have accomplished for the Red Cross and kindred activities, using for them only our surplus time and energy, we may be inspired to undertake to write epics or paint pictures or compose symphonies or establish philanthropies or conduct business enterprises.

A Happy New Year to us all! May it bring us the wisdom to make best use of the lessons we have learned during four agonizing years; and may it bring us full freedom to give careful thought as to what should be the proper and right activities of citizens at peace in a world which we trust is planning to stay peaceful!

The Meaning of It All

Ages and ages back,
 Out of the long grass with infinite pain raising itself into the upright position,
 A creature—fore-runner of Man—with swift eyes glanced around.
 So to-day once more,
 With pain, pain and suffering—driven by what strange instinct—who can tell?
 Out of the great jungle of Custom and supposed Necessity, into a new and
 wonderful life, to new and wonderful knowledge,
 Surpassing words, surpassing all past experience—the Man, the meaning of
 it all,
 Uprears himself again.

—Edward Carpenter in "Towards Democracy."

News Notes

CALIFORNIA

The last California Blue Bulletin published by The State Department of Education is especially interesting. It begins with a stirring paragraph by Dr. Margaret S. McNaught of which the following is a part:

Truly these are days to work in, days to grow in, days to lead in. Never before has education been viewed so seriously by the great mass of the people and never before have the schools been so interesting to them. Proudly the teacher takes a place among the worthiest citizens of the nation, a recognized important factor in solving the problem of Americanization without which we can have no true democracy.

May we all work heartily and wisely to Americanize not only those who have come to make their homes with us from foreign lands, but also our own native-born boys and girls, for "American" has a deeper meaning than "born in America."

The following items are of special interest:

The school system of this state and of this country will become efficient only when we eliminate the waste material from the content of the various subjects of the curriculum. Every subject and every part of every subject taught in the elementary schools should be brought before a court of inquiry and should be made to defend itself on the grounds of social utility.

The Industrial Arts and Gymnasium Annex of the Orland Union High School shows what the adolescent can produce. When it became apparent that it would be necessary to provide a building for Physical and Industrial Education, Mr. Busse, the instructor, proceeded to interest the students of his manual training classes in the project. Through the constructive thought and earnest labor of these students the project was completed at the end of two years. Most of the ideas for the building originated with the students and the details of these ideas were worked out in drawings by them. It is a monument to the success of each boy who contributed to its creation. "Such industrial projects have a profound influence on the boys engaged in them. For the first time, many of these boys found their entire physical and mental forces concentrated on one purpose. Those who have watched the growth of this building under the laboring hands of these student workmen realize that it has made demands upon the will, the independence, and the ingenuity of each of these pupils.

Certain sections of the state are demanding trained teachers. In San Benito County nearly 90% of the teachers are professionally trained. During this year some of the country teachers will receive \$96 per month. There are but two schools of the county that will pay less than \$76 per month.

KANSAS

Professor W. E. Ringle of The State Manual Training Normal School of Pittsburg has been in France since early in September. He is working under

Dr. Spaulding (formerly of the Cleveland Schools) in the Educational Commission of the Y. M. C. A. and the Army. He is head of the organization of the Agricultural branch of the whole army educational scheme. His address is Professor Wm. Edgar Ringle, American Y. M. C. A., 12 Rue d'Aguesseau, Paris, France.

NEW YORK

In a recent number of *Science* there appeared an article by Dr. Maurice A. Bigelow of Teachers College, Columbia University on *Contributions of Zoology to Human Welfare*. He discusses Zoology as it concerns human intellectual welfare and racial welfare. He states that only through organized education can the physical and intellectual values of Zoology be made to contribute to human welfare in the largest sense.

Professor and Mrs. Comstock of Cornell University are spending the winter in the southern states.

Professor and Mrs. Liberty Hyde Bailey are spending the winter at Cambridge, Mass., where he is pursuing his scientific work at the Gray Herbarium.

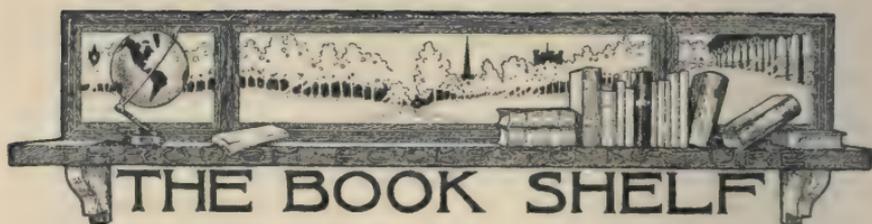
TO OUR SUBSCRIBERS

Please note your expiration date and send in your renewals promptly, as The War Industrial Board has requested all newspapers and magazines to adopt the following regulation:

"No subscription to be continued after expiration, unless renewed and paid for."

Owing to the increased cost of paper and printing, also to the fact that The Nature-Study Review has not raised its subscription price, we will print only enough magazines each month to cover the subscription list and its normal increase.

A blue check on the wrapper indicates that your subscription expires with this number.



The Teaching of Science in the Elementary School. Gilbert H. Trafton, Instructor in Science at the State Normal School, Mankato, Minn. Houghton Mifflin Co. 288 pp. \$1.30 net.

Professor Trafton is quite in the habit of writing excellent and most helpful books for teachers and this latest from his pen is no exception to the rule. It is not long since he gave us for THE NATURE-STUDY REVIEW a most excellent and practical outline for teaching nature-study in the grades; in the present volume he has enlarged the plan and has given outlines for all elementary science work. As we glance at the pages we are impressed by the practical, specific help given for the teaching of all the phases of the subjects; the point of attack and the methods and the materials are all there, stated clearly and interestingly. This is surely a volume which should be on the desk of every alive and up-to-date teacher.

The book is divided into parts dealing with the various sciences. Part I is given to the Pedagogy of Science Instruction, with chapters on The Content and Place of Science, Aims of Science Teaching, Materials and Correlation, Motivation and Methods of Science Teaching. Part II—Biological Science deals with teaching children about birds, insects, trees, flowers, seed dispersal, flowerless plants, pets and domesticated animals. Part III—Agricultural Science has to do with gardening and weeds. Part IV—Hygiene, considers The Principles underlying the Teaching of Hygiene and Teaching Hygiene through Experiments. Part V—Physical Science deals with physics and chemistry, the study of weather and sky. Part VI—concludes the book with a detailed outline of Science Teaching by Topics and Problems arranged according to grades and seasons.

Manual of Tree Diseases. W. Howard Rankin, A.B., Ph.D., Assistant Professor of Plant Pathology, New York State College of Agriculture at Cornell University. The Macmillan Company, New York. 398 pp., illustrated. \$2.00.

This timely book accomplishes its aim of bringing to those interested in trees a discussion of diseases of trees and suggested methods of control for those most studied. Enormous losses annually occur in our large tracts of forests on which we are dependant for our timber supplies; and methods of controlling diseases have not yet begun to operate appreciably in reducing losses because the owners have been slow to adopt the fundamentals of scientific forest practice. The tree owner must understand the nature of parasites causing diseases, the appearance of the symptoms they produce and many other facts before he can intelligently and effectively attempt their control. This volume

assists greatly to this end. The material is arranged to facilitate the diagnosis of diseases and it will be found to be very useful for owners of shade and ornamental trees as well as those interested in large timber tracts.

The book includes chapters on the injuries, diseases and their remedies, affecting seedlings, leaves, bodies, branches, and roots of trees in general; and to the specific diseases of the alder, arbor vitae, ash, bald cypress, basswood, beech, birch, buckeye, butternut, catalpa, cedar, chestnut, elm, fir, hackberry, hemlock, hickory, juniper, larch, locust, maple, oak, pine, poplar, spruce, sycamore, walnut, willow.

Peach Growing. H. P. Gould, Pomologist in charge of Fruit Production Investigation, Bureau of Plant Industry, U. S. Department of Agriculture. Macmillan Company, New York. 426 pp., illustrated, \$2.00.

This subject is treated by a man who has had a wide experience in fruit production investigations and has dealt with many questions through an extensive correspondence, and so he is able to offer in this book in a practical and comprehensive manner the results of his experience and investigations. It will prove a helpful resource to the experienced peach grower and those interested in the industry.

The book deals with the history, economic status, extent of the industry, orchard site and location, propagation, planting, orchard management, tillage, inter-planted crops, fertilizers, pruning, insect and disease control, thinning, irrigating, temperature, annual cost factors, varieties, botany and classification, picking and packing, transportation, storage and marketing.

Key to American Insect Galls. E. P. Felt, New York State Museum Bulletin, Albany, N. Y.

Seldom has a State scientific publication had so much of value in it for Nature-Study teachers as has this. The galls constitute a most interesting phase of life for nature-study. These little houses of magic are more wonderfully made than those created by the genii of Aladdin. There are so many species that it has heretofore been almost impossible to identify them to any extent. Now, with the help of this admirable key we may unlock the doors to a wider knowledge. The illustrations are many and exceedingly good. Dr. Felt has done a great work for us and we are grateful.

HOW TO KNOW THE BUTTERFLIES

A Manual of the Butterflies of the Eastern United States, by

JOHN HENRY COMSTOCK

Emeritus Professor of Entomology, Cornell University

AND

ANNA BOTSFORD COMSTOCK

Assistant Professor of Nature-Study, Cornell University

This work contains descriptions of 152 species and varieties of butterflies. This includes all of the species and their named varieties found in the eastern half of the United States excepting a few extremely rare forms.

There are 45 plates with 312 figures showing the insects in their natural colors and 49 figures in the text.

12mo.
Cloth,
\$2.50 net;
postage,
20c. addi-
tional.

The work is written in popular form without being superficial, and will serve as a Baedeker among Butterflies to the casual observer or the close student of this most picturesque phase of nature.

THE COMSTOCK PUBLISHING COMPANY

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THE NATURE-STUDY REVIEW

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No. 2

Birds' Nests

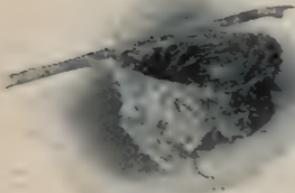
A. A. ALLEN

From The Cornell Rural School Leaflet, by permission

EDITOR'S NOTE.—Probably most teachers are familiar with the use of a key. The first section of the key in the following article divides the nests into eleven main divisions. First determine in which of these a nest belongs, and then turn at once to that division and trace it through. Whenever a letter is doubled or trebled, it indicates alternative conditions, and after determining which one the nest falls under, the others are ignored and the tracing continued under the correct heading. [EDW. M. TUTTLE.]

The most satisfactory and accurate way of identifying a bird's nest is to find it while still occupied and to identify the builder. Then after the young have flown, the nest can be taken, and will mean much more in the collection than it would if it were not discovered until winter.

The following key is intended to assist in the identification of such birds' nests as are ordinarily found after the leaves have fallen. The general type of nest built by each species of bird is fairly constant, but in so far as the materials conform to the general requirements of the nest, those used will always vary with the kinds most available. In writing this key the attempt has been made to select the characters that are most constant, but undoubtedly many exceptions will be found, which can be identified only by a specialist. The size and particularly the depth of the nest



Red-Eyed Vireo



Robin

will vary with the state of preservation in which it is found, and the key will prove practicable only for such nests as are fairly well preserved.

The nests of such birds as the cardinal and others that breed only rarely or locally in New York State, have been omitted from the key in most cases. Others that are uncommon have been marked with an asterisk. Ninety per cent of the nests found will belong to one of the following nine birds that are common throughout the State and that build the most conspicuous nests: catbird, chipping sparrow, goldfinch, oriole, redstart, robin, song sparrow, vireo, and yellow warbler.

KEY TO THE NESTS OF THE COMMON SUMMER RESIDENT BIRDS OF
NEW YORK STATE

A. On the ground or in tussocks of grass	I
AA. In the ground (in burrows)	II
AAA. Above ground, in bushes or trees, on cliffs, or about buildings	
B. Hanging or semipensile nests	III
BB. Not hanging	
C. In holes in trees or in bird boxes	IV
CC. Not in holes	
D. Containing sticks or large twigs	V
DD. With no sticks	
E. Felted nests of cottony materials	VI
EE. Not felted	
F. Containing an inner layer of mud ..	VII
FF. With no mud	
G. Covered with lichens	VIII
GG. With no lichens	
H. Mostly of bark, fibers, and rootlets, with or without horsehair lining	IX
HH. Mostly of grasses, rootlets, straws, and leaves, usually with horsehair in the lining	
J. Not spherical	X
JJ. Spherical nests	XI

I. ON THE GROUND OR IN TUSsockS OF GRASS:

These nests are seldom found except when occupied, and then can be identified by the birds. Only a list will be given.

See also spherical nests.

IN FIELDS: Bobolink, bobwhite, field sparrow, grasshopper, sparrow, horned lark, killdeer, meadow lark, nighthawk, pheasant, Savanna sparrow, song sparrow, spotted sandpiper, vesper sparrow.

IN WOODS: Black and white warbler, brown thrasher, Canadian warbler, hermit thrush, junco, Louisiana water-thrush, mourning warbler, ovenbird, ruffed grouse song sparrow, towhee, veery, water-thrush, whip-poor-will, woodcock.

IN MARSHES: Bittern, black duck, black tern, coot, Florida gallinule, king rail, loon, marsh hawk, Maryland yellowthroat, pied-billed grebe, short-eared owl, sora rail, swamp sparrow, Virginia rail, Wilson's snipe.

II. IN BURROWS IN THE GROUND:

A. Nesting in colonies in sand banks BANK SWALLOW

AA. Nesting singly

B. Drilling its own burrow KINGFISHER

BB. Utilizing some other burrow

ROUGH-WINGED SWALLOW

III. HANGING OR SEMIPENSILE NESTS:

A. In reeds or swamp bushes

B. Open above

1. A platform only slightly hollowed LEAST BITTERN

2. Deeply hollowed RED-WINGED BLACKBIRD

BB. Spherical nests

LONG- AND *SHORT-BILLED MARSH WRENS

AA. In upland bushes and trees

B. Small, less than 2 inches deep inside, fully suspended

1. In berry bushes *WHITE-EYED VIREO

2. In low branches or saplings RED-EYED VIREO

3. In evergreens (usually) BLUE-HEADED VIREO

4. In middle of tree YELLOW-THROATED VIREO

5. In tree top or outer branches WARBLING VIREO

BB. Small, pensile, partially supported

*ACADIAN FLYCATCHER

BBB. Larger, over 2 inches deep inside

1. Of grasses, sometimes partially supported

ORCHARD ORIOLE

2. Of fibers, strings, and the like

BALTIMORE ORIOLE

IV. IN HOLES IN TREES OR IN BIRD BOXES:

A. Nesting in colonies.....PURPLE MARTIN

AA. Nesting singly

B. Drilling holes, no nest at bottom

1. Opening about 1 1/2 inches...DOWNY WOODPECKER

2. Opening about 1 3/4 inches...HAIRY WOODPECKER

3. Opening about 2 inches.....

RED-HEADED WOODPECKER

4. Opening over 2 inches.....FLICKER

BB. Using old woodpecker holes or natural cavities of the same size or bird houses with similar openings, building a nest at bottom of cavity.

1. Nest of sticks.....HOUSE WREN

2. Nest entirely of grasses.....BLUEBIRD

3. Nest of straws and feathers

a. Nest cuplike, open above TREE SWALLOW

b. Nest spherical or partially arched.....

HOUSE (ENGLISH) SPARROW

4. Nest of fibers, wool, and feathers.....

CHICKADEE AND NUTHATCH

5. Nest usually containing a cast snake skin.....

CRESTED FLYCATCHER

BBB. Using flicker holes or natural cavities of similar size, no nest built.....

SPARROW HAWK, SCREECH OWL, AND *SAW-WHET OWL

BBBB. Using larger natural cavities.....

BARRED OWL, GREAT-HORNED OWL, AND *WOOD DUCK

V. CONTAINING STICKS OR LARGE TWIGS

A. Bulky nests in trees, 15 to 60 inches outside diameter

1. Very large, 30 to 60 inches.....

*FISH HAWK AND *BALD EAGLE



Chipping Sparrow



Catbird



Mourning Dove. Eggs unequal in size

Photo by R. E. Wager



Yellow Warbler

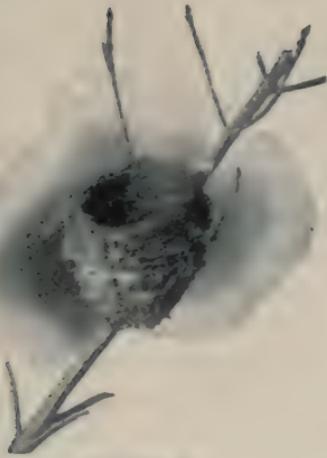


Redstart



Fig. 5. The Song Sparrow's Nest. Slightly Elevated.
Containing 2 Cowbird's Eggs (at the right) and one
of the Song Sparrow.

Photo by R. E. Wager



Goldfinch



Baltimore Oriole



Fig. 8. Nest of Brown Thresher
Photo by R. E. Wager

AA. With few or no leaves

B. Less than $1\frac{3}{4}$ inches inside diameter

1. With thick horsehair lining.....

CHIPPING SPARROW

2. With few hairs, or none.....FIELD SPARROW

BB. Over 2 inches inside diameter

1. With many or few hairs in lining SONG SPARROW

2. No hairs, a few leaves YELLOW-BREASTED CHAT

XI. SPHERICAL NESTS OF GRASSES, BARK, OR FIBERS

A. On the ground very thickly lined with soft grasses.....

MEADOW MOUSE

AA. In bushes or vines, usually on some old bird's nest lined
with cotton or wool.....DEER MOUSE

AAA. In trees or about buildings

1. Of bark and fibers, no lining, usually some leaves or
sticks, often on an old crow's nest....SQUIRREL

2. Of grasses, lined with feathers....HOUSE SPARROW

Gloaming

MELICENT ENO HUMASON

Day flung her sun-stained mantle in the air,—
A mermaid, rising from the foamy sea
Espied the golden garment, and in glee
Wrapped it around her dewy form and fair,
Till luminous pearls, and shimmering vapors rare
Compassed the world, and toilers slowly homing,
Lifted their eyes in love, and called it Gloaming.

It does not matter what one studies
so long as he is earnestly on a quest.

ALICE GERTRUDE MCCLOSKEY.

Some Considerations in Teaching a Bird Course

J. M. SHAVER

Department of Biology, George Peabody College for Teachers, Nashville, Tenn.

There is an awakening interest in nature-study throughout our country. Many teachers are seeing for the first time the value of teaching children about their immediate environment and consequently are introducing Home Geography and Nature-Study into their schools. Superintendents and Boards of Education are adding nature-study to their curriculum and even high school science is partaking of this great out-door spirit. The resulting demand for teachers of these subjects has caused many teachers' colleges and normals to offer nature-study courses. To the public these appear to be easy, pleasant courses with little disciplinary value.

This criticism of nature-study courses in general is likewise directed against bird courses, and we must admit that there is some basis for this criticism. But should there be? Cannot a course like bird study be pleasurable and at the same time intellectually profitable?

It is in answer to these questions, that I wish to give my own experiences in teaching bird study, to compare the courses as given by me with courses given elsewhere, and to offer suggestions as to how these courses might be improved.

In the spring of 1917, I offered a two hour credit course in Peabody College, which met two mornings a week from 6 to 7:30 A. M. for laboratory and field work, and one hour extra every two weeks for lectures, recitations and class discussions. No laboratory work was done, the entire morning period being given to field work. Students provided themselves with Reed's Bird Guide, notebook and pencil. Quite a number of the students also had field glasses.

At first the field work consisted of identification of the birds as we met them on our trips and a record made of the species identified and the number seen, together with data in regard to weather. It was seen at once that most of the field work must be spent in identification. Data gathered previously in my nature-study class showed that the average student in this class knew only 11 kinds of birds. This was a class of twenty-three girls. These figures are comparable to those obtained by Prof. Rice of the Ohio Wesleyan University from his bird classes of 1902, 3, and 4. From statistics

of 126 students, 55 men and 71 women, he found that each man knew on the average from 31-35 different birds, but that each woman knew only 11-15 different species.

After a few periods of field work, it became apparent that it was not yielding as good results as was expected. Therefore the field work was reorganized around some few of our most common birds, with the aim of giving easy recognition by sight and note, facts concerning their habitat and economic importance and some plans for encouraging and protecting them rather than seeking to glance at a great number of different birds. The method was now tried, of having the students study each bird according to some definite scheme and recording in writing all observations made. This scheme was a modification of that used by Dr. R. M. Strong, in his bird courses while at the University of Chicago. The modified scheme follows:

DIRECTIONS FOR FIELD WORK WITH BIRDS

1. Size:

Compare with the English sparrow, robin or crow. If possible, estimate length.

2. Form:

Note whether the bird is slender or compact, the shape of bill, and any unusual features such as length of legs, neck, etc.

3. Color:

Note distinctive colors and color effect from a distance.

4. Flight:

Describe the flight as well as possible. If necessary, represent diagrammatically.

5. Voice:

Try and represent the song by syllables or any other way that will indicate what the song sounds like. Distinguish between call notes and songs.

6. Where found:

- (a) On ground
- (b) In low trees, bushes or thickets
- (c) In high trees

7. Nest:

- (a) Where placed
- (b) Height above ground
- (c) In what
- (d) Size

- (e) How attached
- (f) Of what material constructed

8. Eggs:

- (a) Number
- (b) Size
- (c) Color
- (d) Any other interesting points

9. Nestlings:

- (a) Number
- (b) Color
- (c) Behavior
- (d) Other interesting points

10. Young in juvenile plumage

Note points of difference between young and parents.

11. Females:

If male and female birds have obvious differences in plumage, form or color, indicate them here.

Records were made in the field in ordinary note books and later transferred to cards which were filed alphabetically in individual card files according to the method suggested by Dr. Strong. From time to time these cards were collected and graded.

The limited number of class discussions were taken up with questions of an economic nature. For instance at one meeting the food habits of the sparrows were discussed, each group of students preparing a written report of some one or in some cases two species. Later periods were devoted to studying injurious and beneficial species with a view to their easy recognition in the field. Means of attracting birds by the planting of appropriate shrubbery, the putting up of nesting boxes, the establishment of feeding stations, protection from cats and millinery hunters, and protection by suitable game laws were some of the topics discussed.

The most glaring defect in this course was the lack of laboratory work. Stuffed specimens should be studied in the laboratory in such a series that the characteristics of each species will be known by the time that species arrives from the south. This method has been used at the University of Chicago and the Mankato Normal School, but is manifestly impossible where there are no stuffed specimens. A public museum in some cases would make it possible to study, but perhaps not to handle mounted birds. It is possible to study the birds from colored pictures in a somewhat similar way

to that in which the stuffed specimens were studied. Lantern slide tests of the student's ability to recognize birds quickly are recommended by Dr. Strong. Carefully colored and numbered slides are shown for two or three minutes at a time and the student is asked to write down the name of the bird and the characteristics used in its identification. After about twenty slides are shown, they are reshowed, the instructor naming each specimen and its distinguishing characteristics. Where lantern slides are not available, colored pictures might be substituted in a similar way. The object of this laboratory work is to fit the student for rapid, intelligent field work.

The early morning hours worked a hardship on quite a number of the feminine members of the class. I think hereafter, we will give the work from 8-10.

A mistake was also made in having students copy field notes onto cards. It is always a mistake to have students do unnecessary work. Furthermore, we do not have students copy botany notebooks or chemistry experiments over at their rooms because we want the original impressions and thoughts of the student and not something that he may have acquired after leaving the laboratory. We want only what he has found out, not what he has read that someone else has discovered.

The scheme for field work as outlined at the beginning of this paper is admirable but would be improved by adding to the printed scheme a small outline picture of a bird on which the student could indicate in writing color markings and other characteristics.

But not all of the field work should be spent in identification, part should be given to a study of habits, especially feeding habits during the nesting season. Very valuable relay observations may be made of the habits of a pair during a single day. Two students should watch the nest during the first hour in the morning, then they should be relieved by two others, and so on at intervals of an hour throughout the day. Notes should be taken on:

- (a) Time of feeding of young.
- (b) Whether fed by male or female.
- (c) Kind and amount of food fed when possible to determine.
- (d) Where procured, if under observation.
- (e) Times parents feed themselves.
- (f) Times waste material is taken from the nest.

(g) Any other incidents that will throw light on life of young or adult.

(The scheme above is modified from Miss Thayer's paper "A Day's Work in Birdland," N. S. R. Vol. 9, p. 289).

Another valuable method, where time will permit, is to have two or three students spend an hour each day throughout the nesting season studying the nesting habits of a particular pair. Other groups may study different species in the same way or other pairs of the same species. Records should be made as suggested in the previous paragraph and in addition on:

(h) Development or change of plumage of the nestling.

(i) Development of voice.

(j) Age at which nestlings first leave the nest.

(k) Any other incidents such as their response to various stimuli.

In bird study as in any other subject accurate records are indispensable.

Important as the field work is, the class discussions are almost equally so. Topics such as those suggested at the beginning of this paper are perfectly satisfactory. Students should also be taught how to teach about birds in the grammar grades. Lessons should be planned for the different grades on the topics that best fitted for each. These should be discussed in class and if possible actually taught before the students.

Material consulted in the preparation of this article:

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The Tent Caterpillar, Nature-Study and Civic Improvement

IDA AGNES BAKER

Washington State Normal School

Last summer I saw the statement that the Boy Scouts were organizing a drive on the tent caterpillar. The work was certainly needed but the enemy was not routed and never will be until the work is conducted more intelligently than in a summer drive.

Like the rest of the practical work, it is up to the school teachers of the state to push things. Every school in a district where there has been the pest of the tent caterpillar should have lessons this school year on the life history of the enemy, consisting of field lessons and terrarium demonstrations in the class room, and including at least one reading or story.

Now is the time to begin. Go out under the common red alder (wild cherry in the east) trees. They furnish the tent caterpillar's favorite food. If they were in your neighborhood last year, you can depend upon finding their eggs, for next year's progeny, carefully stored on these twigs, sealed from the wet winter weather. Pull down a branch and glance over the twigs until you see a place that seems to be swollen a little and darker and shinier than the twig. If you press it, it yields a little as the twig never does. If you prick off the varnish-like covering you will find dozens of eggs about the size of the head of a pin, arranged neatly and orderly around the twig.

During July and early August one could not turn on a light by an open window without attracting several chunky little light brown moths.

I don't know whether it was aspiration or frivolity that kept these moths fluttering about our lights but I know that when they were at work they laid their eggs in these orderly rows and tucked them in under this translucent varnish that will weather any winter. They placed them just before our eyes the color of the twig in perfect camouflage.

However, when once you have seen a cluster they are not so hard to find. The children's sharp eyes are equal to the insects' cunning instinct and now is the time for another drive. Last fall each member of my nature-study class brought one in a mounted specimen of alder cones, old and new, of pistillate and staminate blos-

som buds, of a leaf bud and a twig on which was a clutch—shall we call it—of tent caterpillar eggs.

Each one meant to my mind's eye a tent of destructive caterpillars that would not make its appearance on the campus next summer. Sixty tents prevented! I thought that a pretty good drive.

This was the first lesson. In February we had our second lesson: When we began forcing twigs for the Forestry lessons we filled one jar with alder twigs. We kept them in a sunny window, changed the water and trimmed off the butt ends every other day. The buds soon swelled and in less than two weeks we had alders in leaf and blossom.

Then we made the terrarium. A flower pot filled with soil and a large lamp chimney served our purpose. We soaked the soil thoroughly, and stuck an alder twig on which were caterpillar eggs, and several of the leafing alder twigs into the soil and, putting the chimney over them, pressed it firmly into the soil. The pot was in a saucer of water, and placed in a sunny window.

The week end was warm and sunny and when we came to school Monday we found our incubator hatching.

We watched the tiny creatures, about one-sixteenth of an inch long, crawl, one out of each of those pin-head eggs, straight for food, spinning white threads for the tent as they went.

The leaves vanished and the tent grew. We watched the creatures chew and explore their quarters. At first we kept a white netting over the top but soon found that the rubber band was all we needed to keep them in.

They would come over the rim down to the little rubber band but never over it. We could not see why for it was no larger than their own bodies. They began to show their pretty coloring.

When I saw that they had developed as much as they could in such close quarters, I destroyed them. It is never a pleasure to take life, even that infinitesimal bit that is in a caterpillar and a caterpillar enemy at that; but they would have slowly starved to death. They were born to an untimely end.

My class consists of grown students but I did not destroy these creatures before them. Much less would I do so if the pupils were children. They have to soon learn that there is a choice between a quick death and a low torturing one but they need not see either. This was the end of the second lesson.

Now we were ready for observation lessons in the field. In May the tents began to grow in the trees. We watched them grow, the twigs becoming bare of the vanishing leaves, the caterpillars going out to feed in the warm sunny day and cuddling back into their tents at night. The poor trees were being slowly choked and starved by the loss of their leaves.

This is when the Boy Scouts made their drive and also, most grown people. They burned the tents and watched the caterpillars writhe in the flames. It was not nearly so effective as my drive in the fall on the eggs; and after all the burning there were plenty left.

Now in July the caterpillars began to wander away from their trees, over the walks, onto the shrubs and fences anywhere, anywhere to find a good place in which to go to sleep.

This is when most people discover that there is a pest of caterpillars in the land.

Ugh! Oh! Throw him away!

The nasty thing! See what lovely coloring of brown and black and gold! Oh! but they are everywhere! Ugh! Kill him! Aren't they awful! This is the way they are usually studied.

This was the time for our third house lesson: We brought out our terrarium again; wet the soil, put in fresh alder twigs and several caterpillars, which had been experiencing the wander-lust. This time we were careful to fasten a netting over the top of the lamp chimney. We had no faith in rubber bands as barriers to these creatures in their present state of mind. We put in the alder twigs lest they were still hungry. But they were not. They were tired, ready for the new life. Within a week there were several white cocoons about an inch long fastened to the underside of the net covering. Now we knew what the tent caterpillars cocoon looked like and we found them everywhere. On the undersides of the plants, especially the ferns, by the roadsides, and under the eaves of buildings there were rows of these pretty white cocoons each one the cradle of our enemy.

This was really the time for another public drive but I did not hear of one.

Meanwhile in our terrarium matters were progressing. We did not see how it happened; no one will ever see it happen for it all goes on behind the silky white cocoon curtain and if you rend that curtain the mystery disappears in death. But one day a chunky

little fawn brown moth was fluttering in our terrarium, and we knew that one of our caterpillars had awakened.

This finished the cycle of the tent caterpillars' life and finished our series of lessons. Now we are beginning another preventive drive on the enemy. By the conditions of his life and ours he is our enemy, and every child should be taught to see his eggs and aroused to this preventive drive.

But more, every child has a right to see the wonder in the life of even this common pest, to feel the awe that is awakened in coming to understand the experiences of this lowly infinitesimal bit of universal life, the tent caterpillar.

Listening

Do you know that Winter day
When the world is white and blue—
Not the flashing sapphire hue,
But the tender blue of Spring—
When the hills are far away
And the woods seem listening
For a voice, a sign, a word?
Not a thread of sap has stirred,
Not a twig's precision blurred,
Not a chickadee has heard
Hint of any growing thing,
Willow bud or daffodil,—
All the world is frozen still,
Yet the wood is listening.

—DOROTHY LEONARD in *New York Times*.

The Seasonal Development, Gross Structure, Ecology and Geographical Distribution of *Sanguinaria Canadensis*

RHEA OLIVE BAKER

Botanic Department, University of Pennsylvania

THE SEASONAL DEVELOPMENT

Among our earliest spring flowers is the blood root, *Sanguinaria canadensis*. Quite a while before most early spring flowers have begun to appear, the white buds of the Blood Root show above the leaf litter of the forest floor.

When, about March first, Skunk Cabbage flowers first appear, Blood Root sends forth from the growing end of the thick, creeping rhizome its single floral bud. May-apples, Rue Anemones, and Jack-in-the-pulpits are beginning their season's growth. Blood Root, however, develops much more rapidly. Within the growing tip, which at this time is just about 1 cm. long is the entire growth for the season. Under favorable conditions the tip pushes upward and appears above ground usually leaf first, in 1918 on March seventeenth. The leaf is tightly rolled and is borne on a delicate stalk which slowly elongates. After two or three days, the growth slows up for a few days. As soon as the leaf and stalk are entirely clear of the ground, we notice that there are two stalks, (that is, if the plant is to produce a flower.)—one bearing the leaf and the other enclosed within the leaf. This second stalk bears the flower bud which, during its development, is carefully sheathed and protected by the leaf.

From eight to eleven days after the leaf tip first appears above ground, the leaf begins to open very slowly, uncurling slightly every day. As the leaf unrolls, the flower stalk lengthens, and from now on until the flower opens the flower stalk lengthens more rapidly than the leaf stalk. Simultaneous with this lengthening of the flower stalk is the unfolding of the leaf. Eight to thirteen days after the appearance of the plant above ground, the bud shows signs of opening. Over the tightly closed petals are two very pale green, faintly lined sepals. When the bud first appears these sepals entirely close it, but gradually they spread further and further apart until they drop off. This usually occurs either the day before or on the day of blooming, although occasionally the sepals may persist until after the flower has bloomed.

The flowers usually open on the first day during daylight at no particular hour. Toward night the petals begin to close and gradually resume the appearance they bore just after the sepals fell. At about seven the next morning, the petals begin to re-open, and by noon, they have spread further and further apart until they are reflexed thru an angle of about 112° . About three of the afternoon on cloudy days, or four o'clock on clear days, the petals begin to close. This opening and closing of the flower is a regular daily event, as long as the petals persist.

On very dull, or rainy days the flower may not open completely, or it may scarcely show any expansion. If a sponge saturated with chloroform be placed near the flower, and a bell jar be inverted over both about an hour before the time for opening or closing, the movement of the petals is prevented. The whole plant becomes weak and limp and remains prostrate several days.

It seems to be a general opinion that the petals persist only a day or two, but in all the flowers which I observed, I found the petals persisting from five to ten days. Previous to the dropping of the petals fertilization ordinarily occurs. The flowers are so open and flat that many are probably wind pollinated, but I have also observed insect pollination. The insects which I saw pollinating the flowers were wasps and a peculiar kind of fly. I noted an interesting thing in connection with these flies; as I reached for them to examine them instead of showing signs of flight, they merely tumbled off the flower to the litter on the forest floor. One or two could be picked up without making any effort to escape. At first I thought the drowsiness, which these flies displayed, was due to the fact that it was rather early spring, and while this may be true, I have since reached the conclusion, which, however, is not based on experimental evidence, that there is in the plant, an opium-like substance such as occurs in other plants of the family Papaveraceae. I do not know just what relationship exists between the time when the flower is pollinated and the time when the petals fall, but I feel sure that there is a definite relationship.

The period during which one may find Blood Root plants in bloom is quite long, the time of blooming depending in each individual case upon the exposure, soil and to some extent the age of the plant; so that from March 29, the date when I first found the plant in bloom until May 4, which was the latest date that I saw it in bloom, plants were constantly blooming. It is interesting

to compare the dates of blooming this year with those of previous years. These records are taken from an Article "Phyto-Phenology in its Application" from "Contributions from the Botanical Laboratory of the University of Pennsylvania."

Below are given dates as recorded by Geo. C. Butz of State College for the appearance of the first flower (fl) and the first leaf (lf) for each year from 1896 to 1906 inclusive:

	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906
fl	4/8	4/23	4/12	4/20	4/21	4/28	4/20	4/6	5/1	4/20	4/22
lf	4/22	4/26	4/24	4/23	4/28	4/29	4/23	4/6	5/3	4/22	4/24

In these records the most striking thing is that the first flower appears in each case before the first leaf, whereas in my experience the leaf has always been first and is usually seen protecting the flower bud.

The following are records made for the Botanical Society of Pennsylvania from 1900 to 1909:

	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
fl	4/19	4/12	3/28	3/26	4/10	3/20	4/12	11/13	(?) 4/5	4/1
lf	4/13	4/10	3/27	3/16			4/22	3/17	4/7	

After the fall of the petals there is little left that may be called seasonal development except the maturation of the fruit and the disappearance of the leaves. While the fruit is developing the leaf stalk elongates and soon the leaf spreads out full size above the developing fruit in a protecting manner, as soon, as the fruit is mature, From the pistil of the flower the fruit develops into a two-valved capsule while the stigma remains until the fruit ripens. The capsule may reach a length of $2\frac{1}{2}$ –3 cm. and it is quite due to its being densely packed with seeds, (about 16) peculiar in that at one side is borne a well-defined white ridge, the carunculus (Fig. 2.) Some have advanced the theory* that the ridge is present to enable ants to grasp the seed more readily, so that it may be carried down into their ant hills for storage and incidentally they may there germinate. I have found no proof of the statement, for neither have I seen ants carrying the seeds or the plants growing from ant hills. Hence I conclude that this ridge is developed for some other purpose, perhaps it has a respiratory function.

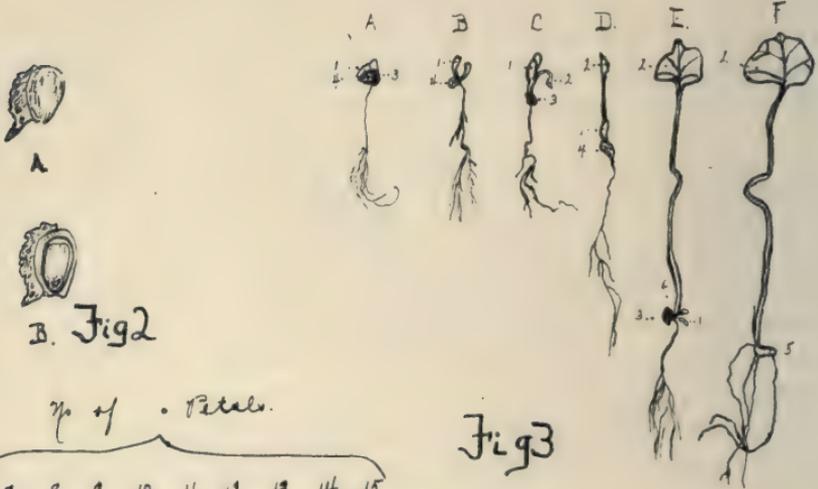
*Dr. E. B. Southwick informed William M. Wheeler (Ants their Behaviour, 1910:315) that he has seen the ants in Central Park, N. Y. carry away the seeds of the blood root and feed on their caruncles, so that they may be scattered anywhere and not necessarily in ant hills.

When the capsule bursts, or rather, splits longitudinally the seeds are flung some distance and some at least fall on the ground, where after a period of rest they germinate. The drawing at the left will show the appearance of young seedlings (Fig. 3.) There first appear two small, elliptical plumule leaves and a fine radical. For a time both the seed coats adhere. The outer coat is hard, brittle and dark brown in color. The inner coat is fine, delicate and papery, of a brick-red color. This development is shown in Figure 3, A and B. In C, we see the appearance of the first-foilage leaf which expands gradually as shown in D, E and F. In F, we see that at the junction between what was stem and radical a thickening is formed from which the roots are now given off. This marks the beginning of a rhizome. Under favorable conditions the plant will continue to develop until it reaches the adult stage.

I do not consider that the plant has become adult until it produces flowers, and, while I have had plants under observation only six months, I am convinced that the plant does not produce flowers before the fifth or sixth year. I came to this conclusion on finding a large number of plants which bore no flowers, and still had a rhizome of considerable length and a leaf which was neither so deeply lobed as those of plants which flower or so entire as the leaf of seedlings, and also as evidenced by the number of scarrings on the rhizome (Fig. 1.)

GROSS STRUCTURE

I do not intend to take up in detail the microscopic anatomy of the Blood Root, but I shall describe the gross structure which distinguishes it from other plants. It arises from a creeping rhizome which varies in length from less than half a centimeter to single rhizomes attaining ten centimeters length. The rhizome is thick and chunky and contains an abundance of a blood-red latex, which does not respond to the action of acids, alcohols or alkalis in any definite degree. From this latex, the name of the plant is derived. Very young rhizomes contain a very small amount of latex, and I think, it may be said that latex is entirely absent in the rhizome of seedlings. Along the length of the rhizome are circular scars which surround it (Fig. 1). These are the scars left by the bracts and each circle hence marks a year's growth. The space between two rings may vary very considerably on the same rhizome. From the



B. Fig 2

Fig 3

Development from Seedling
 1. First cotyledon leaves
 2. First foliage leaves
 3. Outer seed coat
 4. Inner seed coat
 5. Beginning rhizome

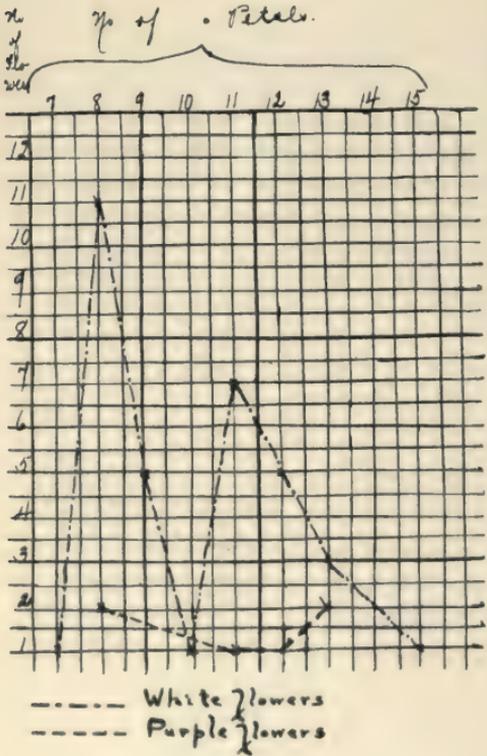


Fig 4

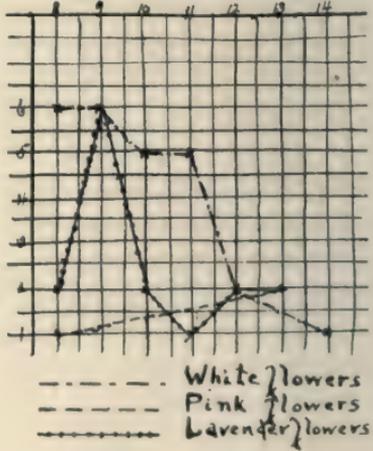


Fig 5

rhizome very small, fibrous roots are given off and from these secondary and tertiary rootlets are formed. The rhizome constantly grows forward at one end, and decays away at the opposite end. It lies below the surface of the soil about $2\frac{1}{2}$ or 3 inches in a horizontal position.

From the growing end of the rhizome, we frequently notice a budding out and from each individual bud arise flowers and leaves. It is customary for rhizomes to have but one growing tip and hence to produce but one flower and leaf. But on the other hand, I have found rhizomes which were much branched or budded. I found this difference of structure in the rhizome varying in different localities. Along Darby, Crum, Cobbs and Neshaminy creeks, I found almost all of the rhizomes unbranched, and of the three or four that showed branching, none possessed more than two growing tips. On the other hand, along the banks of the Pennypack, I found very few rhizomes, with only one growing point. Here they grew in clumps and the rhizomes showed 3, 4, 5, 7, 8 and, in one instance, 11 growing points from each of which came a flower and leaf. I interpreted this difference in habit to difference in the length of time in which the plants had been established in this given locality. I take it that the regions where the plants grow in clumps they have been established longer, than where they grow singly. Moreover lack of disturbing influences might aid in giving rise to the clumped formation.

From the growing tip arise the leaf stalk and leaf and the flower stalk and flower and the ensheathing bracts. The bracts vary from four to six in number, and are arranged in pairs oppositely placed. The two outer bracts are usually very small and almost indistinguishable,—if they are present at all. The next inner pair is somewhat larger and rarely absent. It is the innermost pair which is most important. Of these the longer is one and a half to one and three-quarters the length of the smaller. The longer bracts vary from 3 to 10 cm. in length, while the shorter ones vary from 1 to $4\frac{1}{2}$ cm. The larger sheath encloses the flower stalk and aids in the protection of the flower-bud. The smaller bract covers over and protects the rudimentary next year's leaf. The bracts are thin, papery of a pale yellowish green color and faintly lined.

The flower stalk is usually very slender, and varies in length from 12–19 cm. It is of a reddish color due to the pigment

anthocyanin. Usually the flower stalk is straight, although occasionally it is bending, the reason for which will be described later.

Borne terminally on the flower stalk is the solitary flower. The flowers vary little in size, so that most of them are $2\frac{1}{2}$ to 4 cm. across. The flowers possess all four circles the outer of which consists of two pale, green caducous sepals. The second whorl—the petals—is the most showy part of the flower. The petals vary in number from four to sixteen. I have sorted collections from two days into groups containing flowers having the same petal number and have plotted them on accompanying graphs in order to illustrate the variation in frequency of petal number for different localities. Figure 4 shows the petal frequency for flowers collected at Crum Creek, and Figure 5 shows the same for flowers collected along Pennypack Creek. The flowers having 7 and 8 petals arranged in two tiers, three and four and four and four respectively. The seven-petaled flowers are very rare and the eight-petaled flowers occur frequently. Four possibly is the original petal number. The sixteen petal flowers are the quadruple ones, but these are rare. The flowers with petals varying from nine to fifteen are quite frequent. These extra petals are developed from the stamens. I found several small or reduced petals which bore at the side a tiny yellow streak and which showed the structure of an anther. The flowers are usually white, but there are frequently pink, blue, lavender or faintly purple colorations on the under surface of the petals. I thought this difference in coloration was due to some chemical difference in constitutions, but I found on one rhizome which was two branched, one flower which was pure white, and one which was decidedly lavender.

The stamens vary in number from twenty to forty-eight and their number bears no definite relationship to the petal number, so that I found eight-petaled flowers having 24, 25, 29, 30, 31 and 32 stamens; nine petalled flowers having 24, 26, 27, 31, and 36 stamens, 10 petalled flowers bearing 25, 27, 31 and 36 stamens; 11 petalled flowers bearing 20, 26, 30 and 35 stamens; and 12 petalled flowers having 26 and 33 stamens. These are only a few of the records which I have, but they will serve to illustrate. There is only one pistil with a two-lobed stigma, very short style and long slightly thickened ovary, which develops into the two-lobed fruit already described.

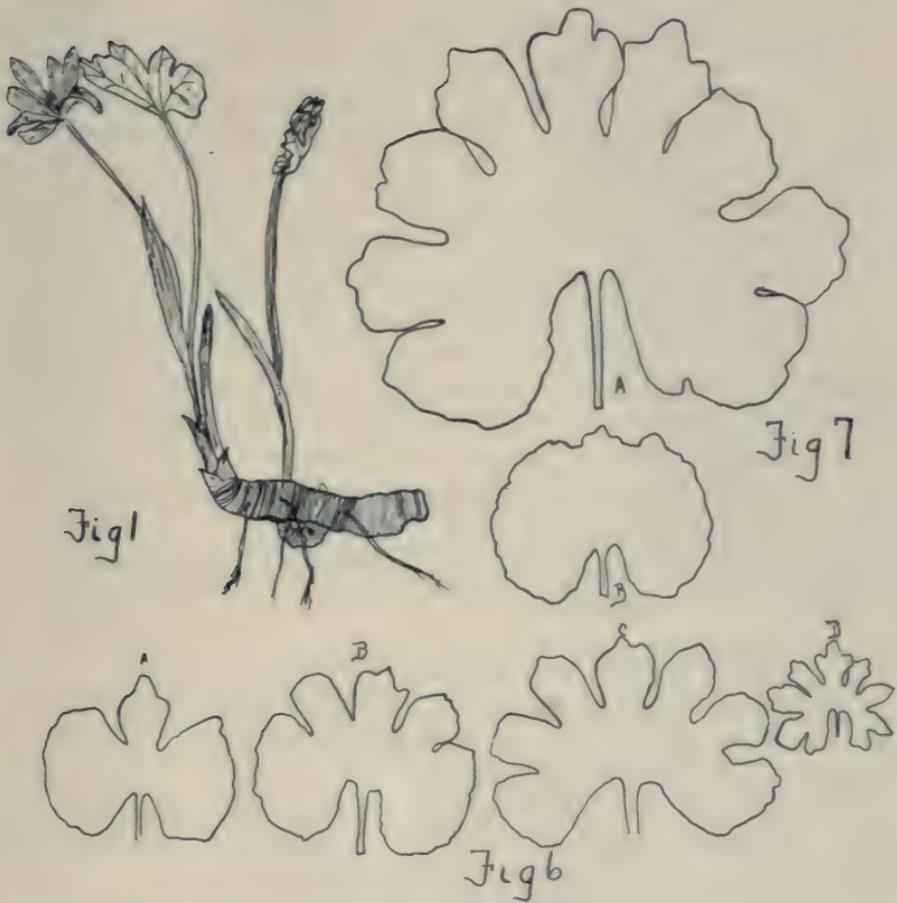


Fig. 1. Blood root plant showing rhizome.

Fig. 7. Two leaves from two buds on the same rhizome which measured 9 cm. and weighed 9 gm.

Fig. 6. Outlines showing variations in the lobing of the leaves and also how the leaf lobing varies with the weight and length of the rhizome, which in turn depends on age

- A. weight of rhizome 1 gm, length 3 cm.
- B. weight of rhizome 2 gm, length 5½ cm.
- C. weight of rhizome 3 gm, length 4½ cm.
- D. weight of rhizome 3½ gm, length 6 cm.

The leaves vary in size from $\frac{1}{2}$ -24 cm. They are thick, fleshy and green. They are variously lobed. It has been said that the leaves show a youthful and an adult stage with all stages in between.* In the very young foliage leaves of the first, second and third years there is little or no lobing, but as the plant becomes older the leaf shows three, five, seven, nine and occasionally older plants eleven lobes. The accompanying drawings show the difference in lobing (Figs. 6 and 7). In order to discover, if the weight and length of the rhizome had any effect on the leaf lobing I weighed and measured twenty-seven rhizomes. I found the weights varied almost directly with the length. I planted them in order and have since observed the leaves which as, might be expected showed increased lobing in the direction of increased weight of the rhizome. But since the length and weight of the rhizome depend directly on the age, the lobing of the leaf depends on the age of the plant. Leaves arising from buds of different age vary in lobing according to the age of the bud and not according to the age of the rhizome. Hence two leaves from two different buds of different age on the same rhizome may show entirely different lobing (Figs. 6 and 7).

THE ECOLOGY AND GEOGRAPHICAL DISTRIBUTION

We usually think of Blood Root growing on shady slopes of woods where the soil is a rich loam, with a neutral or slightly alkaline reaction, and the drainage rather complete. Blood Root does customarily abound in such places, but these conditions are not requisite. Instead of a drained loamy soil I have found several plants of Blood Root growing among Skunk Cabbage in a sandy loam, which was only ten or twelve feet from a rapid little stream and on a level with it. Although we more usually find Blood Root where there are few rocks and large roots, I found it growing thickly on a slope rising from the banks of the Neshaminy in a region where the top soil is largely disintegrated shale, the rocks of which range in size from very small to those of the size of one's hand. The roots too are large since there is a close stand of the larger trees. The disintegrated rock mass is loosely piled together, and here we

*Consult the paper by Dr. John W. Harshberger, "Juvenile and Adult Forms of the Blood Root," which appeared in May, 1903, in *The Plant World*, Vol. VI, No. 5.

For reference to this paper and to general help in the preparation of this thesis, I am indebted to Dr. Harshberger.

find the rhizomes of the Blood Root located farther beneath the soil than usual (perhaps as much as three inches) and the flower and leaf stalk is long, pale and tortuous, winding in and out about the stones. We find them almost without exception in shady or semi-shady locations. We find associated with the Blood Root, the Hepatica, Jack-in-the-pulpit, May-apple, Dutchman's Breeches Dog's tooth Violet, Violets, Anemones, Spring Beauty and Wild Ginger. Blood Root is one of the ground floor plants of the deciduous forests, and in the neighborhood of Philadelphia, it is found on the floor of the deciduous forests along Crum Creek, Cobb's Creek, Darby Creek, Neshaminy Creek, and the Pennypack. Blood Root is widely distributed thruout the region of the United States east of the Rocky Mountains. West of the Rockies it seems to be practically unknown. Specimens have been obtained in the following regions of the named States:

NEW ENGLAND

MAINE: Augusta, Brunswick, Cambridge, Dixfield, Farmington, Island Falls, Livermore, Macardis, Orono, Patten, Sangerville, Strong, Vassalboro.

NEW HAMPSHIRE: Exeter, Hancock, Kensington, Lancaster, Northumberland, Plymouth.

VERMONT: Barnet, Burlington, Johnson, North Herd, North Pownal, Peacham, Townshend, Westminster, Willoughby.

MASSACHUSETTS: Adams, Ashburnham, Beaver Brook Reservation, Blue Hills, Bradford, Brookline, Byfield, Malden, Melrose, Montague, Mt. Tom, Noxquit, Northfield, Russell, Roxbury, Sheffield, So. Hadley, Cambridge, Canton, Colerain, Granville, Greenfield, Gill, Lexington, Stoneham, Sunderland, Waltham, Waverly, West Roxbury, Weston, Whately, Williamstown, Woronoco, Wyoming.

RHODE ISLAND: Cumberland, Cumberland Mills.

CONNECTICUT: Meriden, South Windsor, Middlebury, North Guilford, Southington, Trumbull.

ATLANTIC COASTAL STATES

NEW YORK: Binghamton, Brooklyn, Canton, Deerfield, Elmira, Morris, Tioga Co., Waverly.

PENNSYLVANIA: Allegheny, Baumgardners, Chester, Conestoga, Delaware, E. Dauphin, Franklin, Harrisburg, Huntingdon,

Lancaster, Merion, New Hope, Northampton, Pittsburg, Safe Harbor, Valley Forge, Wrightsville.

NEW JERSEY: Mt. Tabor.

DELAWARE: Wilmington.

MARYLAND: Harper's Ferry, Rock Creek Park. Throughout the State.

DISTRICT OF COLUMBIA: Brockland, Chevy Chase Park, Rock Creek, Wood Ridge.

VIRGINIA: Alexandria Co. (Mt. Vernon), E. Buchanan, Hungry Hollow, Marion, Rosslyn, Smythe Co., Walker Mt.

NORTH CAROLINA: Biltmore, Lynn.

GEORGIA: Americus, Sumter Co.

GULF AND INTERIOR SOUTHERN STATES

FLORIDA: Chattahoochee, Jacksonville.

ALABAMA: Auburn.

ARKANSAS: Eureka Springs, McNab.

MISSOURI: Allanton, Blackwell, Bower's Mill, Cliff Cave, Courtney, Creve Coeur, Eagle Rock, Joplin, Kansas City, Kimmswick, Lake Grandin, Lawrence, London, Meramac Highlands, Forest Park, Jackson Co., Jefferson City, Jerome, Newton Co., Reading's Mills, St. Louis.

KENTUCKY: Bowling Green, Burgin.

TENNESSEE: Beaver Ridge, Duck River, E. Tennessee, Knox Co., Knoxville, Northern-Tennessee.

WEST VIRGINIA: New Bucklin, Upshur Co.

MISSISSIPPI VALLEY

OHIO: Cincinnati, Collamer, Columbus, Cuyahoga Co., Dayton, (Generally distributed throughout State.)

ILLINOIS: Athens, Decatur, Elgin, Ft. Sheridan, Glencoe, Golf, Grocelan, Hinsdale, Joliet, Kankakee, Maywood, Oquawka, Peoria, Urbana, Winnebago Co., Worth, Hennepin.

INDIANA: Cooks Co. (Silver Creek), Bluffs of American Bottom St. Clair Co.

IOWA: Ames, Decatur.

WISCONSIN: Bear Lake, Eagle Heights, Preble, Pueblo.

MICHIGAN: Alma, Jackson Co., Sawyer, Turin.

NORTH DAKOTA: Fargo.

SOUTH DAKOTA: Brookings Co., Whitewood.

NEBRASKA: Council Bluffs, Northeastern Neb.

KANSAS: Leavenworth Co., Quindaro.

OKLAHOMA: Shawneetown.

TEXAS: (Marshall-Harrison Co.).

CANADA

Battersea, Ontario. Belleville, Nova Scotia. Kingston, Ontario
Perth, Lanark Co. St. Thomas, Elgin Co. Charcoal, Victoria
Co., N. S. Woodstock, N. B. Garmouth, Utopia. Park
Stanley, Michipicotin Island. Gloucester Co., Hammond.
Quebec, Montreal. Lake Superior, Oaklands near Hamilton.
Low Grounds, London, Toronto.

I am indebted to Dr. Youngken of the Philadelphia College of Pharmacy, Dr. Millspaugh, Curator of the Field Museum of Natural History, Dr. B. L. Robinson, Curator of Gray Herbarium, Prof. N. L. Britton, Director of Botanic Museum, Bronx Park, Prof. Stewardson Brown of the Academy of Natural Sciences, Dr. F. V. Coville, U. S. National Herbarium, and Dr. Jesse M. Greenman, Herbarium of the Missouri Botanical Garden for much of the above data.

On pages 358 and 359 and from pages 382-396 in "Phytophenology in its Application of "Contributions from the Botanical Laboratory of the University of Pennsylvania," Dr. Marion McKenzie has given some interesting records which she has made on Blood Root with regard to plant growth under varying conditions of temperature and illumination. The results are not given here, because it has no direct relation to my problem.

The Messenger

WILLIAM PRINDLE ALEXANDER

The Seneca Indians had a most beautiful traditional belief, the substance of which is set forth in the following verse. It was believed that the near kin of a maiden might communicate with her after death by taking a fledgling bird with the hair of the departed, and teaching it the message of love which it was to bear to the girl when liberated; this was done when the bird first began to sing. The custom was long practiced by this tribe.

An old Sachem speaks:

She is dead, brethren dead,
And her spirit like the roe
Swift has fled:
Take her body to its bed
In the arms of swaying trees
When the morning makes the breeze
Sing soft and low:
When the war-club that is woe
Made her brothers feel its blow,
Bent her father's ancient head,
Left us only power to know
That her Spirit wings were spread,
And the maiden straightway fled
To the rest and peace of Gitche Manito.

Go! my sisters, make a snare
Of the maiden's gleaming hair,
And make captive of some little bird that sings;
One that never felt its throat
Swell with wild and wayward note,
And but late grew bold upon its feathered wings.
Build a house of bough and reed
And with mystic shell and bead
From the maiden's breathless bosom, make it bright,
Till it sing both loud and well,
And its voice with yours, in tenderness unite.

Nay, your footsteps cannot pass
Like the sunbeam o'er the grass,
To the Spirit-land, beyond the distant hill;
But the singing bird can bear
Soft and swiftly through the air,
All your tenderness to her whose voice is still.
So let your sad heart teach
Words of love, in gentle speech,
That our messenger, may weave them in his song;
He will know the way to go,
He will know, he will know
Though the way be dark, and wearisome, and long.

Oh! you shall not think of rest
Till the arrows from your breast
Are out-torn, and with the fleet-winged singer laid;
Then shall you take your way
When the twilight veils the day,
To the sweeping trees, where sleeps the gentle maid.
There give him liberty
Let the feathered one go free,
Oh! sisters bid him hasten to her hand;
Bid his bursting throat outpour
All the sorrow that you bore,
Since she fled afar, to dwell in Spirit-land.

"No people should be forbidden the influence of the forest. No child should grow up without a knowledge of the forest; and I mean a real forest and not a grove or village trees or a park. There are no forests in cities, however many trees there may be. As a city is much more than a collection of houses, so is a forest much more than a collection of trees. The forest has its own round of life, its characteristic attributes, its climate, and its inhabitants. When you enter a real forest you enter the solitudes, you are in the unexpressed distances. You walk on the mould of years and perhaps of ages. There is no other wind like the wind of the forest; there is no odor like the odor of the forest; there is no solitude more complete; there is no song of a brook like the song of a forest brook; there is no call of a bird like that of a forest bird; there are no mysteries so deep and which seem yet to be within one's realization."

The Holy Earth by L. H. Bailey.

Bird Notes from Brandon, Vermont

CARRIE W. ORMSBEE

Mar. 24, 1917. "Wouldn't have missed it for anything, of course I wouldn't, this afternoon's walk!" I had been busy with Spring sewing in the morning but when it was mentioned at dinner, that bluebirds had been seen in Rutland day before yesterday and yesterday in Pittsford only eight miles away, I made up my mind, no matter how many other things might demand my time in the afternoon, I must go bluebirding—and 3:30 found me on my way.

I turned off the road above the church to the left through the entrance guarded in summer by a wicket gate—open now—and made my way up the steep path to the ledge slowly, for I had to strike my heel into the soft snow at every step and then wait for my rubber to melt in a bit in order to gain a foothold. The snow had melted off the rocks and moss and I soon stood still, delighting in the warm, bright sunlight and in the promising "tsweet, tsweet" coming from the bushes and thorn-apples below. This continued and I soon began to see flittings in and about and before long I had caught sight of a pair of chickadees, that seemed intent upon scanning the twigs and branches carefully and to be pecking at them, cocking their heads now on this side now on that; and certainly they were saying: "Syr-up dee-dee! syr-up dee-dee!" Surely they could not be trying to draw sap from those bushes! At any rate I am quite sure now, that chickadees, as well as the rest of us, must somehow be enjoying Vermont's new-syrup season. Soon they emerged from the thicket and flew about among the trees by the roadside and down to the ground beyond some fence rails. Led on I soon wished I had wings too, for how was I to cross the new brook that had appeared in the pasture? Well, it was too wet to stay where I was, so over I went quite safely, from mound to stone, from stone to mound. Then I was confronted by a high wire fence with barbed wire strung on the further side. I put my opera glasses through, took off my hat and put it over, then tried to crawl under. Oh, but the ground was wet! Discovering a place by an elm tree where the barbed wire had not been strung I climbed the high outer wire fence square by square and gained the other side only to cross a narrow strip of pasture and then be obliged to crawl through some immovable bars.

I was out upon the main road and slowly climbing a hill when—listen! there were the very notes I had been longing to hear. Two

bluebirds over in the tree yonder were telling me with greatest complacency, that spring is "tru-al-ly" here. They were too far away on the other side of the old garden with its summer-house and, alas, wet ground and two fences, for me to get nearer and from the road I could not even with my glasses catch the blue but there was no mistaking the voices or the message. I had seen and heard two bluebirds.

On I went everywhere meeting more brooks than one could count. The tranquil, tiny brook, that trickles down through a rocky pasture in summer—the one that gives us the lovely forget-me-nots in June—was a tumbling, seething little torrent, flecked with foam. It had rapids and a great pool swirling round the big rock at the roadside and after it had crossed under the roadway, as it went leaping down the slope, it boasted a series of cataracts. Little unknown brooks were continually crossing the road in the most unexpected places seeming to say: "Now watch and see what I can do!" What an amount of good it does us all to find things out-of-doors alive again and Spring "tru-al-ly" here!

Mar. 25. as soon as I wakened I could not help knowing that the robins had come. During the day I watched three. As I started to walk up our street I was attracted by some modest notes coming from half way up an old, tall tree, whose branches had been chained together. I levelled my glasses at a rufus-crowned sparrow, that seemed to be sitting on the upright trunk in a way that puzzled me. As I walked all about trying to get a good view with my glasses my little friend sat chirping away quite undisturbed. The breast was light gray with a not very marked dark longitudinal streak just below the throat. The bird suddenly disappeared, in an instant reappeared and walked out a branch, when I saw the very neat hole, on the edge of which it had been sitting and which was evidently the entrance to its home. Do you think it was a chip-ping sparrow? I may be able to tell you better what I think later. Further up the street in another old tree a similar sparrow, with however, a fluffier breast, seemed equally unconcerned as to my movements. Here the loud notes of a hairy woodpecker called me across the street to watch his busy labors.

As I came near a bit of woodland I stood for several minutes listening to the unexpected plaintive notes of a wood pewee, which our Vermont Bird List gives as arriving toward the last of May. A friend living out in the country, upon whom I called, informed me she had been listening to red-winged blackbirds listed "about the middle of April."

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN
ELEMENTARY SCHOOLS

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Editorial

NATURE-STUDY FROM A CAR WINDOW

We are quite sure that we should be able to identify South Carolina by its trees, supposing other evidences of its individuality were lacking. For one long, beautiful, sunny day the trees that decked the broad acres of this venerable State waved branches at us as we journeyed southward by train, with the result of making us feel very well acquainted indeed.

We began in the morning with thousands of acres of scattered pines. At first the species was the Northern Pitch Pine (*P. rigida*), but ere long, this gave way to a species of much longer needles and longer cones. There were two remarkable things about the growth of these pines: one, that they were always sparsely set, as if Nature knew the amount of soil and water available for each tree; and the other, that often there would be many acres with trees of the same height and age as if due to the work of foresters; and yet the surroundings belied the practice of scientific forestry. But there they were, making us think in a desultory fashion of those forests in Europe where each block of woodland is painfully monotonous in size of its trees. These pines of South Carolina are straight and tall, especially the long leafed species; and the seedlings were such funny youngsters, each lifting up one mighty tassel of leaves a foot long, evidence of its year-old-ness; while the three-year-olds reached out tassel-tipped branches like whisk-brooms only they were green and vital. Here and there through these scattered pines a road wound its way in and out, hardly more than a well worn trail, it gleamed

white like a silver ribbon, losing itself in mystery even as it began in mystery; for why should any road begin where there is no sign of habitation! And after beginning, why should it ever end when one mile of it is like every other mile, winding in and out among the pine boles!

In some regions, scattered among the pines were deciduous trees,—oaks, probably black-jack and Spanish. Quite often a sycamore would lift its great blotched branches gleaming in the sunshine; these southern sycamores are more majestic than ours of the North. Also there were many straight, splendid tulip trees, their branches dotted with their compound seed capsules.

As the day wore on we occasionally passed through a cypress swamp: straight grey trunks arising like columns from their swollen bases, their upper branches draped with grey moss, the grey, still waters below knobbed with the sharp knees, otherwise mirroring perfectly the picture above,—a wonderful duplicated study of a *waterscape in ashen grey*.

Approaching the vast marshes of the coast, the character of the trees changed, the pines mostly gave way to the live oaks, the water oaks, and the white cedars. These cedars have solid crowns, very dark green, almost black but along their margins as they stand silhouetted against the sky, are wisps of fine foliage. The water oak is generally straight bodied and a far more conventional tree than its neighbor the live oak. Its foliage is almost willow like and in January it begins to turn brown.

The live oak is surely one of the most picturesque of trees. Its broad, solid, rounded crown of shining, polished, dark green leaves is supported by a rather short, stocky bole often four feet or more in diameter; the magnificent lower branches come off at more than a right angle and extend out perhaps for thirty feet; these giant branches are not straight, but irregular as if they had at different periods of their existence experienced an impetus to grow up or down or sidewise, the result being a majesty of uncertainty; sometimes one of these limbs being so heavy and so long would droop so that it rested on the ground; fit support are these giant-branches for the magnificent crowns that seemed like an army camp of rounded tents against the sunset sky.

What could be more interesting to a nature lover than a wide car window through which to see a movie picture of pines in the morning, cypress swamps at noon and live oaks in the evening!

News Notes

CALIFORNIA

The following note appears in the last number of *The Blue Bulletin*:

The commissioner of Elementary Schools made a tour this spring of San Luis Obispo County. In many of the schools patriotic programs rendered by the children showed how, even in the most remote districts, the teachers were alert and loyal leaders.

Miss Marguerite Shipsey, who teaches the Los Berros School, has kindly sent me the photograph of two little Japanese boys in her school. The elder, Akira Saruwatari (Second Grade), recited the following lines with so much patriotic spirit that every member of the audience, both children and adults, cheered him to the echo, while his proud young mother smiled her approval and happiness. Thus do we train, not *for*, but *in*, Americanism:

A SMALL BOY'S OFFERING

I have two hands, no more, no less,
Eight fingers and two thumbs;
These hands belongs to Uncle Sam
Whenever trouble comes!

I have two feet, that's all I have, but
Let me say right here
They'll march to time for Uncle Sam
Whenever danger's near!

I have one head—no more, you see—
Poor gift it is indeed;
That head is Uncle Sam's to use,
Whene'er he feels the need!

I have one heart; it beats right here
It's ever on the job.
It's beating now for Uncle Sam
With true and loyal throb!

M. S. M.

MISSOURI

Prof. J. Andrew Drushel has prepared a course in Nature-Study for the seventh grade of the St. Louis schools. It is devoted to different phases of the study, an important part of which is the mapping of all the shade trees in each school district by the pupils.

PENNSYLVANIA

Mrs. E. S. Campbell who gave us the interesting story of the "Little Red School House" now adds the last chapter of its activities: "On November

nineteenth I had our first community fair which was held at the School House. I did not expect many entries but knew we must have a beginning. What was my surprise and delight to have between two hundred and two hundred and fifty entries of canned fruits and vegetables, needlework and poultry. About thirty-five women came in the afternoon to listen to an open meeting on Household Economics and over two hundred men and women attended the evening meeting. The people were surprised themselves to see the splendid things from their own community. They enjoyed it and decided to have a larger one next year.

My program for the winter's work is purely economic. For the children, current events and a selection of books in their circulating library supplementing their school work. The community evening meetings are to be practical. First, a series of three sets of slides on the "Finding of the New World," "Our Period of Independence" and "Our Natural Resources," informing them a little on why, we, as a country now stand preeminent. Later, "Insects," "Bird Control" and "Spray Control," with whatever may come up that we feel we need. The Poultry Club are doing their winter's work in an egg laying contest and the women have had the first of three demonstrations on Household Economics. The best part of all is that now they want to come and take part.

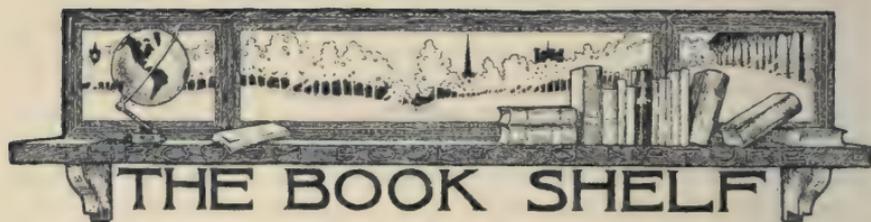
TO OUR SUBSCRIBERS

Please note your expiration date and send in your renewals promptly, as The War Industrial Board has requested all newspapers and magazines to adopt the following regulation:

"No subscription to be continued after expiration, unless renewed and paid for."

Owing to the increased cost of paper and printing, also to the fact that The Nature-Study Review has not raised its subscription price, we will print only enough magazines each month to cover the subscription list and its normal increase.

A blue check on the wrapper indicates that your subscription expires with this number.



Manual of Vegetable-Garden Insects. Cyrus Richard Crosby and Mortimer Demarest Leonard of The New York State College of Agriculture at Cornell University. The Macmillan Co. \$2.50.

Any entomological book of which Professor Cyrus Crosby is the author is sure to be thoroughly scientific, practical, up-to-date and reliable. This volume was written by Professor Crosby and Mr. Leonard, his assistant in laboratory and field work for several years and who is an excellent observer, as well as a practical economic entomologist. The book is all that we might expect from these authors. It is clearly written, comprehensive with no padding and gives the last and best advice as to the control of the insect pests of the vegetable garden.

The injurious insects are treated in groups—each chapter dealing with insects damaging a certain plant. The following is a list of the chapter headings with only a few of the insects named. Insects injurious to cabbage and related crops as the cabbage aphis, the turnip aphis and the imported cabbage worm; Pea and Bean Insects as the Pea and Bean weevils, the Bean Ladybird and Bean Thrips; Beet and Spinach Insects as the Spinach leaf-miner and aphis and the Beet leafhopper; Insects injurious to Cucumber, Squash and Melon; Potato Insects as the Colorado potato beetle and potato aphis; Tomato Insects; Eggplant Insects; Insects injurious to Carrot, Celery, Parsnip and Related Crops as the Black Swallowtail butterfly and the Parsnip leaf-miner; Asparagus Insects; Corn Insects as the Corn root-aphis and Stink-bugs; Sweet Potato Insects; Onion Insects, as the onion maggot and thrips; Insects injurious to minor vegetable crops as Rhubarb and Lettuce; Cutworms and army Blister-Beetles; Flea-Beetles and Unclassified Pests as Wireworms and Grasshoppers. The final chapter takes up Insects and Insecticides.

Old Crow and His Friends. Katharine B. Judson, author of "Old Crow Stories" with illustrations by Charles Livingstone Bull. Little, Brown & Co. \$1.35 net.

This author has written attractive stories of Old Crow before and in this new book she offers as fine a collection of children's stories as one could wish for. These are stories which Indians related to their children years ago to the great delight of young and old. The originals are from authentic sources and the author relates in very simple yet clear and forceful language these old magic stories full of life and the great woods and out-of-doors. There are principal characters throughout the stories as "Rabbit the leader in all the mischief."

"Otter with the finest coat of long, smooth, soft fur," "Grizzly Bear," "Old Crow," Coyote and many others. The chapters are short and each makes a nice little story in itself. There is great variation in the action of the stories and the exciting parts are written in a pleasing manner. Many very clever lessons are brought out as an explanation of nature's ways. Thus Fox is red to this very day because he was so ashamed when all the others laughed at him after he had tricked Eagle out of some eggs and Eagle had carried him away out to sea and left him on an island. Then, too, Otter lives in the water always because once upon a time, Rabbit, in order to steal Otter's coat for himself, threw hot coals in the air and shouted, "It's raining fire," then scampered off with the coat while poor Otter ran to the water to put out the hot coals. And so this book is full of just such interesting and fascinating tales which are always one of the child's greatest pleasures. The striking pictures by Charles Livingston Bull are a real feature of this book. Children who can read will find this a pleasing book and surely it is just the kind that mothers find especially helpful in guiding the young child's mind and answering the many questions. It is bound to keep a child interested at any time.

Knowing Insects Through Stories. Floyd Vralliar. Funk and Wagnalls Co. \$1.60.

This is a book full of interest to anyone who cares about nature or the multitude of small creatures living about us. The author possesses a great sympathetic imagination which combined with the reason of a scientific man gives us the facts and laws of nature in terms both of reason and of imagination. The book is full of facts for the author constantly preserves an essential scientific accuracy. He has written the material in such a way as to enable readers to lay a scientific foundation for future study. It is bound to lead one to search out new little acquaintances which are willing to become most intimate friends. There are excellent stories of Butterflies and Moths, Beetles and Weevils, Grasshoppers, Crickets and Silver Fish, Bees, Wasps and Ants, Bugs and Flies and also "Madam Doodleburg" and other "Divers Little People." There are good illustrations, many of which are colored and as a further aid, in learning these little known friends of ours, the author gives keys at the end of each part which are quite simple and understandable. This book proves that there is much of interest in the common things about us. It is bound to awaken the interest of its readers, both young and old, and is certainly a most helpful book to build a foundation for nature-study and systematic knowledge along these lines. Surely it will appeal to anyone with a mind the least bit in harmony with such things.

HOW TO KNOW THE BUTTERFLIES

A Manual of the Butterflies of the Eastern United States, by

JOHN HENRY COMSTOCK

Emeritus Professor of Entomology, Cornell University

AND

ANNA BOTSFORD COMSTOCK

Assistant Professor of Nature-Study, Cornell University

This work contains descriptions of **152 species** and **varieties** of butterflies. This includes **all** of the species and their named varieties found in the eastern half of the United States excepting a few extremely rare forms.

There are 45 plates with 312 figures showing the insects in their **natural colors** and 49 figures in the text.

12mo.
Cloth,
\$2.50 net;
postage,
20c. addi-
tional.

The work is written in popular form without being superficial, and will serve as a Baedeker among Butterflies to the casual observer or the close student of this most picturesque phase of nature.

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Gardening and Nature-Study in the Cincinnati Schools

By ROLAND W. GUSS

Director of School Gardening, Cincinnati, Ohio

The tentative time value assigned to "Nature and Geography" in the Cincinnati Schools is 60 to 175 minutes per week in the first four grades, 120 to 210 minutes per week in higher grades. Nature but not geography receives attention in the lower grades while geography is stressed in the upper grades. One hour per week in school time is allowed for garden-work when and where this can be arranged for, but under the pressure of necessity for food production, this time has been extended in upper grades to one-half day per week (not necessarily taken from geography time), during the planting season at least, in case of children cultivating not less than $1/20$ acre in school gardens under supervision. Children using school time for garden work are expected to give at least an equal amount of time outside of regular school hours to supervised garden work and in fact when they are allotted space in a school garden, both they and their parents sign an agreement that the children will care for it under direction throughout the summer unless excused.

It is safe to say that the nature-study which prepares for, consists of, and grows out of garden work has had here more attention, more supervision, more tangible results, and we think results more vitally affecting the lives of the children than other nature work undertaken without special supervision.

To carry on this work there are, besides the director, eight supervisors, each in charge of gardening work in a number of schools, five or more assistant supervisors, and about thirty-five teachers of gardening. Nearly all schools which have or can secure any facilities are given supervision. Five of the supervisors now devote the entire year, except two months' vacation in the winter, to teaching and supervising gardening and the related nature-study. The writer's course of study, published in *THE NATURE-STUDY REVIEW*,

May, 1916, though not slavishly followed, indicates the general character of the work. The other teachers of gardening are usually regular teachers in charge of a room and devoting after-school and Saturday time to garden work in spring and fall and, except one month's vacation, full time, through the summer, for which they receive extra pay. They visit and instruct children at their home gardens (of which there have been about 12,000 the past season), as well as in school and in school gardens. Those having gardens receive a grade on their report cards and buttons or other badges if earned. The Board of Education has expended more than \$15,000 for the work during the year. Supervision of poultry clubs is to be added the coming year and a substantial increase in the budget has been allowed.

The director conducts a course in connection with the Teachers' College at the University of Cincinnati, intended to qualify persons for positions as teachers of gardening.

Reports from about 11,000 of Cincinnati's "Junior War Garden Volunteers," who wear the insignia of the U. S. School Garden Army, show that on about 160 acres of school and home gardens they raised during 1918 nearly \$40,000 worth of vegetables, which is at the rate of \$242 per acre.

Fifteen hundred children, who gardened the past season in about 50 school gardens, having a total area of 37 acres, produced nearly \$9,500 worth of vegetables, or \$256 worth per acre. Children report from their home gardens, which had less close and constant supervision from the teachers, an average production of \$240 per acre. There were 600 children in the "Market Garden Clubs" who cultivated at least 1/20 acre apiece through the season (total 45 acres) and harvested \$14,500 worth of vegetables, or \$322 worth per acre. From the children's gardens at least 2,035 quarts of vegetables were canned by them and 11,841 quarts by their parents and others.

The expense for plowing, fertilizer and seeds of the school gardens was \$2,220. Of this the Board of Education advanced \$1,538 and the children have repaid to the Department so far about \$675.

Car tickets to the value of \$226 were furnished by the Board and other friends, to transport down-town children to suburban gardens. Two hundred seventeen of these children have cultivated nearly 11 acres and produced more than \$1600 worth of vegetables. Including car tickets furnished but not the cost of

supervision, the net expense to the Board of Education was about \$600. Most of these children traveled more than five miles to reach their gardens.

One school garden of two acres cultivated by 30 children of a suburban school yielded produce worth \$1056. Children kept record books. The reports, from various schools, of at least fifteen children having gardens which averaged more than $1/20$ acre in size, show production values in excess of \$550 per acre. An eighth grade boy raised on two house lots ($4/20$ A.) \$166 worth of vegetables and a seventh grade girl on $1/20$ acre in a school garden raised \$58 worth. The production of several children was at the rate of more than \$800 to the acre.

The total value of the produce raised by our school children under supervision amounts to nearly three times the entire budget, of the Gardening Department. By placing emphasis here upon financial returns, we do not mean to underestimate the educational values of such work which are no less, but rather more, because the nature-knowledge acquired and the supervision received made such results possible. The educational values of the work need not here be defended. They are not less because the instruction given leads to practical results which can be estimated in dollars and cents. The fact that such results are in direct proportion to the amount of instruction and supervision makes it easier to interest *children and parents* in the nature knowledge which contributes to the results. Fundamental moral values are secured through inculcating habits of thrift. Aesthetic values can as well be derived from the study of plants and animals, forces and processes met with in a garden as in a weed-patch or a forest or anywhere else.

Transportation of City Children to the Suburbs For Gardening

ROLAND W. GUSS

Cincinnati, Ohio

In order to make it possible for down-town children to cultivate larger gardens in the suburbs and in order that none may be prevented from doing so by their inability to pay car fare, the Board of Education of Cincinnati has made \$500 available for the purchase of car tickets which are to be in the hands of the garden teachers

and supervisors at the gardens and to be given to children who must use the cars to reach their gardens. Two hundred and twenty-five children who will each cultivate one-twentieth acre or more are in this group, representing fourteen schools.

REGULATIONS

Following are the regulations governing distribution of these tickets:

1. Tickets are to be given only after completion satisfactorily of a half day's work under supervision on at least one-twentieth acre.

2. Once a week or not more than twice, according to need, a car ticket to return home and one to come again to the garden are to be given, on above conditions, during the first ten weeks (up to the latter part of July) and during the following ten weeks once a week, only on condition that satisfactory work has been done up to that time and that the child has paid his own fare at least once a week during the first ten weeks.

3. In order to receive car tickets children are required to work in their gardens at least two half days or one whole day per week during the first ten weeks unless excused. During the second ten weeks one-half day of work per week may be accepted if that is all that is needed.

REPAYMENT OF EXPENSES

4. Only those may receive car tickets or harvest crops from their gardens during the second ten weeks who shall have paid by August 1 their share of the estimated expenses for the season for fertilizer, plowing and seeds furnished.* provided crops of sufficient value can be raised.

Children shall pay for fertilizer and plowing only on land in excess of one-third square rod, but in no case more than \$2 for one-twentieth of an acre nor more than one-half of the value of the produce, of which careful record must be kept, but all children provided with seeds are expected to pay pro rata in advance for seeds furnished, at wholesale price.

*In 1919 one-half the estimated share of the expenses is to be paid in advance.

A Flexible Planting Plan

WALTER A. BAUSCH

Supt. Market Garden Club Work

For Grades 3-6

(*Vegetables Only*)

For Plots 15 ft. by 6 ft. or More

The figure in parentheses after the name of each plant indicates the grade for which that plant is recommended, but higher grades may choose those plants also. The "*early crop*" plants should be planted first. (See planting tables for distances between plants.)

The figures at the beginning of paragraphs indicate the distances of rows from end of plot.

CHOICES OF PLANTS

6 in.—Beets (3), carrots or Swiss chard (4), kohlrabi (5), parsnips endive or onion seed (6).

1 $\frac{3}{4}$ ft.—Bush beans (3), turnips or kohlrabi (5), or same as at 6 in. Any of these may be preceded by *early* radish, lettuce, spinach, beets, or onion sets.

2 $\frac{3}{4}$ ft.—(For early crop). Radish (3), lettuce, curled or head (3), or spinach or onion sets (4), or early beets (3), or dwarf early peas.

4 ft.—Tomatoes (3 or 5), cabbage (5), potatoes or corn (6). Early radish, lettuce, etc., may be grown in the same row with either of the first two. Early sweet corn or potatoes may be followed by beets or beans, turnips or kohlrabi in the same row and between the rows, i. e., at 2 $\frac{3}{4}$ ft.

5 $\frac{1}{2}$ ft.—(For early crop). Same choices as at 2 $\frac{3}{4}$ ft.

7 ft.—Sweet corn or pop corn (6), tomatoes (3 or 5), cabbage, seed or plants (5), potatoes (6), cucumbers or bush squash (6), pole beans or tall peas.

8 $\frac{1}{2}$ ft.—(For early crop). Same choices as at 2 $\frac{3}{4}$ ft.

10 ft.—Same choices as at 4 ft.

11 ft.—(For early crop). Same choices as at 2 $\frac{3}{4}$ ft.

12 ft.—Same choices as at 1 $\frac{3}{4}$ ft.

13 $\frac{1}{4}$ ft.—Same choices as at 6 in.

14 $\frac{1}{2}$ ft.—Same choices as at 6 in.

For the last two rows another row of bush beans at 14 ft. may be substituted. Climbing beans may be grown along the fence.

In plots only 10 ft. long, instead of the last six rows substitute bush beans or turnips, etc., at 9¼ ft.

A FLEXIBLE PLANTING PLAN FOR HIGHER GRADES

For larger gardens, 1-20 acre gardens, 60 x 36 feet, etc.

First crop in small letters. Second crop in italics. (Distance of each row from the preceding at the left.)

Spinach, onions, radish or lettuce

- (April) *beans* (bush string) or *beets* (Aug. 1)
- 18 in. Sweet corn (May 1) . . *beans* (string) or *beets* (Aug. 1).
- 18 in. Spinach, onions, radish
lettuce (April) *beans* or *beets* (by Aug. 1).
- 18 in. Sweet corn (May 1) . . *beans* or *beets* (Aug. 1).
- 18 in. Spinach, onions, radish
or lettuce (April) *beans* or *beets* (by Aug. 1).
- 18 in. Sweet corn (May 1) . . *beans* or *beets* (Aug. 1).
- 18 in. *beans* or *beets* (by Aug. 1).
- 18 in. Potatoes or peas (April)
- 18 in. *late sweet corn* (July 1).
- 18 in. Potatoes or peas (April)
- 18 in. *late sweet corn* (July 1).
- 18 in. Potatoes or peas (April)
- 18 in. *late sweet corn* (July 1).
- 18 in. Potatoes or peas (April) or
- 18 in. *lima beans* (June 25).
- 18 in. Potatoes or peas (April)
- 18 in. *beans* or *beets* (by Aug. 1).
- 18 in. Potatoes or peas (April) . *beets* (Aug. 1).
- 36 in. { Onion sets, endive, lettuce,
- 36 in. { radish or spinach planted *tomatoes* or *late cabbage* (May).
- 36 in. { in April if possible in the *tomatoes* or *late cabbage* (May).
- 36 in. { rows were *tomatoes* or cab-
- 36 in. { bage is to stand; also be- *tomatoes* or *late cabbage* (May).
- 36 in. { tween the rows *tomatoes* or *late cabbage* (May).
- 18 in. Lima beans (June)
- 18 in. Lima beans (May 1-15) . *turnips*, *beets* or *beans* (July).
- 18 in. beans (string) or kohlrabi
(May) *turnips*, *beets* or *beans* (July).

- 18 in. beans (string) or kohlrabi
(May) *turnips, beets or beans* (July).
- 18 in. Carrots or beets (Apr. 15-
June) *turnips, lettuce or endive* (July 15).
- 18 in. Carrots or beets (Apr. 15-
June) *lettuce, endive, or turbins* (Aug.).
- 18 in. Carrots or beets (Apr. 15-
June) *lettuce, endive or turnips* (Aug.).
- 18 in. Turnips (April) *beans, beets, lettuce or radish* (July).
- 18 in. Turnips (April) *beans or beets* (July 15)
- 18 in. Parsnips or onions (April-May)
- 12 in. Lettuce, onions or radish
(April) *turnips or beans* (July).
- 12 in. Onions or parsnip (Apr.-May)

By omitting five rows of corn, potatoes, or tomatoes, for example, and making the rows longer this plan can be adapted to one-twentieth acre plots 45 x 48 ft. By adding four such rows it can be adapted to plots 72 x 30 ft. which also contain one-twentieth acre.

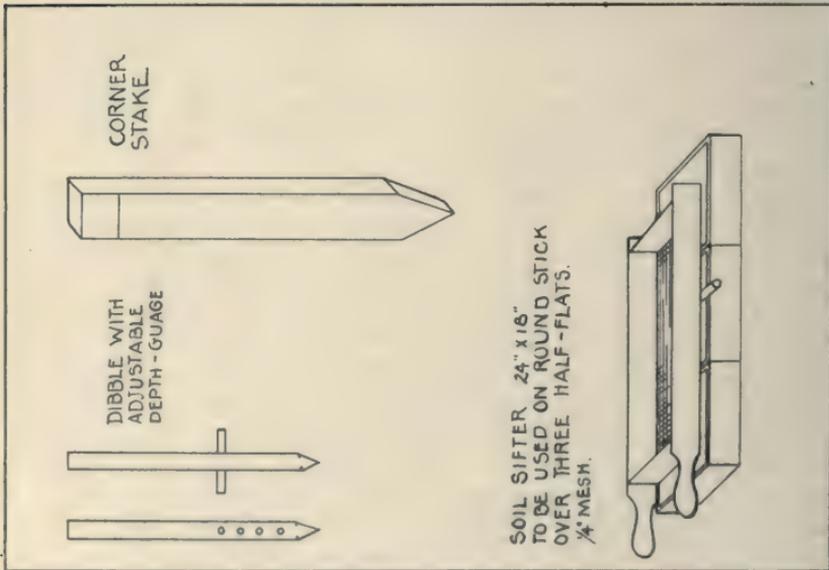
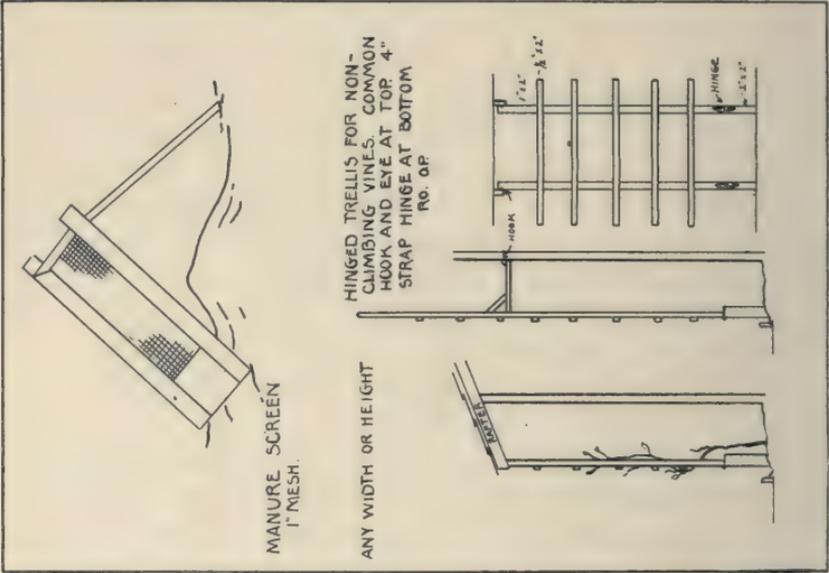
News Notes from California

As a result of the work of the studies of Mr. and Mrs. C. M. Goethe abroad during more than a decade, the European Nature-Study Field Excursion is to have a rather extended test in California here this coming summer. It is a part of the work looking toward an International Recreation Clearing House and is a continuation of the demonstration playground which Mr. and Mrs. Goethe are conducting in Calcutta.

A group of summer resorts at Lake Tahoe will probably be selected for the testing by the State of California, of directed nature-study walks.

Preliminary tests of the work have been made at Yosemite and at Catalina Island by the California Fish and Game Commission and elsewhere in California by the California Nature-Study League. The more ambitious experiment next summer will be in charge of Dr. H. C. Bryant of the University of California and will be under the auspices of the Fish and Game Commission. Dr. Bryant will take a limited number of people on the tramps to acquaint them with the wonders of high mountain wild life. In the evening he will give lantern slide or camp fire talks on the bird, mammals, wild flowers and trees of the high Sierras. It is possible arrangements may also be made for moving pictures of wild life. It is also planned to have small libraries of Nature-Study books, preferably under the California Library system.

The continued experiments are based upon observations of similar work in Switzerland, Holland, and Denmark by C. M. Goethe, President of the California Nature-Study League. They are part of a foundation being laid for an International Recreational Clearing house to be later established in New York City.



Co-operation of Shop Work and Gardening in the Schools

W. E. HALE

Schools are established for the education of the child. Sometimes it almost seems that they are established to exploit this or that department of school work as full co-operation of one department with another to accomplish the real aim is so infrequent. The gardening department can lend material assistance to the geography department by raising products needed for illustration and to a limited extent carry out harvesting methods. Many school gardens on small plots have grown flax, cut and retted it; peanuts have been stacked in the peculiar shape adapted for drying them; corn has been cut with a corn knife and shocked and root crops have been stored by approved methods.

The manual training department can be of vital use to the garden department. A helping hand from the shops will drive home the lessons of thrift and economy that the garden aims to teach. Children should be taught to repair or replace broken tool handles; straighten the rake's teeth; sharpen hoes and spades. The manual training department of the Los Angeles schools saved the garden department of that city a large item of expense for labor and at the same time gave its work a most practical turn by fencing new gardens and repairing old fences; building lath houses, cold frames and hot beds; making tool boxes and hinged trellises. This latter is a very suggestive home device for there are still many who prefer that vines shall not be attached directly to their houses. The trellis is fastened by a strap hinge to a 2" x 2" post driven into the ground and fastened to the building by means of hooks and eyes. By unhooking the trellis painting can be easily done without disturbance to the vines.

Many useful tools can be made completely in the shops. A ten inch length of $\frac{1}{2}$ " dowelling, rounded at one end and pointed at the other makes a handy dibber for small bulbs. To aid little children, holes $\frac{1}{4}$ " in diameter should be bored an inch apart. A two inch length of $\frac{1}{4}$ " dowelling inserted at the required depth of planting will insure that the seeds are not buried. Plant labels; labels for rows and corner stakes are easily made and are needed in large numbers. For the greenhouse seed flats and sieves and trays for carrying plants are not too difficult for boys who have been trained

in the use of the saw and the hammer. Their ingenuity is brought into play as the figure shows in which the simple addition of a broom handle lightens the work of sifting the soil and filling the flats. Every article mentioned is valuable for the home garden and to the mind of the writer of more practical service than the tabret, shoe box, picture frame, or unlaidd inkwell stand suggested in some courses of study.

Work Together

Too few fathers spend sufficient time in fellowship and camaraderie with their sons. Any movement that will bring father and son together with common interests, working out the same or similar problems, will contribute a great service to civilization. The garden movement, growing out of the highly accentuated necessity for increased production of food stuffs, will help to solve this problem. Parent and child working together in the garden will together have their minds opened to the great fundamental problem of food production and conservation and its bearing upon civilization and the destinies of nations, and, what is more important, they will come to know each other better.—*School Life*.

Tickle the earth with a spade and she will laugh back at you with a joyous crop.

Stories, an Aid to the Nature Study Teacher

ANNETTE EMORY

The mind of primitive man endowed objects of nature with life and with characteristics similar to those of man. He explained the mysteries of natural phenomena by regarding them as the outward evidence of some power embodied in them or otherwise exerting a controlling influence over them. The inventions of his imaginative mind descend to us in the form of myths. As the child mind reproduces largely the primitive mind the nature-study teacher may occasionally use such myths to advantage.

In the myths woven around the early spring flowers usually a youth personifies spring, through whose mild, gentle influences old winter is driven into his hiding place giving way to flowers, birds, and other messengers of springtime. "The Story of the First Snowdrops" tells of an old man who sits thinking of the mighty deeds he has done. Outside he hears a sound which interrupts him. He looks and finds there a youth who tells him that he has heard of his wonderful deeds and has come to find if they are true. They talk all night and as morning appears the old man grows weary, and the youth, merry. The morning sunlight brightens; the old man disappears and there are only snowflakes to mark the place where he stood. The youth looks again; the snowflakes have disappeared and in their place are little white flowers. These are the snowdrops.

The "Legend of the Arbutus" is told in "Wigwam Stories" by Mary Catherine Judd. The old tepee stands by the frozen river in the forest. The tops of the trees are white with snow; icicles are hanging from the pine branches. In the tepee sits the old chief. He is very cold and crawls to the fire and blows the coals, at the same time calling for help. Looking toward the door he sees a beautiful Indian maiden carrying a bundle of willow buds and early maple leaves. "I am Segun," she tells him, "I blow my breath and the flowers open their eyes." She waves her hand over the old chief and he grows smaller and smaller. His deer-skin clothes turn to leaves. She takes the flowers from her hair and hides them under the leaves. She blows her breath upon the flowers and they become sweet. Segun goes, but the flowers remain to tell of her visit. The children find them and know that Segun has sent the ice and snow away and that spring has come.

In connection with the study of our common garden flowers we have such stories as "Clytie," the story of the sunflower, "Heliotrope," "Mignonette," "Pansy," "Marigold," "Moss Rose." The story of "Clytie" tells how the beautiful maiden by that name was given the form of the sunflower so that she might watch the sun god, Apollo, as he rode across the sky in his golden chariot. This explains why the sunflower faces the east in the morning, looks directly overhead at noon, and in the afternoon watches the chariot as it disappears below the western horizon.

It may be of interest to the children to know that Canterbury bells are so called because of their resemblance to the bells rung by the pilgrims while wending their way toward Canterbury to pray at the tomb of Thomas á Becket. They will enjoy hearing how Queen Louise, of Prussia, fleeing from Berlin before the advance of Napoleon, hid with her children in a grain field and there amused them by weaving the cornflowers into wreaths which she put upon their heads. Later the Emperor of Germany made this flower his emblem.

The following German legend of the pansy is a favorite with children of all lands. Each pansy flower is a little family made up of five members, the petals. The large petal at the bottom is the stepmother who is so large that she occupies two chairs—the little green sepals of the flower. She has two children of her own who are just above her. She is so fond of them that she gives each a little green chair to sit on. Above them are the two stepchildren who are forced to sit on one chair far away from the mother. But where is the father of this family? He is a tiny little man who sits all day long at the feet of the stepmother, bathing himself in honey dew.

Flowers of field, meadow and brook have furnished material for fascinating myths. "The Story of Lily-Star" tells of a time when the world was filled with happy people. Everywhere there was plenty; the trees yielded their richest fruit; bushes bent low with berries. Birds sang their happiest songs. One night, the people saw a beautiful, bright star. As they watched it, it fell down and down until it stood at the foot of a great mountain. The people went forth to meet it. "I have come to dwell with you," it said, "Tell me where I may make my dwelling." The mountain tops seemed so far away from the happy people; the hillside, also, was too distant; the forest was dark and cold. At last, the star

came to the lake where the water was soft and warm. She came down and alighted on the lake. The Red Children say that the rays took root and when morning came, there lay a beautiful water-lily upon the lake.

Plants used for food have not had much that is imaginative woven about them. The story of Mondamin, the story of the corn coming to the Indians should always be told at harvest time. Facts are the interesting things in connection with vegetables. Tomatoes were regarded as poisonous less than a hundred years ago. They were planted as curiosities in the flower garden and were known as love apples. This was also true of the egg plant. It was believed to poison the wits so it was called the raging apple and the mad apple. The potato was taken by Spanish explorers in South America to Spain and planted as a curiosity. Sir Francis Drake introduced it into England in 1585 as cattle food and later it became the food of the rebellious Irish. Sir Walter Raleigh became so depressed at the condition of the Irish in times of famine that he personally interested the peasants in its cultivation. In 1720 there occurred what is traditionally known as the "great frost" or "black frost," which completely destroyed the potato crop, penetrating the ground to a depth of nine inches. The earnest, patient work of Luther Burbank, starting when a boy of ten years is a lesson worthy of study by many an American boy.

The suggestions given here include but a few of the many nature stories and myths at our command. Others may be found in the following books: "The Book of Nature Myths," Florence Holbrook; "Legends of the Red Children," Pratt; "Flowers and Flower Lore," Friend; "The Folk-Lore of Plants," T. F. Thiselton Dyer; "Wigwam Stories," Mary Catherine Judd; "Nature Myths of Many Lands," Farmer; "Myths and Legends of Flowers," Skinner.

WANTED

2 Copies of Sept., 1918 Nature-Study Review.
20c each will be paid upon receipt of same by

THE NATURE-STUDY REVIEW

Ithaca, N. Y.



Photo by Pearl Beard

An invitation to our garden friends to partake of suet and peanuts in addition to their regular insect fare.

Our Garden Friends

PEARL BEARD

Washington, D. C.

'What joy it must be like a living breeze,
To flutter about 'mid the flowering trees;
Lightly to soar, and to see beneath
The wastes of the purple blossoming heath,
And the yellow furze, like fields of gold,
That gladdened some fairy region old!
On the mountain tops, on the billowy sea,
On the leafy stems of a forest tree,
How pleasant the life of a bird must be!"

The lives of the birds are not all joy and song. If they have that appearance, it is because they have learned to do their share in the world's work joyfully and happily. For they have a most important work to do. Indeed wise men say that we could not live upon the earth without the birds. They are nature's army and they carry on a constant warfare with injurious insects, weeds, and destructive rodents. Without them as allies, agriculture could not be carried on successfully, and all vegetation would gradually go to satisfy the terrible appetite of the increasing thousands of rodents and insects. In his tale of "The Birds of Killingworth," Longfellow tells us what happened in a village where the town council were mad enough to order all the birds slain because they fancied they ate a little too much of the crops:

"The days were like hot coals; the very ground
Was burned to ashes; in the orchards fed
Myriads of caterpillars, and around
The cultivated fields and garden beds
Hosts of devouring insects crawled, and found
No foe to check their march, till they had made
The land a desert without leaf or shade."

The people of Killingworth were glad to acknowledge their error and to import birds into their community from far and near. But their experience did not serve as sufficient warning to others! In certain of our western states, acts were passed giving bounties on hawks and owls. Not until the grasshoppers had increased so that they threatened to rival the Biblical plague and the field mice had destroyed many a noble orchard and alfalfa crops, did the legislatures awake to their folly, and repeal the laws. Then the hawks and owls, the one working by day and the other by night, flew to the rescue, and with the help of the crows the pests quickly disappeared.

As a matter of fact, perhaps it would be well to say right here, that hawks and owls have been much maligned. Of the fifty or more species of hawks and the thirty-five varieties of owls within our borders, only three of the former and one of the latter are entirely injurious. They are the goshawk, very few of which are found in our country. Cooper's hawk, the sharp-shinned hawk, and the great-horned owl. The red-tailed hawk and the red-shouldered hawk are particularly slandered by the name of "hen hawk" which is frequently applied to them, as the Biological Survey has fully proved that not more than one and one-half per cent. of their food is made up of poultry and game. The Swainson hawk of the western plains destroys enough grasshoppers, crickets, beetles, mice, and other small rodents to save the farmers more than one hundred thousand dollars every year. The crow, too, bears a reputation almost as black as his feathers, and mostly without reason. The Government experts consider him a benefactor and say that he destroys enough field mice, cutworms, and insect pests every year to leave a fine balance in his favor.

If you know what a bird eats, you know what he is. If he eats pests, he is a blessing—if he eats blessings, he is a pest. If he is in the former class, he should be protected, if in the latter, destroyed. Some birds do all good and no harm; few, if any, can be said to do no good. The Biological Survey and the Audubon Societies of our country have been of inestimable help in determining what birds are useful, not only by watching their habits in real life, but by actual examination of the contents of their stomachs. They have found that: "The thrushes, wrens, larks, and sparrows scour the surface of the earth for insects. The warblers, nuthatches, and creepers inhabit the trees and bushes, and few insects escape their microscopic eyes. The woodpeckers, besides looking after the limbs and bark of trees, by digging into the wood draw forth and devour the burrowing larvæ which are safe from all other foes. Fly catchers and warblers snap up the winged insects as they fly from tree to tree, and the nighthawks and swallows patrol the high air above pastures, bushes, and trees, on the alert for those of the enemy who have escaped pursuit below. The waters and their shores also have their feathered police which keep in subjection the marauding insects and rodents, except where man destroys the balance of nature by killing the patrols.

One robin will eat as many as two hundred cutworms in a single morning. These worms if laid end to end would reach about

fourteen feet. Think of it! If a man ate at this rate he would consume about seventy pounds of flesh and six gallons of water.

Busy as he is kept, providing for his own hunger and that of his family, the robin is never nervous or hurried. He is the symbol of cheerfulness and his call, "Cheer up! Cheer up!" comes from the very depths of his sunny heart.

The catbird has quite an appetite for fruit and berries, but he more than pays for the little he eats by the vast number of insects and moths which he destroys.

The bluejay is a handsome fellow, but in his case beauty indeed covers a multitude of sins. He is cruel, murderous, inquisitive, dishonest; as mischievous as a small boy, as destructive as a monkey, and as deft at hiding as a squirrel. The latter characteristic is about the only praiseworthy thing about him, however, as owing to his industry in hiding nuts and seeds, many a waste place is clothed with shrubs and trees.

The kingbird, the phoebe, the wood pewee, and the great-crested flycatcher, are dull, dark-olive or gray birds. Their voices are harsh and plaintive, and they have a habit of sitting moody and silent upon some conspicuous perch, waiting for insects to fly within their range.

The tireless barn swallows, their cousins the eave swallows, the blackbirds, the purple martins, warblers of almost every kind, the crows, the humming-birds, the cuckoos and the orchard orioles, in their dress of black and wine-color, not only make gay the life in the garden and orchard, but are the greatest asset the gardener has.

School Credits for Garden Work

It is becoming more evident every day that gardening is to become a regular part of the educational curricula. In many of the best school systems it now has a definite and well recognized place and the present emphasis upon real things in education is bringing home its importance to all educational leaders.

That knowledge and proficiency in gardening are as deserving of recognition as similar attainment in other school studies requires no argument. Many superintendents grant such recognition either directly or indirectly and thereby help to give the subject its proper standing. In some places gardening is listed as a separate subject; elsewhere the credit is given in the form of extra points or credited to geography or related subjects.—*School Life*.

The United States School Garden Army

Extracts from *School Life*, Oct. 1, 1918, U. S. Bureau of Education

WHAT IT IS AND HOW IT WAS ORGANIZED—FUNDAMENTALLY
A SCHOOL PROBLEM—RESULTS OF THE 1918 CAMPAIGN

ORIGIN

The United States School Garden Army was organized in March of 1918, growing out of the school and home garden work which had been inaugurated by the Bureau of Education in 1914.

President Wilson set aside \$50,000 from his national security and defense appropriation to promote the work for the first six months. He has since appropriated \$200,000 more to carry the work through another 10 months.

PURPOSES

Two main purposes prompted the planning of the United States School Garden Army: (a) Increased food production and (b) training of school children in thrift, industry, service, patriotism, and responsibility.

The Bureau of Education undertook to accomplish this through the organization of the United States School Garden Army. It is a problem both of production and education, and belongs to the schools.

PLAN

The plan of organization involves:

(a) A general director, who is responsible for organization, propaganda, and administration.

(b) Regional directors, who are charged with the responsibility of writing instructions upon gardening that will enable supervisors and teachers to take a garden company successfully through a season, even though not expert gardeners. These instructions have been put out in leaflet form and sent from the central office to all who applied for them.

(c) Assistant regional directors, who work under the regional director and whose duties are similar to those of the regional director, excepting that of writing garden leaflets.

(d) Co-operation with the State councils of defense through a State representative appointed by them.

The army plan of organization was adopted and has proved to be very popular and efficient. Simplicity of organization was desired, however, and but few of the divisions of the army were paralleled in the Garden Army plan.

A company consists of 150 garden soldiers as a maximum number. This number should be, and usually is, much smaller. Each company is entitled to a captain, a first and second lieutenant. A garden teacher is required for the company. The officers have been used to great advantage by many teachers in helping them on their reports, inspecting gardens, encouraging members of their company to do their full duty as true soldiers, and in arranging for exhibits, pageants, plays, etc.

INSIGNIA

The insignia of the Garden Army consist of a double bronze bar for the captain, a single bronze bar with two stars in the border for the first lieutenant, and one star for the second lieutenant, and a combination bronze and black enameled bar for privates.

THE PROBLEM

As this is fundamentally a school problem, it should be provided for by superintendents and boards of education and financed by them from school funds. Not only is this as legitimate and as necessary for a well-organized and administered school system as the teaching of any other branch, but to care for it at this time has become a patriotic duty. To lead boards of education to see it thus was the most important problem to be met. The success attained has been very gratifying and the promises for next year are encouraging. Some cities have done remarkable garden work this season, and most cities are coming to see that the schools must assume responsibility for it to insure its success and permanency.

Rather than enrich and adjust the work of our schools we close them during the summer months. This makes supervision of garden work in summer difficult, and without supervision it will fail. The spirit of work to win the war has been strong, however, and probably by the time we have finished the war we will have learned that school work, as other work, is as profitable in summer as in winter.

RESULTS

One million five hundred thousand boys and girls have responded to the call of the President and enlisted in the United States School Garden Army. Sixty thousand acres of unproductive home and vacant lots have been converted into productive land. This will release an equal acreage now used in truck gardening for the production of other food stuffs more important for war purposes. It will also relieve transportation congestion through home con-

sumption of home-produced foodstuffs. Fifty thousand teachers have received valuable instruction in gardening through the garden leaflets written by experts in this office and distributed from here. One million five hundred thousand leaflets have been sent out.

Boards of education and other civic organizations have been influenced to give financial and moral support to the school and home garden movement and to pay extra salaries for supervision and teaching. Hundreds of thousands of parents have become interested in the garden movement and are working with their children in home gardens. In Salt Lake City alone 5,200 mothers, representing 62 parental associations, are actively supporting food production in the schools. Hundreds of civic, commercial, and patriotic organizations have become interested in the movement and are giving it hearty support. One and one-half million children have been given something to do during the summer; something that will help carry the burden of their country in this struggle for freedom, something that will help them to build character, and something that will appeal to and develop their patriotism.

Home and vacant lot gardening in cities, towns, and villages has been dignified and made popular to a degree that practically insures it a prominent place in the school system of our country. It would be difficult to estimate the educational and material value of such results. No other movement in history promises so much in aiding the "back to the soil" movement as this.

Cities and towns offer the most important field for this work, since heretofore the millions of city boys and girls have had but little opportunity to plant, cultivate, harvest, and market food products. That they should learn to do these things has come to be recognized as highly important, because the world's cry for food is increasing in volume while the world's food producers are decreasing in numbers, and because the future of America's citizenship, if not the future of the world's civilization, requires that American boys and girls share responsibility, carry their part of the load, and actively participate in the stirring events of this world war. Boys and girls in the country not only have had the opportunity to help, but in most cases they have always been required to do something to help feed the world. City boys and girls have been without this opportunity or necessity and their leisure time was being spent not in helping their country in its time of need, but in actually adding to its present burdens and developing weaknesses in their own characters that boded ill for its future.

The Spirit of Nature Study

RUFUS STANLEY

Elmira, N. Y.

My childhood was spent in Iowa on the shores of the Mississippi and my first recollections cluster around the finding of carnelians on its pebbly banks and seeing the mysterious rafts accompanied by the musical sounds of the mighty sweeps guided by the husky steersmen down the stream at eventide.

My boyhood was spent on the banks of the "Wapsie" that wound its way through the prairie swamps and bottoms. During that period my recollections cluster around Saturday afternoons spent among the myriads of wild fowl that covered the overflowed bottoms in the spring, the free prairie life along them in the summer and the exploring of the river on my skates in winter.

My youth was spent in Illinois on the shores of Lake Michigan and my recollections cluster around its broad expanse of blue waters and the friendly stretches of woods that lined its shores peopled with manifold life.

My manhood has been spent on the banks of the Chemung in New York State where the habits of my early life have led me along its historic and hillside banks.

During the first period I was usually in company with my companion father when off for an outing, and during the second with boys of my age.

Chums of both sexes were my companions in the third period and for the last thirty years I have been followed during summer and winter by a bunch of boys from 10 to 15 in number and age.

During none of these periods was I taught, nor have I tried to teach nature-study and I am now wondering if I will be called to account at the judgment day for my indifference in regard to the latter.

Somehow the spirit of the streams, prairies, lakes, woods, fields, hills and wild life has appealed to me more strongly than their characteristics.

Probably the latter would have appealed to me even more strongly had I done the former, yet sometimes I think that the "letter killeth and the spirit giveth life" in nature-study as in other studies.

At any rate I have never been able to get away from my child-

hood joy in the beauty and mystery of the world about me. The glory of winter's sparkling robe, tinted with wondrous sunrise and sunset pink; the trackless fields of spotless white; the footprints of unseen birds and beasts tracing the woodland snow; the marvel of frozen cocoons; the resurrection of spring; the first angelic song of bluebirds; the weird honking of migrating geese; the mysterious swelling of buds; the exquisite coloring of treetops; the struggling of ice in the freshet; the awakening wasps slowly feeling their way; the drumming of grouse deep in the woods; the first spring storm; the softness of hepaticas; the sunning of snakes; the odors of the woods; the smell of the earth; the greening of the fields; the nesting of birds; the transparent colors of spring; the flashing of fish; the scream of hawks; the peeps of baby birds; the power of the sun; the fragrant hay; the pasturing herds; the summer sunset; the autumn leaves; the mumpy chipmunks; the flocking of robins; the jewelled spider webs; the lifting fog; the crystal coat of frost; the first fall of snow; all of these and myriads of other common sights and sounds in the world about us have appealed to me in a mysterious way from childhood.

I wonder if I would have enjoyed them more if I had known more about them, or studied them at school in the formal way.

If you plant a garden you won't have so much back yard to mow.

Breeding houses for birds belong to school gardens as truly as salt does to bread or a cup to the social meal.—Dr. ERASMUS SCHWAB.

Give a man the secure possession of a bleak rock and he will convert it into a garden; give him a nine years' lease of a garden and he will convert it into a desert.—ARTHUR YOUNG, 1741-1820.

A garden is something more than a plot of ground. It is as Amiel said of a landscape—a state of soul.—*Selected*.

Lantern Slide Sets Loaned by the United States Government

I. DIVISION OF AGRICULTURAL INSTRUCTION, STATES RELATION SERVICE

U. S. Department of Agriculture, Washington, D. C.
(Gardening and Nature-Study)

INSTRUCTIONS TO BORROWERS

The Division of Agricultural Instruction has a collection of lantern slides on agricultural subjects for educational purposes. One set of slides at a time is loaned for use for one week after receipt thereof, on condition that the borrower agrees to pay all transportation charges and to be responsible for slides lost or broken from the time they are received until they arrive at this division.

Slides should be ordered *by the number and the title* of the set wanted, and the borrower's express office as well as his post office address should be given. Shipments are usually made by parcel post, and a bill for charges sent to the borrower. Return shipments must be prepaid.

Since the demand for these lecture sets is usually larger than the division can supply, a borrower should have his application reach this division as long as possible before the slides are needed, stating in order first choice, second choice, etc. Reservations are made long in advance.

	No. of Slides
Set I—The preparation and use of illustrative material for elementary agriculture.....	41
(Methods—teacher—training)	
Set V—School Gardens—how and why.....	53
Set X—Lessons in planning and planting a garden.....	60
A-7 Flowers, and common birds of farm and orchard.....	47
(No syllabus)	

II FOREST SERVICE

U. S. Department of Agriculture, Washington, D. C.

Sets of about fifty colored lantern slides, each set accompanied by a syllabus for a lecture, will be loaned for short periods on condition that borrowers agree to pay transportation charges, to be responsible for slides lost or broken, and to forward the slides promptly and in good condition at the direction of the Forest

Service. *Applicants must state that they agree to these conditions.* These sets are usually engaged for a considerable time ahead. Application should, therefore, be made for them as far in advance of their need as possible. The subjects upon which sets are available are as follows:

FOR SPECIAL USE IN SCHOOLS

Nature-Study and Forestry.
Botany and Forestry.
Manual Training and Forestry.
Geography and Forestry.
Agriculture and Forestry.
Life of a Tree.

Write to the Forest Service for information relative to its travelling photograph and wood exhibits.

Farmers' Institute, U. S. Department of Agriculture, Washington, D. C.

Set No. 14 The Farm Home Grounds.
Set No. 27 The Farm Vegetable Garden.
Set No. 33 The City and Suburban Vegetable Garden.



Another Corner of the Van Vlissingen School Garden, Chicago

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN
ELEMENTARY SCHOOLS

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Editorial

Teachers should be thoroughly conversant with the concerted action of the Bureau of Education and the U. S. Department of Agriculture to establish agricultural education in the public schools. The editor of the garden number of THE NATURE-STUDY REVIEW feels space is well devoted to a reprint from the publication—*School Life*—of the Bureau of Education outlining the work of the United States School Garden Army. Read it carefully; then, write to Director Frances, Bureau of Education, Washington, D. C., to send you its publications. They are equally valuable to the teacher of school gardening and the home gardener. After you have a clear idea of its meaning organize your school into a unit of this great army of children who are serving their country by producing food; serving by industry and thrift; serving by conservation and at the same time laying up lessons of value for the time when they are the men and the women of the United States.

A boy who wears the insignia, be it that of a private or an officer has back of him the President of the United States, the Secretary of the Interior and the Commissioner of Education. With these high officials vitally interested in the reconstruction of education the children of the future have an outlook for an education that will teach them to live. Quoting Dr. Lyman Abbot, "education and life will be brought together." "I am not so much interested in what boys and girls are doing for the soil," he says, "as I am with what the soil is doing for these boys and girls. Agricultural education is a great unifier. It brings the home and school together, the teacher and parents together; education and life together and what is perhaps best of all fulfills the promise of the

Hebrew prophet and turns the heart of the fathers to the children and the heart of the children to the fathers."

Make use of the publications of the Department of Agriculture. Recently, lesson helps have been published by the Division of Agricultural Education suggesting methods of using bulletins in schools. The lantern slides for gardening and nature-study, mentioned in this number are most valuable. The Department of Agriculture is a great university extension course whose researches are free. Are you on its mailing list? If not, write to Joseph Arnold, Division of Publications to put your name on it. With your school as a unit of the U. S. S. G. and with information from the government bureaus to guide you, your school will be so vitalized that the harvest time will so quickly follow the seed time that you wonder how the growing time escaped you.

New York State Agricultural College has met the demand for instruction of teachers in gardening by offering a well planned summer course in the subject. If one can spare two summers for the work he can procure an interesting and practical course that is applicable to the home garden, school garden or community work. This course gives credit of thirteen points for a degree, seven the first summer, six the second. A certificate is also given stating that such a course has been taken.

The first summer the course covers general vegetable gardening each class member having his own garden plot; garden flowers; soils and their treatment including a study of fertilizers; nature-study, and for the benefit of teachers a course in management of children's gardens. A small garden grown by children is used for the purpose and through classes of children demonstrations of correlated classroom subjects are given.

The course of the second summer includes more advanced work in vegetable gardening. Visits are made to successful home and community gardens. The work of the previous summer in garden flowers is applied by planning home and school gardens from a decorative point of view. Nature prose writers and poets are read and discussed in the advanced nature-study. Actual practice in handling children in garden classes is offered in methods work. Garden insects and pests are also studied in the advanced course.

Try the course next summer. Nothing can keep you from completing it the second year.

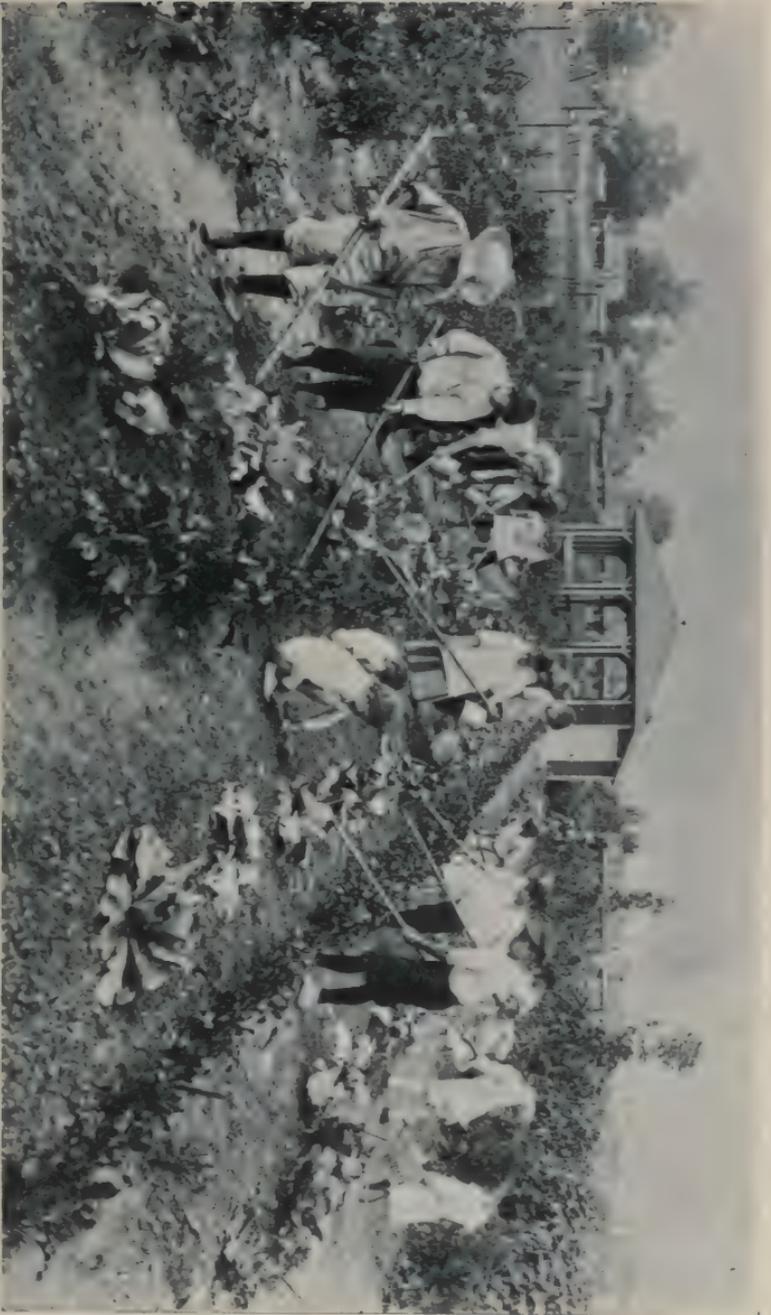


Photo by Emilie Yunker

Cultivating the beets and cabbages at the Albert S. Brandeis School Garden, Louisville, Ky. Frank Stratton Memorial Shelter House with tool room in the rear. Area of Garden $\frac{1}{2}$ acre. Cost of seeds 1918, \$7.55. Estimated Value of Products \$97.60. (See next page for other items of interest regarding this garden)

Garden Teaching in Louisville

EMILIE YUNKER

Supervisor of School Gardens

After the crops are harvested in October, instructions are sent out to every school concerning fall work; cleaning up, plowing, planting winter onions, trees, shrubs, small fruits and other perennials, bulbs, and making hot beds and cold frames.

Three assistants give all of their time until December 1st. Vacation—December, January and February. The Supervisor's vacation covers two months.

Wherever possible, the Science Teacher or some other gives two or more periods per week to the work. In some schools, the teacher, after giving definite instruction, leaves the work in charge of a company of garden soldiers: captain, lieutenants and privates.

Plans are made, seeds ordered, early vegetables planted in window gardens and hot beds by the children guided by the teacher, under the direction of the supervisor. The outdoor spring work is thus carried on with the help of three garden assistants.

In July and August, in fact, as soon as school closes, a teacher for each school garden is appointed. Three days per week are spent in the school garden, the remaining days are given to visiting home gardens.

Reports of enrollment, attendance, visits made, crops harvested, sales, estimated value, etc., are sent in weekly. In October a complete record is made. For final reports on home gardens the following questionnaire was sent out:

Total number of home gardens planted.....	00
Estimated average size of each..... Total size....	00
Total number of vacant lots or other gardens.....	00
Estimated value of products used at home.....	00
Value of products sold.....	00
Value of canned goods sold.....	00
Estimated value of canned products for home use.....	00
Name of company reporting or school.....	00
Number of garden soldiers.....	00

This work is conducted under the auspices of the Board of Education, the Street Cleaning Department, War Garden Committee, Outdoor Art League, Woman's Club, Liberty Insurance Bank, Rotary Club, Ahrens & Ott Manufacturing Company, Commissioner of Agriculture in Kentucky, and other private individuals who are contributing and giving their hearty co-operation.

The Louisville School Gardens were started with one model garden in 1915 by Mrs. John H. Miller with public subscriptions; taken over by the Board of Education in 1916, with \$750 set aside for the maintenance of three gardens, two others carried by Parent Teacher Association and Mrs. John H. Miller; 24 school gardens in 1917 with the appropriation doubled, 36 in 1918 with 27 teachers (in vacation), and an appropriation of \$3750 plus the Supervisor's salary, \$1,300. In order to meet the demands for trained teachers, the Garden Club has been formed by the Louisville Educational Association with the Garden Supervisor as instructor.

Notes From the Children's Corner of the Garden

GARDENING IN 1918

Sent to THE NATURE-STUDY REVIEW from Washington, D. C

Nov. 18, 1918.

In the spring of 1918 the boys on our block made a great sacrifice for the aid of the Allies. They gave up the lot they played baseball on, to make a war garden. And what was more, they helped to work that lot into shape for potatoes, chard, beans, corn and tomatoes. They helped to build a fence around it, to make it safe from thieves.

I had charge of the beans, and I hope that if I ever eat another bean it will be a store bean, for every time I see one of the beans I raised it reminds me of last summer. I worked in an office part of the day, but in the early morning and in the evening I nearly broke my back tending to those beans. Say, if I could have sold weeds for a cent apiece, I would be a millionaire by now just with the weeds I pulled from around those beans.

And then autumn came, and the beans had to be picked. That wasn't so bad, but I only got about two and a half bushels, whereas I thought I would get a carload.

I am not what you would call a garden fiend, but I am planning to have a garden next year, because the Allies and we, ourselves, have to eat the same as last year, and it would not be wise to let up, just when we are getting the knack of gardening.

7th Grade, Ross School.

JAMES MOONEY.

OUR HOME GARDEN

Last year when I lived in Georgetown, my father and I had a back yard 80 ft. long and 16 ft. wide. We spaded it up in the month of April, planted a part of it in onion sets, sowed lettuce seed and radishes in drilled rows. In twenty-one days' time we had radishes all we could eat, and in thirty days we had onions and lettuce. In the early spring we had kale. We planted a part of it in early bush string beans. On either side of the walk we had a row of tomatoes. When the radishes and onions were gone, we replanted in radishes and onions and Kentucky wonder beans with sweet corn to support the beans as they grew up. We had a bed of parsley and spring mint which we sold as fast as it grew.

We had lima beans around the fence which formed a beautiful wall of green from which we had messes of them until the frost killed them. One Sunday morning we picked thirty-five ripe tomatoes, twenty-three of which weighed twenty-five pounds. We had a family of eight and more vegetables than we could eat. We picked three bushels of string beans in one week. The largest tomato we raised weighed three lbs. and six oz. We had some beans from the Philippine variety which measured from 36 to 40 inches in length. We also raised five stalks of Calabash gourd. We had a bed of celery, clymblings and egg plants and salsify. We had a hose which run from one end of the yard to the other for irrigation purposes. Our garden was admired by hundreds of people and was pronounced the finest in the District of Columbia for its size. It was located on Wisconsin Ave., the rear of 1229.

6 B Grade, Carberry School.

GLADYS MICHAEL.

OUR WAR GARDEN

My story that I will tell you about our "War Garden" is quite different from others because having no back yard it was made on our front lawn.

I do not mean that we dug it up and planted things in rows so it would spoil the looks of our lawn, but by arranging the vegetables among flowers, and beside the shrubs, the yard was admired by many.

We left the lower part of the yard with grass, and back towards the house, near the center we had a triangular bed: at each point we had shrubs and in between those on outside rows we had tomatoes and peppers, in the middle of this little plot we had several plantings of spring radishes.

The tomatoes really looked nice with their yellow blooms and red fruit and the peppers looked like little trees. Among the roses next to the hedge were onions, and behind a big shrub was lettuce. We also had parsley which under a hot bed will be nice next spring.

Across the cellar windows was a bed of bulbs between which we planted more onions. Then we planted five lima beans and trained them over our front window and their white blooms and green pods looked very pretty, and between these we had carrots and had one for soup whenever we needed it.

And in a round bed bordered by flowers we planted two cucumbers and made a frame and the vines run up it and the "cukes" hung down and we had plenty all summer and pickled a jar full.

6A Grade, Buchanan School.

JAMES N. WALLACE.

OUR WAR GARDEN

I did not have a war garden all my own last summer but I helped to hoe and weed the family garden and I will tell you about it.

We had plenty of room so last spring we decided we would have a garden. First we put manure all over the space we had laid out and then potash. When we had it plowed all this was turned under making the ground nice and rich. Then our garden was harrowed to break up the large clods and the furrows laid. It was now ready for planting and we set to work.

First we put lima beans around the fence and next two rows of early, sweet corn. Then Irish potatoes, green beans and wax beans, and English peas. Turnips, cabbage, celery and onions came next. The tomatoes, which of course, you know that no garden is complete without, we planted in a small bed until the plants were about six inches high. Then they were transplanted into rows. The radishes, lettuce and parsley were also planted in beds as they do better that way. Our carrots we planted along each side of the walk because their feathery tops make such a pretty border.

Our things came up well and grew nicely but, ye gods, how many evenings we had to fight. First of all the weeds came up by the thousand and tried their best to choke out the nice vegetables, the cutworms cut down the young tomato plants and English peas, and the moles ate the little potatoes.

We had to hoe and weed until our backs were almost broken. We did not have to water it because there was plenty of rain. But we got a bounteous reward for our labor. The healthful out-of-door work was good for us all and we had plenty of nice fresh vegetables all through the summer.

We hope to have a garden next year for we found it very profitable and enjoyable.

Sixth Grade, Brent School.

RUTH CALLAHAN.

GARDENING IN 1918

The first garden I ever had was last summer, and I think I got a pretty good reward for my labors.

Mine were school gardens, numbers 37 and 38, at Eleventh and Girard streets. In the early spring the lot we selected for the garden was the community dump yard from appearances, because there was all sorts of trash scattered about. But when the Ross School started to straighten things out the lot looked like it had gone through a severe scrubbing. When the lot was cleared up we began planting almost right away. The first thing we planted was two rows of chard, next we planted seven rows of green string beans, and after this we planted five tomato plants, and then we planted the corn. After school closed the boy next to me gave up his garden and I bought it. The first of the vegetables to get ripe was the chard. I had so much of this chard that I had enough for my family, besides giving enough to the lady next door for her family. After this the beans got ripe and my mother said they were the best beans she ever tasted. She canned about twenty quarts.

The tomatoes we got from the gardens were beauties. Every one of them were great big, round, red tomatoes. And at one time I got a great big clothes basket full of tomatoes, which my mother canned. The corn wasn't very good as the ears were rather small. Toward the opening of school the crops declined, and when school opened the only vegetables were chard and green tomatoes.

As I had very good luck with my garden, and as it was also patriotic I think I will have one next year.

7th Grade, Ross School.

JOSEPH MCKAIG.

Dear Mrs. Alburdis:

Nov. 21, 1918.

I want to tell you how much I appreciate the nature teacher's trouble to come and tell us all the interesting things about plants and the soil. The corn, I thought, was the most interesting study we had. The fact that it is truly American is best of all. The best time I ever had in the country was running through a corn field and then finding myself covered with fine yellow dust which I lately learned was pollen. The ear of the corn is my favorite vegetable. The stalk of the corn is so tall and stately it reminds me greatly of our fine boys in the army and navy. I am sure every girl and boy enjoyed the lessons as much as I did. I also send the absent children's thanks.

Very sincerely,

H. D. Cooke School, Washington, D. C.

VIRGINIA FORWARD.

MY GARDEN

Last year when the Food Administration asked our people to save food, I decided to make a garden in my back yard, just as I have always done.

My yard is forty-two feet long and ten feet wide, large enough to make a good-sized garden.

The first thing I did to prepare my garden was to spade the ground, and remove the stones and other things that will do harm to the plants. Next I raked it smooth, and made furrows in which to plant the seed. When all was

ready for planting, I began by starting at the north end of the rows and working down.

In the first path of my ground I planted lettuce, the seed of which must be scattered, and raked into the soil very tenderly. In the next patch, I grew string beans which I planted in rows about three inches apart. Our family used all the beans we wanted, and I had some to sell.

The third patch was planted in dwarf lima beans which yielded a fine crop. I placed the beans in hills with about four or five beans to a hill.

Lastly I planted tomato plants, by the shed; and back of all the other vegetables, because they grow big. From these tomatoes, I had two crops. One was the ripe tomatoes that we ate, and the other the green tomatoes. From the latter I picked a basketfull, from which my mother made fifteen pints of chow chow. One thing that I failed to mention is my cabbage patch which yielded about fifteen heads, each weighing about three or four pounds.

As this garden was a success I am going to make another one next year.
8A, Wallach School NORMAN LEAMAN.

MY FIRST GARDEN

The thought of a garden was little joy to me when I was told that the course I was taking included preparing, planting, and caring for one. Being city-bred it was all new and consequently a matter to be approached with considerable trepidation.

However I plunged in by selecting my patch. I decided that the things I planned to grow should have the best advantages I could arrange for them, so my very small 10 by 15 ft. muck plot was chosen in the one spot in the garden which got the best sun and was not undermined by tree roots. I had the sod removed the middle of March and April 14 marked my active entrance into the conflict with a spade for weapon. I wielded it pretty successfully for when I put it up that evening I was more tired, dirty, and interested than I could have believed possible—and although during the next few days the novelty wore off of spading the thought of making as much of a success as was possible out of my bit of ground grew apace. My first real planting experience was in setting out two ten foot rows of lettuce plants and it was one that brought more meaning with it than just the starting of green things growing. I was anxious to avoid all possibilities of having the sun scorch them, as they had been well started—so early one evening, in old clothes, I got out during an April shower and planted and the memory of the freshening both the earth and I got that evening will always mean Spring to me.

My two twelve foot rows of onion sets went in next and my lettuce and onions received my most vigilant care and working up for several weeks until in the early part of May I put in one twelve foot row of string beans, six cabbage and eighteen tomato plants and my garden was complete. I spent, on an average, not more than ten minutes a day on it and it yielded:

45 heads lettuce, 1st crop; 20 heads lettuce, 2d crop. 10 qts. string beans, 1st crop. 8 qts. string beans, 2d crop. 6 bunches onions. 6 heads cabbage, good, firm ones. 7 pecks tomatoes from which we canned. —4 qts. string bean. 6 qts. tomatoes. 3½ qts. tomatoes preserves.

I also got sufficient green tomatoes from my vines as I was pulling them up the last of October to make three quarts green tomato pickles.

But outside and beyond my material results—which are what anyone will get who goes at his garden with his mind made up to get all that it is capable of yielding him—I found that the hot summer day had been started right for me when at my work I could look back to the early morning and feel myself out again harvesting my days crop with the dew still on it and bringing my full market basket in from my garden.

MARION REBUSCHOTIS.

Normal School, Washington, D. C.

TO OUR SUBSCRIBERS

Please note your expiration date and send in your renewals promptly, as The War Industrial Board has requested all newspapers and magazines to adopt the following regulation:

“No subscription to be continued after expiration, unless renewed and paid for.”

Owing to the increased cost of paper and printing, also to the fact that The Nature-Study Review has not raised its subscription price, we will print only enough magazines each month to cover the subscription list and its normal increase.

A blue check on the wrapper indicates that your subscription expires with this number.

The Right and Wrong Ways of Using Garden Tools.

One does not tire so quickly and has more pleasure from his work if he uses his tools efficiently



(Courtesy States Relation Service)

Upper left—Incorrect method of spading. Dangerous to arch of foot, the back and the lungs

Lower left: Not many gallons of water will be put upon the garden when watering can is carried in this position

Upper right: Correct method of spading

Lower right: This position promises sufficient water for the carrier will not tire

The Right and Wrong Ways of Using Garden Tools.

One does not tire so quickly and has more pleasure from his work if he uses his tools efficiently



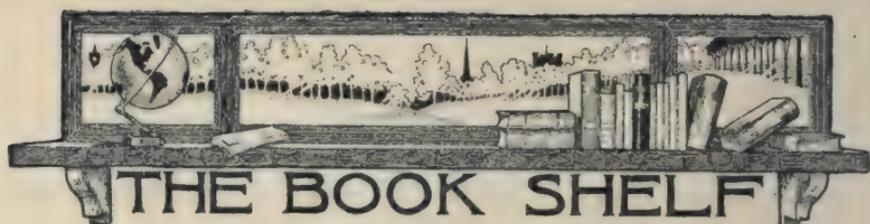
(Courtesy States Relation Service)

Upper left: Inefficient method of hoeing

Lower left: Inefficient method of plowing; strain on calf of leg; chest contracted

Upper right: Efficient method of hoeing.

Lower right: Efficient method of plowing; more work accomplished with less effort.



Science of Plant Life. A High School Botany Treating of the Plant and Its Relation to the Environment. By Edgar Nelson Transeau, Professor of Botany, Ohio State University. In New World Science Series, edited by John W. Ritchie. Cloth. Illustrated. ix + 336 pages. Price \$1.48. World Book Company, Yonkers-on-Hudson, New York.

Botany has found itself. For a number of years it has been groping its way with unsteady tread. The student has followed botany with the same uncertainty in his progress and has found himself experiencing a wonderment over what it was all about when the course was finished. To be sure, he had acquired an extensive vocabulary of strange and impressive-sounding terms which he could use to the consternation of them initiate, especially after he conducted them on a sightseeing tour of his herbarium of carefully mounted, preserved and stiffened specimens of plant life most of which afford interest because of their strangeness.

Botany is no longer restricted to the study of the flower. It really is a basis for, or introduction to, the arts and sciences relating to plant producing—even plant distribution and plant consumption. Probably it is the study of agriculture that has shown botany the way. However, that may be, it is obvious that the purpose of botany must be more than cultural. On the other hand, its cultural value will not be minimized by giving it a practical slant. And botany that will serve as a basis for agriculture or any art or science relating to plant production must be conceded to be a good botany and possessing all the desirable cultural qualities.

No one has better outlined the purpose of Transeau's *Science of Plant Life*, the selection of material and its treatment, than the author, himself, in his preface.

Farm Science. A Foundation Textbook on Agriculture. By W. J. Spillman, Chief of the Office of Farm Management, U. S. Department of Agriculture. (The first book in The New Work Agriculture Series, edited by the author) Published by World Book Company. Yonkers-on-Hudson, New York. Cloth. Illustrated. vii + 344 pages. Price, \$1.28.

Spillman's *Farm Science* presents scientific truth in a way that the farm boy can understand. It does not attempt to teach what any bright farm boy has already learned by experience. It does attempt to explain to him the reasons for the facts the farm boy knows to be true.

It deals with fundamental principles, which are the same everywhere. This makes the book adapted to all sections of the country.

The material is arranged for convenient use in the classroom, and a teacher does not have to be an expert in agricultural science in order to use the book effectively.

Fundamental principles are presented in simple language, with homely illustrations that enable the student to grasp them.

The numerous experiments outlined in the text and at the end of the various chapters can be performed with apparatus to be found on any farm.

The chapter on soil improvement is an important addition to the literature of agriculture.

The whole of Farm Science is so presented as to make it a fascinating study.

The book will make an excellent foundation for further study of agriculture on the farm and in the schools.

The author's broad experience as a teacher of agriculture has been brought to bear in the organization of material and the manner of presentation.

Trees, Stars and Birds. A Book of Outdoor Science. By Edward Lincoln Moseley, Head of The Science Department, State Normal College of Northwestern Ohio. In New-World Science Series, edited by John W. Ritchie. Illustrated in colors from paintings by Louis Agassiz Fuertes and with over 300 photographs and drawings. Cloth. viii + 404 + xvi pages. Price \$1.40. Published by World Book Company, Yonkers-on-Hudson, New York.

Trees, Stars, and Birds covers three phases of nature-study that have a perennial interest, and it contains material that will make the benefit of the author's experience available to younger teachers.

The author believes in field excursions, and his text is designed to help teachers and pupils in the inquiries that they will make for themselves. Approximately equal sections are devoted to the three phases of the subject. The topics dealt with are those of most general interest.

Hindu Achievements in Exact Science. A Study in the History of Scientific Development; by Benoy Kumar Sarkar, Professor, National Council of Education, Bengal. Longmans Green & Co. 82 pp. \$1.00.

It is seldom that a book of such slender proportions contains such an encyclopedic amount of information, written, withal, so interestingly. As the advertisement states, "The main object of this little book is to furnish some of the chronological links and logical affinities between the scientific investigations of the Hindus and those of the Greeks, Chinese, and Saracens." The claims of the brilliant young author, for Professor Sarkar is a young man, are supported by a bibliography of seventy-two names of which fifty-one are non-Hindu, most of them English.

He reminds us that positive science is but three-hundred years old, even in Europe, and that the Saracens are admitted to have been the teachers of the Greeks in those distant times which are here characterized as the prescientific era of science. The Saracens having learned from the Hindus, the latter were at least on a par with the European nations until the 13th century A.D. We must remember that "we are now living in the midst of the discoveries and inventions of the last few years of the nineteenth century."

We are accustomed to think of these people as meditative but unpractical, and to speak of the "dreamy Hindu." This little book goes far to give us a more just idea of them. They are shown to have been pioneers in at least sixteen branches of science, including Mathematics (Arithmetic, Algebra, Geometry, Trigonometry, Co-ordinated Geometry, and Differential Calculus). They knew scientifically something of Physics, Chemistry, Metallurgy, and the Chemical Arts, probably because of their very practical nature. Some of the arts in which the people of India are known to be proficient are,—bleaching, dyeing, calico printing, tanning, soap-making, glass-making, manufacture of steel. The secret of manufacturing the so-called Damascus blades was learned by the Saracens from the Persians who had obtained it from the Hindus. They also made gunpowder and fireworks and preparations of cements. So early as the sixth century the mercurial operations alone were nineteen in number. Pliny, in the first century, "noted the industrial position of the Hindus as paramount in the world." The preparation of fast dyes and the tempering of steel were two original and important discoveries made by them.

Even in medicine and surgery they had some proficiency and for the times a surprising amount of accurate scientific knowledge. To our surprise we read that "dissection of the human body and venesection were normal facts in medical India," and "the doctors of the Sushruta School declared that dissection was necessary for a correct knowledge of the internal structure of the body. It also helped them in their surgical operations to avoid vital parts." "In the Hindu surgical laboratory were at least 127 surgical instruments," and among these were included besides knives, scissors, forceps, etc., the catheter and the syringe. In this connection we are reminded that it is only fair to remember the barber-surgeons of Europe in the fifteenth and sixteenth centuries and that, quoting from Wallace, "by the side of the latest discoveries and inventions, any achievements of the human brain in the past, whether in the East or the West, are but children's toys."

In Embryology they had accurate knowledge that was fundamental. Their knowledge of plants was practical as was their familiarity with animals and they had a veterinary science, and one is hardly surprised to learn that the Hindus had hospitals for animals in the third century B.C. They were especially skilled in "the science of horses and elephants, the two animals important in warfare." We learn that there have been scientific encyclopedias in Sanskrit.

Their theories regarding the nature of life sound very modern, there being three schools; the Charvahas, corresponding to our materialists, held that life and consciousness is the result of combinations of dead matter; the second school or Samkhyas believed that life is "a reflex activity, a resultant of the various concurrent activities and reactions of the organism;" a third school, the Vedantists assert that "sensations do not explain life. Life must be regarded as a separate principle—prior to the senses."

The author presents no claims for modern attainments of the Hindus in science. The reasons for their present backwardness may perhaps be shown by the student of history, but the evidence here presented seems to show that it is not due to a fundamental difference in mentality.

M. E. H.

THE NATURE-STUDY REVIEW

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No. 4

The American Toad

ANNA ALLEN WRIGHT

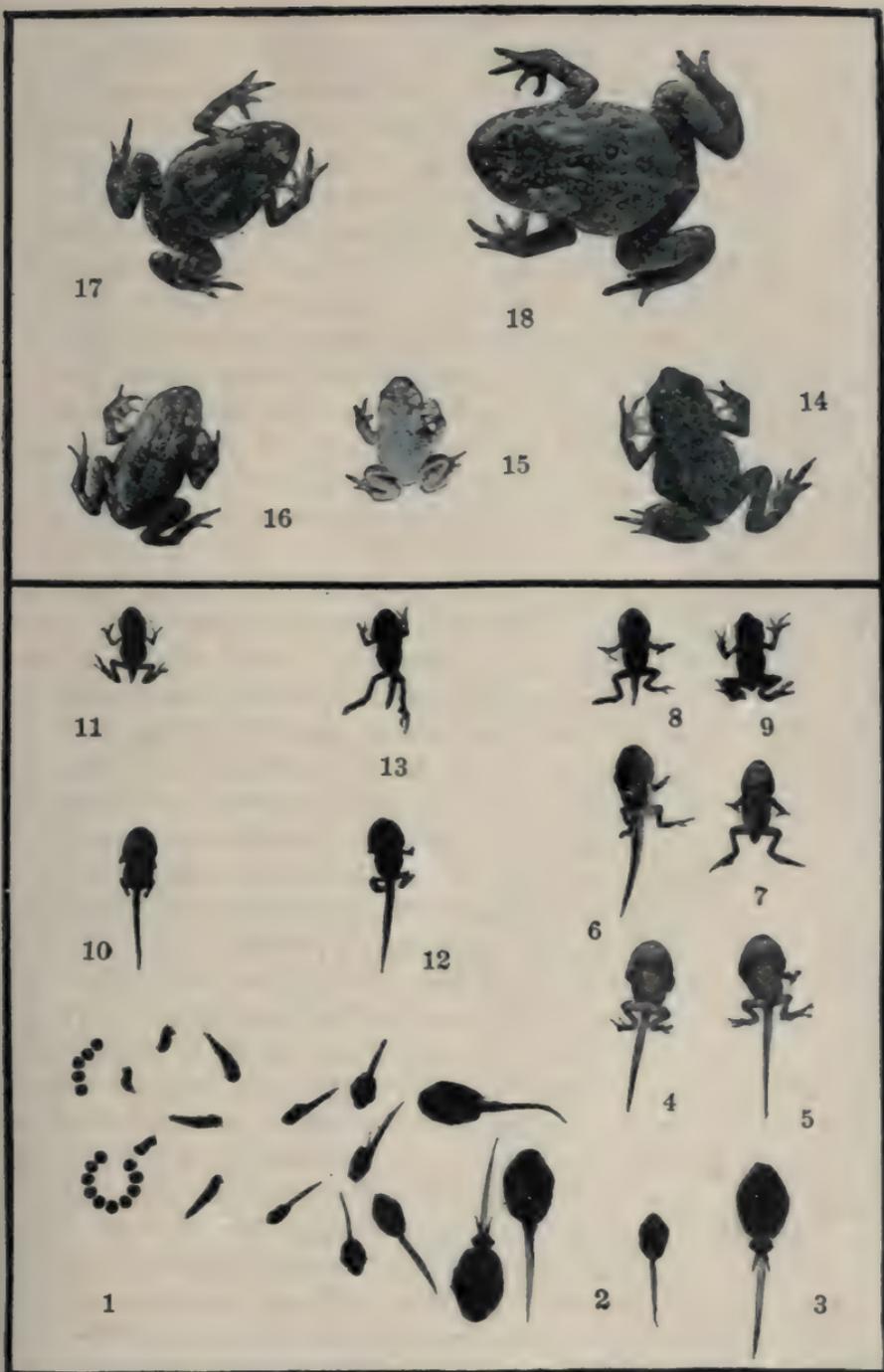
There are toads all over North America, many in South America and in Europe, and in fact, almost everywhere in the world. In our southwestern states, there is a toad, as big as a large bullfrog but the toad we all know is the common American toad. When full grown, it is about three inches long, usually with dark grayish brown warty skin. It looks fat and short-legged and seems very quiet and slow moving as we see it in our gardens after worms and insects. The life history of this small animal is very interesting, and the marvellous changes from eggs through tadpoles to adult toads take place so quickly that we can see the whole story enacted in two months. Perhaps on quiet evenings you have often listened to their pleasant trilling songs heralding the springtime. Perhaps you have watched them in the daytime. Then, it is often hard to get close to them without scaring them, but, if you will visit the pond at night with a flash light, you will have no trouble in watching the toads swell out their throats like great white bubbles, as they rest in the water with just their heads and throats out. They are particularly fond of shallow ponds though any quiet water will satisfy them.

Toads are very responsive to the weather. In a very early spring, they may come out toward the end of March, and eggs may be laid early in April, but the average time for their egg laying is toward the end of April and through May. The eggs are in two long twisted rope-like coils, arranged in pairs, two coils each of which may be about twenty feet long. They look like black beads in tubes of jelly, when freshly laid. After a day or two, they are frequently covered with muddy particles. Some strings lie on the bottom of the pond, others are twisted about weeds and twigs. The eggs are black above and white beneath. The body of the tadpole grows on the black side of the egg. As it grows larger, the white side of the egg grows smaller

and smaller. If the days are warm, the tadpoles will hatch in four days, and come out tiny particles of life, so small and so active, that it is hard to tell what they look like, until they hang themselves up to the outside of the remnants of their egg tubes or to nearby plants. They do this by the sticky discs that are on the under side of their heads.

At first, these little tadpoles have distinct necks, no eyes, or at least very indistinct ones under the skin, and mouths that are mere indentations. Their tails are so small as to be hardly worth the title, and bear but the slightest suggestion of crests. All they can do at this time is to hang themselves right side up so that they won't get smothered, and wiggle their tiny black bodies. They don't need to eat at first because some of the yolk of the eggs they grew from is still there to feed them. Immediately, finger-like gills grow out on each side of the neck, and a fold of skin grows back and covers them, leaving just one hole, the spiracle, on the left side. This leaves the tiny creature without a neck. If you see all this, you will have to watch the "tads" very closely. By this time, the eyes are on the surface, the sticky discs that held them up are disappearing, and little round mouths have developed which have horny jaws and several rows of horny teeth on the lips. These teeth help the little tadpole scrape off its tiny particles of food from the plants and "scum" that is in the pond. A prominent rather milky looking crest has appeared on the round tipped tail and little tadpole is having a lively time. He is now a mature tadpole, and is dark brown or black in color and spotted with tiny gold and silvery spots. He breathes the air that is in the water by taking water into his mouth which then passes over his gills and out the spiracle. He grows larger and larger, until measuring from the tip of his head to the tip of his tail, he may be a little over an inch long. His food is tiny particles of vegetable or animal matter that he can scrape up around the pond. He keeps very busy doing this for he cannot stop growing for a minute.

He must get ready to become a grown up toad. He must lose his little round mouth with its horny jaws, and develop a real toad mouth with bony jaws. All his bones must develop rapidly. He must have lungs to breathe air, and as these grow, he keeps coming to the surface of the pond to try them out. As he grows older, he comes more and more often to the surface, and takes more and more air. His legs start out as tiny buds, and as they grow develop



Toad development in a single season

Photo by S. H. Gage

toes and then grow bigger and stronger. His hind legs show first as they bud out on each side at the base of the tail, but his front legs are growing, folded up under the skin near his throat. When they are ready, first the left one comes out the spiracle, then the right one breaks through the skin. While this is happening, we have first a little animal with two hind legs, then one with four legs and a tail. Next, his tail must disappear, for no grown-up toad can have a tail. So his legs grow stronger, and his tail grows shorter. It seems to shrink back into his body in only two or three days. The little tadpole's blood and lymph, as they flow out into the tail, carry tiny particles back into the body until the tail is gone. This furnishes strength to the little "tad" just as food would do, so that during these few days, he needn't hunt for food, but can often rest almost out of the water at the shore of the pond, or can sit on a floating leaf or twig and dream about the journey he is soon to take.

All these changes must take place quickly for the little tadpole that came out the egg about May 1, must be ready to leave the water by the Fourth of July, or even sooner if the weather is very warm. There are many smaller tadpoles that may not be ready to leave until August. Long before this, most of the big toads go back to their gardens to hunt insects. By the time the tadpoles are ready to leave, the pond may be much smaller, almost dried up in fact, but the ground around the pond will often be so crowded with tiny hopping toads that it looks black as if covered with a mass of crickets. The tiny toads are only about half an inch long, much smaller you see than when they were tadpoles. Yet each little toad feels very grown up and is ready to sit in a shady spot and watch for insects. They must look for shady spots, for if they staid in a hot dusty place, they would soon dry up. Toads drink water by absorbing it right through their skins, and that is why they like so well to hop around in the rain. Little toads often leave the pond on a rainy day. And just because so many little toads travel together on some showery summer day, people have told the queer story that they rained down from the sky. We know better. Perhaps these little toads started yesterday on their journey to find a new home, and then the bright sun came out and made them hunt for a shady crack or corner. Then as the first drops of rain hit their dry skins, out they came to go further on

their way, literally rained up out of the earth, instead of down from the sky.

When you see all the eggs in your neighborhood pond, and the thousands and thousands of tiny toads hopping away from the pond you will think you ought to find a toad in every shady nook, and under every board and stone, but that is far from the truth. While they are in the pond, salamanders, fish or ducks may find them dainty tit-bits, and after they leave the pond, snakes and birds are on the lookout for them. It is well for the little toads that like their fathers and mothers, they feed mostly at night, or I fear hardly a one would grow as large as the ones we commonly see. As the toad grows bigger his skin may grow old and dry or it may grow too tight for him. Then a new skin grows right under the old one, and the old one splits down the back or down the stomach and down the legs, and the toad wiggles and twists as he works it off over his head, and sometimes swallows it, before he hops away in his bright fresh coat.

For three summers, these little toads must busily catch insects and grow bigger and stronger. For four winters, they must dig little hollows in the ground, perhaps under a board or stone, and sleep for many months before they will be ready to wake up some fine spring day and join all the father and mother toads in the jubilee in the pond. Wouldn't you like to see a toad dig himself in for his winter sleep? He digs with his hind legs and body, and pushes backward into the hole, and "pulls the hole in after him," at least the earth caves in on top of him as he backs into the earth.

If you pick a toad up carefully, his skin will feel cool and dry though covered with warts, and he will enjoy a few gentle strokes down his back. While you are holding him, look at the large oblong warts or crests on his head, and notice that his throat is darker than a mother toad's would be. If handled roughly, a toad will eject a colorless liquid from the vent, and a milky liquid from the skin, but this can never in any way harm a person. It is only an imaginary story that toads cause warts. But if a dog catches a toad in his mouth and squeezes him, this liquid will make the dog foam at the mouth and teach him to leave toads alone.

Toads are great friends of farmers and gardeners. In some countries in Europe, gardeners have bought them to help fight the insects that would hurt their plants. Toads eat a great many sow-bugs, caterpillars, ants, cutworms, cockroaches, grasshoppers and

other insects. One toad in three summer months would eat 10,000 insects. They feed mostly at night, though they never scorn an additional meal in the daytime. Soon after sundown, they start on their hunt. They follow more or less of a regular beat and come back again to their accustomed resting places. Two toads that have been watched for a long time, have been said to live in the same dooryards, one twelve years, the other twenty-three years. It is likely that many toads live ten or twelve years. Toads are fond of sitting under electric road lights, for they have learned that these attract great numbers of insects which are stunned by the light and fall to the ground to be quickly snapped up by the waiting toads. It is quite a surprise to see the expectant toad throw out his tongue which is fastened at the front end, and see its sticky surface fasten to the fly and carry it back into his mouth. When he gets a big "June bug," it is fun to see him close his eyes as he tries to swallow it. When he closes his eyes like that, he can press them down on the inside and help crowd that big hard shelled beetle down his throat.

Very few of our animal friends work as hard for the benefit of mankind as do the toads. Few others are as worthy of our friendship and kindly consideration, and yet I fear few others are as scornfully looked upon by most of us. As we know them better, we enjoy them more. The tadpoles in our ponds eat much that might otherwise cause us trouble. They work busily in cleaning a skeleton, or eating a dead fish, or devouring the algæ that grow so rankly in a stagnant pool. We cannot speak too highly in favor of the adult toad. He eats almost no insects that could benefit us, and eats instead vast quantities of those that would become troublesome pests. It would pay us all for selfish reasons alone to befriend the toad, but in addition we have the pleasure of watching its interesting habits.

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THE NATURE-STUDY REVIEW, ITHACA, N. Y.

The Spring Peeper

(*Hyla crucifer*)

ETHEL H. HAUSMAN

New Haven, Conn.

"And the frogs pipe in chorus,
'It is spring, it is spring.'"

Among all of the inspiring spring melodies, there is none—not even the note of the Song Sparrow—which is more welcome and cheering than the shrill, yet musical piping of the little Spring Peeper, he who used to be called *Hyla pickeringii*, but who now bears the name, *Hyla crucifer*, or cross bearer.

The voices of Spring Peepers may be expected to gladden the air about the middle of March, in our locality, though records tell us that they have been heard as early as the last of January. The little singers do not emerge from their winter hiding places under moss and leaves until the temperature has reached about fifty-four degrees, and then it is that the first pipings are heard as the procession of males starts from the meadows bound for pools and shallow ponds in the lowlands. The first staccato of song gives way to a fuller chorus, until nature's grand antiphonal nocturne reaches its full power during the first weeks of May, and then diminishes until at the first of June only a few voices are occasionally heard. The piping is resumed again late in summer, but never in such volume as in the spring. It is a



Hyla crucifer

pleasure to think that the distribution of this little musician is very wide, for its range extends all over New England, New York, Pennsylvania, Maryland, North and South Carolina, Ohio, Illinois, Michigan, and from New Brunswick to Manitoba in Canada. How many people wait anxiously each year for the first notes of the spring

chorus of peepers. It may be that the voice of the peeper helps, as Thoreau says of the notes of the first Song Sparrow, "to crack the ice in the ponds."

Nearly every one has heard the piping frogs in the spring, but how few there are that have ever seen them! It is not strange, however, that the pipers have escaped detection, for they are such little midgets of frogs, averaging from three-quarters of an inch to an inch in length, for the males, and slightly longer for the females. These little peepers are full grown frogs, however, and not young frogs of other species, as some suppose them to be.

The smooth shiny skin of the adult is marked with varying shades of brown, variegated with darker dots and lines. A characteristic X-shaped design occurs on the back, whence *Hyla crucifer* derives his appellation of cross bearer. Both the fore and the hind limbs are crossbarred. The under parts are usually tinted a dull, creamy white. Beside the protection afforded by its diminutive size, *Hyla* has the power, similar to that which the chameleon possesses, of changing its color to match the background upon which it rests. Normally the general tone of the creature is of a light yellowish brown, but it may effect a change in a half hour to a pale greyish yellow, dark wood brown, or even a reddish or salmon brown.

The peepers are the least shy of all our frogs and toads. If one cautiously approaches the pool where these choiristers are numerous, and sits down patiently to wait, his effort will probably be rewarded ere long by the sight of first one, and then other little peepers which appear floating on twigs or leaves or perched on grasses or cat-tail stems, or seated along the edge of the pool. One of the best times to see peepers, and to catch them, if this latter is desired, is at night. At such times they seem neither to hear nor to see the intruder, nor do they object to the strong light from a lantern.

At night their songs are rendered from the open, but by day they remain more or less concealed. It is only the male which possesses the vocal sac and that sings. The female produces no note. When a frog is about to peep the lungs are filled with air (expanding apparently his whole body) which is then injected into the grayish vocal sac underneath his chin. This fills out into a globular, moist, glistening, translucent bubble of tissue half the size of his entire body. The sac is kept distended for several minutes at a

time, and with each peep it is deflated slightly. During the calling, the mouth is kept tightly closed, the sound issuing from the nostrils. The vocal sac acts as a resonator, thus enforcing the strength of the tone, and making it possible for the sound to be heard effectively for a distance of a quarter of a mile in calm weather. If one is successful in isolating the notes of a single individual it will be noticed that the tone produced is the pitch of E, slurred to F in the highest octave of the piano, but this may vary slightly with different individuals. The whole effect of the peepings of a pond full of Hylas is a pleasing and mellow volume of flute-like notes, with individual tones of superior clarity rising above the ensemble, like the notes of a solo instrument in a concerto. On cloudy days peepers call incessantly, but usually their voices are not evident until about four in the afternoon, at which time the first movement of the Hylan Nocturne begins, the finale coming sometime the next morning.

In the spring the males come first to the ponds, followed by the females. In April the eggs are laid attached singly to the leaves and stems of aquatic plants, or occasionally to stones upon the bottom. All of the rest of our frogs and toads lay their eggs in masses or in strings. The eggs are so small, being but one-twelfth of an inch in diameter, that they resemble tiny seeds, as they cling to their support by means of a drop of viscid jelly by which they are surrounded. Because of their minute size, single placentation, and their submergence beneath the water, peeper's eggs are not easy objects to find. Each egg is enclosed in a globular capsule of viscid jelly, and when first laid is a deep brown above and cream yellow below, but during the early stages of development it becomes a light gray.

Within from six to twelve days the eggs have elongated and developed into pale yellow tadpoles, which escape from their incarcerating gelatinous envelopes and literally hang themselves up on horizontal leaves and twigs beneath the water by means of a pair of minute knob-like protuberances or holders, one on each side of and below the mouth. Dark brown and gold pigment spots appear on the back as the little creatures assume the true "pollywog" form. The gold color gives place to a vivid green when the hind limbs bud out and does not change again until the appearance of the arms and the disappearance and absorption of the tail, when the color becomes that of the mature frog.

About eight weeks of time are passed in the tadpole stage. During this period, the most perilous in the life of any of the frog and toad forms, the little creatures may meet with various mortal mishaps. Other amphibians, beetles, spiders, crows, herons, newts and various fishes all consider tadpoles to be particularly delectable morsels. What the logical results of such a consideration are we can very well guess! Or the pond may be only a "wet weather pond" and may dry up before the little creatures become fitted to be air breathers. When such a disaster is imminent, the oldest of the tadpoles are, as it were, hurried thru the latter stages of their development by anxious nature, and become lung breathers before all of the water has left the pond bed dry. These are, however, pale in color and small in size, at first, and remain a trifle undersized for some time afterwards, only gradually assuming normal proportions and coloration. So eager do the older tadpoles seem, to leave the water, that they apparently cannot wait until the final stage of the metamorphosis is complete. Hence as soon as the arms break through their covering (by this time the legs are stout and strong) they clamber about out of the water on grasses and sedges near the edge of the pond but when danger threatens, back they go as if in terror at their too great haste to leave the element of their childhood! In June, wee tailless frogs may be found in multitudes among the leaves and mosses near the banks, and as they leap about among the dry leaves before your tread they sound like the pattering of tiny raindrops that herald the approach of a summer shower. They appear much like young toads at a hasty glance. While in the water the tadpoles devour myriads of mosquito larvæ, and as soon as they emerge upon the land stage of their existence they begin their search for the mature mosquitoes, as well as for ants, gnats, and similar minute forms of insects and spiders.

By the first of June the period of egg laying is over, and the adult frogs have become silent and have left the pools, migrating towards orchards, gardens, and woodlands. During the summer months that follow they may be found not only on the ground, but clinging to the twigs and branches of trees, on ferns, amid mosses, and, in fact, in almost any situation where an abundance of tiny insect life may be had. The greater number, however, remain on or near the ground, usually in the vicinity of marshes.

The tongue of the *Hyla* is heart-shaped, as is that of the rest of our frogs and toads, its bifid portion hanging free behind while the

front edge is attached to the floor of the mouth just within the lower lip.

When catching an insect the frog throws the free hinder end of the tongue forward, and the insect is caught in the sticky saliva with which it is covered. The tongue, with the adherent prey is then whisked back into the mouth. The entire process occurs in the twinkling of an eye.

Hyla crucifer is a characteristic climber. By means of adhesive discs on the tips of the fingers and toes, and of glands in the hands and feet which secrete a sticky fluid, it is able to maintain its hold and to climb upon any surface, no matter how smooth. Thus it can ascend the vertical trunks of trees, or the stems of plants, or even the sides of glass aquaria, with perfect ease. Between each toe is stretched a web, which enables it to swim well, which it does frequently, especially during the nuptial season.

Occasionally, during the fall months, on muggy days, the *Hyla* gives vent to a few peeps, reminiscent of the glorious voice that he possessed while wooing his mate in the spring of the year. These isolated "peeps" are commonly taken to be the chirp of some bird or loud voiced insect.

Peepers are delicate and interesting little pets to keep indoors in a terrarium. In captivity, if well fed and watered, they become quite fearless, swelling their throats and singing on dark days, more especially late in the afternoon. They usually remain partially concealed beneath moss or leaves, as much to keep their delicate skins moist (for through this they take considerable oxygen) as for protection from physical injury.

The little *Hyla crucifer* can well be looked upon as the embodiment of spring, since it is the first clear, unequivocal voice in the proclamation of the presence of that joyous season. In its loud, clear annunciation of spring's arrival it is not unlike that other voice which soon follows it, the Meadowlark's. In the economy of nature does it not seem strange that the creature which is the earliest, loudest, and cheeriest of spring's heralds should be the one to retire for its winter sleep latest, and to enjoy the shortest period of hiemal slumber? For the *Hyla* does not go into hibernation until late in November or in the early part of December, and yet he is out again in February or March, a sort of nature's alarm clock to rouse the sleepy legions with the welcome news that the old man with the long hoary beard and locks has been seen hurrying north-

ward, while from the south a lovely youth, whose tucked up mantle is laden with flowers has been espied approaching.

The Call of the Hyla

L. A. HAUSMAN

“Peep, peep;” it is spring; hear the Hyla’s clear voice,
 “At my call let all nature arise and rejoice!
 Come Meadowlark, Bluebird, and Song Sparrow, all
 Respond to my summons, and echo my call;
 Through a land winter-weary the glad tidings sing,
 Awaken ye sleepers; Peep, peep; it is spring.”

April

HELEN HUNT JACKSON

Robins call robins in tops of trees;
 Doves follow doves, with scarlet feet;
 Frolicking babies sweeter than these,
 Crowd green corners where highways meet.

Violets stir and arbutus wakes,
 Claytonia’s rosy bells unfold;
 Dandelion through the meadow makes
 A royal road, with seals of gold.

Golden and snowy and red the flowers,
 Golden, snowy, and red in vain;
 Robins call robins, through sad showers;
 The white dove’s feet are wet with rain.

For April sobs while these are so glad,
 April weeps while these are so gay,
 Weeps like a tired child who had
 Playing with flowers, lost its way.



The Story of Little Red-Spot

SUSANNA PHELPS GAGE*

In a hollow on the side of a hill, in a sunny pasture, there is the tiniest pond that ever was called a pond at all. Into the bottom of it keeps bubbling up fresh water, sparkling and clear. Every bubble from the bottom is greeted by a glad nod from a graceful water plant; every breeze on the top sets countless tiny leaves of duck-weed in motion. On a glorious May morning one would expect to find this a place for quiet thought. No, indeed; moving day in the city could not be the scene of greater hubbub. Great frogs are beating their bass drums, toads are croaking for dear life, while the very air aches with the loud and long-continued calls made by the tiny tree-frogs. And splash they go into the pond, sending waves to its outermost edge. Then they blunder about in an awkward fashion which must be very annoying to a couple who had apparently chosen this place for a quiet retreat. What a contrast to their busy-body neighbors, Mr. and Mrs. Red-spot, quaker-like in their dignified repose of manner. They remain perfectly still, by the half hour, till the wonder is how they ever do it.

Almost all of one of those beautiful May days Mrs. Red-spot spent down among the water plants. She was very happy, for all along the sides of a water plant were placed little eggs, each carefully hidden in such a cozy way among the tufts of leaves.

*This charming biography of Red-Spot was written by Mrs. Gage some years before her death.

Right in the topmost tuft is one egg just like the rest, but it is the one we are interested in. It is about the size of a small pea, a little sticky so that the leaves as they were pressed against it almost hid it. The outside is tough like India rubber, but clear as glass. Inside can be seen a little yellowish ball.

Mother and father do not heed the egg, but the sunshine of May falls about it and broods it, the bubbling water bathes it, the leafy cradle rocks it, while each watchful day sees in it some wonderful change. Little knobs and ridges and hollows appear on the yellowish ball, and soon knobs and ridges and hollows can be called brain and eyes and gills and tail.

In less than thirty days the little ball begins to shake and quiver, for in it a little fellow is actually trying to swim, in a place no bigger than a drop of dew. There he stays and strives until all the little yellow ball has been taken into the little living body for it is to him both meat and drink. After that is gone and he can endure it no longer, out he bursts from the home which has become so small as to be a prison. Eyes are for seeing the world, so forth he goes to a free life, no longer hidden by a few needle-like leaves.



1. Salamander
Tad pole
2. Salamander
eggs

A hungry stomach soon calls for all the energy the little fellow has; it is not many hours before he finds food and can provide for himself most bountifully from the tiny living things that swarm about the water plants. Just think of it! He is no longer nor larger than this—, yet he hunts and fishes and swims. Except for his beautiful, spreading red gills when he is at rest he might be a needle so straight and motionless is he. But the quiver of a leaf sends him darting away as though shot from a bow, so shy is he. And he needs to be shy, for freedom has multiplied his dangers.

Larger and larger he grows. There are stripes on his sides, just plain grayish stripes; but as the days go by bright red specks begin to show on his back, one on each side, two on each side, until at last we know this is really the hero of our story. Red-spot, and not some tiny changeling who has been trying to impose on us! Now he begins to be prettier, his coat is greenish, his vest buff, and except for his gills he looks quite like his father.

His little active body gets so hungry for air as well as food, that his gills, three on each side, like a bunch of cardinal ostrich plumes,

float out wide on each side of his head so as to catch all the air from the water that is possible. Bye and bye his gills begin to shrivel, and then what is our poor little hero to do, how is he to breathe? Well, when he gets restless and hungry for air, he tries an experiment, comes to the top of the water where it is all air, takes a mouthful of it and swallows it right into —his stomach, no—into his lungs, which he didn't know much about before. I fear he is rather lazy now for he does not take the trouble to go to the top very often even for this little mouthful of air, but goes panting away in the water, getting all the air possible by drawing it into his mouth. You may be sure he is too intelligent to swallow that water into his lungs, or his stomach either. He forces it out of his gill-slits and takes a mouthful of fresh water.

Red-spot stays in the pool—which now is still and warm. Most of the Babelmakers go away, leaving their thousands of voiceless children behind them. We wonder if the children could cry would the parents stay to take care of them. However that may be, little Red-spot's alert, quick motions still are very necessary to him. If the largest, hungriest mouths are gone, the pool is full of growing morsels of life, many of whom are relations of Red-spot. But a mere matter of relationship is of small consequence, each seems only to be eager to swallow any living morsel which is a trifle smaller than himself. So Red-spot has a two-fold anxiety; first to catch plenty of fine fat mollusks and worms for himself, and then to see that he is not eaten by some other hungry fellow out in search of dainties. He acts as though he were haunted, so suddenly does a little shiver run through the fin that goes ruffling from the back of his head to the tip of his tail. That shiver sends him far away from the cause of his terror.

About the middle of August he feels he is no longer fitted for life in the narrow pond. An impulse strong as any that moves youth to daring deeds forces him to try his fortune in the great unknown world of solid ground.

Imagine his joy when he sees that he is growing beautiful! First a dusky red hue spreads all over him, then his coat gradually changes to a beautiful orange red, while his vest is a shade lighter. The vermillion spots on his back grow larger and a dot or two of black appears beside each red spot. His gills are gone, his tail loses its frill. If a fairy godmother had touched him with her wand, the change could not be greater.

The new problems he has to meet are vital ones,—how shall he breathe, what shall he eat, where can he hide himself from danger, who are his foes? After he has left the old home he must be rather homesick for there he had to take water into his mouth only about twenty times in a minute; while now, besides the air he gets into his lungs, his little throat must throb about one hundred times in a minute to pump his mouth full of air or he might suffocate. The delights of the palate now fill his mind and his taste is better pleased by seeing the wriggle of an angle worm's tail than anything else. You would laugh to see him stretch his neck, raise his head and cock it on one side, then dart after that wriggle just disappearing in the sand. Poor angle-worm, its of no use to struggle, Red-spot has you already half way down his hungry throat.

Once in a while he finds his coat is getting too short in the sleeves, too narrow in the shoulders, and withal a little rusty. So he wriggles and twists till it bursts off from his head. Then he gets it off from his front legs and his back, and when he has stripped it off from the last toe of his hind legs onto his tail he turns around and pulls it off with his mouth. Then what does he do but deliberately swa low it! His new coat does not have to be put on, it was already there, new and fresh, under the old one.

It seems as though such a pretty, graceful creature as he might have higher ambitions and daintier tastes; for he lives in the midst of the most beautiful things. There are dark cool green mosses and soft gray lichens and the rich browns of decaying wood. He wanders at will in shady nooks where ferns grow, where it is cool in summer and warm in winter.

Sometimes, after a warm summer rain, so happy and reckless he grows, so sure he can glide like a flash of flame colored light out of harm's way, that out he comes from his secret hiding places into the open. This is the way he has gained the reputation among people of raining down with the angle worms. We know better than that. He is just bent on an angle-worm hunt, that is all. Rained down, to be sure!

This happy-go-lucky, selfish existence cannot go on always. When he is two-and a half or three years old, a new impulse seizes him irresistibly; for the ways of countless ancestors before him have left their impress on him. Does his throat feel parched and dry? Are his dreams of his childhood's home? We know not, but away he goes, driven as by fate. Think of a journey of miles

for such a little fellow. No path,—a mole hill is huge to him. Down he goes into valleys, helping himself from falling headlong by hooking his finger-like tail to any projection; then up over hills,—mountains to him,—over hot sand, through high brambles, until someway he reaches what he longed for,—water.

Were his eyes dazzled by the mirrored sunshine? If so he shuts them and plunges in. Perhaps he is not at ease at first for he is not yet completely fitted for the changed life. Even his memory does not serve him, for this is not the pool of his babyhood. That is far away and his wanderings have brought him to the lake, to him a boundless place. The water plants are not just the same. The moving creatures are new and strange. Here are great fish, larger than his wildest fancy could picture, and they are all such hungry fellows, too. Only his caution and shy darting movements keep him from the deadly mouths opening so often all around him.

But all is not horror; there is great joy, too, for he finds here, stately and dignified, many figures that are most precisely like the dimly remembered father and mother. These are old residents. Besides them are others so like himself that he must be puzzled. They, too, were driven to find water, and from far and near they have come.

He is now becoming used to staying under water, for he can take water instead of air into his throat and breathe just as he did when he was small. Imagine his terror one day, when he has been a little uneasy, to turn around and see his own form, transparent but perfect in outline, floating about in an aimless manner. It looks like a ghost, but, like most ghosts, is not so queer when looked at more closely. It is only his very outermost skin, just like what he has been casting off all his life, but he never saw it take on his image before like this. After this his color begins to change and soon he is decked in an olive green coat and a buff vest, the whole suit set off with black ornaments. His ever present red spots have fine black rings around them instead of the two or three black specks they had a little while ago. If he knew how to sigh he might "wonder if its I," like a certain old lady we know so well about. Then his tail grows wider with a handsome waving frill all around it, and on his legs comes black horny ridges. He is as proud as a young man with a mustache and a cane. He can swim with the greatest ease, and can sit on nothing with the most pompous air imaginable.

Here at last, after a varied career, after many dangers escaped, Red-spot has reached the goal of his efforts and no longer can it be said, "when you grow bigger you can do thus or so." His airs and manners are quite laughable, but he manages to make friends with a number of gay young Red-spots of about his own age. He is especially pleased, by one very pretty little friend. She is smaller than he, her coloring is a little less striking, and altogether she is more dainty in her general make up and way.

Do you suppose he sings to her as do the frogs, his cousins? He can cry out faintly with pain, but if he sings for joy our ears are not tuned to hear. Perhaps hers are, for he grows very confidential, and might tell her of many things that would be of intense interest to her; of his hopes, his fears, and his adventures in life, of his famous hunts for angle-worms that crawl, insects that swim in air, and spiders that live in gauze houses.

One long story he might have told her, and probably did, was the result of an angle-worm hunt. This is the way it runs, "I was caught and forcibly detained in a great glass prison for days and days, then I was peered at and poked, turned over and stared out of countenance till I thought I should die. Staring great eyed creatures went about on two legs and looked at me with curious instruments made of brass and glass which they held in their front paws. Every time one of them came near me I tried to make believe I was dead. But that was of no use; they seemed to know better. At last, after many failures, by a desperate and heroic effort I scaled the wall of my prison, reached a safe place, and at night stole away. Never again will I be caught that way by creatures who look at me just to see what I am like, even if they do not actually hurt me."

This is the way he closes his story. "One thing makes me glad that I endured all those terrible hardships, for in that prison I heard the whole history of our race and now understand many things that were a puzzle to me before. All over the eastern United States in ponds and pools and lakes and bogs are Red-spots as like to us as pins on a paper. We are genuine American blue-bloods, salamanders of stock as ancient as the red Indian. Of course we have connections in Europe and Asia, and I fear from what I heard, that we shall be obliged to recognize the claims of the frogs and toads to distant relationship. The history of our special line has been studied by wise people for over seventy years, and after calling us all the names they could devise, it has been settled that to our

branch of the family belongs the noble name of *Diemyctylus viridescens*. I tell you all this because I hope you will share this name with me and help me to make it honored in all the land."

Probably she accepted the high sounding title, for afterwards they were seen together more than ever. In perfect quiet and content they remain motionless near each other, their beautiful golden brown eyes alone showing how watchful they are. There they wait until some little creature swims or floats before them, then, quick as a wink, the creature is gone and Mr. *Diemyctylus* is smacking his lips and blinking his eyes as if to say, "Well that was a tasty morsel; who would be a vegetarian, indeed, who could dine on such fine fat mollusks on the half shell?"

Then all is quiet again except their regular pulsating breathing as shown by their throats, or an occasional dash to the top to get a great swallow of air.

In a month or two, when again the air is full of the song of every creature with a voice, Mrs. *Diemyctylus* hides away some little eggs among the water plants, and soon the children of our hero are beginning their life. Is it not a pity that his eyes cannot see, and that he cannot tell how the mysteries in those little eggs unfold, how the marvelous changes are wrought in the varied life history of these little ones? Perhaps the pity is even greater that he does not love them enough to even look at them at all, but just leaves them to fight their own battles as his parents left him.

The Garden Number of the Review

Mrs. Susan Sipe Albertis is the editor of the Garden Numbers of the *NATURE-STUDY REVIEW*. The common every-month editor spent last winter in Florida and never saw the March Review until it was published. Mrs. Albertis did all the work of collecting articles and pictures and of editing and proof-reading, and yet so great is her modesty that nowhere does her name appear as Special Editor. The best that can be done now is for the common every-month editor to tell her readers that she is very proud of the March Number and the many compliments it has received and that its excellence is entirely due to the efficient management of Mrs. Albertis.

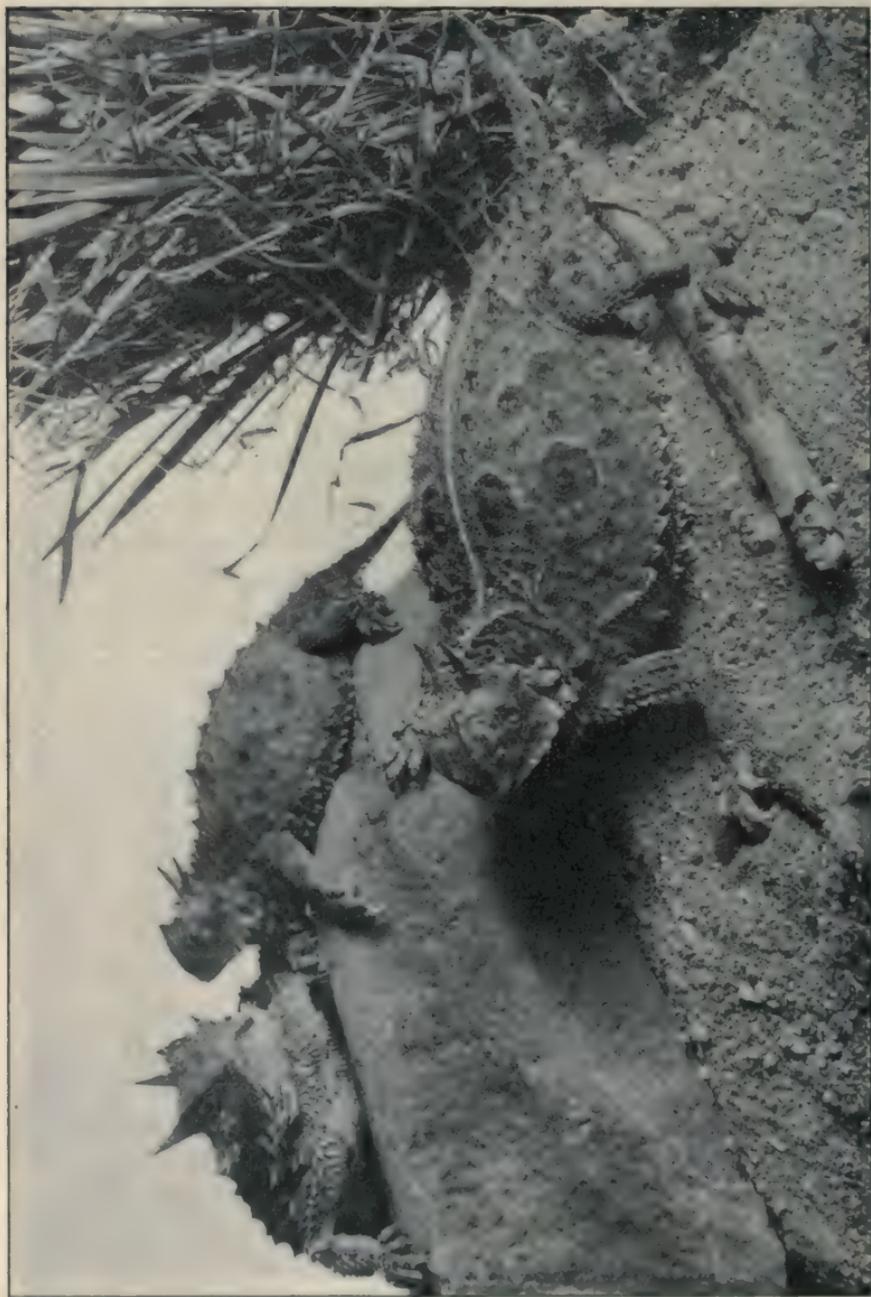


Photo by R. W. Shufeldt

Horned Lizards

The Horned Lizards of the United States

Dr. R. W. SHUFELDT

Washington, D. C.

We have in this country a great many different genera and species of lizards, and they range all the way from the famous *Heloderma* to the limbless Glass "snake" and the Worm lizard of Florida. As a group of the *Reptilia* they offer a most interesting one for study and observation, and this applies particularly to that most remarkable assemblage of forms seen in the genus *Phrynosoma*, which long ago was created to contain our Horned lizards. Most people have come to know these as "Horned toads," and they are very generally referred to as such; while as a matter of fact they are no more to be classed with the toads than Snapping turtles are—indeed, with not so much reason, for Horned lizards and Snapping turtles both belong to the *Reptilia*, while *toads* are representatives of an entirely different class of animals, namely the *Batrachia*. We should do all in our power to prevent the perpetuation of such erroneous ideas as this, and the best way to do so is by calling things by their *right names*; for, as names and forms are ever associated, the giving of the name *toad* to a creature when it is in truth a *lizard*, simply makes for biological confusion to say the least, and such misconception in any instance is fatal to the progress of science. Then, too, when one really comes to compare any of our seventeen different species and subspecies of Horned lizards with a specimen of our common toad, the resemblance is, as a matter of fact, very slight. So, to make any such comparison here would be only a waste of time and valuable space, with no material benefit to any one. Out of the seventeen species mentioned, four occur only south of the Mexican Boundary line.

Recently I had in my possession a number of living specimens of the Horned lizards, and I succeeded in making some excellent photographic negatives of them; a print from one of these has been reproduced as a cut for the present article. These specimens were of the species known as the Texas Horned Lizard (*P. cornutum*), which is a large and handsome form, and the one to which probably the misleading name of "Horned Toad" was first given. It occurs practically throughout the entire state of Texas, northwest to Nebraska, eastward from Galveston to western Arkansas, and southward through the Sonoran and Chihuahuan states of Old

Mexico. In nature its habits are pretty much in agreement with its several congeners of the genus, and it thrives pretty well in captivity, though perhaps not so well as some other western species.

The appearance of one of these Horned lizards is well illustrated in the accompanying cut. The specific and subspecific characters of the various representatives of the genus are all well marked; many of them possess a very scaly skin, the scales having different arrangement, coloration, and sizes in the various species. Some of the species have definite patterns on their backs and under parts, rendering their markings worthy of our admiration. Some of the scales in some species support strong, pointed elevations or processes; while the row of more or less prominent postcephalic "horns" are really the structures responsible for the vernacular name applied to these truly gentle little creatures.

These lizards bring forth their young alive; and, many years ago, while residing in northwestern New Mexico, I kept in captivity numerous specimens of the form most abundant there (*P. d. hemandesi*); to the best of my recollection it was one of this species that gave birth to nearly twenty young one morning in my study.

In the matter of their diet, Horned lizards are strictly insectivorous; and many species of them inhabit various parts of our rainless, desert regions, where they thrive on the hot sands, the prevailing temperature of which would be unbearable for any of us for any length of time. A Mexican form of this genus is entirely lacking in the matter of "head spines;" but, in so far as I am aware, it has not been taken in the United States up to the present time.

Horned lizards capture their insect food by the aid of their tongue, which is employed in a similar manner and for the same purpose as in the case of our common toads of the genus *Bufo*.

That Horned lizards of this genus can squirt blood from their eyes has now been known long, and abundantly proven.

It is also well known that those species of *Phrynosoma* which inhabit desert regions have a way of shuffling down in the sand by aid of their lateral projecting scales and the head, and that to a depth of two or three inches, or perchance to only cover itself over the back and tail. This is usually performed rather late in the afternoon, the reptile remaining thus until the following morning.

If well fed on proper insect food, these interesting little creatures may be kept a long time in captivity, under which condition it will well repay the young naturalist to carefully study their habits.

Field Notes on the Horned Toad

VIRGINIA BALLEEN

From *San Francisco Bulletin*

Horned toads like human beings. Somehow they have gotten the idea in their queer-spined heads that humans are admirable creatures. When they run from one it is in a manner as if they feared, yet half wanted, to be caught. They can run fast enough if they want to, if the big Road Runner is after them, or the Prairie Falcon swoops over them.

The Road Runner chases them mostly for fun. He has not learned to manage the horned toad very well. The lizard erects his spines and nearly always pushes himself out of the bird's long bill that opens far back into its head.

The short, overlapping, hooked beak of hawks and falcons is another matter. These birds rake them over on their backs and tear at them before trying to swallow them.

When a human hand lowers over the horned toad, he scoots and wiggles a little distance ahead, and after a short race, allows himself to be caught. He likes to be stroked and petted, and he likes the sound of the human voice.

Human beings generally like the horned toad the first time they see it, which is the very reason the fat, little lizards like us. If we liked snakes they would not look at us with such fear in their eyes. Even in the human eyes an expression of fear is very like a look of hate. Fear looking out of the eyes of the wild people is exactly like an expression of hate. So we think the snakes have hateful, evil eyes.

If we felt toward the harmless snakes as we feel toward the horned toad we would soon have many more friends in the fields and woodlands.

We cannot have too many friends and acquaintances in the open. The friendly little horned toad closes his eyes with rapture when we rub his back. Rub him on the sides and he tips over sidewise, blinking with delight. Rub his stomach and he can be taught to stand on his hind feet. Many lizards stretch up and even make dashing runs here and there on their hind feet when they are playing. The horned lizard eats like a toad, darting out its sticky tongue and catching flies like a real toad.

If you keep bees look out for the horned toad. He sits at the door of the hive and swallows the bees as they come in. But in a

garden he is a great help, eating slugs, snails, lice and flies. When a snail walks forth with his house on his back the lizard glues his tongue to the snail and wipes off the shell with rubbing whacks on the ground.

The horned toad is a nomad lizard. Sometimes it has a hole that it likes and goes back to in the evening. But usually it makes a night burrow anywhere it happens to be wandering. It bores its head into the earth, prying the soil up with its spiked crown. Then it twists its body in deeper, using the spines on its side to enlarge the opening. None of these movements are abrupt. We see the horned toad on the surface of the ground. Then we see the lumpy barely-stirring soil which looks a little like a horned toad. Then the soil is quiet, and there is no horned toad there.

These lizards take the color of the soil they live upon. In desert regions when the sand is pink, they are rosy in shade. On black lava ground their skin is shining black. On lichen-covered earth they become grayish-green. In Central California they are brownish grey, with darker blotches on each side of the neck.

When winter comes, the horned toad digs a hole deep in a sunny patch of earth, and lies dormant until summer.

In August and September the toads bring forth their young alive, enveloped in a thin sack of skin. The little horned toads are smooth. They butt their heads through the skin and wiggle out. Everybody likes them, they are so fat and jolly and likeable. We have never heard of any human being killing a horned toad, as we often strike down things just to be killing something. They inspire no fear.

We must be careful, however, not to call them by their right names, to strangers. They are really lizards, or reptiles. But only to their well-established friends may we call them that. Most people are foolishly afraid of reptiles. "The Horned Reptiles" would have a fearsome sound, wouldn't it?"

It is quite likely that the round, fat lizard made so many friends in the first place because he was called the horned toad. There is so much in a name, and so little reason in stubborn prejudice. Perhaps if we called snakes Live Ribbons, or Ornamented Worms, or The Farmer's Friend, or any other name but plain snake, they, too, would be better liked.

Cousins Under Their Skins

JAY TRAVER
Willoughby, O.

CHARACTERS

Mr. FROG	LITTLE BOY
Mr. TOAD	LITTLE BOY'S MOTHER

TIME, SEASON

About five o'clock on a warm summer day.

PLACE

Grassy bank beside a little pond.

Enter Little Boy.

LITTLE BOY: *I think I will lie down here and go to sleep for awhile.*

Mr. FROG: (Climbing up on bank out of pool) *How-do-you-do, little boy.*

LITTLE BOY: *Oh! how you frightened me! How do you do, Mr. Frog. I thought frogs were afraid of boys.*

Mr. FROG: *Only of big, noisy boys who throw sticks and stones. You don't look like that sort of boy.*

LITTLE BOY: *Please tell me something about yourself, Mr. Frog, Have you always lived in the water?*

Mr. FROG: *Yes. Once I was a tadpole and I could not even climb out on the bank then.*

LITTLE BOY: *How can you swim so fast?*

Mr. FROG: *See these webs between my toes. And see how strong my hind legs are. They help me to swim.*

LITTLE BOY: *Oh! look! Here comes Mr. Toad.*

Enter Mr. Toad.—

Mr. TOAD: *Good afternoon, cousin Frog, Good afternoon, Little Boy.*

LITTLE BOY: *Do you live in the water too, Mr. Toad?*

Mr. TOAD: *Not now. But I did once when I was a tadpole. Even yet I like cool, damp, places. That is why I usually sleep all day and come out towards night.*

Mr. FROG: *But in the spring I often see you in the water.*

Mr. TOAD: *Yes. Toads come to lay their eggs in the water then. The eggs are laid in strings, and soon the tadpoles hatch out from them.*

Mr. FROG: *We lay our eggs in the water too, but in masses not in strings.*

LITTLE BOY: *What do you eat, Mr. Frog?*

Mr. FROG: *I eat insects mostly.*

LITTLE BOY: *And you, Mr. Toad?*

Mr. TOAD: *I eat insects too. See me catch this bug.*

LITTLE BOY: *All I saw was a dark streak.*

Mr. TOAD: *Yes, I am very quick about it. My tongue is fastened at the front of my mouth.*

LITTLE BOY: *What do you do when the North Wind blows?*

Mr. FROG: *I burrow deep down in the mud of the pond.*

Mr. TOAD: *And I burrow into the earth, beneath a stone sometimes, and sleep all winter long.*

Mr. FROG: *You would never know we were cousins, would you, little boy?*

LITTLE BOY: *No, indeed. Mr. Frog is green like the grass and Mr. Toad looks like a grey stone. Why is that?*

Mr. FROG: *Shut your eyes and we'll show you.*

Mr. Toad sits down beside a stone. Mr. Frog hides under green leaf.

Mr. FROG: *Already now.*

LITTLE BOY: (Opening his eyes) *Why, where are you?*

Mr. FROG: *Crroak! Cr-r-r-oak! !*

Mr. Toad gives a queer little squeak.

LITTLE BOY: *Oh yes, now I see you both. How well you can play hide-and-see!*

MOTHER: (Calling from stage entrance) *Ro-ber! ! Ro-ber! !*

LITTLE BOY: *That's Mother calling me to supper. I must go now. Good-bye, Mr. Frog. Good-bye, Mr. Toad.*

Mr. FROG: *Good-bye, Little Boy. Come and see me again some day.*

Mr. TOAD: *Good-bye. Tonight you may see me in the garden, if you look close^s*

Exit all

TEACHER'S NOTE—This play may be given by third grade children after a Nature-Study lesson on the frog and toad. It may well be left very largely to the children as to how much and in what order the story shall be acted out. It may easily be adapted for higher grades; or for second grade children, by cutting out some of the conversation.

Over-Night Nature-Study Trips

VAUGHAN MACCAUGHEY

Honolulu, H. I.

For several years the writer has conducted courses, at the Chautauqua Summer Schools, for teachers of nature-study. These courses aim to give as much field work, and first hand contact with natural phenomena, as is possible in the brief six weeks of the session. Four kinds of field trips, classed on the time basis, are utilized in these courses:

1. Dawn and sunset trips, each about one hour in duration.
2. Morning and afternoon trips of several hours duration.
3. All-day tramping trips, covering distances of 6 to 12 miles.
4. Over-night camping trips, involving two, or sometimes three days. The present paper deals solely with the fourth type of excursion. The other trips are well known to teachers of nature-study; the over-night trip, to the author's knowledge, is but little used in summer school work. The writer has been much impressed with the distinctively educational values of the over-night trip, and has made a somewhat detailed study of its usefulness.

Contrary to general belief, there are few practical difficulties involved in a two-day outing. The compensations, both in direct nature-study observations, and of other sorts, are large, genuine and unobtainable by means of the briefer trips. The following data applies solely to summer conditions; suitable modifications would be made during the other seasons.

The Chautauqua Lake region, in which these trips have been made, is especially favorable for field work of this nature. The plan, however, may be easily adapted to any locality. By utilizing local transportation facilities the party can easily get far enough away from congested districts to find a satisfactory camping place.

At least one member of the party, preferable a man, should be thoroughly familiar with camping and camp life. He will select the camp site and make arrangements with the land owner for permission to camp thereupon overnight. Many farmers are naturally suspicious of city picnickers, who are notoriously careless and selfish, and who often set the woods on fire. The leader must explain the purposes of the trip, and assume responsibility for leaving everything in good order.

Our parties consisted almost exclusively of women teachers, young and middle-aged, who were actively interested in nature-

study, but who had not done much camping or tramping. The number joining the excursions varied from eight to forty. For over-night trips a party of twelve to eighteen is amply large. If there are too many the problems of camping are likely to be increased. Smaller groups, of from four to ten, can have very profitable trips, and do more along certain lines, (for example bird study, and insect collecting), than can the large groups.

We found the best time for starting to be either nine or ten in the morning or three or four o'clock in the afternoon, preferably the latter. The morning start gives a longer time for tramping before making camp, but in turn involves carrying blanket-rolls and other luggage a longer distance. The afternoon start avoids the heat of midday, and gives relatively a shorter trip before making camp. Here the luggage is deposited, leaving everyone free to make short excursions in various directions, unburdened from cumbersome luggage. Tramping during the midday period in summer is particularly fatiguing, especially to beginners, and will be avoided by the wise leader. If a morning start is made, a prolonged rest period should be planned for midday.

One distinctive advantage of the over-night trip in summer, over the all-day trip, is that the all-day trip misses early morning and late evening (the choicest parts of a summer day), and enforces walking during the hot, glaring hours of midday. The over-night trip avoids this arid, sultry period, and gives opportunity for maximum enjoyment of the cool, lovely hours of sunrise and sunset. For midsummer bird study these are the only good hours of the day.

Moreover, the over-night trip permits the visiting of more distant regions and with a greater amount of leisure, than one would ordinarily plan for a day trip. Most people, too, enjoy the primitive element of the camp. It gives a maximum amount of human "reversion" to wild life in the minimum amount of time. It takes people away from fretful humdrum, from deadly routine, out of their old selves, and gives them a new, fresh, revitalized self of the woodlands, the campfire, and the starry night.

Perhaps the outstanding feature of these trips is that they give the nature lover unusual opportunities for the observation of nature at twilight, at night, and at dawn. The average woman teacher, especially if she be urban, rarely has been in the woods at these times. She has not slept out-of-doors, under the open sky.

She has not known the joy of early dawn in the fields. The over-night trip gives a new and delightful series of nature contacts. It enlarges the soul. It gives old subject-matter a fresh spiritual significance. The brook of afternoon is not the brook that sings in the starlight. The first bird notes of early dawn are not those of midday. The woodland floor pied by the last long slant orange sun-shafts is a revelation to those who know it only in the day's high tide.

Another value of the over-night trip, for the woman teacher, is that it gives her a new sense of freedom and simplicity. Such women are likely to be house creatures, accustomed to their own rooms, with all the little accessories and comforts; and used to meals prepared by others. The experiences of carrying one's own luggage; of selecting a camping site; of preparing food over the camp-fire; of making a bed in the open; of sleeping without ceiling or walls to shut one in; of washing in the beautiful woodsy stream:—these simple acts have a deep and direct spiritual significance. New and enriching decisions, reactions, and experiences, are invoked by wood-magic.

The weather is an important controlling factor in the over-night trip. Such outings should not be made when the ground or vegetation is wet, as people unaccustomed to sleeping out-of-doors are sure to take cold. In all cases the camp site should be reasonably near roofage or shelter, so that in case of unexpected rain the party can easily move base. A rain-proof shelter is not easily constructed in the woods; the labor is too great for a single night's use. Only well-seasoned trampers can endure drenching rain. The over-night trip is essentially a fair weather trip, and for its success, demands a clear, starry or moonlit-night. "Rainy day" nature studies, which are intensely fascinating, especially to those who are not accustomed to tramping about in the rain, are best made by starting in the morning, and returning to shelter and dry clothes as soon as the party begins to feel chilly. A good nature-study trip should always be tonic and beneficial. There is something radically wrong with the trips from which people have to recuperate.

The distances to be covered are carefully planned with reference to topography, baggage, meal times, and camp size, as well as to natural history features. We found that women (not in training), could comfortably carry blanket rolls and provisions for three to five miles without suffering fatigue. Longer distances than this

are inadvisable, and this distance is best accomplished by frequent stops,—perhaps every 20 minutes. The very spirit of good nature-study work requires frequent stops for the purpose of examining wayside trees, plants, topographic features, etc. We definitely planned and used these resting periods educationally, so that at every stop someone would have some interesting material to present, questions to ask and answer, and suggestions for observations along the way.

Our plan in general, was as follows: We would go by trolley or boat (Lake Chautauqua) to within three to five miles of our camping place; proceed afoot to the camp site, in the leisurely manner indicated; make camp, eat supper and arrange sleeping places. During the remaining hour or so of daylight the party would break up into small groups and wander in various directions for bird study, collecting, etc., returning at nightfall. We would then build a fine big camp-fire, and sit round it until bedtime (ten o'clock). In the morning everyone awakened early; by seven-thirty breakfast was concluded, and we had the day before us for tramping, nature-study, and returning home. We endeavored to plan the homeward journey in such a way as to avoid walking during the heat of the day.

The practice of taking some good woodsy book,—the "Pocket R. L. S.," Walt Whitman's "Leaves of Grass," Jeffries, "The Story of My Heart," Van Dyke's "The Blue Flower," Burroughs' "Songs of Nature," Thoreau's "Walden," or some similar volume,—and reading aloud from it, either at the camp-fire, or during some rest period on the day's tramp, is delightful. It elevates the tone and thought of the entire trip, and assists to make the episode a memorable one.

The itinerary should not be too rigid or too detailed. Flexibility and freedom are requisites of successful nature-study. People do not enjoy tramping under the pall of a railway-like schedule. A good trip is a series of unexpected diversions, and a good leader will give each of these its full educational value. Nature is large and leisurely, abounding in the unforeseeable, and not addicted to itemized schedules. Some of the finest products of a good trip are *by-products*. All is game that comes to the nature lover's net. A trip that has been planned chiefly in terms of tree study may turn out to be the most successful bird study outing of the summer.

Elasticity, serenity, willing compliance with the moods of the day and place, these are touchstones to success in the camping trip.

The camping site should be located near a bountiful water supply, including pure drinking water. Surface water is always liable to contamination. There should also be plenty of firewood, for cooking and camp-fire. The sleeping places should be in the open, on dry ground; where the grass is short, or where there is sand. Amateurs often make the mistake of camping in deep woods, or heavy grass, where dew and insect pests ruin the night. Experienced woodsmen always camp in the open. The gravelly shingle along the stream is a better sleeping place, for example, than is the moist ferny undergrowth of the forest. In the selection of a site a sharp lookout should be kept for poison ivy, nettles, and other noxious plants.

The women, after experimenting with various types of clothing, found the most satisfactory garb to be about as follows: *Shoes*—comfortable, broad-heeled, broad-soled, buckskin leather; not heavy boots; shoes not too thick. Shoes with high heels, narrow soles, or made of thin leather are worse than useless on tramping trips. They are most fatiguing, and usually cripple the wearer. Brown tennis "sneaks" are good, but tiresome to any one accustomed to shoes with heels. Comfortable shoes, well oiled, and well broken in, are absolutely essential to good field work in nature study. Hobnails are helpful, especially where there is much climbing, or slippery grass.

Stockings—fairly thick; excessively thin, gauzy hosiery gives no protection to the feet and legs. A fairly heavy stocking not only cushions the foot, but also protects the legs from poison ivy, stickers, etc. Leggings are not necessary. They are heavy and tiresome to any one not accustomed to them. Shoes, thick stockings, and bloomers, comprise a far better combination for the average woman than any arrangement involving high boots or leggings.

Bloomers—These are most desirable, and may be made of any strong, durable material. Wool or serge is better than khaki, which is too heavy. A light-weight skirt is worn over the bloomers until the "pale" of convention is reached, and then joyfully discarded. The bloomers should be cut full, but not as baggy as ordinary "gym" bloomers. Ample pockets, with flaps and buttons are necessary.

Waist—The best waist is made of durable cotton, wool, or silk; not too thin. It is cut full across the back and shoulders, with sleeves that can be rolled up, and loose comfortable cool neck. Many women like the regulation "middy blouse." Wool waist and bloomers possess the very decided advantage that in case of rain the wearer is not likely to chill. Wet cotton clothing, on the other hand, is cold and clammy.

Jacket—Some women like to have a light-weight jacket, matching the skirt and bloomers. This jacket is cut military or Norfolk style, with roomy pockets and belt. A coat or jacket of this kind is useful in rainy weather and at night.

Hat—Any broad-rimmed, light-weight hat, that will stand dust, wind, and rain, is satisfactory. Many women prefer a man's felt or duck hunting hat.

The individual pack of each member of the party was as follows: Blanket—heavy army blanket is best; cotton blankets are not thick or warm enough.

Extra clothing—handkerchiefs, hose, jersey, etc.

Toilet articles—towel, soap, tooth brush and paste, comb, brush, mirror, talcum powder, etc.

Provisions for the required number of meals.

Frying pan, knife, fork, spoon, cup.

Beginners commonly do not know exactly what to take nor how to pack it. The leader can give instructions and demonstrations concerning the making of a compact, comfortable pack. An awkwardly arranged pack is irritating and fatiguing. The pack should be well tied up, with plenty of stout twine, and with a comfortable handle. The blanket roll, over the shoulder, is too hot for summer use; the hand pack is better.

In the party were also such articles of equipment as: field glasses, camera, topographic maps, hatchet, matches, ball of heavy twine, small roll of annealed iron wire, candles, etc. Every camper should have a stout pocket-knife,—the Boy Scout knife is excellent,—with sharp blades. Such a knife has innumerable uses in nature-study and in camping. Flimsy pen-knives are of little worth. Most women teachers do not know how to use a knife; such use is good training.

The best arrangement with reference to food and cooking is that each person is wholly responsible for his or her commissary. This avoids all possibility of complaint as to what has or has not been

brought, and everyone is satisfied. Food and cooking utensils may be used in common, as mutual agreement dictates, after camp has been established. Bread, jam, steak, bacon, cheese, pickles, eggs, oranges, figs, chocolate, and coffee were standard items in our camp diet. A small frying pan is best for bacon; bread may then be fried in the grease. Steak can be broiled on forked sticks. Many of the complicated cook kits are worthless or unnecessary. Two or three small frying pans, and a couple of pails for chocolate and coffee, are sufficient for a party of ten or twelve.

When the camp site is abandoned, it should be left clean and tidy. All rubbish, papers, etc., should be burned. Tin cans and bottles should be buried or hidden. The average American picnicker and camper leaves a disgraceful litter. This should be absolutely prohibited. Great care should be taken to *completely extinguish* the camp-fire. After the packs have been made up, it is well to look over the ground and make sure that nothing has been forgotten.

It is essential, of course, that the two- or three-day camping trip be a *real* nature-study trip, and not a mere picnic. Genuine observational natural history studies must be made the dominant note, to which the other features of the trip are subsidiary. This is almost wholly a matter of judicious planning on the part of the leader.

The trip's value is greatly increased by carefully planned preliminary talks or lessons, in which all important features, itinerary, natural history, etc., are discussed. By this means every one in the party is familiar, at the outset, with the significant features of the excursion. An excellent device is to assign or suggest some specific line of observation or collecting to each member of the party. One person lists all the trees; another, the plants in flower; a third collects mosses and lichens; a fourth lists the birds, a fifth collects butterflies; and so on. This arrangement gives each member of the party the feeling of personal responsibility for some particular phase of nature-study. Around the camp-fire, and later in the class room, the individual findings are reported, discussed, and made of general educational value.

Suggestive topics for trips

Plant life of the roadside—herbs, shrubs, vines; flowering, abundance, modes of distribution.

Weather studies—cloud formation in early morning, noon, evening; wind direction at various times of day.

Earth sections—studies of earth layers exposed at embankments, cliffs, railway cuts, etc.

Trees—composition of the woodlots; solitary trees of the open fields; roadside trees; trees attacked by insect or fungous pests.

The lay of the land—hills, valleys, drainage systems, ponds, relations of roads and trails to topography.

Bird studies—birds of the roadsides, thickets, fields, secluded woodlands, marshy places; songs and calls; relations to food supply.

Insects—collections of special groups; habitats; gall-forming insects; leaf miners and rollers, etc.

Edible plants—wild berries and other fruits; mushrooms; medicinal herbs.

Animals—observations of roadside and field animals; frogs and toads, salamanders, snakes, brook fishes; animals and their food.

A feature of our trips, upon which considerable emphasis was laid, was the study of the local topography. Most people are not able to read an ordinary map, and are only dimly aware of the real significance of the commonest topographic features. So, during every trip, we studied the lay of the land, hills, swamps, and beaches, asking about each the questions—Why is it here? how long? how constructed? The relations of plant distribution to physiography, and of animal communities to plant zones, were made standard subjects for observation and comment on every trip. Studies in place names, local history, legends and folk tales, also have a legitimate place in such topographic studies. One of the great aims of nature-study is to create and develop pride in the locality,—pride based upon intimate sympathetic knowledge of the locality.

Studies of the summer sky, and other star observations, form a natural and interesting feature of the over-night trip. Such themes as the Milky Way, the important constellations, the lunar month, the "shooting stars," etc., are readily suggested.

The woodcraft and "scouting" phases of nature-study easily come to the front during an excursion of this character. Weatherlore, the different kinds of fire wood, the edible products of the forest, the harmful animals, and many other aspects of woodcraft can be discussed and studied. Much helpful material may be

found in the Boy Scout Handbook and other standard books on scouting and woodcraft. Most people do not know how to be at home in the woods; the over-night trip gives unusual opportunities to develop this side of nature-study.

How Do I Know?

HOPE H. GIRARD

How do I know that spring is coming?
The brook is swelling, the willow budding;
A gentler breeze the branch is swaying,
The clouds it's driving, the sky it's clearing.
Out from under the brown autumn cover,
Where they grew embosomed under ice and snow,
I see the tender grass-blades peeping,
Short, and green, and yellow-tinged.
And on the trees when the rain is beating,
I see the moss on their cold bleak sides,
A brighter, fresher, mellow green
Than it was in winter, when the days were drear.
And out in the garden, where the sun can reach,
The jonquils are pushing the sod away:
Vying with hyacinth, and crowd'd narcissus',
To color their bed ere the May-flower springs.

The birds that sang the year-round,
Sing a cheery song, a clearer note,
That blends with the air, the sprout, the tree,
Into a soft and vibrant chord.
And as I sit with window closed,
And watch the tips of the pine trees turn,
I feel spring-strains—with ear and eye—
Rouse every fibre of my sentient soul.
A calmer look o'er Earth's face is stealing,
Her eye is clearer, her cheeks are rounding;
She holds her robes with wondrous charm!
That's how I know, that spring is coming.

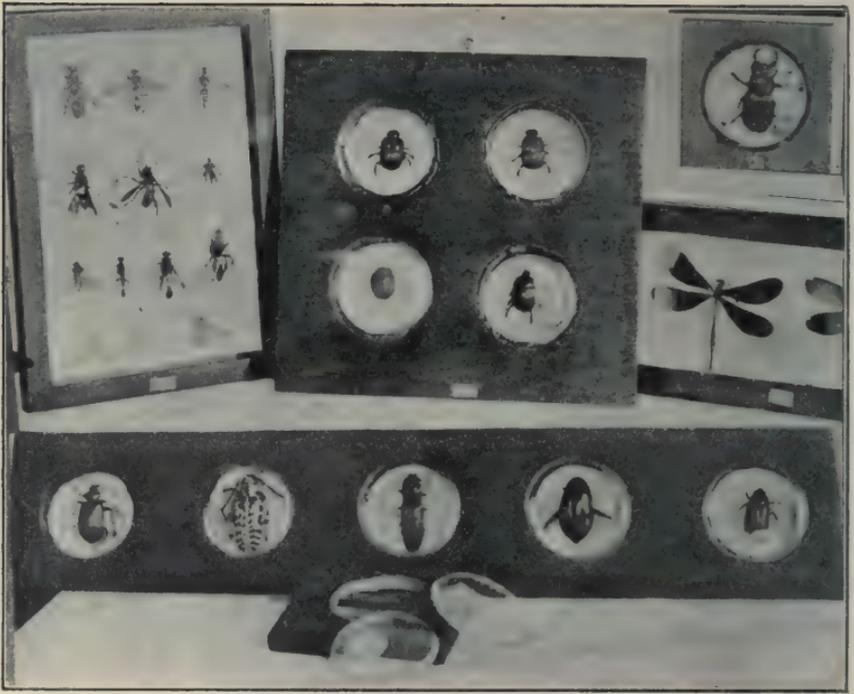


Fig 1 below

Fig. 2 above

Another Way of Mounting Insects

ALBERT E. SHIRLING

Kansas City, Mo.

"Nature-study without illustrative material is a waste of time." Illustrative material in nature-study may include, and should include, a great assortment of subjects and a number of devices for illustrating each of these subjects.

It is well agreed that living specimens best serve the purpose of all animate nature-study. It is also well agreed that nature is best studied in its natural environment, hence outdoor work, field trips and the school garden are the more idealistic bases for illustrative nature lessons. It is also very evident to those who are really at work in the school room with classes of thirty-five or forty-five children, or even with adults, that many, many difficulties may prevent these more idealistic plans from being followed at all times, therefore the desirability of more or less artificially prepared material in the way of mounted specimens, cages, pictures and other indoor additions to illustrate the lesson.

Of these many indoor schemes, I wish to discuss an original plan of mounting small insects in an attractive, durable manner. Fig. 1

shows the general plan but does not show how attractive the mounts may be.

Discarded watch crystals that are slightly nicked at the edges may be obtained free or at a very slight cost from the larger establishments. It is well to have quite an assortment on hand and match them as to size and thickness. The larger crystals will be better. Now select some wood strips or boards of good grain and color and about one-half inch, or less in thickness. Cut circular holes in these boards, just large enough for the watch crystals to slip through. The holes may be cut with an extension augur bit. It will take a little care to bore the holes without splitting the board, but this can be done by cutting first on one side and then on the other, and by waiting till the holes are all bored before cutting the board up into smaller blocks. Now cut strips from thick cardboard and glue around the inside of the hole in the wood. These strips are a bit narrower than the thickness of the wood and are to serve as a flange, or rim, on which the crystal may rest, and bring the convex surface of the crystal on a level with the surface of the wood.

Another and better way, if you have the facilities, is to cut the holes with a chisel by means of a turning lathe. This requires a block of wood that may be fastened to the lathe and to which the block to be cut may be clamped. The instructor in the manual training shop will know how to do this. With this arrangement the holes can be cut perfectly, and the ridge on which the crystal rests can be cut with the chisel, thus doing away with the cardboard strips. The boys in the manual training shop of the high school cut two hundred blocks for me in this way,—good practice for them and useful products for me.

The next problem is the cementing material. Common glue will serve the purpose, but it had a tendency to become too hard and brittle after a time, and the specimens jar loose. It is better to use a combination of venice turpentine and common glue half and half. This does not become brittle and is used especially for gluing the specimen to the watch crystal. For fastening the watch crystals to the block, one may use this same combination of glue and venice turpentine, but I prefer to use a kind of sealing wax made of red-lead, rosin, beeswax and a little tallow or oil to keep it from becoming too brittle when cold. These are all melted together and may be molded and kept on hand till needed. This cement really

serves a great variety of purposes other than the making of insect mounts. It should be used hot.

The insects, of course, have already been caught and killed and spread. The beetle or bug or wasp or small moth should be glued to the watch crystal by first touching a drop of the glue to the center of the crystal and then pressing the insect to the drop. The watch crystals are then cemented to the block by drawing up the hot wax with a small pipette or pen filler, and squirting it around the edge of the crystal that fits a bit below the surface of the block. This makes an attractive margin for the specimen and also fills every chink and crack and keeps out the museum pests. It requires a little practice to do a neat, clean job, but the third attempt will be a charming success. The specimen blocks may be small and made with a single hole, or they may be larger and contain a row or group of holes and of specimens. Red cedar wood, unstained, makes a very attractive mount.

The value of this plan of mounting is, that the specimens are attractive, they can be seen on both sides, they can be passed around in the class without damaging, and they will keep indefinitely. The labor required is not so great as one might think. The materials should be assembled in quantities sufficient to last for some time, then when some interesting specimen is found, it takes but a short time to get out the box of supplies and make the mount.

Fig. 2 shows a block with four holes and specimens of different species of scarabæid beetles "Tumble bugs." It also shows another well known method of mounting insects by using two plates of glass (old photograph negatives) separated by wood strips or cardboard. In this mount, it is well to let the glass extend a trifle beyond the frame and then fill in the space with plaster paris. This makes it dermestid proof. After drying, it is then finished with passe-partout binding.

These plans of mounting are most too difficult for the children to do, but they are well worth while for the teacher to make, and have on hand for supplementary illustrative material to add to the children's interest and pleasure and knowledge.



Photo by Verne Morton

Good Friends!

A Hen in the Kindergarten

ALICE L. SHALLCROSS

Kindergarten Primary Department, Harris Teachers' College, St. Louis, Mo.

On April 3, 1918, a mother hen with her dozen white eggs came to spend her brooding time in the kindergarten of the Wyman School. Being a pet hen, not all all afraid of children, she waited contentedly in the arms of one small boy until her nest was prepared in the large pasteboard packing box which was to be her home. When everything was ready, the children scattered grain for her on the kindergarten floor and watched her drink from a glass of cool water; then they gathered around the box with eager eyes to see her spread her feathers over the eggs and settle down comfortably and serenely in her new quarters.

Of course the whole school took an interest in the kindergarten visitor, and the children on the lower floor claimed her as partly their own. There was much guessing—and some calculating—as to when the first chick would arrive. The kindergarten children made a calendar and marked each day of waiting with a crayolla-colored (reminiscences of Easter) paper egg.

Every day the boy who owned the hen took her out into the school yard, where he fed her and gave her a chance to stretch her tired legs. The kindergarten children watched her come and go, but took no active part in the performance—for they understood that the mother hen must be kept quiet and undisturbed. They always tiptoed when they went into the small room next to the Kindergarten, where they had selected a dark out-of-the-way corner for her temporary home.

Every morning "mother hen" was the first thought of each child as he entered school, and "Have any chicks come yet?" his first question. It seemed to the children that this question was asked many times before, on April 24, a soft "peep, peep" was heard inside one of the eggs. The little boy who heard it first called the others, and great excitement reigned until the teacher found the right egg and held it to the ear of each child. No one missed this experience. The next morning, to the intense delight of all the children, a tiny yellow chick was found waiting to receive them in the kindergarten.

Then, April 25, began the most interesting time of all! An egg, which was just pipped, was laid on a clean towel on a table in the center of the room. Beside it were placed two mason jars of hot

water—to provide the proper temperature. The whole was covered with an inverted glass bowl. As many children as the space could accommodate at one time—(kindergarten and the three lowest rooms) gathered around the table to see what would happen. It was surely an instructive experience for all concerned! The intense interest and sympathy reflected in the face of each child, as he watched the tiny living thing struggle and push its way out of the shell and finally lie still exhausted by its labors, gave way to an expression of extreme satisfaction when the baby chick suddenly announced its recovery with a very lusty “peep!”

The children's spontaneous comments and exclamations were suggestive as well as entertaining to the teachers who watched with them.

“How did you get him in there?” asked one small boy.

“When he pecks he's like the woodpecker,” said another.

“Like our ice man,” added a third.

One little girl—evidently a doubting Thomas as to the reality of the things that happen in school—exclaimed proudly when called to the kindergarten to see the wonders that were taking place: “O, but when I was at my uncle's, I saw a *real* chick come out of its shell!”

To one of the teachers, at least, the small girl's exclamation suggested very forcibly the need of providing many such situations as the one described here—situations in which “school” and life are drawn close together in the experience of the little child.

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Please note your expiration date and send in your renewals promptly, as The War Industrial Board has requested all newspapers and magazines to adopt the following regulation:

“No subscription to be continued after expiration, unless renewed and paid for.”

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Bird and Flower Day Program

BIRDIE CLARETA SMITH

Ellensburg, Wash.

When using the following program, plan the school work so that the work for the program will be a part of the regular school work.

The songs given can be replaced by other similar songs that the children are familiar with.

Have the children make their own conversation.

The platform could have brown cloth over the floor with leaves scattered upon it, or, if the program is given outside, choose if possible, a place where the grass is a little brown.

Have each child make his or her own dress using crepe paper.

Have the same number of children to represent birds that there are children representing flowers, seven of each is a good number.

The flower children are dressed to represent flowers and over these dresses they have brown capes that cover them. The capes can be made of paper or cheap cloth. Brown wrapping paper is very good.

Bird children dressed to represent different birds.

Spring dressed in pale green carrying a green wand with streamers of green. The wand can be made of cardboard wrapped with green paper. The ribbons of green paper.

The colors are:

brown; green; blue; yellow; red; black; gray.

Flowers

blue-bell
buttercup.
red rose, wild.
larkspur.
daisy.
yellow violet.
red poppy.

Dress

all blue.
all yellow.
red dress, yellow cap.
blue with peaked blue cap.
white or yellow, brown cap.
yellow with peaked yellow cap.
red.

Birds

bluebird.
goldfinch.
robin.
bluejay.
song-sparrow.
yellow warbler.

Dress

all blue.
yellow with black cap and wings.
all gray except front of the waist
all blue with peaked blue cap.
brown.
yellow.

red-headed woodpecker. gray with red cap and deep collar of red.

The breast of the robin can be made by pasting a piece of red paper over the gray.

Do not forget to have a dark spot of brown on the breast of the song-sparrow.

The wings can be made by pinning a strip of paper to the child's arms.

I. Music: *Narcissus*, Orchestra with Bird Voices. Victor Record.

II. Bird and Flower Play.

- a. Flower children come in singing, "Good-night to the Flowers" in the *Modern Music Series*, Book I.

When thru singing each child sits down on the floor with his hands crossed on his knees and his head on his folded arms. Each child is then nothing but a little brown mound.

- b. Spring comes singing, "The Sweet Singers," found in *Modern Music Series*, Book I.

While singing, spring awakens each flower by touching with her wand each little mound or with some other light motion. As the flowers are called by spring they should wake with a sleepy motion, rubbing their eyes and lightly and easily stretching their arms letting their capes slip to the floor.

The capes can remain on the floor. The birds come in during the singing of the second verse.

- c. The birds go to their companion flowers and a few of the birds tell the flowers why they have chosen them, as: the song-sparrow has chosen the daisy because the heart of the daisy is brown like the spot on his breast; the bluejay has chosen the larkspur because the larkspur is blue and has a spur like the crest of the blue jay; the yellow violet is yellow like the warbler.

Be sure and allow the children to make their own conversation.

- d. When the birds and flowers have finished talking they have a drill, each bird with the companion flower.

Music; "Robin's Return." Orchestra with Bird Voices. Victor Record.

THE NATURE-STUDY REVIEW

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Editorial

BIRD-FOUNTAINS AS MEMORIALS

Those who have dwelt close to nature and have learned to love her ways seem to have a different attitude toward death than do others who have not been blessed with nature companionship. This attitude is marked by satisfaction in the thought of dissolution; the fact that all the parts of this dear body, which we have used so intimately will ultimately be reclaimed by the elements of the universe is a substantiation of faith in immortality of the soul. Nature's chemical processes in her world-laboratory are gentle, invincible and reassuring.

This being the case—the naturalist's especial corner of this laboratory should be marked with something different from a block of stone bearing a name and dates; it should instead establish a point of contact with life; and what could be more appropriate than to make it a place which the wild birds love and haunt.

The newspapers have contained many suggestions for bird-fountains in different parts of our country as memorials to Roosevelt. Undoubtedly many of these will bear tribute to our appreciation of the naturalist side of this great and diversely gifted man. Surely nothing could give him more satisfaction than to know that in his name there should spring forth in a grateful country—fountains where little birds may come down to drink and gain refreshment.

After life was represented by the Ancient Egyptians as a bird, and the sun, the giver of all life, was symbolized with a pair of wings. We still hold to the symbol with figures of angels and cherubim. But no marble angel with drooping wings could represent the spirit of life like the swift-moving wings of a bird; and

nothing could so typify our idea of this life as a fountain where, for a brief moment, the soul on the wing from time to eternity pauses for refreshment and to gain strength for future effort of flight.

In a beautiful cemetery in Savannah, Ga., there is one grave which thus speaks of life rather than death. Beneath a spreading live oak draped with graceful undulating festoons of gray moss is a beautiful marble basin upon a pedestal in which is kept fresh water for the delectation of the wild birds which there abound. As a monument it is far more satisfying to the eyes of the artist than is any marble shaft. The memorial bears the following simple inscription: "Julia Davis Myers, 1858—1917. But lo! There breaks a yet more perfect day!"

Mrs. Myers was a woman of many good works and was a true lover of birds, and this fountain was devised and erected by those who loved her, as a monument which should rightly represent her to the coming generations. May every cemetery in our land hold at least one such memorial!

PUBLICITY DEPARTMENT,
GOVERNMENT LOAN ORGANIZATION
LIBERTY LOAN COMMITTEE, 120 BROADWAY, NEW YORK
JOHN PRICE JONES,
ASSISTANT DIRECTOR OF PUBLICITY

Our Victory Loan

(Written exclusively for NATURE-STUDY REVIEW)

All loyal Americans have had a hand in the winning of the war, either in battle or in the machinery behind the battle lines. Now they are to play a part, fully as important, in the work of finishing the business of war, without which the fruits of victory cannot be realized.

The Victory Liberty Loan offers to all of us the opportunity to help bring about the era of prosperity for which thoughtful men and women are yearning. By buying Victory Notes Americans enable their Government to pay the debts for munitions, supplies, maintenance, transportation and salaries of the Army and Navy. If these expenditures had not been made, the war would still be raging in France. But they were made, and as a result the war is

over, with victory ours and American soldiers today standing guard on the bank of the Rhine River.

To pay these debts, therefore, is to pay for a victory won by American troops, and we who were not able to fight in France, will be proud to do that. It will be our way of showing gratitude for their sacrifices, and it will demonstrate our determination to make America a debt-free country, with larger prospects for employment and advancement, for the soldiers who return.

It will take ten months to demobilize the American Army to a peace basis. During those months our fighting men must be clothed and fed; the estimated payroll for that time amounts to \$827,970,800, and the Army's meal ticket for the same period will cost about \$279,428,130.

All these American heroes have to be brought back and deposited in their homes at Government expense! The bill for transportation will demand \$400,000,000!

More than one and a half billions dollars are thus needed for the A. E. F. alone. To that sum we have to add large outlays for the care and vocational training of disabled soldiers—men who gave their best for Liberty, and must now rely on American gratitude to support them, or teach them new ways to earn their bread. Greater amounts will go for the munitions and supplies ordered before the war ended.

We will put over this Victory Liberty Loan! We will buy Victory Notes! America's will to finish the war will prove as strong as the will of her indomitable soldiers!

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The Adventures of Jimmie

ELSA GUERDRUM ALLEN

Ithaca, N. Y.

Like other crows Jimmie had a humble origin, but since the day when he hatched from a green egg, in a crude nest, overlooking the city dump, he has achieved distinction, fame, and satiety. Two weeks he lived in his natal home, tormented by hunger, wishing always that something would happen to his two little brothers so that he could for once get a square meal. His parents were very faithful spending their days in search of food, yet Jimmie, though he thought he stretched farther and yelled louder than his nest-mates, never felt full.

It was therefore a happy day for him when his future master adjusted his camera in the snarled old willow to photograph the nestlings and after observing them thus closely, was so captivated by Jimmie's ugliness that he took him home with him for a pet and a companion.

Jimmie then lived in a box, and as long as he was fed to overflowing every ten or fifteen minutes, he was very good and quiet, lying asleep on his bed of straw or feebly blinking his pale blue eyes. At any sound, however, he sprang into life like a Jack-in-the-box, neck stretched, cavernous mouth wide open and yelling, every sheathed feather seeming to stand on end against the pinkish background of his body. It was a problem to keep him quiet. Bread and milk, in however large quantities, was not sufficient. He needed some animal food, so we decided on worms. But digging worms to fill this bottomless pit was an all day job. It was easier to pull them at night when we could catch a couple of hundred of the large fat night crawlers at a time.

These hunts had an element of real sport in them, for matching one's wits against those of the earthworm is not so frivolous as it sounds. The ideal night for "worming" is warm and damp, the

soil light from recent rain to allow the worm easy passage from his subterranean home into the summer night. To the angler, the ways of the wary worm can be nothing new, but to one uninitiated in that gentle art they make a good lesson in nature-study.

A bucket containing moist earth, a flash light, and strong quick fingers are all the equipment necessary. On the first night, being untutored in worming, I strode into the garden and cast the light about; to my amazement a dozen Jimmie meals shot back into their holes like lightning. Catching worms was obviously something more than picking them off the ground. One must sneak up on them with a stealthy tread, for they are very sensitive to the vibration caused by the footfall. One must be careful also not to flash the light directly on the worm he would capture, for his moist, shiny surface is quick to sense the light. And lastly one must observe sharply which end is which and grasp the victim where he emerges from the ground; for the wise worm never quite leaves his snug little hole but keeps his caudal end safely inside, so that he can draw himself back the instant he feels danger. The worm seeker experiences a foolish feeling when he deftly pinches the wrong end, and the worm eludes him entirely or leaves him but a few segments! With swift and noiseless manœuvering, however, we could easily bag from one to two hundred in an hour's hunt so that the bucket became quite densely populated, and we returned with a feeling of relief knowing that we had enough to keep Jimmie quiet for a while.

But only for a while; he always took three or four, and sometimes as many as seven, large worms at a feeding; a young robin, it is said, requires his weight in earth worms every day in order to grow, and Jimmie seemed no less voracious. Many pet crows die from starvation because their owners do not realize their tremendous capacity for food. They should be fed every time they yell. This may be discouraging, but by using worms caught at night when they are plentiful, it is a simple matter to keep the pet crow satisfied or at least sufficiently so to insure its normal development. Worms were, therefore, the mainstay of Jimmie's diet but he was given bread and milk also and all sorts of scraps, for crows are omnivorous and worms alone would not be a balanced ration, even for a crow. Grain was the only food he could not digest as a nestling. At this age he did not discriminate at all but swallowed greedily anything dropped into his mouth. If offered a finger he



Though Jimmie stretched farther and yelled louder than his nestmates, he never felt full.

Photo by A. A. Allen

stood upright resting on the whole tarsus, and fluttering his scantily feathered wings, opened his huge mouth, and, upon feeling the finger in his throat, attempted to swallow it with most realistic gobbling sounds. Young crows will swallow anything. Many a pet crow has taken with relish what later killed him, nails, sticks, marbles,—anything that the curious and mischievous would offer.

Jimmie grew very fast. He was hatched in May and by the middle of June he was fully feathered on the body though of course his tail feathers had not yet attained their growth. As he grew older, the color of his eyes changed from an unintelligent pale blue to grey, and now they are dark brown.

Jimmie never developed any fear of us nor showed any inclination to desert his home for several months. As soon as he could

jump out of his box he followed us about cawing for food; but it was a long time before he would pick up food for himself, even when we laid it before him. Indeed the nestling habits of fluttering the wings and waiting to have the food dropped into his throat, persisted until he was a year old—long after he was hunting his own living.

Jimmie's first summer with his foster parents was one of rural contentment. He loved to pick beans and peas or puncture an occasional tomato or sit affectionately upon his master's foot while he hoed. If Jimmie was a nuisance in the garden he was funny enough to keep us good natured. One day in the garden we overturned an ant's nest; the tiny red creatures scurried about frantically carrying their white pupæ to safety. The effect of this on Jimmie was most curious for he seemed to be thrown into a sort of delirium by the seething mass. He rushed into the thickest part ruffling out his feathers and rubbing his head into them. The ants were fast penetrating his plumage and apparently biting him but, although he was obviously annoyed by it, he continued to rush back at the ants whenever we forced him away. Finally we had to lock him up to recover and rid his fretted body of ants. This he did by drawing his feathers through his bill but he never ate the ants. Smoke at first had a very similar effect on him and whenever we burned anything in the yard we had to stand guard to keep Jimmie from rushing into the fire. Lately, however, he seems to have learned to be afraid of fire, and keeps away.

If Jimmie was fascinated by the garden he was also very partial to the kitchen where he stood a fair chance of getting into the butter or some other delicacy. One day he jumped into a pan of hot fudge and for a week after was busy picking fudge off his legs and breast-feathers. Often we heard unaccountable sounds in various parts of the house and upon investigation found Jimmie pompously helping himself from dressing table or sewing basket. Pulling hair pins and toying with rings and bracelets was particular sport to Jimmie and while harmless enough with the family, it was apt to be troublesome, for one day while a friend was amusing him with her gold bracelet he deftly snatched it from her and carried it into the top of a tree.

But this perfect happiness was fated soon to end. Jim's master and mistress with complete lack of regard for Jim's feelings in the matter, took unto themselves a dog—a noisy, clumsy puppy whom

Jimmie feared and bitterly detested. Although he had been our constant companion from May to September even following us for miles on field trips he now suddenly changed and with a thousand imprecations against the dog and us, he left home and entered upon a chequered career.

After some days we learned that our baby crow was hanging around a saloon. Apparently, Jimmie was getting a bad start in life. We repeatedly brought him home, but as long as we had the dog we could not keep him unless we caged him. He wandered farther and farther seeking always man in preference to his own kind and had it not been for the little aluminum band of the American Bird Banding Association on his leg we might have lost him.

The band was used in the hope that if Jimmie ever returned to the wild state, it would give some further information about the migratory movements of crows, but from the minute Jim left his nest he must have renounced crow society forever for his affections are only for people. After Jimmie had been reported twice to the Bird Banding Association in New York by persons who were detaining him in their homes, we replaced the band with a silver one engraved with our name and address. We were thus able to locate him direct. Word came to us from all parts of the city about our crow; for as soon as we brought him home from one place, he was off in another direction, although there were a few neighboring places where he was a regular visitor—too regular and too constant we shall see.

Jim made both friends and enemies. On one of his first outings he flew up to the upper floor of a suburban home and tapped on the window. The occupants thought it strange but very nice to have a crow come to their window and welcomed him by opening it. Without a sound Jimmie flew over to the bath tub (for it happened to be the bath room) grabbed a cake of soap, and triumphantly flew out again. He always has had a liking for soap, probably on account of its fatty material for Jim's early diet was lacking in fats. Butter and cheese are still a great delight to him.

More brazen than stealing soap were his pranks at the neighbors. Indeed it is a wonder they put up with him as long as they did but no doubt Jim's irrepressibility has a certain likeableness.

The summer that Jimmie was a year old he learned the joy of pulling up young plants in the garden. The destruction of beans

and peas was tolerated for a while; but when he practiced his new trick on strawberry plants our good neighbors rebelled and we had to keep him home. At first we only clipped his wing and put him in the enclosed portion of a ravine near our home, where he could hunt his living and have the company of the ducks and geese which we kept there. But fences were no obstacle to Jim. He climbed them as easily as a squirrel, so we put him in a cage in the yard until the garden season was well advanced.

By August he had moulted and regained his flight so we let him out again but back he went to the neighbors, the bane of their lives. On a certain day he flew up to the kitchen window of a neighbor and finding a pudding set outside, planted both feet in the middle of it and began to eat. The harassed housewife went after him with a broom and drove him across the yard, but Jimmie was back at the kitchen a little sooner than she was and this time captured a fish from a shelf on the porch. The particular delectableness of this find made it necessary for Jimmy to take it aside into the chicken yard. Here he got his feet and bill very dirty and fishy but seeing a freshly washed counterpane on the line he used it to "wipe his bill" and then walked down the centre of it leaving a muddy crow track with every step. This was beyond all housewifely endurance and Jimmie was whisked into a box.

In a few minutes Jim's mistress was called to the telephone. After preliminaries I was asked if I owned a crow. "Yes, is he at your house" I asked for we had had dozens of similar messages about Jim.

"No" replied the deep voice on the wire, "the crow is at 155 ——— St., and the lady has him in a box and "Oh" I interrupted, "that is right near home and the crow knows his way about. Tell the lady to let him out."

"Well," said the deep voice growing a little deeper, "This is the chief of police."

That magic word was all that was necessary. Jimmie was getting himself and us into trouble, but the misdemeanors cited above were the last ones that season for we brought him back to his cage for the rest of the summer and fall.

For the winter we put him in a large pen with the ducks and geese where he could keep fat on corn and have plenty of company. The pen was large enough to fly in and had several long perches—the one in the corner was his sleeping quarters and the one over-

looking the ravine was his sun parlor. Here he basked and preened himself and watched for his master and teams in the road, and always called exuberantly whenever he saw any one.

We always brought Jimmie a tidbit of cereal or meat when we went to feed the ducks and sometimes stayed a few minutes to hunt spiders with him. Jimmie hunts with real enjoyment and when it comes to piercing the soft spherical body of a spider or cracking the scaly exterior of a wireworm he is a true epicure. At first all food was more or less alike to him and he swallowed it without tasting it apparently; but as he grew older he became particular to a nicety; he first manipulates the food with the tip of his bill, tasting it delicately, then deftly turns it over with his tongue before swallowing it. If he likes it, it goes down the first trip, but if he is doubtful about it or not hungry he only half swallows it then brings it back and often disgustedly ejects it entirely. As if not wishing to seem unappreciative, he often hides it in a crack for future use. This is a common crow trick but I have always thought that having hidden the food they forget about it and never return to it unless by accident. But this is not Jimmie's way; we have often watched him take food when he was too surfeited to eat, hide it in the grass, then cover it with a dead leaf, and a thin stone, and another stone. Days later he often returns to such a cache, lifts up one stone, then the other stone, then the dead leaf, and finally picks up the food.

Raw meat or mice or sparrows seem to be the only things that Jimmie never tires of. One day as I was comforting him for being locked up, he stopped suddenly in his affectionate crooning and pounced upon something behind an overturned bucket. When he returned to the perch I saw that he had caught a mouse in his bill, not using his claws as does a hawk. The next morning there was a pellet beneath his roost containing the bones of a house mouse. Having learned the trick, Jimmie liked catching mice for himself in his pen in the barn and even after he had his freedom again he caught mice and shrews in the open. Shrews and small mice he could swallow whole but field mice and sparrows he tore apart. He is not exactly hawk-like in his manner of capturing prey but reminds one more of a fussy old lady high stepping across a muddy road as he runs, and jumps and flutters in pursuit.

Jimmie grew very tired of his captivity and when the first warm day of February came we let him out, intending to put him back in

the evening. One look at the dog, however, now grown to fearsome long-leggedness, sent Jimmie blaspheming down the ravine and we heard no more of him for weeks. Winter was by no means over and we had just about concluded that Jimmie had starved to death or had been shot, when word came to us that he was three miles out in the country on a chicken farm. Finding the door of the dwelling open he had walked in calling for something to eat. The struggle for existence had not agreed with Jim; he had grown very thin and had a drooping wing from which he has never entirely recovered although he finally regained his flight.

There is a common belief that crows will learn to talk if their tongues are slit. Although far from convinced of the truth of this, we decided to split Jimmie's tongue, for we realized that if he could talk, it would be a great advantage to him and no doubt prolong his life which otherwise might be thoughtlessly ended by any boy with a gun or a bean shooter. Jimmie's mistress held him and his master performed the operation with sharp scissors. Only one drop of blood was shed and we put Jim back with the wild fowl to convalesce and learn to talk. Nothing happened although we tried diligently to teach him "hello" and other simple words. His failure to learn any new sounds strengthened our belief that the tongue was not employed.

It was not until Jimmie was released in the spring that he acquired the ability to make word-like sounds. Most birds do not learn to sing until they are a year old and doubtless Jimmie now gained the necessary control over his vocal muscles. At this time we were away from home and Jimmie lived mostly with the school children and soon began imitating many of their words. When we returned, he greeted us with "Hello," "How d'y do," "Mama," "Papa," and many other articulate sounds. So familiar is Jimmie with the schoolboy lingo that he often fools the teachers. One day he perched on the window sill of a school room and said "Hullo! Hullo!" in a conversational tone, and a boy in the back seat was reprimanded for being a nuisance. Just then Jimmie flew over to the blackboard and began throwing chalk on the floor; when the teacher tried to stop him he pecked her fingers and flew up on the door and gave forth an awful scolding to the great amusement of the children.

Now as I write Jimmie sits in a big pine tree nearby, talking, laughing, and shouting. Sometimes it sounds like a bevy of girls

chatting, and laughing, again it is deep and coarse with a lurking impudence throughout. To persons in the road he says something like "How!" long drawn out and very rowdyish, and if they turn around to see what it is, he lends a human touch by laughing loud at them Ha! Ha! Ha! Ha!

Every morning as soon as it begins to get bright Jim feels it his office to waken the household. He usually begins by helling and



Jimmie in full feather.

Photo by A. A. Allen

laughing and then breaks into more complicated variations. Papa he often calls "Pa! Pa!" and, as if annoyed by Papa's inattention, he will articulate vehemently "Paaa-paaa!" If we finally ask him "What's the matter?" Jimmie says a quite intelligible "Come on out." These three syllabled phrases are difficult for him and seem to be modified by the larynx, for they cause the sides of the throat to dilate and the feathers to stand out.

Jim's latest accomplishment is a high pitched almost musical "Hoo-oo-Hoo-oo" such as little school girls use to each other. This is his usual call when he is welcoming us after an absence. But he is not always so agreeable. At times he is very moody and one has no way of knowing before hand how his advances will be received. I feel quite rebuffed when I go out with a tempting bit of meat or sour milk and to my cheerful hello get a curt rough "lope." Again he may be so glad to see us that he will bow low, bill to the ground, and wings and tail quivering. This expresses his acme of joy. Jimmie never shows the same pleasure to others that he does to his master and mistress and to strangers he is not even civil.

Since we lost our dog he has spent most of the time at home and indeed he is a far better protector of the premises than the dog ever was. Be it man or animal that dares to set foot on his precincts he caws his wildest and flies at the intruder. If only he could be depended on at night as well as in the day I would live in darkest Africa with him for he will not even tolerate a black dress or a muff on the clothes line, to say nothing of the people wearing such.

Next to dogs, he hates newsboys with a lasting and virulent animosity. Perhaps he hates all small boys for the drooping wing he received at the hands of one. At any rate he will not permit one to approach without an irate volley of abuse accompanied by flying at the intruder's head and pecking his ankles. Unfortunately the boys fail to see the funny side of their plight and their nervousness is much relished by Jim; but if after hedging and dodging the boy successfully conveys the paper to the door Jimmie relents somewhat and permits him to leave, but not without accompanying him off the premises. Swaying from side to side and dragging his wings he walks stiff legged after the boy jabbing his fast retreating legs.

Jimmie has now weathered nearly two years of ups and downs, hunting his living, fighting his enemies, learning that life is sweet but perilous. Much of the time he has lived as a wild crow but without the advantage of a wild crow's wariness. Indeed the local game warden was on the point of ending Jim's mischief forever when Jim saved himself by flying down on his shoulder with a lusty "papa." This was not his only narrow escape when by a timely guffaw he has saved himself from a bullet.

Jimmie's charm lies in the fact that he has his freedom yet clings to man as his best friend. Aside from this human attachment he is really a wild bird and offers many opportunities for

interesting observations. When he follows us on field trips he goes so naturally and so quietly that wild crows often follow him; especially if he has a bit of food in his bill, but when Jimmie is about the house he is a complete enigma to them. They congregate as near as they dare and caw their astonishment frantically as if to save Jimmie from himself. This is the nearest that Jim has ever come to association with his own kind.

We think, however, that he is beginning to feel the magic call of spring, for of late, he has begun zigzagging through the trees in a delirium of joy and occasionally we have seen him carrying bits of straw and bark about as if he would build a nest. If at last he should take a mate and rear a brood of young, and still keep his attachment for man, he would indeed be worthy of the unique place he enjoys in the community as well as his heritage as a member of the most intelligent family of birds.

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The Bluebird

H. MARGUERITE HESS

Lyons Falls, N. Y.

I like all seasons of the year and can see enjoyment in all kinds of weather. But who is not thrilled much when on an early day in March, the earth looking drear and forbidden, he hears the first greeting of our brave little "Herald of Spring," the bluebird; whose slight, sweet song gladdens us in lulls of the March gale, bidding us be of good cheer, and telling us spring will soon be here.

Without the bluebird there would be no spring and no reawakening of glad new life. God must have planted in the heart of this first bluebird a seed of optimism, and the flower of hope; for he is the sunniest, cheeriest little herald that ever carried good tidings. And he comes to teach us this greatest lesson of life; that of hope, and trust, optimism and good cheer.

The male bluebird usually precedes the female by a week or two, and her final advent is the occasion of beginning courtship, and a

deal of attention on his part, which she receives as a matter of course, and no more than her just due.

The male has a wealth of color: on his back is the tint of the skies when clearest and most beautiful, and on his breast the brown of the earth. The female's garments are not as gay as her mate's and she has no song, but she is content to shine with borrowed lustre and informs you with a queer little nod, "that it is all in the family," so why does it matter?

Late in spring when the birds with brighter garb arrive the bluebird does not appear so prominently, but who could forget that it was he that brought to us the first joys of spring and inspired our souls anew.

Soon after the arrival of the little spring heralds, house-hunting is begun, and as Mr. and Mrs. Bluebird are very particular about their abode; it is a long and hard task consuming days and sometimes weeks.

All sorts of holes, both natural and artificial, in trees, fence posts and old buildings are examined. Sometimes a fence post is chosen and oftentimes a bird house put out by some thoughtful and bird loving person. While the female bird is perched on a neighboring bough, her mate flies to the perch in front of the entrance of the prospective nest, and peeps in, not for a moment interrupting his warbling song. If he likes the looks of the abode, he calls in the most tender tones to his mate, hops about in a fluttering of excitement, and finally darts into the interior. The male always shows a very tender love for his companion.

Then after the site is chosen, both parents are seen for a few days busily and happily engaged in bringing grasses, plant stems, bark strips, and now and then a feather. They are very dainty nest builders and work very slowly, so they do not get their house done and take possession until later than you really think.

When the eggs, ranging from four to six in number, are finally laid, they are just the color that you would expect, a delicate blue suggesting the sky of a balmy day in spring. The male never strays far from the nest while the female is brooding. He often flies to her with a captured insect, sits on the perch before the entrance, every now and then peeping into the interior and singing to her his most beautiful strains. After the birds are hatched the father is still more busy and now the little mother assists, as it takes so much food for this young family. It is, indeed, astonishing what

an immense quantity of worms, flies, caterpillars, moths, beetles, and other insects is devoured by the little ones. It is so interesting to see one of the parents bring a bill full of worms or insects, lighting upon a nearby bush, tree or fence, look all around to see if he is watched and upon deciding he is not, fly into the nest, feed the young, and rush off for more. If anyone is near the nest when the parents are coming with food, there is great excitement. They will flutter from tree to tree in a worried fashion and scold very severely until all appears safe for their approach.

I did so enjoy watching a family of bluebirds one spring, who had their nest half way down a hollow fence post. It was while school was in session and each noon hour we would go across the fields to the nest, to see what progress in growth this young family had made. They grew very rapidly and we anxiously awaited the day when they would fly away, so we could see their attempts to fly up out of the post, as we imagined it would be a rather difficult task the first time. However, we were sadly disappointed as they took their departure at an hour when we were not present.

As soon as the young of the first brood are on the wing, then follows, even before these have become entirely independent a second or third one. After the young are able to care for themselves they congregate with others to form flocks. These flocks are often seen in the fields feeding upon mullein-seeds, or other weed seeds and also upon insects. In the latter part of October when it begins to get very cold the flocks are joined by the older birds and they all take their departure for a warmer climate.

Many are seen during the winter months in the middle states but the majority choose the south Atlantic and gulf states for their winter quarters.

I have read that in the south they act like an entirely different bird, being very timid and mistrustful and rarely uttering a note.

The bluebird possesses only good qualities. When the Pilgrim fathers came to New England, this attractive bird was one of the first that greeted them with tender and friendly warblings. It reminded them so much of their English Robin Redbreast that they named it the "Blue robin." The old settlers of the Mohawk Valley called it the "Cottage Warbler" because it chose to build its nest near their log cabins. The bluebird is in no manner whatever injurious; on the contrary, it is said, that the benefit resulting from its destruction of incalculable numbers of injurious insects, is beyond estimation.

The most dangerous enemy of the bluebirds is the English sparrow which is an enemy to most all other birds as well. It is said that if it were not for these useless and quarrelsome birds we would have bluebirds, wrens and other of our songsters as common around our streets as the sparrows now are.

It is up to every friend of nature, every farmer and gardener, I think, to do what he can to protect those birds of our native species which are most worthy of such attention.

Mr. H. Baumgaertner, whose home is in Milwaukee says, that after many experiments he has found that the sparrows will not use nesting boxes where the perch, right under the entrance hole, is absent, while the bluebird evinces a predilection for such. He uses small wooden paint kegs, bores within four or five inches from the top, a one and one-half inch entrance hole, and fastens them on poles or trees. If there is no perch near the entrance the sparrow cannot support itself at all, or only with difficulty, while the bluebird flies in and out very easily. Bird boxes made of boards with only an entrance hole but without a perch will also certainly prove of good service.

The Chirrup of the Chewink

JOHN WATKINS MOSLEY, JR.

Lawton, Oklahoma

My beautiful birdie, as you sit on your bough,
I wonder what God had in mind when he made you?
It was not I am sure for the sweat of your brow,
Nor the toil of your toes, nor the bugs that you chew.

Before I could finish, with a thrill from his tongue
He flashed from the heart of his God a glad gleam
And showed beyond cavil, for old and for young,
The glory of Him who haunts in vision and dream.

Then with a wonderful burst of medley and song
He lifted the wide-world with his tongue and his tune:
He filled it and thrilled it, brought it along
From doubting December to credulous June.

'Tis the flower of field and the bird of the air
That stiletto the doubts who stalk through the soul.
One whiff of sweet fragrance, one chirrup I declare
Will soon steady my faith, will my future control.



Bird Helpers in the Garden

"A garden is also eloquent to the ear, for it is the home of song birds. Here come and nest the happy people of the sky, accompanying, with their vocal music, the thoughts and emotions which the garden, by its silence, breathes into us. They pipe their lays to our mood either of morning exultation or of evenings meditation. The mystery is that they come upon us not as disturbers or intruders in this retreat of quietude, but rather as companions in labor or as friends in sympathy."—TEMPLE SCOTT.

We have all enjoyed the birds in our gardens, except perhaps the robins in cherry time—or the hens at any time, but very few of us realize that all the wild birds which frequent gardens are doing a valuable work for us, and are truly our "companions in labor." It should be a part of the work of every teacher of gardening to lead the children to observe for themselves how important are these bird helpers and how varied are their activities, and how they may be induced to remain permanent summer tenants of nesting sites near the garden.

First of all, the birds that help us most, spend the early part of summer in nesting, and feeding the young; and since the food of all nestlings consists almost entirely of insects which are attacking plants—the benefit to the garden is great. Grubs, caterpillars, beetles, grasshoppers and bugs form an acceptable diet for young birds. Of these almost none are beneficial insects; in fact the beneficial insects in the garden are seldom sufficiently numerous to

attract birds. The bees are the most beneficial of the insect friends and birds have learned to let them alone. Moreover, many of our common birds live during the later summer and fall, upon the seeds of those weeds which seem always on hand to plant themselves in our garden beds, and by destroying them save us a deal of backache incident to pulling weeds

The birds which are most likely to affect our gardens are—the phoebe, chipping sparrow, song sparrow, house wren, humming-bird, bluebird, chickadee, swift, swallow, robin, catbird, and mockingbird. Let us see just what each one may do to help us.

THE PHOEBE

This bird comes to us early, and likes to nest in a little used piazza, or some safe nook in some building. The field of its operations is always near the house garden. The phoebe sits upon some branch, or other resting place not far from the ground, and spends its time darting out after any insects detected by its sharp eyes.

A pair usually raises two broods in the same locality and the number of insects put down the young phoebes' throats is great beyond belief. The young are fed exclusively on insect diet which includes cutworms, moths, grasshoppers, spiders, caterpillars, and flies. All these are taken from our garden and made into phoebe birds. The adults feed largely on beetles and grasshoppers.

CHIPPING SPARROW

The active little chippies build in our garden shrubbery, hedges, and vines, and they are the most devoted of parents. Professor Clarence Weed is the Homer of the chippies' achievements in the economic field. His observations began at 3:40 A. M. and continued until 7:40 P. M. There were three nearly fledged nestlings which the parents were feeding, and 220 visits to the nest were made to satisfy the ravenous appetites of these youngsters. Fifty caterpillars were brought, but crickets, craneflies, earthworms and grasshoppers usually form a very important part of the young chippies' diet. A pair usually rears two broods after May 8th and they do valuable work in the garden, especially as their young are such cry babies and follow their parents around, teasing for food after they are as large as their parents and a good deal fatter.



A bird fountain in the garden is a constant attraction to the birds and a good investment for the garden

Photo by A. A. Allen

THE SONG SPARROW

This bird of "Merry, merry cheer" is of as much use to the garden as to our spirits by his wonderful song. All through the nesting season, the parents are largely insect eaters and the young are fed entirely on insects. The song sparrows are indefatigable parents—they may raise as many as four broods in one season—and all these birds when they are grown, devote themselves during the winter to eating weed seeds, and never attack our berries or fruits. So, from first to last, all summer and all winter, the song sparrow is the friend of the garden, near which he builds his nest.

HOUSE WREN

The pugnacious little inhabitants of the wren house we can place at will in the garden. The great point in the wren's favor is that it works near its nest and does not go far afield when foraging. It feeds almost entirely upon insects, being especially fond of caterpillars, beetles, bugs and spiders and it works most industriously, searching shrubs, plants, vines and every nook and corner in fence or wall, for hidden insects. A pair has been found to raise three broods of six each and it requires only a little calculation to estimate the help to a garden of such birds. Every one who makes a garden ought to read in the year book for 1900 of the U. S. Dept. of Agriculture in report by Sylvester Judd, the list of 110 insects brought to the three nestlings, by the parents in one forenoon. The way to have these birds help us is to put up wren boxes around the garden and clean them out at the end of the season so that next year the wrens will find clean boxes; for they would not clean out the twigs and rubbish themselves.

CHICKADEE

While the chickdees devote a large part of their time to searching trees for insects and their eggs, during the summer they hunt everywhere for food. Their families are large in numbers and they take insects wherever they can find them. I have seen them hunting the rose bushes for slugs and aphids and the currant bushes for currant worms, and the peonies for any visiting insects. While the chickdee may not naturally be a garden bird, if we put nesting boxes fitted for him in trees near the garden, we can convert his energies into garden protection, with certainty.

HUMMINGBIRDS

These "flowers on vibrating wings," as they have been called, will visit any garden where there are flowers. The food of these dainty creatures consists largely of insects and nectar. Adults feed on gnats, ants and aphids, while the young are fed on flies, beetles and spiders. They take their insects in mid air and also those small insects visiting flowers. The tongue is especially adapted to sweeping up insects and sucking up nectar. The hummingbirds do a very great work in our flower gardens, in carrying pollen from flower to flower and thus helping to produce good seed.

CHIMNEY SWIFTS

Unfortunately the old fashioned chimneys which enticed these birds to build, are no longer an attraction; but it is safe to say that a chimney in which the swifts build is a valuable asset to the garden, for they are entirely insectivorous all their lives. Beetles, flies and ants are their chief food, which they gather while on the wing. They are partial to potato beetles and the tarnished plant bug, both of which can well be spared from the garden, this bug being one of the worst and most hopeless pests, since it attacks everything.

THE SWALLOWS

The purple martins live where we put up a house for them and this should be where the garden may get the benefit of their tireless activities in hunting food. While they feed largely on flies, gnats and mosquitoes, yet there are records of their taking moths, flies, beetles, grasshoppers and other injurious insects. One record quoted by Professor Weed, states, that one of the compartments of a martin box was found literally packed with the dried remains of the little yellow and black squash beetle—a most valuable record to prove that a martin house near a garden is most desirable.

The barn and eaves swallows are insectivorous all their lives, and destroy flies, weevils, ants and mosquitoes and other injurious insects. Those, who are fortunate enough to have a barn near the garden, had best make a swallow hole in the gable for the barn swallows, and encourage the eaves swallows to build under the eaves, for we can be assured that these birds will swoop back and forth over the garden, snapping up any of the little winged pests that may be flying there.



The Phoebe, a Flycatcher

PLATE XL

See page.....

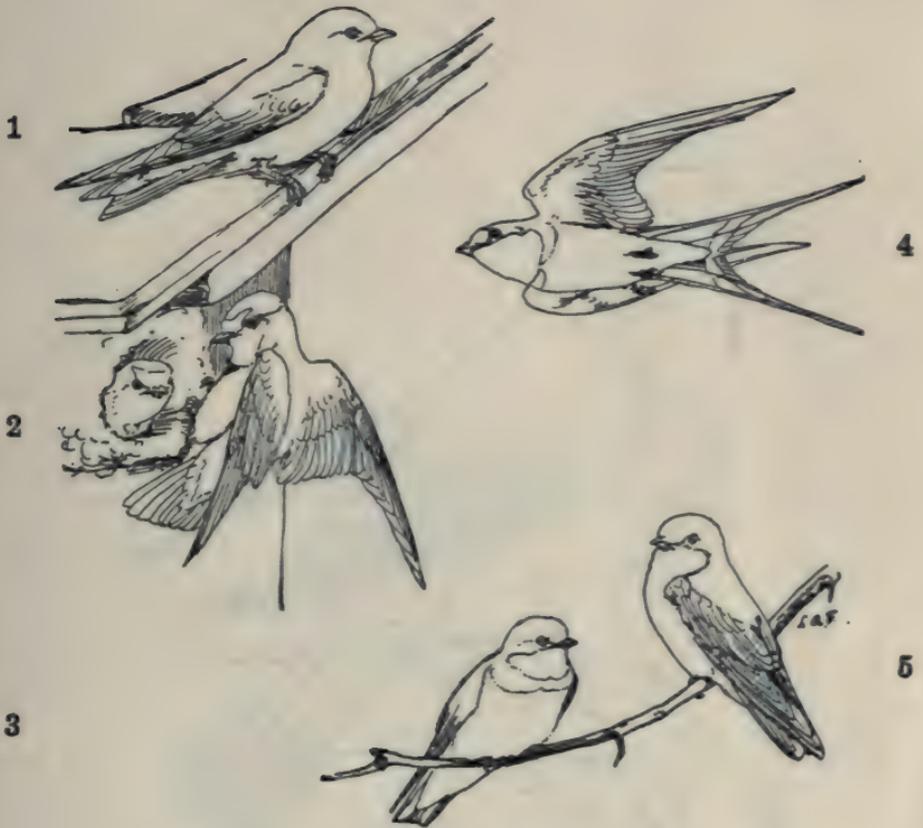


The Chipping Sparrow or "Chippy"



The Song Sparrow

PLATE XII
See Page



1. *Purple Martin*

Shining blue black wings and wings and tail duller

2. *Eave or Cliff Swallow*

Back and crown steel blue, forehead cream white, throat and sides of the head chestnut, breast brownish gray, under parts whitish

3. *Sandbank Swallow*

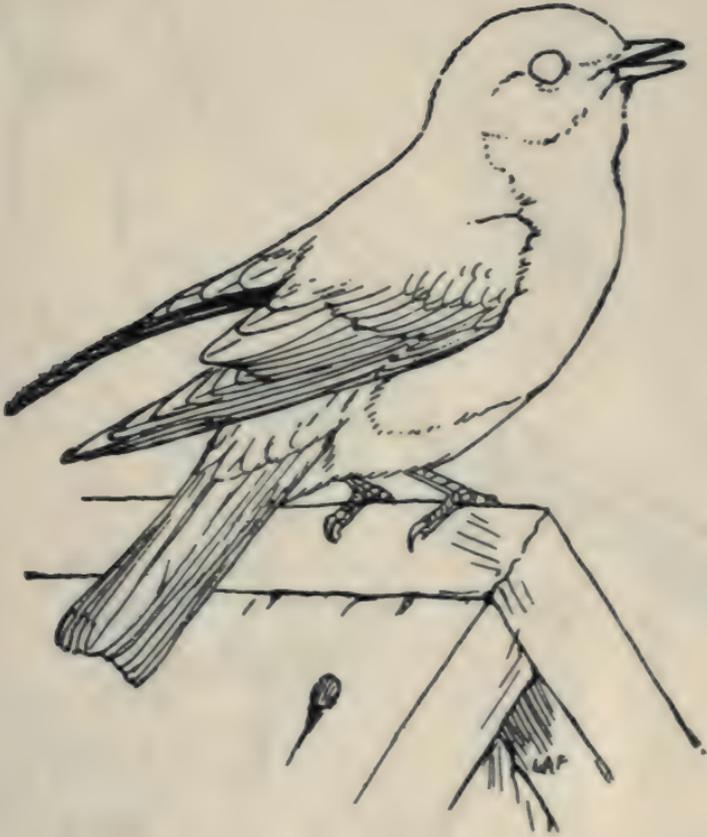
Upper parts and band on the breast brownish gray, throat and under parts white

4. *Barn Swallow*

Upper parts dark blue, forehead, throat and breast reddish brown

5. *Tree Swallow*

Upper parts dark blue or green, throat and under parts white



The Bluebird



The Robin



The Baltimore Oriole

PLATE XVII

See page



The House Wren

PLATE VI

See page

THE BLUEBIRD

This is another bird that may be induced to live in our garden, by placing some nesting boxes there for its use. It has never been accused of injuring the fruit of the garden, while 76% of its food consists of insects, and the vegetable food of the other 24% consists of berries of wild vines. It takes any insects that happen to be present, but likes especially beetles, caterpillars and grasshoppers. The nestlings are fed upon the same insects and some spiders. Because it is such a general insect feeder, the bluebird is a very good tenant of the garden, taking whatever insects it finds destroying our vegetables.

THE ROBIN

This truly domestic bird is in our garden whether we invite him or not. He comes early and stays late, doing various things, some of which we do not enjoy. Many people think that earthworms form the chief article of diet of the old and young robins, but this is a mistake. Investigations have revealed that caterpillars, grasshoppers, beetles and their larvæ—especially May beetle larvæ, are eaten in large numbers while spiders, snails and earthworms form only a small part of their food.

If one has a sense of humor and understands bird language, one may derive some consolation over the loss of cherries, and strawberries, due to the robins. The writer has often gone into her garden, wrathful over these depredations, but as she approached the cherry tree or the strawberry bed, the robins in possession scolded so vociferously and with such conviction that she was trespassing upon their own special property, that she retreated abashed and laughing. Their indignation, when the strawberry bed was covered with mosquito netting was something to be remembered.

If we would only grow mulberries along with our cherries, we should then be able to look upon the robin as a friend to the garden, always, for he prefers the mulberries to the cherries or strawberries. In any case, the robin here in the East helps the garden far more than he damages it.

THE CATBIRD AND THE MOCKINGBIRD

These two birds are so similar in their habits that we may regard their work for the benefit of the garden much the same. The chief

fact to bear in mind is that both of these birds nest in shrubbery of the garden by choice. The catbird usually rears two broods and the mockingbird more. The nestlings of both are fed almost entirely upon insects which injure plants. Ground beetles, cutworms and grasshoppers nourish the little "kitten birds," as a small girl called these nestlings. The mocking bird nestlings are fed upon insects to the same extent. The adult birds feed upon fruits, but choose many of the wild berries rather than the varieties cultivated. A garden would surely be lonesome without a catbird or a mocker, and we had much better provide Russian mulberries for them, than to drive them out because they feast upon cherries or small fruits.

THE ORIOLES

These birds belong more properly to the trees than to the garden, but there are very many of them that live in trees near gardens and hence their value in destroying garden insects. Both the Baltimore and orchard orioles hunt the garden over for caterpillars, and fortunately the oriole doesn't mind a hairy caterpillar, but knows how to extract it from its whiskers, with skill and celerity. Caterpillars, grasshoppers, cankerworms, cabbage worms, currant worms are fed to the nestlings. The adult birds have been known to do some damage, by eating young peas after opening the pods, and sometimes take some grape juice from the ripe grapes to cheer them on their way. The writer has always had a pair of orioles in her garden, and never suffered as to peas or grapes or in any other way, and not for any consideration would she have her garden empty of this "golden shuttle" weaving in and out the green foliage.

THE YELLOW WARBLER

The summer yellow bird is becoming more and more an inhabitant of the garden, for it loves to build its nest in the lilacs or the orchard trees, and is therefore on hand to take caterpillars or other insects that are feeding upon our plants. In our garden last summer, the yellow warblers worked on the rose bushes holding in check the destructive slugs and aphids. The entire food of this bird consists of insects and it also feeds its nestlings on insects. Some one watched a mother bird make fifty trips in one day to her nestlings, each time carrying insects to feed them.

ADD BIRDS TO THE GARDEN EXHIBIT

The birds which help us keep the garden clean of insects should have some recognition in the exhibits of the produce of the garden. A piece of cardboard 18 inches wide and 2 feet long should be given to each bird observed nesting near the garden. The following plan shows how such a card may be arranged to show the bird and give an account of its habits together with the way it has helped in the garden.

Through the courtesy of the publishers, Mr. Louis Fuertes' outlines of eight birds common in the garden have been included with this article. They are printed upon water color paper, so that they may be colored by the pupils and used in your garden exhibit.



COLORED PICTURE
OF THE BIRD

OUR GARDEN HELPER

This (Bird) assisted us in making our garden successful.

It built its nest in _____.

The nest was built of _____.

It reared its young birds by feeding them a great number of insects each day, and many of these insects were injuring the plants in our garden. The names of these insects are (*give a list of insects which the bird is known to feed upon, as found in books or better still as observed by the pupils.*)

This bird comes to us to build its nest and rear its brood in the month of _____, and leaves us in the month of _____, spending its winter in _____.

It does not build its nest or sing its songs in (*the place where it winters*).

Its song is (*description of song*).

We think (*give pupils' ideas about this bird.*)

Nature,—The Supreme Provider

MARY KING SHERMAN

President of Conservation Department of General Federation of Women's Clubs, Longs Peak, Estes Park, Colorado

It is strange to see how little the average man concerns himself about the natural world around him. With eyes only for the works of man and the conventional, he sees little or nothing of Nature—Nature as including the natural resources of the earth. And as for feeling any relation to these elemental things of life, such a thing does not occur to him. To many, Nature suggests something external and entirely unrelated to themselves; something suitable for children and elderly maidens to sentimentalize about. Not for a moment does such a person recognize his utter dependence upon Nature, nor does he comprehend that without natural resources neither nations nor individuals could exist. There are others who appreciate the economic importance of natural resources, but whose attitude toward them is that of superiority. Such as these feel quite sufficient unto themselves, and when they consider Nature at all they apparently believe that now, in this twentieth century, they have her under complete subjection. Nature evidently appreciates the value of tact, for she carefully refrains from disabusing man of his opinions, and quietly and incessantly works out her own laws that he unconsciously obeys. For man is an inseparable part of Nature. His body is as much a part of the material universe as the soil itself. He is now and always has been wholly dependent on Nature and the natural resources for his physical existence.

Without the earth, man as we know him could not have come into being. The physical and mental development of man proceeds according to Nature's plan. She has taught him to adjust himself to his earth-environment; she fashions him for the life he leads. She has made it difficult for him at times in order that the reasoning faculties with which he is endowed may be developed. She has filled the earth with treasures for him, but they are not at his command until he has learned the secrets of their keeper—Nature herself.

It is a far cry from the business man sitting at his desk in some man-built skyscraper to his ancestors of ages ago who made their homes in trees. There was nothing but Nature in those days, yet

man was no more dependent on her then than he is today. Without trees those distant relatives of ours would have perished. For the trees gave them not only food but also shelter from the raging storms, and in the topmost branches they were above the reach of animals that were ever ready to devour them. Now, as in those prehistoric days, trees are among the best of man's friends.

Conditions of civilization have changed, and have increased our needs since then, but many and complex as those needs are today, the earth still supplies them. We talk about community life and action as if it were something of comparatively recent date, while as a matter-of-fact it came into the mind of man when he decided to move from his tree-top home to a cave.

For a long time man had been dissatisfied with the tree-tops; probably it was somewhat of a strain to care for the children in the swaying branches and at the same time keep on the watch for the ferocious animals hungrily howling at the ground-floor entrance. The first household moving days were full of excitement and uncertainty. Man knew that he wanted to move into the caves, but the wild animals appeared to have an unexpired lease on their dwelling-places. At any rate they had possession and refused to vacate. So man had to wait and in the meantime do some pretty hard thinking. Suddenly one day he discovered fire and immediately he knew that his tree-top troubles were over. One night when the occupants were out he moved into the cave of his choice, built a fire in front of the entrance, thereby discouraging the former tenants from returning, and thus took one more step on the uphill road of civilization under the silent direction of Nature. And so group and community life came into existence when our cave ancestors went visiting and sat around a fire—one of the greatest of civilizing influences.

"Down East" it used to be the custom when a young lady announced her engagement for her friends to ask: "Is the young man a good provider?" Nature has been to man more than a good provider; she has lavishly supplied him with everything that he needs. But it was a part of Nature's scheme that man should find out about these supplies for himself. So good were her intentions toward man, that she also gave him the mental ability and the privilege to struggle—the richest of all her gifts.

For millions of years Nature has been busy getting things ready for man. In every stage of his development she has given him

what he needed. She has been a wonderful home-maker, apparently forgetting nothing needful to the human race. Soil was essential to life, so the earth's machinery was set in motion to produce soil. In the beginning—or originally, if you prefer the expression for carrying you back in imagination to the time when this world of ours was barren rock—there were no growing things of any kind, no form of life as we know it. There was not even water upon the earth; the planet was bone-dry. When the chemical condition of the rock became such as to attract moisture from the atmosphere in sufficient quantities, oceans were formed. And for some reason known only to Nature the first ocean-water was fresh. Then after a time plant-life first made its appearance around the water's edge. It was at this period, approximately, that Nature, who has a way of looking into the future, realized the necessity of producing soil. So she set her machinery to work and kept it steadily running night and day for ages before the soil was ready to support the many kinds of life that were to feed upon it. Even then the work did not stop; indeed the same machinery is in motion today, turning out its incessant crop of soil.

There is no labor problem in Nature's shops—no strikes, no stopping for repairs. The earth's soil-producing machinery is made of many parts. These parts neither break nor wear out. Each has a special purpose; there is complete co-operation, and under the direction of the Supreme Mechanician—Nature—the machinery is unceasingly in motion.

Perhaps the most important part of this soil-making machinery was the glacier. A glacier may well be called Nature's ice-mill; that is really what it is. Once upon a time, back in the early days of the planet, there was a drop in the temperature and the water on the surface of the earth froze and took on the form of glaciers. These great rivers of ice have been breaking, grinding and pulverizing the rock and getting it in shape for the elements to finish the work of transforming it into soil.

The glacier slowly plows through mountains of rock, leaving smooth-walled canyons in its wake, and carries with it enormous masses of the rock-surface crushed and ground to dust. Sometimes the process is on a still larger scale, when whole mountains are reduced to the level of valleys and plains. Most of the soil now covering the states of Illinois, Indiana, Ohio, Iowa and North Dakota is the product of the glacier. In fact all the Northern part

of North America has been ground down and transformed into productive soil by the earth's gigantic ice-mill.

But glaciers take up too much room for many to be working at the same time, and since soil-production must go on, air and water co-operate as parts of the earth's machinery that never stops. When the chemical elements of air and water come in contact with rock they form a powerful disintegrating force. It is a combination that no rock can long withstand. Whether the rock lies exposed above the surface to these tools of Nature, or whether it is searched out by air and water underground, the result is the same. The rock crumbles away and turns to food for plants.

In some localities the wind gets hold of the rock with sand-blasts and slowly wears it down. Sometimes it is broken up by water or split apart by extreme heat or cold, and often some chemical action in the rock itself causes it to break apart. A mountain-peak of solid rock is about the most permanent material thing we can imagine. Yet, the geologists tell us that, given time, nothing in the world is more changeable than rock.

The acids and gases released from decaying plant-roots and all forms of vegetation combine with water and air and act as a quick-process rock-to-soil converter. When this action is taking place underground, new soil is being formed beneath the old.

There is no sameness in nature. When it comes to color, she likes variety even in the soil. There is no question about the dyes, either. She manufactures her own and they fade only when life itself goes out. And so she has colored the soil mostly with mineral life, some of it with decayed plants and autumn leaves, and, being always thrifty, she even uses the plumage of birds and butterflies that have lived their lives and turned back to dust and soil.

While Nature's soil-producing machinery runs continuously with a steady output, the process seems slow to some of us who reckon time by minutes and hours. With all the forces going at full speed, it takes about ten thousand years to produce an inch-depth of soil. This doesn't mean that every ten thousand years there is an additional inch of soil evenly distributed over the land-surface of the earth, for the distribution of soil is far from uniform. At the present time, in some places it is several feet deep, in others it may extend down a hundred feet, but its average depth is less than twelve inches. In Japan and Switzerland the layer of soil is so thin that when tilted it is in danger of being rapidly washed or

blown away, until the bare rock lies exposed. This has led the people of those countries to place their scant supply of soil in narrow terraces, protecting the outer edges with stone walls. In some mountainous regions soil is so scarce that the people build their homes in the rocky cliffs in order to leave every inch of it for crops. In such places spots of soil no larger than a bath-towel are cultivated.

Soil is no more permanent than the rock from which it comes. It is continually changing. It sometimes even travels far from where it was first produced. Frequently it takes a water-journey, and from the mountain and hillside slopes it is carried by the streams and rivers down to valley and prairie lands. Much of the soil in the Mississippi Valley has traveled far and arrived by several different routes. The Grand Canyon of the Colorado is an excellent example of the part that water plays in the production of soil. The rushing, plunging, tearing Colorado river has eroded its way down from a high level plateau through the rock for a mile—a mile straight down through the rock! The canyon walls on which it carved its story as the centuries rolled by stand thirteen miles apart at the top. And all that lay between these walls of rock was ground to atoms, mingled with the water, until the river was like liquid mud, and was then carried on toward the Gulf of California. Twenty thousand square miles of soil is carried across two states, finally to become food for water-plants.

Nature knew right in the beginning that the thing we call force is something that man could not get along without, and she so arranged that he has an unlimited supply. The great storehouse for force isn't in the earth at all but in the sun, and notwithstanding the distance which separates the sun and the earth, Nature has established lines of transportation by which it is conveyed to man. It is the best possible system of transportation, for it is always working. There are two lines, one direct, when the sun's rays come in contact with man, the other indirect, through the medium of atoms stored up in plant and animal life, by which man is physically nourished, and also in the various fuels used to supply artificial heat.

Soil—the food for plant-life—like our own, must be nourishing. Nature understood this long before we did. She probably did not think in terms of calories, but in producing food for plants which would in turn feed man she did turn out a rational, well-balanced and adequate supply of soil-nourishment. There doesn't appear

to have been any objection to mixed flour in those days, so Nature added a number of things to rock-flour, the most important of these being ten mineral elements that are essential in food for animals as well as in that for man.

Three of these necessary elements we all should know more about, for the particular reason that it is becoming quite a problem to keep the soil supplied with them in sufficient quantities. One of these elements is nitrogen. If no nitrogen is within easy reach of the roots of plants, they just naturally die—no matter how much they may have of the other nine elements. And while we are considering nitrogen it is well to bear in mind that if plant-life should fail to get an adequate supply of it man could not get food, and he, as well as animals, would suddenly disappear from the earth.

Had some food administration taken charge of feeding the plant-life of the earth, as such authorities are now regulating the food-supply of man, conditions would have been very different. However, Nature, herself was a capable administrator, and she seems in one way or another to have furnished an inexhaustible supply of all that man needs, notwithstanding the efforts of the race to squander and destroy her bounties.

Nature had provided plenty of nitrogen. She put a goodly supply in the soil everywhere to begin with, and then she stored an enormous amount in Chile and other parts of the earth. Perhaps she had an inkling of what human nature would be inclined to do in the handling of natural resources, and so put a comparatively small portion in the earth and an unlimited supply in the air, where it was more difficult for man to get at. Evidently Nature knew that man would need all the help she could give him in making a living, and as the nitrogen of the air—which is about three-fourths of what we breathe—is of no use as a food for plants until it is combined with other chemical elements, she gave the plants themselves in the first place the means of obtaining nitrogen. Later man would learn about the ways of nitrogen for himself. In the very beginning of things, before man had encumbered the earth to any great extent, plant-organism was a very simple affair; there was but one cell to be reckoned with, and plants were comparatively independent in their use of nitrogen. For it was the habit of this one cell to take in all the nitrogen it needed. But after a time the plants became ambitious—not unlike human beings. They grew out of the simple life into that of a complex organism, and then the food problem became more difficult. But when man was ready to

raise clover and beans and the things we call legumes, that needed nitrogen, Nature came to the rescue and formed an underground partnership between the roots of these pod-bearing plants and the original bacteria, as the cells collectively are called, and the situation was saved. Man stumbled upon this provision of Nature and made the most of the discovery. Agricultural scientists said it couldn't be so. But it was. Then the farmers began the rotation of crops, and those plants that could not manufacture nitrogen themselves were fed by the supply that was left from the previous crop of clover, beans, etc. While this is a good process it is rather slow as we consider things today, and man is now doing what Nature very likely intended he should do eventually; that is, getting nitrogen from the air. And this practically settles the nitrogen question.

After nitrogen, comes potassium or potash, which is also an essential element to plant-life. Nature put potash where it was easier to get at than was nitrogen. It is a part of every plant that grows. It is found in the soil and rocks and in the water-plant called kelp, which grows in abundance along the coast of California. The largest potassium beds in the world are in Germany where they lie 5,000 feet deep. But the American people have no cause for anxiety on this account, for there is plenty of potassium for them in this country if they will only take the trouble to get it. We use an enormous quantity of potassium under normal conditions, and now there is need for more than ever before. In the plans of Secretary Lane to provide a piece of land and a home for the returning soldier after the war, by the reclamation of certain lands, the swamp lands of the south are to be drained. This soil has about everything that is needed for plant-food except potassium, which will have to be supplied.

The third vital element that plants require, if they are to serve their purpose and supply nourishment for the blood and bones of man and beast, is phosphorous. Nature put a generous supply in the soil to begin with, so that man might not suffer for the lack of it while yet he had to learn the necessity of it in his food supply. Plants can get along without it, but man and animals cannot. Besides that contained in the soil, there are billions of tons stored in the rocks, from which it can be had for the grinding.

Every now and then Nature seems to give her habitation a thorough "going-over." First she grows enormous forests, and then as her vision carries her into the distant future, and as she sees

the needs of man, she sets the earth's machinery in motion to convert these trees into coal, which she deposits in the cellars of the earth. Then she remembers that man cannot get along without wood, so she grows more forests.

Water, she has provided in abundance, and knowing its habits as it rushes down from mountain streams and hillside brooks, and the damage it may do, if not arrested, in its journey from sky to soil and along the rivers to the sea, she has distributed her crop of trees where they, together with the soil, will hold the flow in check. How Nature's patience must have been tried by man—after all her forethought, to see him cut down these very trees, leaving the watersheds barren wastes and the flood-waters bringing greater disaster every year!

Nature also made provision to remedy the damage done by forest fires. She developed a tree—the lodgepole pine—whose habits actually require the intense heat of fire to enable it to scatter its seeds. And, still more remarkable, the soil these seeds actually need for rapid growth is the mineral ash left after the forest fires have burned themselves out.

Whether or not Nature could foresee the great war in which her people have been engaged, it is certain that she provided the wherewithal for carrying on the war. Besides wood, which ranks with food and munitions, there are iron, copper, and other minerals required in modern warfare. Some of these resources are used in enormous quantities, and others not less important are so precious that they are referred to in terms of ounces. Platinum is in this class. I often wonder what the result would have been if Nature had not recognized the relative value of the supplies she stored upon the earth. Suppose, for instance, that the supply of coal and platinum had been reversed.

Soon, geologically speaking, after Nature laid in her supply of coal she thought of flowers, and these she finally scattered broadcast everywhere. Then, as suitable companions for the flowers, birds and insects came into her mind. The insects seem to spring up naturally from not much of anything, but the birds had an ancestry in common with the reptiles of millions of years ago. Whatever Nature's purpose was in bothering with these unsightly, stupid creatures and the monster dinosaurs, is puzzling. Maybe she was experimenting. And when she saw how much these huge creatures ate, no doubt she was concerned about the food-supply holding out. Possibly they had served a purpose; or Nature

changed her mind. At any rate these earthy monsters finally disappeared, and following the flowers and birds came the ancestors of all our domestic animals.

Perhaps wise old Nature had a theory of her own concerning the "survival of the fittest." I like to think she had and that her idea of the fittest, which she was sending on through all the centuries, was not that of great brute strength, but that with the flowers and birds and the smaller, more intelligent animals, there would eventually result a race in which kindness, compassion, and spiritual strength would be supreme.

Not all the wants of man are supplied with food, clothing, and shelter. He must also have those things that will lift him out of the rut of everyday routine life and give him hope and courage and inspiration. Nature has known this from the beginning, and through all the measureless ages she had in the making perhaps the greatest of all natural resources, in which are all the elements of every other resource. And this great gift of Nature we call, for want of a better name, natural scenery. It is the crowning glory of all of Nature's work in the outward world. Through it she speaks to us, and if we listen we may hear her say: "Come and visit me, and bring your children; I have beautiful things to show you and stories to tell you that you will never forget. I can show you splendid silent forests that breathe the message of the centuries; white leaping waterfalls; rivers rushing on between canyon-walls a mile high; and I can show you glaciers and moraines that tell the story of the ages. Save the most beautiful of my wild scenic places; make parks of them, so that you will always know where to find me at my best. Come and get acquainted with me, and I will give you health and strength and inspiration. Let me train your children to see, to hear, to feel, and to know things as they are. I will make your boys and girls efficient; I will give them high ideals and fit them to be the fathers and mothers of future noble men and women."

No man or woman lives who would not be benefitted by a fuller understanding of the marvels of the earth—a sympathetic understanding that will lead to knowledge of how best to use these natural resources. Such knowledge forms the basis for right living. Both young and older people should acquire it in order that they may receive due benefit from Nature's bounties during their own lives, and also leave them in good shape for their children and all who may come after them.

The Call of the Girls' Camps

WILLIAM GOULD VINAL

The Rhode Island Normal School



When your grandmother was a girl the neighbors used to shake their heads doubtfully and say "Nothing but a regular tomboy, anyway." She could play "Four-old-cat" or climb a tree with skill that was envied by many of the boys. If the up-streeters wanted to go 'cross lots they always waited for "Jimmie" Morrill. Grandmother was a live girl. She use to pick huckleberries, spin cloth, romp the fields, feed the cattle, and tramp the roads.

From these activities she gained health of mind and body.

But times have changed. A new kind of girlhood has appeared. The ordinary girl is contented to sit in a stuffy school room, flat-chested and sallow skinned. She exercises her tongue and finger tips but the body muscles remain flabby. Her circulation has become sluggish, her nerves shriek, she gorges herself with chocolates, takes piano and violin lessons, goes to the movies twice a week, dancing school every Friday, and to various parties on the holidays. Do you wonder at the pallid cheeks, pale eyes, and need of after dinner pills to assist digestion? This type of girl has not learned to live.

It is now spring and that peristent desire to get into the fields, to eat green herbs, to scale the wall, to wear old clothes, to sleep in a cabin, is a call of nature. It is a desire to leap back into the good old days. You want to get away from the crowded streets, the school room, and the moving picture shows. You wish to meet

untamed nature, as did your grandmother, to stride through the rough forest and to quench your thirst from clear pools. This is a natural feeling. It is a call that may be satisfied by the summer camp. It is a positive necessity to go. Then look into a directory for girls' camps and take your pick. Mountain or plain, sea-shore or lake, boating or horse-back riding, it is all there to satisfy your craving for the great out-of-doors.

The opportunities at a girls' camp are manifold. In the first place there is contact with congenial councilors who are true and tried in character. They are usually college graduates who have had experience dealing with girls. The girls and their sympathetic leaders store up energy together for the coming year.

In a camp one sleeps in a tent or cabin with three or four other girls and a councilor. In the days of large families the girls had to learn to consider the happiness of others. One gets the same sort of training at camp for there the elbows touch and they cannot be too sharp. The out-door air makes red blood and healthy appetites, and in camp one not only eats but sleeps in the open.

The first order of the day is reveille which means to get ready for setting-up drill. Indisposition is not a feminine grace in a girls' camp, and every one hustles out for morning exercise. The working of the big muscles—the trunk and leg muscles—builds up health. It gives arterial tone and prevents kidney or heart disease which are increasing so rapidly under the nerve racking pace of today.

The morning air whets the appetite. There is a rush for the table where Miss Camper finds eggs, milk, and johnny cake. As time goes on her mania for candy diminishes. She begins to eat to live, instead of live to eat. The response in her digestion and general health are good omens of right eating.

The morning activities may consist of athletics. In a baseball game a girl is able to acquire that general sturdiness so characteristic of boys. She learns to sacrifice her own wishes for the best interest of the team and besides, it takes courage to slide bases. This spirit of self-sacrifice and courage will help greatly in after life.

The greatest fun of the day is swimming time. As everyone should learn swimming before stepping into a canoe there is a big incentive to acquire this important art. In Japan every boy and girl is taught how to swim but the American girl is just beginning to inherit her right to aquatic sports.



Cooking breakfast on the Atlantic shore. "Here is the spring of springs, and the waterfall of waterfalls. A man may stand here and put all America behind him."

Henry D. Thoreau's "Cape Cod".

After the mid-day meal comes a period of rest and quietness. This may be the time of arts and crafts. It was the spinning and weaving industries of the home that developed the real artistic sense of our grandmothers. These industries have been taken from the homes and put in the factories. In camp, however, this work is lifted from the plane of necessity to that of opportunity.

After the rest hour the campers may take a hike. They learn hiking rules by experience, such as, never walk over anything that you can walk around, or never step on anything that you can step over. The hike may be in the form of a scouting party. The scouts must learn how to find their way and be able to interpret all signs and tracks. There is nothing more fascinating than to sit around the camp-fire after a long ramble, you are tired but it is a 'good feeling' fatigue.

The camp-fire is started, not "um big fire" but "um little fire" as the Injun did,—a fire over which one could cook a supper. The girls are bubbling over with good health and appetites. The fish, just landed from the lake, are baked in a hole in the ground and the baked potatoes are poked out of the hot embers. The ends of the corn husks are tied over the cob, soaked in water, and placed in the hot coals for twenty minutes. Melted butter is then put on with a brush. And then the feast comes and it will be remembered longer than any banquet in a marbled hall hotel. Such occasions form a sunny spot in ones' memory and are pleasant to look back upon as the years roll along.

In the evening the camp community gathers around the fire place (not gas logs) and makes merry in song and story. It was the same in colonial days when the neighbors met and made their own fun. More people should learn to play rather than hire others. There are those who have become so fixed in mind and character that they are not able to learn to play. It is claimed that all the virtues of the human race are brought out in play and if this is true, the play element is an important element in the camp activities.

And so the days go—all too quickly—for the girl who is enjoying the fascination of living with Nature all summer long, hiking through quiet woods and paddling along clear streams. She should have learned the natural pleasures of the great out-of-doors. Let us hope that she is more tom-boyish and in the best sense of the word. She should have red blood, sound nerves, a quick ear, keen sight, a quick step, and many other of the good characteristics of our grandmother—that good old lady who lived so long ago.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN
ELEMENTARY SCHOOLS

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Editorial

NATURE-STUDY OR ELEMENTARY SCIENCE

We have been trying to teach Nature-study for lo! these many years; in many schools we have been successful and it has become a vital part of the child's thought and expression; in many, on the contrary, it has proven so dull and uninteresting that it has been abandoned. Why? Because the teachers lacked knowledge of subject matter or else had the cut-and-dried habit of mind, both fatal to vital teaching. Now many of these teachers are cheering up and saying, "Let us teach Elementary Science instead of Nature-study for it will prove far more interesting." Never was a greater mistake! A teacher who fails in one will fail in the other for the same reasons,—through lack of knowledge of where science impinges upon the child's interests and experience,—and book-teaching rather than teaching with the object itself.

Nature-study and Elementary Science are one and the same and the name given to either makes no difference as to the underlying facts; both deal with the world of matter with which the child comes constantly in contact; both should teach him to know his environment, to think about it, and to make it a part of his mental equipment with which he is to meet the problems of his future life. Whether it be a knowledge of the birds, the insects, the plants, the trees, the soil, the minerals, or the thousand and one processes as to which elementary physics makes such wonderful revelation, it is all the same. The work must be concrete and not abstract; it must make the child think, question, and know; it must take hold of his interests and make them more interesting; it must illuminate his daily life.

Every teacher who aspires to teach Nature-study or Elementary Science should read the address written by President Daniel R. Hodgdon of the Newark College of Technology, delivered before the winter meeting of the N. E. A. which is printed in full in "The General Science Quarterly," January number. We quote a paragraph which every nature-study teacher will surely read and endorse:

"With the world in which we live full of vital, useful, and interesting things, it is a surprising and sad thing that many of the people, and especially teachers, go through this world and die without seeing the beautiful and interesting things we find about us. It takes very little effort on the part of any teacher to open the eyes of his pupils to the things which will function throughout the pupil's entire life. A surprising fact and one which is lamentable, is that too many of us as teachers in scientific subjects go through the world with a pair of scientific spectacles which have been stained the color of abstract facts, in order to filter out the rays of the beautiful, interesting, and the vital science facts of the world that surrounds us."



The bird fountain memorial to Julia Davis Meyers in the Cemetery at Savannah, Ga.

News Notes

CALIFORNIA

The California Nature-Study League conducted by Mr. C. M. Goethe, has sent out some very inspiring and helpful bulletins to the teachers of the state in an effort to build up a Nature-Study Field Excursion. The Bulletin for December was on Galls with directions how to collect and care for them until the adult insects should issue. The Bulletin for January was on Lichens. The one for February was on a "Fairy Ring," from which we quote the following:

Last week, I found underneath some oak trees near Orangevale, a "Fairy Ring." Its toadstools, growing from a center, exhaust the plant food as they progress. Falling on barren ground, their spores starve. Those on the outer edge, find food, live, reproduce in rings sometimes eight feet across.

These rings were familiar to our ancestors in Europe. Their active imaginations pictured them as the fairies' dancing places. Wonderful interference in the human lives was supposed to be planned by these kindly little butterfly-winged creatures as they met for dance and scheming in the light of the moon in the fairy ring.

NOVA SCOTIA

We like to think of the schools of Nova Scotia following out the directions for Local Nature Observations sent out by the Superintendent of Education. There is so much that is interesting and practical and well worth imitation in them that only lack of space prevents us from printing them in full. As we realize that throughout the four years of recent struggle the children of Nova Scotia were being directed in the same pathway always looking for Nature's wonders, trying to forget man's sufferings, we are filled with deep admiration.

The Leaflet sent to teachers gives a list of 52 wild plants and shrubs and 13 cultivated ones with blank spaces to be filled in to make a record as to when these plants are first seen and when they are becoming common. Dates for plowing, sowing, planting of potatoes, shearing of sheep, harvesting of hay and grain, and potato digging are also asked for, and also data as to the opening of rivers, snow, frost and storms. Dates of the fall and spring migrations of 20 birds, the first piping of frogs and appearance of snakes are asked for. To fill out this Leaflet adequately would supply any school with abundant experience in Nature-Study.

OHIO

Toledo. The following accounts from *The Toledo Museum of Art News* show how Nature-Study may be promoted in a most delightful fashion.

A NEW DEPARTURE

Mr. Morrison R. Van Cleve has been added to the staff of the Museum with the title of Supervisor of Nature-Study. Toledo is rich in natural beauty, and there are unlimited possibilities for its enhancement, all of which comes within the province of art.

Mr. Van Cleve is an enthusiastic educator intensely interested in the development of the child. He is instructor in elementary science at the Waite High School, and for a number of years has been Director of the Summer Nature School at Buck Hill Falls, Pa. This latter position he will relinquish to devote his time to the children of Toledo.

Mr. Van Cleve while he will work primarily with the children will not neglect the adult. Committees of interested citizens will be formed to co-operate with the city officials, the police, and park departments, the Commerce Club and all other agencies needing suggestion or assistance in the conservation and enhancing of Toledo's wealth of natural beauty.

REACHING THE CHILD

Toledo children are not sent to the Museum by their parents or by the public school authorities. Any plan to bring a child to a museum is of course a good plan, but the best attendance is when the children come of their own volition as they do in Toledo. As a consequence their interest is spontaneous, natural and healthful.

Short visits do not suffice them for many children bring their lunches and remain all day, especially on Saturdays, when several hundred picnic in the lower galleries where tables and benches are provided. While some seventy thousand children passed through the turnstiles during the year, there were many Museum activities outside of the building, reaching into the home and school life of the child.

Following is a summary of the various 1918 activities with the number of children taking a part in each:

Children's Concerts.....	2,000
Story Hours.....	6,500
Bird Conservation.....	15,000
Nature Classes.....	1,500
Educational Movies.....	18,300
Flower Gardens.....	4,000
Burroughs Celebration.....	20,000
Patriotic Poster Exhibits.....	13,000
Design Classes.....	600
Extension Exhibits.....	3,000
Belgian Orphan Relief.....	1,200
Patriotic Play Week.....	1,000

This makes a total of over 86,000 constructive contacts with the child life of the community during a single year.

THE GARDEN MOVEMENT

For a number of years the Museum has conducted garden campaigns, and by offering prizes and giving practical instruction some three thousand gardens have annually contributed to the beauty of our home surroundings. Last year the efficient garden organization of the Museum was merged into the general war garden movement and Toledo stood well at the head with over 27,000 gardens to its credit. This year with the co-operation of various civic, patriotic, and social organizations the movement should achieve still greater proportions.

RHODE ISLAND

Providence. The various clubs and museums of Rhode Island have certainly not permitted any interference with their meetings and general enthusiasm during the past season. The winter meetings of the Rhode Island Field Naturalists' Club bear witness to this fact. They are apparently as interesting as the Field Greetings—the kind that make you wish you lived there and

could "belong." In January there were four short talks with lantern slides, as follows:

"Beavers and other Wild Animals," Howard B. Smith.

"Roughing it in New Brunswick," William G. Vinal.

"A Field Naturalist in Switzerland," Marion D. Weston.

"Snap-Shots and Anecdotes of the Maine Woods," Prof. J. Franklin Collins.

In February they elected officers, in March they had a special social meeting and their annual meeting.

The following is the program for Spring Lecture Course in Nature-Study at the Rhode Island Normal School, Providence:

Monday, April 21—*Gardening*. The experiences of four Providence school teachers last summer, on their farm at Nooseneck Hill, West Greenwich. Miss Mary Gormley, Teacher in Vineyard, Street School.

Suggestions for teaching gardening. Exhibition of material and passing out of papers helpful to teachers. Mr. Vinal.

Opportunity to visit exhibition of Boys' and Girls' Club.

Monday, April 28—*Seeds*. How the Park Museum can help the teachers this spring. Material and papers for teachers. Mr. Madison, Curator Roger Williams, Park Museum.

Mainly the Pedagogy of Seeds with Some Seeds of Pedagogy. Seed material for use in teaching and charts for coloring will be given out. Bring boxes or envelopes for material. Mr. Vinal.

Monday, May 5—*Nature Stories*. First Grade Readers. A Survey and Criticism. This lecture in part, was given before the Kindergarten League. Mr. Vinal.

Nature Stories True to Life. An exhibit of some of the best nature books for the home book-shelf and for supplementary reading in the grades. Miss Mary E. Robbins, Instructor in Library Science, Rhode Island Normal School.

Nature stories told by Normal School students, to illustrate the when and how of nature stories.

The Montessori Method and Nature stories. Some first grade experiments. Miss Craig, Supervisor of Practice School.

The annual club order for Comstock's Handbook of Nature-Study will be due at this time. Books will be distributed May 19.

Monday, May 12—*The Health of Grade Pupils*. Some new diagrams and papers. Mr. Vinal.

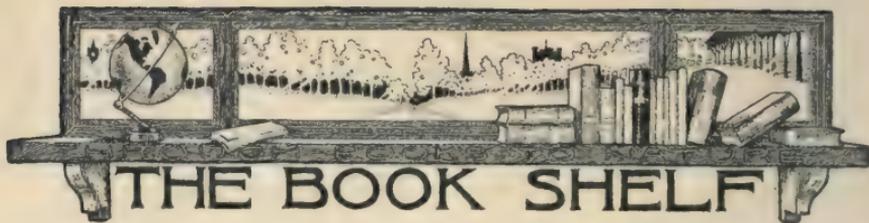
The results of certain experiments now going on in the Practice School. Dr. Weston.

Suggestions for Teachers. Dr. Lester Rounds, State Bacteriologists.

Monday, May 19—*The Health of Plants*. Lessons on Insects. Papers and charts for coloring. Mr. Vinal.

Suggestions for Grade Teachers. Dr. Harlan H. York, Head of Botany Department, Brown University. Field trip to the Brown and Sharpe community gardens.

Saturday, June 7. *Excursion to the Arnold Arboretum*, Forest Hills, Boston. Given at the request of recent graduates. Take the Boston train from Union Station at 9:05 A. M. Arrangements have been made for this train to make a special stop at Forest Hills. This trip will be in co-operation with the Rhode Island Field Naturalists' Club. Please notify Mr. Vinal by June 1st that proper arrangements may be made.



A Field and Laboratory Guide in Biological Nature-Study, by Elliot R. Downing.
University of Chicago Press. Price \$1.00.

Nature-Study and biology teachers everywhere will welcome this helpful book in which Dr. Downing has reduced the study of well chosen groups of plants and animals to definite methods. This will help to dispel a certain haziness in the minds of many teachers as to how to proceed. Those of us who teach for the love of it will find nothing but pleasure in following out his careful directions, answering the questions from our own experience. When we do this, we enjoy out-door nature-study with pupils as companions.

The subjects presented are: *Some Common Insects, Autumn Weeds, Animals of Pond and Stream, Trees, The Spore Bearers, Animal Companions, Birds, Seeds and Seedlings, and The Garden.*

The student makes his records on blank pages close to the questions and directions, thus becoming a partner in the building of a delightful book.

The insect work includes field and laboratory study of the cricket, butterflies and moths, ants in the nest, aphids, wasps, dragonflies, and house-flies. The following will indicate the very practical nature of the directions and questions: "Send fifty cents to the Kny-Scheerer Co., 410 W. Twenty-seventh Street, New York City, for a batch of silkworm eggs. They will come on a small piece of card which may be put in a covered tumbler with a few fresh mulberry leaves. The eggs will hatch in a few days and the tiny larvæ will crawl onto the leaves to feed. Add fresh leaves as necessary and as the larvæ grow, transfer them to an insect cage where more sprays may be kept. Keep record of the length of a newly hatched larva and of its length on successive days as it feeds. The full-grown larvæ will spin their cocoons. How do they do it? Is the silk continuous? How long is it before the moth hatches after the cocoon is complete? Mating and egg-laying follow and the eggs will start the cycle again."

The weed study is based on the making of a collection, mounted and labelled on pages provided in the book. They may be removed and bound separately with covers which are also provided.

In the chapter on animals of pond and stream, special attention is given to the movements of insects, crayfish, fishes, frogs and turtles, and there are good directions for the making and care of an aquarium.

The tree study chapter includes pages for sketching tree outlines, in addition to study of recognition characters of species, and of methods of propagation.

The study of molds, toadstools, mosses, ferns, horse-tails, yeasts and bacteria opens up a field in which nature-study teachers have long wanted help.

The cat and dog, squirrel and rabbit both in the school and at home furnish much information regarding our animal companions, while the bird study

chapter secures much more than knowledge of mere recognition characters of birds. Migration maps, nesting habits, food, bath and drinking fountain all furnish opportunity for an intimate acquaintance with bird life.

Practical work with gardens is preceded by school-room study of seeds and seedlings, and of roots, with practical experiments in soils. Real gardens of annuals, perennials, and bulbs, with carefully guided home gardens may result from this up-to-the-minute guide in nature-study.

The definite *look, do, and make-record* method of the book must give new impetus to the teaching of the subject.

CORA A. SMITH.

Practical Queen Rearing by Frank C. Pellett, published by the American Bee Journal, Hamilton, Illinois.

This little book on Practical Queen-Rearing sets forth the facts in a direct, clear method which makes it easy to use and indeed "Practical" for Beekeepers everywhere. It includes chapters on Races of Bees, life histories, breeding, equipment for Queen Rearing,—early and present day methods employed, preparation of cells, getting cells started, care of finished cells, combining mating with making of increase, shipping queens, the introduction of Queens and the spread of disease from the Queen yard. In the consideration of these topics—this book is ready to answer questions which so often arise in this line of work. In addition to this it is very well illustrated and should prove a very popular and practical work for all Beekeepers.

The Winston Simplified Dictionary—Edited by William D. Lewis, A.M., Ped.B. Principal of the William Penn High School, Philadelphia, and by Edgar A. Singer, Ph.D., Professor of History and Modern Philosophy, University of Pennsylvania. John C. Winston Co. Price ninety-six cents.

This dictionary is all that it claims to be in its title. The words to be defined are printed in large easily read type and they are defined in a simple popular manner, easily understood by young students and foreigners. The directions for pronunciation are very complete and clear. At the beginning is given a very readable and interesting account of how our language has grown, which includes an illuminating account on prefixes and suffixes. The vocabulary includes words of science, history, civics, and current events with special reference to their use in secondary schools. There are also many words added because of their use in our great war. The dictionary of Mythology at the end is surprisingly complete and illuminating. The dictionary of names and places includes the more important cities, countries, lakes, rivers, seas, mountains and also names of men and women of great achievement. There is also a glossary of business terms which is sure to be very useful. We have used this dictionary for several weeks and have found it wholly admirable, and it has a permanent place on the revolving book case—within reach of the editorial hand.

Use Outline Drawings of Common Birds

By LOUIS AGASSIZ FUERTES

in your color work

These drawings were made specially for us and they are put out on a paper suitable for coloring with either crayons or water colors.

Loose leaf outlines of 48 different birds taken from our Bird Notebooks are carried in stock, (see list below). Size $7\frac{1}{4}$ by $4\frac{3}{4}$ inches. Price per set, 40c postpaid. Price per hundred your assortment 80c. Price per thousand your assortment \$7.50. Prices in lots of 10,000 upon application.

LIST OF BIRD OUTLINES CARRIED IN STOCK

Blackbird, The	Redwing	Maryland Yellowthroat, The
Bluebird, The		Mockingbird, The
Bluejay, The		Nuthatch, The
Bobolink, The		White-breasted
Bobwhite, The		Oriole, The
Brown Creeper, The		Baltimore
Brown Thrasher, The		Owl, The
Bunting, The	Indigo	Phoebe, The
Catbird, The		Pigeon, Common
Cedar Waxwing, The		Redstart, The
Chic-a-dee, The		Robin, The
Cuckoo, The	Blackbill	Sparrow, The
Crow, The		English
Finch, The	Purple	Sparrow, The
Flicker, The		Chipping or "Chippy"
Godfinch or Thistle-bird,		Sparrow, The
The American		Song
Grosbeak, The	Cardinal	Sparrow, The
Grosbeak, The	Rose-breasted	White-throated
Junco, The		Startling, The
Kingbird, The		Swallows, The
Kingfisher, The	Belted	Tanager, The
Kinglet, The	Golden-crowned	Scarlet
Lark, The	Horned	Towhee, The
Lark, The	Meadow	Vireo, The
		Red-eyed
		Vireo, The
		Yellow-throated
		Woodpecker, The
		Downy
		Woodpecker, The
		Redheaded
		Woodpecker, The
		Sapsucker
		Woodthrush, The
		Wren, The
		House

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THE NATURE-STUDY REVIEW

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*The American Silk-worms

The larger moths, and some of the smaller ones, afford most interesting and delightful material for Nature-study. It is well for the children to become acquainted with these beautiful insects so that their enjoyment in them may be life-long. It is astonishing to discover how few people have seen these large moths; every season we receive letters about or specimens of *cecropia* or *luna* from people who believe that no one ever saw them before. They cannot understand why, if people knew about these creatures, they should not have trumpeted the news abroad to a waiting world. We hope that this number of THE NATURE-STUDY REVIEW will serve to make many acquainted with these splendid night-flyers.

The silk-worm that gives us the silk of commerce has been domesticated for centuries in China. Because of this domestication it is willing to be handled and is reared successfully in captivity, and has thus come to be the source of most of our silken fabrics. However, we have in America native silk-worms which produce a silk that is stronger and makes a more lustrous cloth than does that made from the Chinese species. But we have never had the time and the patience here in America to domesticate these giant silk-worms of ours, and so they are, as yet, of no commercial importance.

The names of our common native silk-worms are: the *cecropia*, *promethea*, *polyphemus*, and *luna*. In all of these species the moths are large and beautiful attracting the attention of every one who sees them. The caterpillars are rarely found, as their varied green colors render them inconspicuous among leaves on which they feed. None of the caterpillars of the giant silk-worm

*This account of the American Silkworms is taken largely from a leaflet written by the Editor for pupils in the Cornell University Home Nature-study Course in 1905. The leaflet was a popular one and has long been out of print. The illustrations were made from photographs taken by the late Professor M. V. Slingerland.

occur in sufficient numbers to injure the foliage of our trees to any extent; they simply help nature do a little needful pruning. All of the moths are night flyers and are, therefore, seldom seen except by those who are interested in the visitors to our street lights.

The cocoons afford the most ready means of finding and rearing these moths; they may be gathered during the months of November and December. They should not be kept in the hot and dry schoolroom, but should be placed in boxes outside the windows where they may have the moisture of the atmosphere and the temperature which is natural to them. Cocoons kept thus should be brought into the house early in April so that the moths may be watched when emerging and captured for study. Miss Mary E. Hill, who has had excellent success in raising cocoons kept in the schoolroom all winter, dips them at least once a week in a dish of water, letting them remain a few moments and thus keeping the silk from getting so dry and hard, that the moths cannot push their way out before their wings harden and cripple them.

The reason we have chosen these silk-worms for the *Review* is, that they are the most common and valuable subjects for nature-study, and yet but few people know the species apart or know their life histories. They illustrate well all of the phases of insect life, and the children never tire of the miraculous appearance of these magnificent creatures as they issue from the cocoons.



Cecropia eggs enlarged.

THE CECROPIA (*Samia cecropia*)

This is the largest of our giant silk-worms, the wings of the moth expanding sometimes six and one-half inches. It occurs from the Atlantic Coast to the Rocky Mountains.

Food Plants.—The caterpillars of this moth are general feeders living on over fifty specimens of our common trees. They occur very commonly on apple and plum trees and also on the wild cherry.

Eggs.—The moth which issues from the cocoon in the spring lays its eggs upon the young leaves of the tree on which the caterpillar is to feed. The eggs are cream white, and are laid in small clusters of short rows, sometimes on the lower and sometimes on the upper sides of the leaves. Just before hatching the eggs turn grayish; they hatch from ten to fifteen days after they are laid, but the hatching may be retarded by cold weather.

Caterpillar.—When the caterpillar hatches from the egg it is about a quarter of an inch long and is black; each segment is ornamented with six spiny tubercles. Like all other caterpillars,



Cecropia caterpillars fully grown.

it has to grow by shedding its horny, skeleton skin, the soft skin beneath stretching to give more room at first, then finally hardening and being shed in its turn; this shedding of the skin is called molting. The first molt of the cecropia caterpillar occurs about four days after it is hatched, and the caterpillar which issues looks quite differently than it did before; it is now dull orange or yellow with black tubercles. After six or seven days more of feeding, the skin is again shed and now the caterpillar appears with a yellow body; the two tubercles on the top of each segment are now larger and more noticeable. They are blue on the first segment, large and orange-red on the second and third segments, and greenish blue with blackish spots and spines on all the other segments except the eleventh, which has on top, one large, yellow tubercle ringed with black, instead of a pair of tubercles. The

tubercles along the side of the insect are blue during this stage. The next molt occurs five or six days later; this time the caterpillar is bluish-green in color, the large tubercles on the second and third segments being deep orange, those on the upper part of the other segments yellow, except those on the first and last segments, which are blue.



Cecropia caterpillar shedding its skin.

All the other tubercles along the sides are blue. After the fourth molt it appears as an enormous caterpillar, often attaining the length of three inches and is as large through as a man's thumb; its colors are the same as in the preceding stage. There is some variation in the colors of the tubercles on the caterpillars during these different molts; in the third stage it has been observed that the tubercles usually blue are sometimes black. After the last molt the caterpillar eats voraciously for perhaps two weeks or longer and then begins to spin its cocoon.

The cocoon.—This is the cocoon found most often on our orchard and shade trees, and is called by the children the cradle "cocoon," since it is shaped like a hammock and hung close beneath a branch; it is a very safe shelter for the helpless creature within. It is made

The cocoon.—This is the cocoon found most often on our orchard and shade trees, and is called by the children the cradle "cocoon," since it is shaped like a hammock and hung close beneath a branch; it is a very safe shelter for the helpless creature within. It is made



Cecropia caterpillar spinning its cocoon.

of two walls of silk, the outer one being thick and paper-like and the inner one thin and firm; between these walls is a matting of loose silk, showing that the insect knows how to make a home that will protect it from winter weather. It is a clever builder in another respect, since at one end of the cocoon it spins the silk lengthwise instead of crosswise, thus making a valve through which the moth can push as it issues in the spring. It is very interesting to watch one of these caterpillars spin its cocoon. It first makes a framework by stretching a few strands of silk, which like all other caterpillars, it spins from a gland opening in the lower lip; it then makes a loose net-work on the supporting strands, and then begins laying on the silk by weaving its head back and forth leaving the sticky thread in the shape of connecting M's or figure 8's. Very industriously does it work, and after a short time it is so screened by the silk, that the rest of its performance remains to us a mystery. It is especially mysterious since the inner wall of the cocoon encloses so small a cell that the caterpillar is obliged to compress itself in order to fit within it. This achievement would be something like that of a man who built around himself a box only a few inches longer, wider and thicker than himself. After the cocoon is entirely finished the caterpillar sheds its skin for the last time and changes to a pupa.

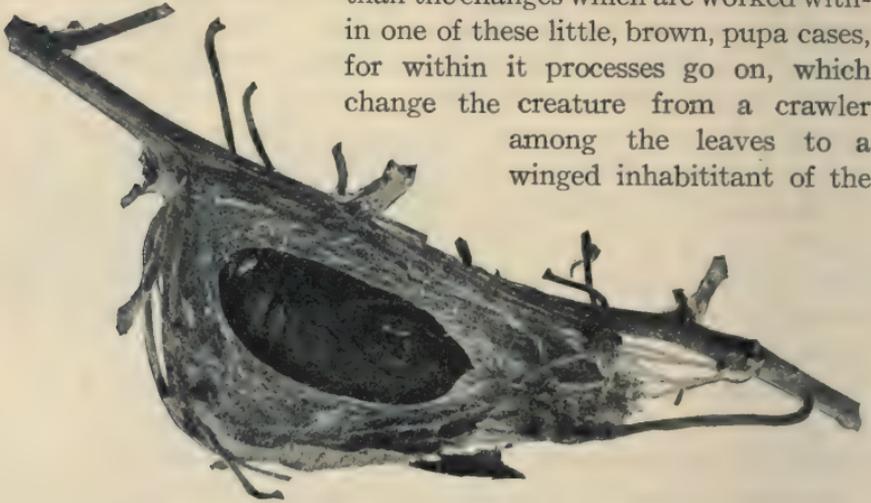
The pupa.—Very different indeed does the pupa look from the brilliant colored, warty caterpillar. It is compact and brown, oval and smooth with ability to move but very little when disturbed. The cases which contain the wings, which are later to be the objects of our admiration are now folded down like a tight cape, around the



Cocoon of cecropia.

body and the antennae like great feathers are outlined just in front of the wing cases. There is nothing more wonderful in all nature

than the changes which are worked within one of these little, brown, pupa cases, for within it processes go on, which change the creature from a crawler among the leaves to a winged inhabitant of the



The cecropia cocoon cut open, showing the pupa within it.

Photo by M. V. Slingerland.

air. When we see how helpless this pupa is, we can understand better how much the strong silken cocoon is needed for protection from enemies as well as from inclement weather.

The moth.—In the spring, usually in May, after the leaves are well out on the trees, the pupa skin is shed in its turn, and out of it comes the wet and wrinkled moth, its wings all crumpled, its furry, soft body very untidy; but it is only because of this soft and crumpled state that it is able to push its way out through the narrow door into the outer world. It has on each side of its body just back of the head two little, horny hooks that help it to work its way out. It is certainly a sorry object as it issues, looking as if it had been dipped in water and some one had squeezed it in his hand. But the wet wings soon spread, the bright antennae stretch out, the furry body becomes dry and fluffy, and the large moth appears in all its perfection. But though it is so large, it does not need to eat; the caterpillar did all the eating that was necessary for the whole life of the insect; the mouth of the moth is not sufficiently perfected to take food.

PROMETHEA (*Callosamia promethea*)

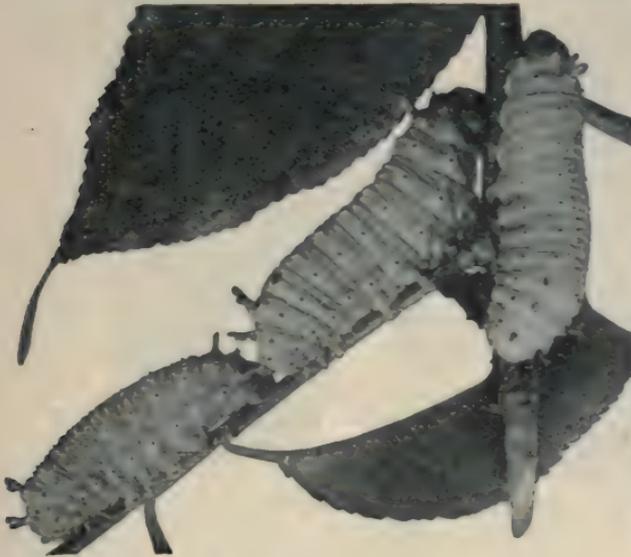
The promethea is not so large as the cecropia, although the female resembles the latter somewhat. It is the most common of all of our giant silk-worms.

Food Plants.—Wild cherry, lilac, ash, sassafras, buttonwood and many other forest trees.

The eggs.—These are whitish with brown stain, and are laid in rows, a good many on the same leaf.

The caterpillar.—The caterpillars as they hatch from the eggs, have bodies ringed with black and yellow. They are sociable little fellows and live together side by side amicably, not exactly "toeing the mark" like a spelling class, but all heads in a row at the

edge of the leaf where each is eating as fast as possible. When they are small the caterpillars remain on the under side of the leaves out of sight. In about five days, the first skin is shed and the color of the caterpillar remains about the same. Four or five days later the second molt



Promethea caterpillars fully grown.

occurs, and then the caterpillar appears in a beautiful bluish-green costume with black tubercles, except four large ones on the second and third segments, and one large one on the eleventh segment which are yellow. This caterpillar has an interesting habit of weaving a carpet of silk on which to change the skin; it seems to be better able to hold on while pushing off the old skin if it has the silken rug to cling to. After the third molt, the color is a deeper greenish blue and the black tubercles are smaller, and the five big ones are larger and bright orange in color. After the fourth molt, which occurs after a period of about five days later, the

caterpillar appears in its last stage. It is now over two inches long, quite smooth and prosperous looking. Its color is a beautiful light, greenish-blue, and its head is yellow. It has six rows of short, round black tubercles. The four large tubercles at the front end of the body are red, and the large tubercle on the rear end of the body is yellow.

The cocoon.—During the winter, leaves may often be seen hanging straight down from the branches of wild cherry, lilac and ash. If these leaves are examined each one will be found to be



Promethea moth, female.

wrapped around a silken case containing a pupa of the promethea. It is certainly a canny insect which hides itself during the winter in so good a disguise, that only the very wisest of birds ever suspect its presence. When the promethea caterpillar begins to spin, it selects a leaf and covers the upper side with silk, then it covers the petiole with silk fastening it with a strong band to the twig, so that not even the most violent winter winds will be able to tear it off. Then it draws the two edges of the leaf about itself like a cloak as far as it will reach, and inside this folded leaf it makes its cocoon, which always has an opening in the shape of a conical valve at the upper end, through which the moth may emerge in the spring. This caterpillar knows more

botany than some people do, for it makes no mistake in distinguishing a compound leaf from a simple one. When it uses a leaflet of hickory for its cocoon, it fastens the leaflet to the mid stem of the leaf and then fastens the stem to the twig.

The pupa.—The male pupa is much more slender than that of the female. The moths do not issue until May or June.



Promethea moth, male

The moth.—The moth works its way out through the valve at the top of the cocoon. The female is a large, reddish-brown moth with markings resembling somewhat those of the cecropia. The male is very different in appearance, as its front wings have very graceful, prolonged tips, and both wings are almost black bordered with ash color. The promethea moths differ somewhat in habit from the other silk-worm moths in that they fly during the late afternoon as well as at night.

ANGULIFERA MOTH (*Callosamia angulifera*)

This is very much like the promethea in appearance except that the white markings of the wings are much more angular in shape, and the males and females are nearly alike in form and

color. The caterpillars of this species do not invariably fasten the petiole of the leaf to the twig, but make the cocoon within the leaf and drop to the ground when the leaf falls.

THE CYNTHIA (*Philosamia cynthia*)

This beautiful moth is an Asiatic species; it is very large and olive green in color with lavender tints and white markings; there are white tufts of hairs on the abdomen. It builds its cocoon like the *promethea* fastening the petiole to the twig. It lives



Promethea cocoons, one cut open to show the pupa.

upon the ailanthus tree, and is found in our State only in the region about New York City, where the ailanthus has been introduced as a shade tree.

THE POLYPHEMUS (*Telea polyphemus*)

This large, yellowish-brown moth is the one of all our species of American silk-worms which would be used for the production of silk if we were deprived of the product of the Chinese species.



The Cynthia or Ailanthus Moth
The male above

Its silk is strong and smooth, very lustrous, and extremely durable. Each cocoon gives about eight hundred feet of unbroken silk.

Food plants.—Oak, elm, maple, chestnut, walnut, beech, birch, apple, pear, wild cherry and many others.

The eggs.—These are flat and round like a lozenge; the top and bottom are white and the sides brownish. They are laid in clusters, usually on the under side of the leaf. They hatch from ten to fifteen days after being laid.



Polyphemus moth

The caterpillar.—When first hatched the caterpillar has a large reddish head and the body is yellow. Later the body turns green, the back being bluish in tint; the tubercles are yellow. It changes its skin at intervals, as do the other silk-worms, but the color of the body does not change noticeably. When the caterpillar has reached its full growth, its body is green with oblique yellow strips on each of the abdominal segments. The tubercles are orange, sometimes red. The shield on the rear end of the body is edged with brown and the head is reddish-brown. The segments of the body are deep and sharp at the edge. The caterpillar has a way when resting, of drawing itself up so that its segments look like a half shut accordion. It will erect the front part of the body if disturbed and hold itself thus motionless for

a long time and undoubtedly thus escapes notice, as it resembles a serrate edged leaf.

The cocoon.—This is quite different in shape from that of the cecropia or promethea. It is a broad, blunt oval and is spun within at least two leaves and often with other leaves in the vicinity attached. Usually when the leaves fall the cocoons go with them and lie safely under the snow all winter. However, during recent years we have found many polyphemus cocoons fastened to twigs and remaining on the tree all winter. Whether this is a chance



Polyphemus cocoon cut open showing the pupa. The wing-cases and antenna show plainly.

happening or the beginning of a new habit, we are unable to say. The cocoon is very solid, and is not double walled, like that of the cecropia.

The pupa.—This is almost globular in shape and shows the antennae and the wing pads very plainly.

The moth.—When the moth breaks open the pupa skin, it finds no valve or opening as does the cecropia and promethea. However, it masters the situation and gets out of its compact case by wetting the cocoon with an acid liquid, which it secretes in its mouth for the purpose, and then pushes its way out between the threads. It can be readily distinguished from all the other moths, as it has what the children call "a window pane" in the middle of each wing. This transparent spot consists of thin membrane; in the hind wing it is the "eye" of the large, decorative eye-spot.

THE LUNA (*Tropæa luna*)

Of all the beautiful silk-worm moths the luna is far the most graceful in form and the most exquisite in color. It may be seen



Luna caterpillar fully grown.

flying about electric lights during May and June, and has been likened to a "great, white ghost of a bird appearing for a moment then vanishing in the darkness."

Food plants.—Hickory, birch, oak, butternut, walnut and others.

The eggs.—These are white and are

laid a few in a row on the leaf of a food plant. They hatch in about a fortnight after being laid.

The caterpillar.—This resembles very much the caterpillar of the polyphemus. It is green when it hatches, but the head is not entirely brown like that of the polyphemus. There is no noticeable change after the molts, except that after the fourth molt, a yellow broken line may be seen running along each side of the body showing on the hind half of each segment. The tubercles vary from red to rose color and yellow, and the abdominal tubercles are sometimes blue. This caterpillar varies much in markings and coloring. It is usually distinguished from the polyphemus because it lacks the oblique yellow lines on the abdominal segments, and has instead a line along each side of the body: but we have had caterpillars that showed this lateral line so set on edge along the segments, that we were very much surprised when luna instead of polyphemus moths issued from the cocoons.

The cocoon.—The caterpillar spins its cocoon by drawing two leaves closely around it. The cocoon resembles that of the polyphemus very much, and like it, it usually falls to the ground with the leaves. However, luna caterpillars have been found on the

ground under the tree weaving their cocoons among the fallen leaves.

The pupa.—This resembles very much that of polyphemus.

The moth.—The delicate, exquisite green of the luna's wings is set off by the rose-purple, velvet border of the front wings, and the white fur on the body and inner edge of the hind wings. Little wonder that it has been called the "Empress of the night." The long swallow tail of the hind wings give the moth a most graceful shape, at the same time probably afford it protection from observation. During the day time the moth hangs wings down beneath the green leaves, and these long projections of the hind wings folded together resemble a petiole, making the insect look very much like a large leaf.

Evening Primroses

HELEN GREY CONE

While gray was the summer evening,
Hast never a small sprite seen
Lighting the fairy fragrant torches
For the feast of the Fairy Queen?

The buds on the primrose bushes
Upspring into yellow light,
But ever the wee deft spirit
Escapes my bewildered sight.

Yet, oft, through the dusky garden,
A dainty white moth will fly,
Or, pink as a pink rose petal,
One lightly will waver by.

Perhaps 'tis the shape he comes in,
Perhaps it is he indeed,
Sir Moth, or the merry Cobweb,
Or the whimsical Mustard-seed.

Samia Cecropia's Love Story*

ELLIOT ROWLAND DOWNING



THE night was fit for lovers' dreams. The moonbeams from a widening crescent fell slantwise through the lattice of clustered blossoms, whose fragrance distilled into the gentlest of spring breezes. It was no wonder that the rapture of mere existence merged into passion, or that Samia's whole being thrilled at the touch of her handsome suitor. His strength, dash and hardihood were quite enough to please so fair a mistress, although his beauty was scarred with the marks of gallant frays. From Samia the bloom of youth had not begun to disappear. She was clothed in all the exquisite freshness and elegance of a debutante. As she lightly moved or poised in garceful attitude, her whole being seemed the incarnation of radiant beauty and perfect happiness. The world was full of charm for this winsome child of the sunbeams and zephyrs; life was pulsing with unabated energy and zest; suitors were all gallant lovers and she care-free.

Despite the beauty and grace of her perfect maturity, this much-courted princess in her immaculate gown had been the homliest of babies. Few ever saw her then without exclaiming upon her ugliness. She was born of a wanderer whose only tent was a leafy thicket, and whose life was soon snuffed out by exposure and want. For Samia the wind sang the rock-a-bye song and truly it was "Rock-a-bye baby upon the tree top," for there was her cradle, yes! a whole row of cradles, swaying on the leaf at the end of a branch. Each cradle was a delicate eggshell. Mother Cecropia had placed them there and had fastened the cradles securely with glue of her own manufacture. They seemed such fragile little spheres, each scarcely larger than a pin's head, yet what a mystery was bound up within each paper-thin shell. That speck of life-substance floating on its drop of nutrition, compassed by the filmy shell, still baffles us, with its unsolved problems. There are the potentialities of a creature of perfect beauty and vibrant energy;

*Reprinted by permission from *The Western Journal of Education*.

there are the possibilities of future generations; there are problems of heredity, of life, aye! of immortality, still locked within those fragile walls.

Nestled by the warm sunshine, the tiny living speck in the cradle grew and grew, feeding on the yolk left near by the mother, until at last the cradle could hold its baby occupant no longer, and out crept a hairy little creature that surely could have no relation to the beautiful Samia. But it was her baby self, though truly a queer little black imp she was with her fuzzy coat.

She was possessed of a tiny body, but a mighty appetite. Her mouth was provided with a pair of keen jaws, which she proceeded to use on the succulent foliage. Madame Cecropia made no mistake when she placed those eggs, for there right at hand, were tender green leaves for her brood of babies. Little "Nig" Cecropia fell to and one could have heard the steady click, click of her jaws as she greedily bit off mouthfuls of the welcome food. Such a gourmand! The youngster seemed to live to eat. An entire leaf did not satisfy her appetite, but she uneasily sought a second one and started her systematic gnawing along its edges until she, with her brothers and sisters, had stripped the sapling of all its tender leaves. How she did grow! At first no bigger than an exclamation point, she doubled her size in a few hours. Then this little larva was a juicy morsel and one wonders how she escaped the sharp eyes of hungry birds. But I suppose a bird would debate for some time before trying to swallow this repulsive, bristling mass of stiff hairs, even if there was a dainty morsel within. At last Samia must leave the bare home cupboard and shift for herself. But saplings were numerous and Samia's tastes cosmopolitan. She was not very particular on what kind of greens she dined, although willows were, perhaps, most to her liking.

But Samia began to feel the discomfort that presaged some change in her life. As she fed and grew, her hairy coat became too small for her increasing bulk. Ill at ease, she clung listlessly to a twig in the bright sunshine, when, suddenly, she felt the old dress split down the back. She promptly crawled out and found that beneath the old skin a new one, tender at first, but which soon became firm and tough. This new dress was a delicate green, ornamented with a double row of gorgeous blue and orange spiny buttons. Still the business of life was to eat, and so this showy dress was soon outgrown and the discarded garment hung up on a convenient twig. This was a frequent practice with Samia, as

well as with other of her insect friends. One often finds afield, a warm grassy nook hung with drying moult skins, a dressing room where costumes have been changed between the acts of the continuous insect tragedy and comedy. *Samia* had now reached the climax of her ugliness. She seemed a great green worm. Only, of course, she was not a worm, because she was a moth in the making. Likely though that this worm-like form is tell-tale of her remote ancestry.

Having eaten until the ennui of existence that overtakes the gourmand, who can find nothing new to his taste, came upon her, she went into retirement. Within her cumbrous body was a whole silk factory. *Samia* wove a silken fabric about herself as she clung to a branch, and soon a brown silken cocoon became her shroud. The first summer of her existence was over. Within the silken warmth she passed the winter. But with the return of summer *Samia* awoke to renewed life. One might have heard mysterious motions within the cocoons upon the trees when tender leaves were budding. Soon the silken strands at one end of the cocoon were pushed aside and there crawled out a clumsy, bedraggled object. Wearily it seemed to drag its length of attenuated body behind it. Moist folds of skin hung down from its back. But it seemed to know what it wanted, for mounting a twig bathed in sunshine, it reeled in its profusion of body, expanded and dried its limp wings. The wet mass of animated material that was so long drawn out in crawling through the little gate way of its winter prison quarters, transformed into the beautiful *Samia*. As dusk came she tried her new wings, then flitted off into the gathering gloom, not to feed, however, for she now disdains such prosaic matters. Life is too short to waste thus when she may sail the perfumed air and play among the moonbeams.

How did her lover find her? The plumes he wears are not useless ornaments of a knight errant, but keen, sensory organs, by which he scents the presence of his lady love, even when she is far away. Their erratic flight together, the wanton display of grace and strength as they flit hither and thither, the beating of their wings in ecstasy of delight, is but the expression of an extravagance of passionate admiration. Let these lovers be joyous while life lasts. It will not be long. The mating time over, *Samia* will lay her eggs, glue her cradles to some leaf or twig, and then, her mission in life accomplished, her life will end as her mother's had done the year before.

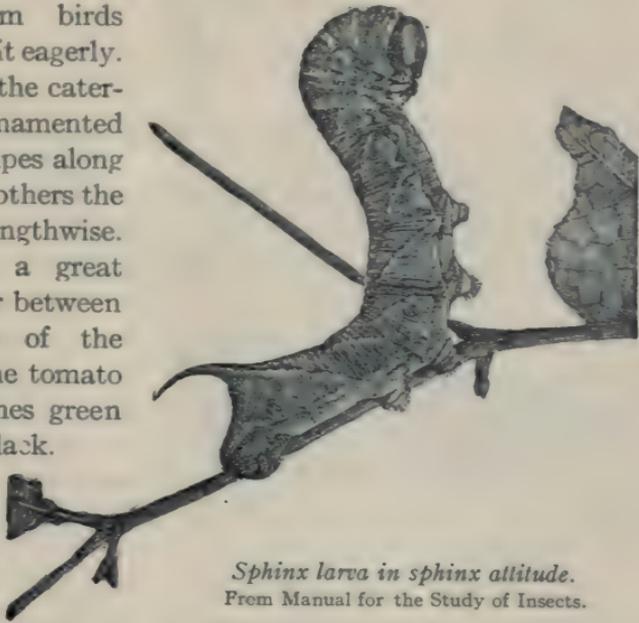
The Hummingbird Moths

Often when we are sitting on the piazza in the early evening we see a hummingbird poising before a flower of the trumpet creeper or a petunia bell, and we hear the whirr of its wings and note how it darts away to another flower. But, at that time of night, all the hummingbirds are safely asleep in their leaf bed-rooms; and their understudies at the flower trumpets are large strong winged, long tongued moths that choose the twilight hour to refresh themselves at nectar wells. They are the sphinx or hummingbird moths.

The sphinx caterpillars are leaf eaters and each species feeds upon a limited number of plants which are usually related; for instance, one feeds upon both the potato and tomato; another upon the Virginia creeper and grapes. In color these caterpillars so resemble the leaves that they are discovered with difficulty. Those on the Virginia creeper which shades porches, may be located by the black pellets of waste material which fall from them to the ground; but even after this unmistakable hint I have searched a long time to find the caterpillar in the leaves above; its color serves to hide the insect from birds which feed upon it eagerly. In some species, the caterpillars are ornamented with oblique stripes along the sides, and in others the stripes are lengthwise. There is often a great variation in color between the caterpillars of the same species; the tomato worm is sometimes green and sometimes black.

The horn on the rear end is often in the young larva of different color

than the body; in some species it stands straight up and in some it is curled toward the back. It is an absolutely harmless



Sphinx larva in sphinx attitude.
From Manual for the Study of Insects.

projection and does not sting nor is it poisonous. However, it looks awe-inspiring and perhaps protects its owner in that way. The *Pandora* sphinx has its horn curled over its back in the young stage but when fully grown the horn is shed; in its place is an eye-spot which, if seen between the leaves, is enough to frighten away any cautious bird fearing the evil eye of serpents. The sphinx caterpillars have a habit, when disturbed or when resting, of rearing up the front part of the body, telescoping the head back into the thoracic segments, which in most species are enlarged, and assuming a most threatening and ferocious aspect. If attacked they will swing sidewise, this way and then that,



Philampelus pandorus a humming bird moth

making a fierce crackling sound meanwhile, well calculated to fill the trespasser with terror. When resting they often remain in this lifted attitude for hours, absolutely rigid.

The six true legs are short with sharp, little claws. There are four pairs of fleshy prolegs, each foot being armed with hooks for holding on to leaf or twig; and the large, fleshy prop-leg on the rear segment is able to grasp a twig like a vise. All these fleshy legs are used for holding on, while the true legs are used for holding the edges of the leaf where the sidewise working jaws cut it freely. These caterpillars do clean work, leaving only the harder and more woody ribs of the leaves.

There are nine pairs of spiracles, a pair on each segment of the abdomen and on the first thoracic segment. The edges of these air openings are often strikingly colored. Through the spiracles the air is admitted into all the breathing tubes of the body around

which the blood flows and is purified; no insect breathes through its mouth. These caterpillars, like all others, grow by shedding the skeleton skin, which splits down the back.

Often one of these caterpillars is seen covered with white objects



A Myron caterpillar that has been parasitized. The white objects upon it are the cocoons of the little grubs which feed upon the fatty parts of the caterpillar.

which those who do not know that caterpillars never lay eggs, have called, eggs. But the sphinx moths at any stage would have horror of such eggs as these! They are not eggs but are little silken cocoons spun by the larvæ of a hymenopterous parasite; it is a tiny, four-winged "fly" which lays its eggs within the caterpillar. The little grubs which hatch from these eggs

feed upon the fleshy portions of the caterpillar until they get their growth, at which time the poor caterpillar is almost exhausted; and then they have the impudence to come out and spin their silken cocoons and fasten them to the back of their victim. Later, they cut little lids to their silken cells which they lift up as they come out into the world to search for more caterpillars.

As soon as the sphinx larva has obtained its growth, it descends and burrows into the earth. It does not spin any cocoon but packs the soil into a smooth-walled cell in which it changes to a pupa. In the spring the pupa works its way to the surface of the ground and the moth issues. In the case of the tomato and tobacco sphinx pupa, the enormously long tongue has its case separate from the body of the pupa, which makes the "jug handle." The wing cases and the antennæ cases can be distinctly seen.



The pupa of the common tomato sphinx caterpillar

Note that the part encasing the long tongue is free and looks like the handle of a jug.

Photo by M. V. Slingerland.

In the case of the other species the pupæ have the tongue case fast to the body. The larva of the myron sphinx does not enter the ground, but draws a few leaves

about it on the surface of the ground, fastens them with silk and there changes to a pupa.

The sphinx moths are beautiful and elegant creatures. They have a distinctly tailor-made appearance, their colors are so genteel and "the cut" so perfect. They have long, rather narrow, strong



Tailor-made moth, the adult of the Myron sphinx.

wings which enable them to fly with extraordinary rapidity. The hind wings are shorter, but act as one with the front wings. The body is stout and spindle-shaped. The antennæ are thickened in the middle or toward the tip, and

in many species have the tip recurved into a hook. Their colors show most harmonious combinations and most exquisite contrasts; the pattern, although often complex, shows perfect refinement. Olive, tan, brown and ochre, black and yellow, and the whole gamut of greys, with eye-spots or bands athwart the hind wings of rose color or crimson, are some of the sphinx color schemes.

Most of the sphinx moths have remarkably long tongues, being sometimes twice the length of the body. When not in use, the tongue is curled like a watch spring in front and beneath the head; but of what possible use is such a long tongue! That is a story for certain flowers to tell, the flowers which have the nectar wells far down at the base of tubular corollas, like the petunia, the morning glory or the nasturtium; such flowers



The tobacco sphinx moth with tongue extended

Photo by M. V. Slingerland

were evidently developed to match the long-tongued insects. Some of these flowers, like the jimson weed and nicotina, open late in the day so as to be ready for these evening visitors. In some cases, especially in the orchids, there is a special partnership established between one species of flower and one species of sphinx moths. The tobacco sphinx is an instance of such partnership; this moth visits tobacco flowers and helps develop the seeds by carrying pollen from flower to flower; and in turn it lays its eggs upon the leaves of this plant on which its great caterpillar feeds and waxes fat, and in high dudgeon often disputes the smoker's sole right to the "weed."

"Tender trifer with the breezes,
Two-sailed argosy of spring,
Clothed on may-flies' slender fleeces,
Thou incarnate loitering!

What desire and what endeavor
Flauntest thou upon thy breast,
With those diamond eyes that ever
Flame upon adventurous quest?

Wings with peacock eyes enamelled,
Burnished fury glittering,
I have caught thee, thou are trammelled,
Thou art lost unto the spring.

In my fingers' curious pressure
Thou art dust upon my thumb,
I have robbed thee of thy treasure,
And thy winking wings are dumb."

From "A Moth" by Nathan Caleb House published in *The Poetry Journal*.



Just out of the Cocoon
Photo by M. V. Slingerland.

My Study of Moths from Living Specimens*

ALICE E. PROUD

State Normal School at Trenton, N. J.

Before beginning to collect the thirty-five specimens of insects required for the nature department of this school, I did not know that there were such beautiful and interesting creatures as the big bird-like night moths in existence. As for day moths, I had no idea that there were such things. My only experience with moths had been with the tiny white and gray ones that flutter at the screens on summer evenings.

My first experience along this line came during my first year of teaching. Late in the fall, a small boy brought me what he called a "queer nest". It was a big baggy gray cocoon, woven to a branch of blackberry. I had no idea what was in it, but when I shook it something inside rattled and felt quite heavy. I kept it at school nearly all winter, but in the early spring I took it home and hung it to a nail on the wall. One week-end, on coming home I found that a big beautiful moth had emerged. It so happened

*This was a Commencement Essay prepared under the direction of Miss Elizabeth P. Sheppard, teacher of Nature-Study in the Trenton Normal School and had several charming illustrations in water color which could not be reproduced by engraving.—*Editor*.

that Mother had seen the damp, feeble creature clinging to the cocoon. It had begun to exercise its wings a little when she discovered it. A woman who lived near us owned Gene Stratton Porter's "Moths of the Limberlost". Mother had borrowed it, and we looked through it to identify our specimen. At last we found a moth that seemed to correspond to ours. The name of the moth was *Cecropia*, or Robin Moth. The latter name was given because the chief colors of the moth are gray and red. The ground color of the wings is gray. Near the edge are black lines and farther in is a terra-cotta line shading into white. On each wing is a terra-cotta and white half-moon. Near the margin of the upper wings is an irregular line of lavender. The cocoon, as well as the moth itself, is very helpful in identification of species. The shape does not vary much; the cocoon is generally rather long and narrow at the ends and fastened along one side to a branch. The middle is large and baggy. I have seen cocoons ranging in color from deep brown to pure white.

I saw no more moths until June, after school had closed. Then one warm sultry evening, a small boy appeared bearing a large lamp-chimney box, which he assured me contained a "great big butterfly." He had caught it near an arc light in the park. When I opened the box, I noticed a strong smell of musk. The moth was chiefly dark olive green and cinnamon in color. It had a wing spread of fully six inches. It was a female Regal moth and was depositing eggs. I thought it best to leave the moth over night until all the eggs were laid. Then I added her to my collection. The eggs were like little oval pearls, about one-sixteenth of an inch in diameter. I kept them in a jelly glass for a week, and at the end of that time one could see the young caterpillars inside. When they hatched out, they were brown and hairy, with horns on their heads. After they left the egg, they rested for a time, then ate all their egg shells. They grew rapidly and were soon large enough to be kept in a shoe box, covered over the top with mosquito netting. They had enormous appetites and consumed quantities of hickory and walnut leaves. I gathered fresh leaves twice a day for them. The leaves were always washed in cold water in order to supply the caterpillars with water to drink. It was great fun to watch them eat. Their jaws worked from side to side, never stopping until a whole leaf was devoured. They were so interesting that I spent most of my time feeding them, cleaning

out their box and observing them. Almost every week they would stop eating for a day, and, crawling to a safe retreat on the side of the box, proceed to make a change of costume. Such struggles as they endured getting rid of those skins! Some of them ate their discarded raiment, but other more fastidious ones left their skins in the bottom of the box. Nearly every time they molted, the new skin was lighter in color, until after six weeks of eating and growing, they were a blue-green color, with big brown horns on their heads. At this time they were six inches long and nearly an inch thick. For some reason, perhaps my ignorance of the right kind of care, all but five died. The survivors were the pride of my existence and the terror of the children of the neighborhood. No child ever quite believed me when I stated that the caterpillars would not bite. During the last week, the appetite of those caterpillars were incredible. They lived but to eat. Then quite suddenly they refused food and became very active. They raced about the box as though in search of something. I had read that this was a sign that they were ready to pupate. So I filled a bucket with soil and put them in it. They continued their racing for a little while, then began to burrow. I was so curious to know what had happened to them after they had disappeared under the soil, that I had dug them up. They did not seem to mind it, however, and soon burrowed again. I did not know that the soil should be kept moist, so all my caterpillars dried up and were useless. I lost a fine chance of raising moths, but it was a lesson not to be forgotten.

Although I had no success with the earth pupating caterpillars, I had very good luck with the weaving ones. During the same summer, a little boy brought me a queer-looking worm. It was about three inches long, in color light green, with yellow, red and blue tubercles on its back. It was not fully grown and possessed a very healthy appetite. For a dwelling place I lined a strawberry box with maple leaves and covered it with mosquito netting. This seemed quite adequate and the caterpillar grew to be four inches long. I searched the moth book for a description of such a caterpillar, and found it to be a *Cecropia*. After its feeding time was over, I watched it closely, for I wanted to know how it spun. It used its mouth to gum the edge of a stick I had put in the box; then it drew out long threads and enveloped itself in a thin network of silk just the shape that the finished cocoon was to

be. It was interesting to watch how it threw its head from side to side, weaving rhythmically back and forth. The first layer of silk was so thin that one could see plainly through it. When the cocoon was finished, it was a lustrous silky brown. I kept the cocoon over winter and was careful to moisten it occasionally, for I had learned through sad experience that I must create conditions as nearly like those of nature as possible.

Late in the spring I witnessed for the first time the birth and development of a moth. The newly-emerged moth was wet and soggy-looking, with vivid coloring. Its head and body were of natural size, but its wings were only little stumps about the size of one's small finger nail. I was bitterly disappointed about the wings, for I thought the moth had emerged too soon. It was as weak as a new-born baby as it clung to the cocoon. At intervals it ejected a white milky fluid, useful in softening the cocoon. After observing it for a few moments, I thought the wings appeared to be getting larger. I could not believe my own eyes, so I called Mother. We stood there and watched those lovely wings grow and grow until they measured fully five inches from tip to tip. Of all the wonders that nature performs, I think this is one of the greatest. It appealed strongly to every one of the many children who accompanied me on my field trips and hunted new specimens for me. They could not realize that a beautiful large moth had been sheltered all winter in an insignificant little gray cocoon. Grown-ups as well as children became much interested, and many fine specimens were sent to me by people who had seen my collection. *Cecropias* are very common near my home. I find the cocoons and larva on alder bushes, especially near houses. *Cecropia* seems to be very fond of human society

I had learned to know a great many night moths before I ever became acquainted with any day moths. I had always associated moths with the night time. But I had an interesting experience that taught me the truth. One morning about eleven o'clock, I was in a clover field observing the different kinds of butterflies. They were slow in coming that morning, so I turned my attention to the bumblebees. I sighted an unusually large one busily engaged in breakfasting from a pink clover blossom. As I came nearer, I discovered that this was not a bumblebee at all, but something entirely new to me. It was a beautiful and graceful insect. Its body was green and velvety and its head was deep red. Its

wings were like thin glass, all edged with red velvet. My hands trembled so in the excitement, that the specimen almost escaped from the net. I looked through the moth book and found that this little day moth is called "Bloody Nose" or *Hemaris Thysbe*. Later I saw a number of them hovering over the phlox and August lilies in the garden.

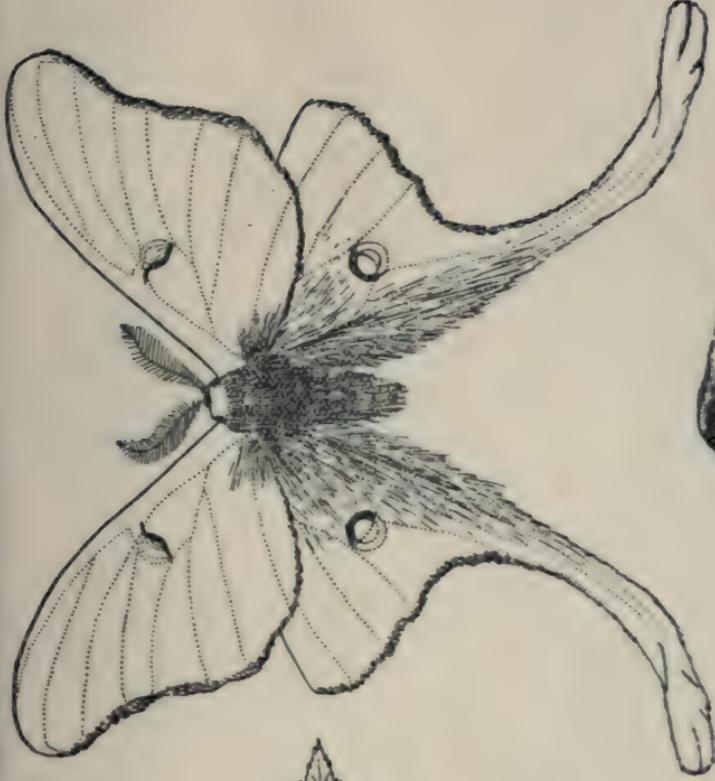


Hemaris thysbe

By this time, I had learned to know a number of moths. But so far, I had never been able to get either a Luna or an Emperor. It was by the help of one of my little friends that I at last found the latter. A little boy came to see me one afternoon and said, "If you want any big yellow moths, I know where there are lots of them." I very naturally wished to know. He said that if I would go down to the park with him that evening, he would show me where to find them. He was as good as his word, and I found that I could catch as many as half a dozen fine Emperors in an evening. The best places to catch were in the dance pavilion and around the arc lights.

It was not until the summer of nineteen sixteen that I found any Luna moths. Then it was entirely by accident. Walking by a clump of alder bushes, I saw a sight that almost took my breath away. There, clinging to a branch, were two large Luna moths. They were a lovely pale green, with long graceful trailers. Their wings were edged with deep lavender. I have never yet found either the cocoons or larva of this moth.

The latest work I have done with moths has been done during the school year. I brought a number of my cocoons and pupae to school and kept them in a wire cage. Some of them I hung from the wire, others I placed in boxes. They were all labeled and a brief description of the moth given. The only care they required was an occasional sprinkling. When a female *Cecropia* emerged on the sixteenth of April, I put her in a cage and placed her on the campus near the rockery, in hope that some early-emerged males might find her. But it was probably too early for any but house-wintered moths to emerge.



Cocoon

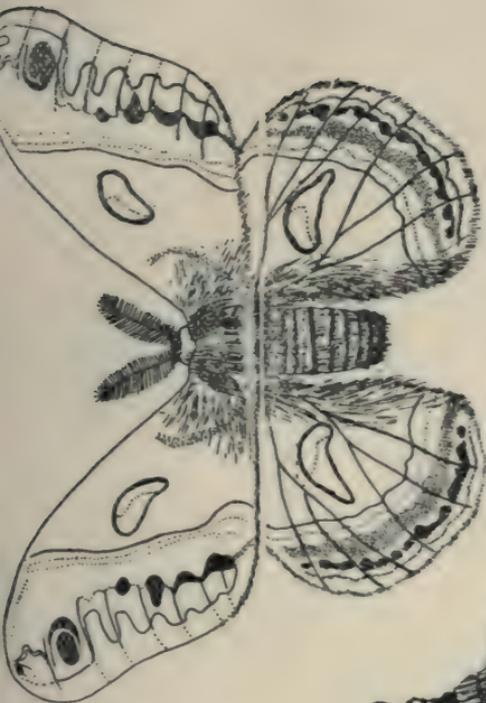


Luna Moth



Larva



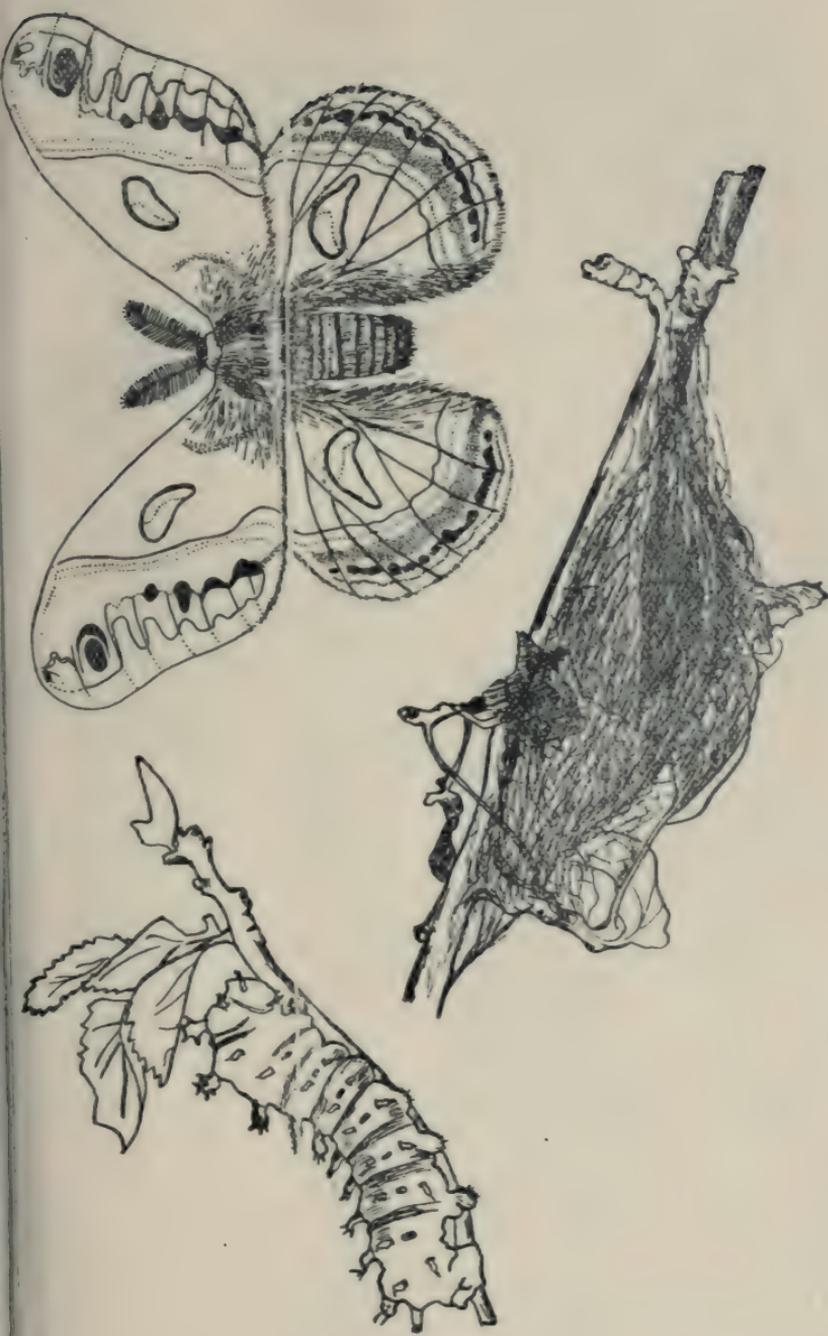


Larva

Cocoon

Cecropia Moth





Larva

Cocoon

Cecropia Moth



This piece of work is the latest I have done. However, I have a multitude of ideas and plans to be realized. One of the most cherished plans is to capture males and females of the same species and let them mate. Then I want to rear the young caterpillars and get new moths. In order not to lessen the number of moths in the vicinity of my home, I always distribute a part of any brood of caterpillars I have, upon their favorite trees. Another plan is to get pictures of different species of moths from egg to maturity. I am very anxious to learn how to care for the pupating caterpillars through the winter.

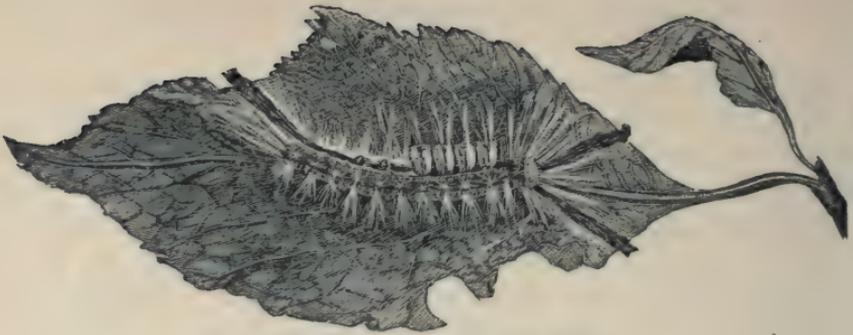
With all this planning of future work, I anticipate a very pleasant and profitable continuation of my study of moths, during the coming summer.

The Tiger Moth

CHARLES R. FOX

Float in the shadow of night!
Orange thy wings and rich parded,
Figured and blotted with velvet—
Thickening the dust with thy stillness,
Fold thy soft plumes like a blossom!
Hooded thine head with fur helmet,
Antlered with fiercely pale feelers,
Sensitive, set with saw edges,
Float in the shadow of night—
God through the darkness beholds thee
Fleeced with farina of flowers,
Mealy with dust of the rainbow.

Shine then my soul in night's bosom,
Hid in the dark of this human,
Eyes may not see thee, but round thee
Lives the transparence of heaven.
Fixed with full face on the God-light,
Shadows and fears drop behind thee,
Sifting thy sources of being:
Darkness is God looking down thee,
Draining all light by His presence;
Darkness is but thine own shadow,
Cast by the glory above thee.



Notolophus leucostigma caterpillar

How to Study the White-Marked Tussock Moth

(*No-tol' -o-phus leu-co-stig' -ma.*)

The eggs are laid by the mother moth in a white mass on her cocoon, in the summer or early fall; they do not hatch until the last of the following May. The young caterpillars feed at first on the under side of the leaves; later they destroy the whole leaf, except the main ribs. When nearly full grown many of the caterpillars leave the trees and wander about on the walks and ground. It is supposed that these are the females, and that thus the distribution of the species is ensured. When full grown the caterpillar chooses some crevice in the bark of the tree trunk, or on the lower side of the larger limbs, or, perhaps, on some fence, or side of a building, and here spins a cocoon, out of silk loosely woven with hairs from its own body. Within this cocoon the insect transforms to a pupa—yellowish white in color, shaded with black or brown. It remains in the pupa state about two weeks, when it issues from the cocoon, a full fledged moth, the last of July or in August. The male is a pretty insect with mottled-gray and brown wings, which expand a little over an inch. These moths may be found in the day time resting upon the sides of houses. The female is a stout, spindle-shaped creature with no wings. It is supposed that once the female had wings like the male, but that they have been lost through disuse through many generations. She crawls out of her cocoon, and clings to it constantly; she finally lays her eggs upon it, and then dies and drops to the ground. The eggs are laid in a frothy mass, which later hardens, and protects them from the storms of winter. There are from 100 to 500 eggs in each mass. In early fall these egg masses are very conspicuous, but the dirt and smoke of the city settles upon them, and make them dark and hard to find in the spring.

This is the cycle in the life history of the moth completed: it lives in the egg from August until the May following; it lives as a caterpillar during June and a part of July; it lives in a cocoon as a pupa about two weeks during the last part of July and the first of August; it lives as a moth during August and perhaps a part of September.

DIRECTIONS TO THE TEACHER



Notolophus leucostigma
male

The teacher should have the children collect some of these cocoons, with the eggs on them by or before May 15th. Keep them in a pasteboard box until the eggs begin to hatch; then prepare a breeding cage, by using any common board or pasteboard box, with netting over it. In this box place a bottle filled with water. In this place some branches of horsechestnut in full leaf. Branches of linden, soft maple or elm may be used instead, for the insect feeds on many trees; but continue to use the kind of leaves you begin with. Place the caterpillars on the leaves as soon as they hatch. After a little you will have to put in fresh branches, as the caterpillars are voracious. Do not think you must keep all the caterpillars that hatch from one egg mass; fifteen or less are sufficient to show the life history.

QUESTIONS WHICH PUPILS SHOULD ANSWER THROUGH THEIR OWN OBSERVATIONS

1. Where did you find cocoons with eggs upon them?
2. How many eggs do you suppose there are in an egg mass?
3. Since you cannot count them with the naked eye count the caterpillars that hatch from one egg mass.
4. Upon what date did your caterpillars hatch?
5. What color are the caterpillars at first?
6. What part of the leaf do they first feed upon?
7. How old are they when they first eat a hole through the leaf?
8. How many times does this caterpillar change its coat?
9. How old is the caterpillar when the long black plumes first appear?
10. Shake a branch with some young caterpillars on it and see if they fall off.

11. If they save themselves from falling by a silk threads observe from whence the silk comes.

12. On how many kinds of trees do you find these caterpillars? Learn the names of the trees and draw pictures of the leaves of the different trees.

13. How do the caterpillars injure the trees?

14. Why cannot a tree live without leaves?

15. Describe a caterpillar as it appears about the middle of June or make a drawing of it if you like. Has it any coral color except on its head? How many tussocks has it on its back and what color are they? See the peculiar hairs which make up the three long black plumes. Look at a single one of these feathery hairs under a microscope if possible. Where are the long black plumes on the caterpillar?

16. Count the caterpillars in the cage and then count the leaves eaten by them and see how many leaves a single caterpillar will destroy.

17. Let the teacher give a number lesson based upon the reasonable supposition that from the egg mass of one mother moth 200 caterpillars hatch and mature and that 100 of these in turn are mother moths and each deposits eggs that will produce 200 caterpillars the year following.

SUMMER WORK

Give the pupils the following outline to be completed when school begins in the fall.

1. Watch a tussock moth caterpillar make its cocoon and tell how it is done.

2. Gather many cocoons and place them in pasteboard boxes and note what comes out of them in the spring.

3. In September find some cocoons which have no egg masses upon them and put these in paste board boxes and see what comes out of them. If you find some small black insects that look like flies coming from the cocoon, note that they have four wings like bees instead of two wings like flies. The young of these insects have destroyed the pupa in the cocoon and they are therefore our friends and should be allowed to go free.

4. Watch carefully during the summer and see what birds feed upon the tussock moth caterpillar.

5. Watch carefully for caterpillars in September and October—to discover if there may be a second brood as there is in the South.

Some Other Large Moths

THE IO

Not all the great and beautiful moths have caterpillars that spin enough silk to entitle them to be called Silkworms. The commonest of these is the Io which often comes to the light and flutters about, looking twice as large as it really is; it can be readily determined by the great round eye-spot in the center of each hind wing; this is blue, broadly bordered with black and has a fleck of white at the center; the two sexes differ in color and size; the male is the smaller and has front wings of deep yellow crossed by two oblique wavy lines of purplish red; the front wings of the female are purplish brown mingled with gray crossed with gray wavy oblique lines.



Automeris io

The caterpillar of the Io is very striking in appearance and of which Dr. Wm. T. Harris gives the following description: "It is of pea-green color

with a broad brown stripe edged below with white on each side of the body; it is covered with spreading clusters of green prickles, tipped with black and of uniform length; each of these clusters consists of about thirty prickles branching from a common center." These prickles in all their elaborate, starry arrangement are by no means for ornament solely, for they sting like nettles and are a very efficient protection from intruders. Dr. Harris gives the following engaging description of these insects: "When young these caterpillars keep together in little swarms. They do not spin a common web, but, when not eating, they creep under a leaf, where they cluster side by side. In going from and returning to their place of shelter, they move in regular files, a single caterpillar taking the lead, and followed closely by perhaps one or two in single file, after which come two, side by side, close upon the heels of these creep three more, the next rank consists of four, and

so on, the ranks continually widening behind, like a flock of wild geese on the wing, but in perfectly regular order. When about half grown they disperse and each one shirks for himself."



Automeris io, larva

We were rearing a brood of the Io caterpillars one

summer in a pasteboard box; one day the cover of netting became loosened and the caterpillars started to escape; they reached the edge of the box and evidently considered it the high road to freedom, for they began to march around and around on it in Indian file; some were larger than the others, so the procession had an uneven appearance, but it was determined and consistent in morale and evidently thought it was getting somewhere. If we had not rescued the little green pin-cushions and given them fresh forage, they would have marched on until exhausted. The caterpillars feed upon apple, cherry, willow, elm, currant and many other plants.

THE REGAL MOTH

This is the beautiful moth which has attained such a wide reputation through the charming story "The Girl of the Limberlost." Mrs. Porter certainly did justice to this glorious creature but it is not so rare now as it was in the day of "The Girl," for collectors sell specimens of it for twenty-five cents apiece. Its front wings are greenish-gray with all the wing-veins outlined broadly with orange-red and are adorned with patches of yellow; the hind wings are orange-red with yellow patches; the wings, when expanded measure five or six inches across.

The Regal moth has a perfectly adequate and magnificent caterpillar, which people uneducated to caterpillar standards call "The Hickory Horned Devil;" for it is hard to imagine such a formidable looking creature to be so perfectly harmless, as it is. When it is fully grown it measures four or five inches in length; it is green with a "bias" band of pale blue sometimes white on each side of each segment; the head and legs are orange colored; each segment of the body is adorned with red spines but the upper pair on the second and third segments back of the head are what gives the popular name for they are long and look like red horns.



Citheronia regalis

The Regal Walnut moth made famous in "The Girl of the Limberlost."



The Hickory Horned Devil

The caterpillar of the Regal moth.

(Courtesy of American Forestry. Photo by Dr. R. W. Shufeldt.)

When disturbed, the caterpillar raises its head and horns and shakes them from side to side in a manner to bring fear to the heart of the bravest; but this is all a bluff, for it is as no more dangerous than a walnut on the tree above it. Toward the end of the summer when it is fully grown it descends and burrows into the ground and changes to a pupa without spinning a cocoon. The popular name for this insect is "The Regal Walnut Moth" for its food plant is the walnut.

THE IMPERIAL MOTH

This is not such a showy species as the Regal moth, but it is very beautiful in its coloring; its wings are sulphur yellow thickly sprinkled with purplish brown dots, with a large patch at the base, a small round spot near the middle and a wavy band towards the outer margin of light purple; the males have the outer margin of the front wings purplish brown. The moth measures about five inches across its expanded wings. It appears in June and lays its eggs on the leaves of the sycamore, hickory or butternut, on which its larvae feed.

In its early stages the caterpillar has long movable horns "as if it were own brother to the hickory-horned-devil;" but with age, it loses this fierce appearance; when fully grown, it is four and a half inches long, green in color tinged with red and sometimes is brown; short hairs are scattered over the body and each segment bears six yellow knobs ornamented with black spines; the head and legs are pale orange and the breathing pores are white. The caterpillar gets its growth by autumn and descends from the tree and goes into the ground to pupate; it makes no cocoon; the pupa has at the rear end a long forked spine which aids it in working its way up through the soil when ready to emerge as a moth.



Basilona imperialis, caterpillar



The Imperial Moth.



Woolly bears

Photo by M. V. Slingerland.

What the Woolly Bear Said

LILIAN LYBOLT HAMMOND

"Ouch!" I woke up suddenly to find myself being pushed about and rolled over several times and finally picked up. I remained as I was—a ball of woolly hair thinking then maybe I'd be let alone.

Why had I been disturbed? It was only a few days ago that I had found this nice sheltered spot under some boards of a lumber pile and curled up to sleep while it was so cold. After a time as it was warm where I was now, I uncurled and started out to find where I was and whether it was spring instead of the cold fall. My eyes are so tiny I cannot see very far but I stretched out feeling in every direction with my head. And then as I started to move about, the place I was in opened up and I heard a voice saying, "Come, see what I have Mary," and then I knew I was in the hand of a little boy. He did not hurt me and it was so warm there I forgot to go to sleep again.

"Ugh!" said Mary, "How can you touch one of those horrid worms."

"I'm taking it to school," said the boy. "Teacher said to bring in anything that we find."

"Yes," said Mary, "but maybe she wants only pretty things—flowers and pretty flies."

But the boy said, "He is just as pretty as the marigold," and he put me in a box where there was another like myself.

The teacher did seem glad to see me. "What can you tell us about this caterpillar?" she said to the Boy, holding me out on her hand so that all the children might see me.

"Well," he said, "My big brother called it a woolly bear and he said it told by the color what part of the winter was going to be coldest. This one, he said, pointing to the other caterpillar that was hurrying about the box, has a lot of black near the head, then the middle part is brown and the tail is only black a short ways so he said the winter was going to be cold along at first a little while at the end. But this one here," he said, pointing to me, "is alike on both ends, so I guess they don't tell all the truth."

Then the teacher showed them how nicely my hair grew in little rosettes in rows around my body and how when I curled up they all stood straight out so it would be very hard for anything to hurt me. And the children looked at my three pairs of patent leather shoes on my true legs and saw that I did not wear any on my prolegs so I could take a hold of things better. I thought my hair was much neater than Mary's and she had on only one pair of patent leather shoes.

"What do you suppose he was doing?" asked Teacher of the Boy when he told where he had found me.

"Maybe he would die," he said, "in the cold with nothing to eat."

"Maybe it was sleeping for the winter like the real big bears we read about," said another.

"Yes," said Teacher, "That is what it does," and then she told them what a wonderful little creature I was; that after I was full grown I could go all winter without eating.

"I don't like things that crawl," said Mary. "What does it do when it wakes up?"

Teacher smiled, "Let's keep it and see," she said. So I was put in the box with the other one and we were placed outdoors in the cold and soon I went to sleep.

One day I awoke, finding the cold gone and then I knew the warm days of spring were here. I was in the school-room again and through the open window came the song of a blue bird. There was arbutus on the teacher's desk so I knew it must be about April. My woolly comrade had disappeared but there was a little object in the box that was very quiet. I soon felt a change

come over me and I also wanted to be like that. Then I found that I could spin some silk threads out of my mouth so I set to work to cover myself up. I moved my head back and forth fastening the silk in the corner of the box and from the sides to the bottom, making a little curtain around me.

Teacher saw me and showed the children so they could see me

making my little silk cocoon as my curtain around me is called. As my hairs were now coming out I wove them in also and soon I had finished and curled up in my compartment which was



*The Isabella tiger-moths, the adults of the woolly bear.
The larger is the female*

Photo by M. V. Slingerland.

much smaller than I had been. There I again slept.

Once more I awoke and pushed out of my little cocoon and climbed to the top of my box over which had been placed a net. What change had come over me. I was no longer a black and brown haired woolly bear; neither had I a silk cocoon around me but I had soft hairs on my body and, stranger still, four wings on my shoulders. My color was now grayish-yellow or tawny, my hind wings were tinted with dull orange and there were black dots on my wings and body.

In place of the arbutus there was now trilliums on the teacher's desk, and an oriole was singing from an elm tree. It was the last of May. Could it be possible that in a month I should have changed from a woolly bear to this wonderful being?

Again I was showed to the children but this time as the Isabella Tiger Moth.

"Why, how pretty," said Mary, "did it really come from that worm?"

Again teacher smiled.

"I'm so glad I brought these woolly bears to you last fall," confided the Boy.

"Maybe we can find some little woolly bears on grass or dandelion where the mother moth lays her eggs," said the Teacher "and tonight we will let the moth out for that is the time it likes to fly."

The Fire Worshippers

Most moths are night fliers and a very large number of species are attracted to the light. Why this is so we do not know, but the fact is of great use to the moth collectors, for many a rare specimen is found at this rendezvous. While dozens of different kinds may be found fluttering around a street light in July of a warm damp evening, many of them belong to the large family of Owlet Moths, the

Noctuids. These are thick bodied medium sized moths with front wings beautifully and modestly mottled and marbled in browns and grays; one large genus, the *Plusias*, have a shining white punctuation mark at the middle of the front wing. Their eyes shine with all kinds of metallic tints as they dash around the shining goal of their desires. The caterpillars of

these moths are naked, dull in color and feed upon the leaves of plants, although some are borers and some gnaw into fruits. Among them are some of the most important insects injurious to agriculture.

Among the most interesting of the larger moths found at the light are the Underwings or *Catocalas*. They live in the forests and their front wings are brown or gray, marked with zigzag lines so resembling bark that when they are at rest on a tree trunk



Plusia simplex



Catocala ilia

the keenest eye cannot detect them. But the moment one of them flies up it is a striking object, for its hind wings are broadly banded with black and white or yellow or red or rose pink. The caterpillars of the Underwings feed upon the leaves of various forest trees and are as protected by their colors from observation as are the moths.



A Catocala

To a Night-fly Approaching a Candle

PHILIP FRENEAU

(Our most distinguished Poet during the American Revolution)

Attracted by the taper's rays,
How carelessly you come to gaze
On what absorbs you in its blaze!

O moth! I bid you have a care:
You do not heed the danger near—
This light, to you a blazing star.

Already you have scorched your wings:
What courage, or what folly brings
You, hovering near such blazing things?

Ah me! you touch this little sun—
One circuit more, and all is done!
Now to the furnace you are gone!

Thus folly, with ambition join'd,
Attracts the insects of mankind,
And sways the superficial mind:

Thus, power has charms which all admire,
But dangerous is that central fire—
If you are wise,—in time retire.

The Leaf Rollers and the Leaf Miners

We are not to judge the importance of a moth by its size. The codlin moth, the grain moth and the clothes moth, none of which measure more than a half inch across the expanded wings, have



Nest of *Cacæcia rosana*

made a far greater impression upon the world than have the magnificent luna or cecropia. However, not all the moths are so iniquitous as those mentioned above; many of them are exquisitely beautiful and have captivating life-histories.

The entomologists, who are not lacking in imagination, have a pretty custom of ending the scientific names of these small moths in "ana" or "ella." Those whose caterpillars have the leaf-rolling habit are the "anas"; the one that rolls the currant leaf is *C. rosana*; the pine leaf tube-builder is *L. politana*. The midgets of the moth world, the Tineids, whose caterpillars are leaf miners and case bearers are the "ellas;" the one that mines the white oak leaf is *L. hamadryadella*; the one mining apple leaves is *B. pomifoliella*; tremendous names for such tiny creatures!

THE LEAF ROLLERS

If we look at the young basswoods, we find perhaps many of their leaves cut across, and the flap made into a roll and likewise fastened with silken ropes. The witch-hazel, which is a veritable insect tenement, also shows these rolls. In fact, we may find them upon the leaves of almost any species of tree or shrub, and each of these rolls has its own special maker or indweller. Each species of insect, which rolls the leaves, is limited to the species of plant on which it is found; and one of these caterpillars would sooner starve than take a mouthful from a leaf of any other plant. Some people think that insects will eat anything that comes in their way; but of all created animals, insects are the most fastidious as to their food.



Cacæcia rosana.

Some species of leaf rollers unite several leaflets together, while others use a single leaf. In the case of the sumac leaf-roller,



it begins in a single leaf; but in its later stages, it fastens together two or three of the terminal leaflets in order to gain more pasturage. The little silken tent ropes which hold the folded leaves are well worth study with a lens. They are made of hundreds of threads of the finest silk, woven from a gland opening near the lower lip of the caterpillar. The rope is always larger where it is attached to the leaf than

at the center, because the caterpillar crisscrosses the threads in order to make the attachment to the leaf larger and firmer. Unroll a tent carefully, and you may see the fastenings used in an earlier stage, and may even find the first turned-down edge of the leaf. However, the center of a leaf roller's habitation is usually very much eaten, for the whole reason for making its little house is that the soft-bodied caterpillar may eat its fill, completely hidden from the eyes of birds or other creatures. When it first hatches from the egg, it feeds for a short time, usually on the under side of the leaf; but when still so small that we can barely see it with the naked eye, it somehow manages to fold over itself one edge of the leaf and peg it down. The problem of how so small a creature is able to pull over and fold down or to make in a roll a stiff leaf is hard to solve. I, myself, believe, it is done by making many threads, each a little more taut than the last. I have watched several species working, and the leaf comes slowly together as the caterpillar stretches its head and sways back and forth hundreds of times, fastening the silk first to one side and then to the other. Some observers believe that the caterpillar throws its weight upon the silk, in order to pull the leaf together; but in the case of the sumac leaf-roller, I am sure this is not true, as I have watched the process again and again under a lens, and could detect no signs of this method. Many of the caterpillars which make rolls, change to small moths known as Tortricids. This is a very large family, containing a vast number of species and not all of the members are leaf-rollers. These little moths have the front wings rather wide and more or less rectangular. The names of these moths end with "ana;" the one that rolls



Leaf roller in sumac, with diagram showing the fastening of the silk stay ropes

the currant leaves is *Rosana*; the one on juniper is *Rutilana*, etc. Since many of the caterpillars of this family seek the ground to pupate and do not appear as moths until the following spring, it is somewhat difficult to study their complete life histories, unless one has well-made breeding cages with earth at the bottom; and even then it is difficult to keep them under natural conditions, since in an ordinary living room the insects dry up and do not mature.

THE LEAF MINERS

In every leaf, however, thin, there are rows of cells containing the living substance of the leaf, with a wall above and a wall below to protect them. Some of the smaller insects have discovered this hidden treasure, which they mine while safely protected from sight, and thus make strange figures upon the leaves.

Among the most familiar of these are the serpentine mines, so called because the figure formed by the eating of the green pulp of the leaf, curves like a serpent. These mines are made by the caterpillars of tiny moths, which have long fringes upon the hind wings. The life story of such a moth is as follows: The little moth, whose expanded wings measure scarcely a quarter of an inch across, lays an egg on the leaf; from this, there hatches a tiny caterpillar that soon eats its way into the midst of the leaf. In shape, the caterpillar is somewhat "square built,"

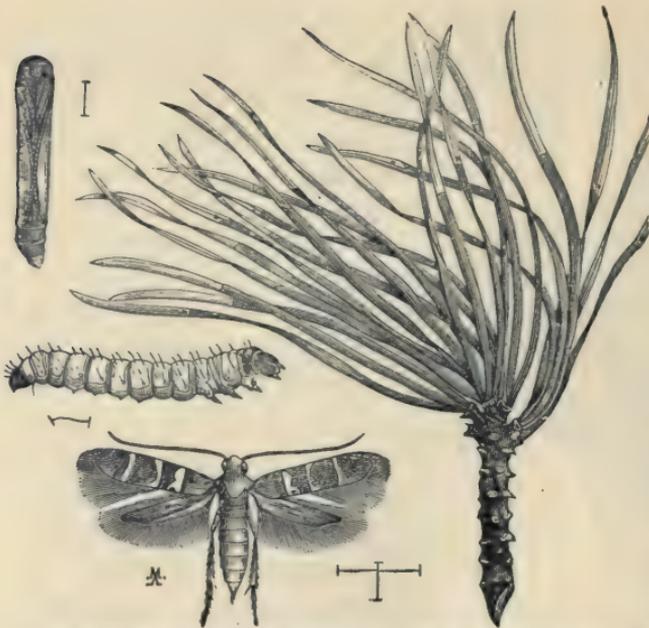
being rather stocky and wide for its length; it feeds upon the juicy tissues of the leaf and divides, as it goes, the upper from the lower surface of the leaf; and it teaches us, if we choose to

look, that these outer walls of the leaf are thin, colorless, and paper-like. We can trace the whole life history and wanderings of the little creature, from the time when, as small as a pin point, it began to feed, until it attained its full growth. As it increased in size, its appetite grew larger also, and these two forces working together naturally enlarged its house. When finally the little miner gets its growth, it makes a rather larger and more commodious room at the end of its mine, which to us looks like the head of the serpent; here it changes to a pupa, perhaps after nibbling a hole with its sharp little



A serpentine mine in nasturtium leaf

jaws, so that when it changes to a soft, fluffy little moth with mouth unfitted for biting, it is able to escape. In some species, the caterpillar comes out of the mine and goes into the ground to change to a pupa. By holding up to the light a leaf thus mined, we can see why this little chap was never obliged to clean house; it mined out a new room every day, and left the sweepings in the abandoned mine behind. Mines of this sort are often seen on the leaves of nasturtium, the smooth pigweed, columbine, and many other plants. There are mines of many shapes, each form being made by a different species of insect. Some flare suddenly from a point and are trumpet-shaped while some are mere blotches. The blotch mines are made, through the habits of the insect within them; it feeds around, instead of forging ahead, as is the case with the serpentine miners. The larvæ of beetles, flies and moths may mine leaves, each species hav-



The pine-needle leaf-miner. The mined leaves of pine natural size. The caterpillar, pupa and moth of the leaf miner much enlarged. The lines show actual size of insect.

ing its own special food plant. Most of the smaller leaf mines are made by the caterpillars of the moths, which are fitly called the Tineina or Tineids. Most of these barely have a wing expanse that will reach a quarter of an inch and many are much smaller; they all have narrow wings, the hind wings being mere

threads bordered with beautiful fringes.

One of these little moths, *Gelechia pinifoliella* lives the whole of its growing life in half of a pine needle. The moth lays the egg at about the middle of the needle, and the little caterpillar that hatches from it, gnaws its way directly into the heart of the needle; and there, as snug as snug can be, it lives and feeds until it is almost a quarter of an inch long, think of it! Many a time I have held up to the light a pine needle thus inhabited, and have seen the little miner race up and down its abode as if it knew that something was happening. When it finally attains its growth it makes wider the little door, through which it entered; it does this very neatly; the door is an even oval, and looks as if it were made with the use of dividers. After thus opening the door, the caterpillar changes to a little, long pupa, very close to its exit; and later it emerges as an exquisite little moth with silvery bands on its narrow, brown wings, and a luxurious fringe on the edges of its narrow, hind wings and also on the outer hind edges of the front wings.

"And there's never a leaf nor a blade too mean
To be some happy creature's palace."

—Lowell

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Editorial

MOTH PHILOSOPHY

Solomon told the sluggard that he might improve himself by studying the ways of the ant, but more than sluggards may be benefitted by considering thoughtfully the ways of the moth. First of all to be noted are its methods of efficiency that put to shame the best plans of our human experts. The moth's life is divided into three highly specialized periods. The caterpillar is the last word in efficiency in the art of eating and growing and laying up energy to be used in later life. It eats and rests, eats and rests, with no distracting enterprises of any sort; if it had the use of the wings, which are budding safely inside its anatomy, it naturally could not attend strictly to the business of eating any more than folks can follow their usual humdrum routine after they purchase an automobile. Incidentally the caterpillar has the wisdom of the serpent, that special brand of wisdom consisting of resembling its background so much that it entirely avoids being seen. This is the reason that everyone is so startled when he chances to stumble upon a serpent. If that wily beast had been pink or scarlet so that he might be detected from afar, he would have been a greater favorite with mankind, which resents an animal that makes it shiver with surprise and say "Oh!"

Each species of caterpillar has its own devices for looking like its surroundings. The great silk-worms of America have their segments rather sharp on the ridges to resemble the serrate edge of a leaf. The editor once tried to pick a *Polyphemus* caterpillar from a twig of hawthorn, thinking it was a wonderful leaf, an act that lead to reciprocal recriminations, each in our own tongue.

However, Mr. Polyphemus preserved his dignity and won out in the end, turning around and walking off with a haughty air.

Consider, for instance, the sphinx caterpillar feeding smugly on the Virginia creeper, climbing over your pizaza! The floor shows unmistakable signs that a sphinx has domiciled himself on your vine, and yet you may hunt for it by the hour and never discover it except by chance; then you find it such a remarkable looking creature that you cannot understand how you saw anything but it when you were searching for it. The reason for all this camouflage is simply an arrangement to protect the caterpillar from interruptions in its great business of eating, and resting to digest what it has eaten.

Moreover, it was probably a caterpillar that gave Ariadne the idea of providing Thesus with a thread to guide him out of the labyrinth, for it is a caterpillar habit to spin a thread as it goes, and thus it is able to follow its own multiple footsteps back to where it started, if it chooses; in the case of the tent caterpillars, they leave their webs during the day and good weather to feed on leaves, on far distant branches, but they retrace their way by following the siken threads laid down on the way out, and thus find the home tent at night.

Perhaps of all caterpillar wisdom, foresight is the most remarkable. When one has eaten and grown until it feels its appetite failing, it suddenly turns hermit and starts off in quest of some proper place to establish a hermitage; finding this, it begins with great skill and industry to weave around iself a cocoon of silk, always cunningly concealed by its color, and often having leaves or other material woven in to make the concealment more perfect; the outside of the cocoon is coarsely woven, but the inside next to its precious body is soft and of fine weft. Filled with prescience that it may sometime cease to be a hermit, it may build one end of the cocoon more loosely or in valve form to permit of easy exit. This accomplished, it changes from a caterpillar to an oblong object, smooth and brown and proceeds to the business of an inner revolution which, like other revolutions, consists of tearing down all existing conditions in a true Bolshevik manner; later, the work of reconstruction begins on a more complex and noble plan that finally finds expression in wings and glorious powers of flight.

Now there comes a change in the philosophy of our insect. What was the chief business formerly, eating, is no longer a matter

of interest. In fact there are many moths that have no active mouth-parts and therefore do not eat at all. The swift flying sphinges and some others seem to continue a keen interest in refreshments but they sip only nectar. Other and wider interests now prevail. The wings of the moth can be compared to the down of the thistle seed,—a means of spreading the species over a wide area. In the safety of the night the newly winged moths come forth and through some sense that we merely guess at, so wonderful is it, they seek and find their mates in the friendly darkness.

Now it devolves upon the mother moth to study botany in moth fashion; she must find the special species of plants that her kind have lived upon during the past ages on which to lay her eggs; if she should make a mistake, her youngsters would refuse to eat and promptly die after hatching, for caterpillars are the most fastidious as to their food of all created beings; a caterpillar whose ancestors have lived upon cherry would rather starve than take one bite from an oak leaf. Thus it behooves the mother moth to look well and be sure of her plant species before she ventures to deposit her eggs upon it.

In only one particular do moths seem to be lacking in wisdom, and that is their recklessness in seeking the light. Who has not of a warm evening sat at a closed window and watched the moths eagerly trying to force their way through the barrier of glass in their efforts to reach the lamp? They flutter up and down, some with eyes glowing like rubies, others like emeralds or topaz, all expressing the fierce desire to reach the flame, and experience so far as we can detect, a blissful holocaust. What faint perceptions of beauty and greater things in their little minds leads them to this act must always remain a mystery to us; but we, who have so many inchoate aspirations and emotions, should sympathize, even if we cannot understand.

NOTICE

Extra copies of this issue will be available and orders for same should be placed promptly. Price 15c per copy as long as supply last.

A special printing of this issue will also be run and bound in tough paper cover similar to our OUTLINE OF NATURE-STUDY and entitled MOTH STUDY Number. Price 25c per copy. Ten or more copies at 20c per copy postpaid. It will be a valuable addition to the teacher's library.

Suggestions for the Moth Collector

Nature-study has to do with living forms rather than dead ones. But collections of moths and butterflies are of use in interesting the pupils in the life histories of the insects and therefore may be a legitimate means to a wider knowledge of living forms.

THE KILLING BOTTLE

It is desirable to kill the insects in a humane way so that they will not suffer by the process; it is also desirable that they should not revive after they are pinned, both for their own sakes as well as for the sake of the feelings of the collector. The best way to secure painless and sure death for the insects is by the means of a "cyanide bottle."

MATERIALS NEEDED FOR A KILLING BOTTLE

1. A bottle with a wide mouth; a morphine bottle or a small olive or pickle bottle will do. Even a glass fruit-can holding a pint will answer very well, although taking off and putting on the cover consumes more time than is desirable. A fruit can is very desirable for the large moths.
2. A cork that will fit the bottle tightly and is long enough to handle easily.
3. A few cents' worth of cyanide of potassium.
4. A few cent's worth of plaster of Paris.

These latter materials may be procured from any drug store.

Place the lump of cyanide of potassium in the bottle and pour in enough water to cover it. Add immediately enough plaster of Paris to soak up all the water; leave the bottle open in a shady place for an hour and then wipe the dry plaster of Paris from its sides, put in the cork, and it is ready for use. The plaster of Paris forms a porous cement which, while it holds the cyanide fast in the bottom, also allows the fumes of the poison to escape and fill the bottle. It should be labeled "poison." If kept corked when not in use a killing bottle made like this will last a whole season.

The first rule in using the killing bottle is this: Do not kill any more insects than you need for your collection. The second rule is: do not breathe the fumes of the bottle; for they smell badly and are not good for you. When you uncork the bottle to put an insect in it hold it away from your face and cork it up again as quickly as possible.

Some insects may be caught from flowers, etc., directly into the bottle by holding it uncorked beneath them for a moment; the fumes of the poison soon overcome them and they drop into the bottle. In taking insects from the net take the bottle in the right hand and the cork in the left; insert the bottle into the net and place the mouth of it over an insect crawling on the inside of the net, then put the cork on the outside of the net into the mouth of the bottle, net and all, for a moment until the insect falls into the bottom of the bottle; then remove the cork and take the rest of the imprisoned insects in the same way. Insects should be left in the bottle at least an hour, and may be left in there over night without injury to the specimens.

INSECT PINS

After the insects are caught they should be pinned so that they may be arranged in the collection in an orderly manner. Common pins are not good

for pinning insects; they are too thick and they corrode very soon, covering the specimens with verdigris. Regular insect pins are desirable as they are very slender and do not corrode so quickly. These may be obtained of any dealer in entomological supplies.

All moths should be pinned through the middle of the thorax, which is that part of the body just behind the head.

MATERIAL NEEDED FOR A MEDIUM SIZED SPREADING-BOARD

1. Two strips of pine or other soft wood 18 inches long, $1\frac{1}{2}$ inches wide and $\frac{1}{2}$ inch thick.
2. One strip of wood 18 inches long, $3\frac{1}{4}$ inches wide and $\frac{1}{2}$ inch thick.
3. Two cleats $3\frac{1}{4}$ inches wide, $\frac{3}{4}$ inch high and $\frac{1}{2}$ inch thick; and two cleats one inch wide and as high and thick as the others.
4. A strip of cork or linoleum 17 inches long and a little less than an inch wide.

To construct the spreading board take the two narrow strips of wood, place them one-fourth inch apart and on the under side fasten them across the ends to the longer cleats. Then on the same side as the cleats tack the piece of cork or linoleum over the space between the strips of board; on each side midway the boards fasten the two smaller cleats. Fig. 2 shows a cross-section

of the spreading board just in front of these two middle cleats. Now it is ready for the bottom board which will fit exactly if directions are followed, and this completes it. The space between the two upper boards is wide enough to take in the body of the moth or butterfly. The cork or linoleum below the space will hold firmly the pin on which the butterfly is impaled. The cleats hold the top and bottom boards apart and so protects the points of the pins. Spreading boards may be made much smaller or much larger to suit moths of different sizes; the space between the top boards must always be large enough to admit the body of the insect.

To use the spreading board: insert the pin with the butterfly on it into the linoleum just far enough so that the body of insect will be in the space between the boards up to the wings, Fig. 1. Place the wings out flat on the board and fasten them there with narrow strips of paper pinned across them. While held down by these strips of paper arrange them so that the hind margins of the front wings shall cover the front margins of the hind wings and shall be in a line at right angles to the body; then pin large pieces of paper over the rest of the wings. Sometimes isinglass is used instead of paper to hold the wings down.



Fig. 1. A spreading board.

The insects should be left on the spreading board at least three days; and when the board has insects on it, it should be kept in a box where the museum pests and mice cannot get at it.

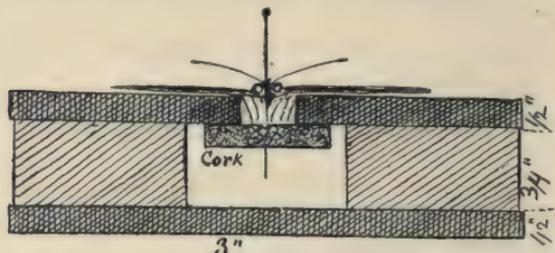


Fig. 2. A cross section of spreading board in front of the cleat "d" in Fig. 1

Sometimes when the moths are not spread soon after being killed they become so stiff that the wings cannot be moved without breaking them. In such cases the insects should be put on some paper in a jar which has some wet sand in the bot-

tom and which can be covered tightly. The air in such a can is so moist that in two or three days the insect will become limber and may be spread with ease.

THE RIKER MOUNT FOR MOTHS

Probably the most attractive and pleasing manner of preserving specimens of Moths is by placing them in Riker mounts. The process is a very easy one. The mount consists of a shallow pasteboard box with a glass plate fitted into the cover. On the back is a place for the name of specimens, locality and remarks. The box is filled with a layer of white cotton batting. To mount, simply remove the cover, place the specimen, which has previously been spread, carefully on the cotton, replace the cover and then seal the box with gummed paper. Lantern slide binders serve the purpose well. It is necessary to cover every crevice between the box and cover to keep museum pests out. These mounts may be made doubly attractive by adding a bit of the pressed plant that the specimen is found on or about. Often the male and the female are placed in the same mount. These mounts may be obtained in different sizes. The picture of the two *Cynthias* on page 273 was photographed in a Riker mount

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The Burrowing Spider of the Dunes and its Chief Enemy

ELLIOT R. DOWNING

Professor of Biology, School of Education, Chicago University

The prevailing storm winds over Lake Michigan come out of the northwest. The consequent surf and the currents pile up the sand in bars along the southeastern shores, then fill in the shallow lagoons behind them and so extend the sandy beach. These same winds pick up the sand as soon as it is dry and carry it inland, piling it up in great drifts or dunes. These continue to move, encroaching on fields and forests, filling ponds and streams until new dunes built up nearer the lake protect them from the fury of the wind. Fig. 1. The moving dunes then become stationary. This fixation of the dune is helped along by the growth of plants upon it—sand-binding grasses, vines, shrubs and trees, whose interlacing roots hold the sand and whose tops check the velocity of the sand-laden air currents. So stretching back from the lake is a region covered with dunes and interdunal valleys, all more or less parallel to each other and to the shore. The dunes farthest inland are well covered with woods, those near the shore are moving hills of sand while between these extremes there are all stages of the process of fixation and forestation.

This dune country, beginning at the very gates of Chicago and extending around the south end of the Lake and well up the east shore, is a wonderful region. Its plant and animal life is a strange mixture of northern and southern forms. You may pitch your tent in a grove of jack pines with an undergrowth of juniper, bearberry, prince's pine, checkerberry and imagine yourself five hundred miles farther north, the vegetation is so characteristic of the higher latitudes. The ruffed grouse and many other northern birds nest here. There are great sphagnum moors, fringed with tamarack, where grow leatherleaf, pitcher plants, sundew

and many orchids: even the characteristic northern gnats and mosquitoes are present to complete the illusion. Then you may find nearby on the older black oak dune beds of cactus (*Opuntia Rafinesque*) and the little six-lined lizard both reminiscent of southern desert areas.

One of the most interesting animals of the region is the burrowing spider, *Geolycosa pikei*, the subject of this sketch. He is a good sized sand colored spider that digs a vertical shaft in the ground in which he hides by day. These are located usually on the open dunes though not infrequently they are found on the oak covered dunes. A good sized specimen of the spider, (Fig. 2,) with legs extended will cover the palm of the hand. His coloration is so exactly that of the sand that one scarcely sees him until he moves. He hunts in the dusk, running rapidly over the sand to find stray insects upon which he may pounce. On quiet mornings when the sand is not drifting, the surface of the dune near the spider's hole is covered with the telltale tracks of the night's hunting trips and these often run many rods from his retreat.

During the glare of the day he remains in his hole unless some unwary insect comes near enough to be captured without undue exposure. The hole varies in diameter and depth with the size of the animal, being only as large as a knitting needle in the case of the baby spider but three quarters of an inch or so in diameter for the full grown animal. (Fig. 3.) The hole sometimes extends down into the moist cool sand a distance of two feet, though the average for the mature spiders is probably not over eight or ten inches. While the sand of the dunes appears very dry it is only necessary to scrape away the top two or three inches to get down to the moist and firm sand. Naturally the dry surface sand is very unstable and the spider's hole would speedily cave in were it not for the fact that he spins a silken lining for the upper two or three inches. (Fig. 4.)

The digging and the deepening of the hole is commonly accomplished at night. Often in the early morning the holes are surrounded by little dabs of moist sand that are then conspicuous on the lighter colored dry surface. These have been thrown out by the spider in the process of excavation. (Fig. 5.) You may catch the digger at this occupation; then as you stand watching the hole there shoots out a little mass of sand, a miniature volcanic eruption. Close observation shows the spider near the opening and apparently he hurls the sand out by a quick movement of his palps.



Figs. 2—The burrowing spider; 3—The sand dug away to show the deep burrow; 4—The sand removed from the silken tube, leaving it standing; 5—The spider's hole with recently thrown out sand; 6—The spider's worst enemy; 7—The spider disappearing down the wasp's hole; 8—The wasp packing down the sand with hammer strokes of her abdomen.

In spite of the fact that the spider has his safe retreat his life is not without its thrilling adventure. There is a black wasp continually on the watch to capture him and use his plump carcass for food for her young. (Fig. 6.) I watched one of these wasps as she spied her prey running over the sand in the early evening. She darted toward him and he scurried to cover, running into a clump of nearby bunch grass. She however followed him and pounced upon him, quickly paralyzing him with a thrust of her sting. Then she dragged him over the sand as she rapidly backed up, seeming to handle the heavy load with ease for she pulled him over the sticks and stones that lay in her way without hesitation. This in spite of the fact that, as I later found out by weighing both, she weighed only .18 grams while the spider weighed .82 grams. She travelled with her load some four rods from the point where she had killed the spider before she dropped him and went scurrying around to find her hole. She ran about in a tortuous course over an area of some four square yards often crossing and recrossing her tracks. It took her about a minute to locate the hole she had previously excavated.

I had seen the wasp busy making her excavation before but had never seen her bring in her prey. She digs a hole in the sand much as a dog would, scratching with the fore feet and sending the sand out between the wide-spread hind legs. The forefeet of the wasp are flattened and broad so making a very serviceable pair of excavating tools. The hole, dug in a little hillside, is about as large as ones thumb. The opening is semicircular, the bottom a straight line approximately, the top up-arched.

Having found the hole she made a bee line for the spider which she had dragged a yard beyond the hole, seized him with her jaws again and pulled him to the mouth of the burrow. (Fig. 7.) She backed in with him so promptly that both were out of sight on the instant. She was gone nearly a minute then she reappeared and began filling up the hole, scratching the sand in, in the same manner that she digs it out. She stopped every few minutes however to pack the sand down with rapid hammer strokes of her abdomen. (Fig. 8.) The task was completed in about three minutes, the surface of the sand showing no indications of the whereabouts of the spider.

I then dug the spider out. The wasp had packed the sand in so well that one could see no demarcation between the recently

removed sand and that of the firm walls of the hole. In fact you could not tell where the hole had been and the spider had to be discovered by scooping out the sand of the region and sifting him out of it. He was limp but responded to touch by spasmodic movements of his legs. Though left on the sand in the open air for several hours he made no attempt at escape.

The egg of the wasp was found attached to the spider's body between the third pair of legs. Presumably she had laid it in place in the interval between her disappearance into her hole with the spider and her reappearance. When the egg hatches into the little larva the spider serves as food while it is growing. The full grown larva pupates in its underground cell. In due time a wasp hatches out from the pupa, digs its way to freedom and is ready to carry on its life. If a female it will, without instruction, without even seeing the process done, go through this whole complicated performance dig its hole, hunt about for a spider, paralyze it with its dagger thrust, store it underground with the egg upon it, fill in the excavation. And the young spider is no less remarkable. It digs its hole and lines the upper part with silk quite as well as does the old one. Such complicated instincts quite beggar explanation.

Annual Meeting and Election of Officers

This Meeting will be held in St. Louis in connection with the meetings of the American Association for the Advancement of Science. Officers to be elected are as follows:

A president to succeed Prof. S. C. Schmucker, Pa.

Five vice-presidents.

Five directors for three years to succeed

Prof. J. A. Drushel (Mo.), Prof. C. H. Robison (N. J.)
Prof. S. C. Schmucker (Pa.), Prof. G. H. Trafton (Minn.)
Prof. W. E. Wager (Ill.) whose terms have expired.

Five directors for two years to succeed

Mrs. Anna B. Comstock (N. Y.), Prof. J. A. Dearness (Ont.),
Prof. L. H. DeWolfe, (N. S.), Prof. J. G. Needham (N. Y.),
W. A. Slingerland (N. Y.), whose terms expire this year.

Nominations should be sent in at once to Mrs. ANNA B. COMSTOCK, Sec'y-Editor.



Photo by Verne Morton

A Story of Chickens and Stepmothers

A. E. YELEVER

Syracuse, N. Y.

The story began when an indiscriminating hen laid an egg in a duck nest. The first we knew about it, however, was when we heard a doleful peeping out by the woodpile one rainy day. There we found two creatures in distress—one, a wee chicken, cold, bedraggled, hungry and lonely,—as disconsolate a little animal as one ever saw, the other its first stepmother, a perplexed but well-meaning duck which had done the best she knew for this queer untimely child, as long as it would stay with her, but whose sense of duty required her to stay on her nest when the chicken, impelled by hunger left the shelter of her wings. She was plainly relieved when we took away this strange foster child that didn't like rain and that failed to understand her language.

The motives which prompted us to interfere thus with the duck's domestic affairs were not wholly altruistic. In fact, we wanted

to remove the cause of the mournful distressed "yeep, yeep," which had disturbed us. But in doing so, we assumed responsibilities greater than we realized. For two days the rain continued to fall. To put the chicken out of doors was not to be thought of, for it was bright, lively, and altogether a hopeful specimen of a valuable breed. So we fed it and gave it drink for the good of its body, and cuddled it at odd and sundry times for the good of its feelings (incidentally, too, for the peace of mind of a sick person who was annoyed if he heard it make a sound). Truth compels me to add that the cuddling was the pleasantest part of the program, for it evoked such a grateful response of contented, happy chirps and peeps that we spent more time in the woodshed than conditions really seemed to demand. At least, that is what mother hinted.

When the weather cleared, we put the chicken into a wire enclosure in the yard, but no efforts of ours could keep it there. It always found a way to get out, determined to be near us. So Harriet and I, like any other indulgent stepmothers, let it have its own way rather than hear it cry.

A name for our pet was the next consideration. "It" was far too impersonal for so interesting and intelligent a pet. "He" was scarcely more satisfactory, though a characteristic rooster's alarm soon gave us a clue to his sex. Mother proposed a name. "Kaiser," she called him, but to tell why would make a story in itself. Anyway, that's purely a family affair.

"Kaiser" soon learned his name, responding to it promptly. If happy and contented, he answered with a cheerful twitter; if in an unhappy mood, he changed his tone immediately when we called him, and came running to us. In fact, his loyalty and affection were very pretty to see. No one of the household could stir without having him at our heels, now running, now hopping, now half flying, any way and every way to keep up. When one of us sat on the porch he was waiting for the opportunity of getting into her lap. This act he accomplished by dint of much exertion, climbing or scrambling or flying, as the occasion demanded. Once there, he would settle down, the picture of contentment,—eyes half closed, singing his sleepy song whatever the time of day. Even Mother, who does not care for feathery things fell a victim to his habit of taking his welcome for granted, for it soon became her custom to let him sit comfortably in her lap while she read or sewed.

Harriet and I were soon to leave. Mother was too busy to have even one additional care, so we debated not a little what to do with the chicken. As if to solve our problem, a yellow hen appeared on the scene, anxious to assume the role of stepmother; but Kaiser would have none of her.

What a sight it was, when we first saw them together! A wild outcry of fright had brought us to the door in a hurry. Up the path came Kaiser, as fast as his legs could carry him, and with wings outstretched, in a desperate attempt to escape from the over-friendly yellow hen; where she had come from, no one knew, but there she was, close behind, clucking and fussing, feathers all ruffled up and with one idea in her mind. No stepmother ever tried harder to win a child's favor than did she, and no child ever took less kindly to well-meant advances. To be able to turn our pet over to the care of a hen-mother seemed to promise a ready solution of our difficulty, so we set ourselves the task of bringing about a better state of mind on Kaiser's part.

That was more easily said than done, for her very appearance was the occasion of an almost senseless exhibition of fear and a touching appeal for protection. He scarcely dared venture a rod away from the woodshed door, for the hen was sure to be near, waiting for him to come in sight. Very gradually however, this change of mind was brought about. At first, we held him gently, while the hen clucked and spluttered about. After awhile it seemed to dawn on him that she meant no harm by these queer actions. Then, very timidly, and a little at a time, he yielded to her coaxings. Presently he was accompanying her on short excursions and eating the tid-bits she found for him. In a few days he had overcome his fear to the extent of letting her attend to him in the daytime when none of us were about, but he never consented to her hovering him at night. Every evening he came, singing his bedtime song, to be wrapped snugly in a cloth and put to bed in a box. This caused the hen much distress till she found where we kept him. For a time she was satisfied to sit on the edge of the box and croon to him. But one night she managed to get into it. Poor little Kaiser, wrapped securely in the cloth could not free himself, so he came to a sad end. One might almost say that he was the victim of mistaken kindness. Certain it is that he had one too many stepmothers.

This naturally ends the story of Kaiser, but another chapter is needed to tell about the yellow hen. She drooped and acted lonely for a day or two, then she began to look about in search of a new outlet for her affections. This she found in a tiny white chicken, the only child of its mother, and for that reason, of course, dearly beloved. No well-balanced hen would have tried to take that chick from its mother, but this hen, did try. You could not expect the mother of an only child to stand quietly by and see the child taken from her. So the white hen fought the yellow hen. Being well-matched in size and strength, first one gained the victory, then the other. As for the chicken, it looked out for itself while the battles were in progress, and at their close it went with the victor. For a week or more this state of affairs continued, then some sort of compromise was effected. Hostilities ceased, and both the hens devoted themselves to the care of the chicken amiably and peaceably by day and both sang to it at night till it was so large that it left them.

The Lights of November

THOREAU'S JOURNAL

The glory of November is in its silvery sparkling lights. I think it is peculiar among the months for the amount of sparkling white light reflected from a myriad of surfaces. The air is so clear, and there are so many bare, polished, bleached or hoary surfaces to reflect the light. Few things are more exhilarating, if it is only moderately cold, than to walk over bare pastures and see the abundant sheeny light like a universal halo, reflected from the russet and bleached earth. The earth shines more than in spring, for the reflecting surfaces are less dimmed now. It is not a red but a white light. In the woods and about swamps, also, there are several kinds of twigs, this year's shoots of shrubs, which have a slight down or hairiness, hardly perceptible in ordinary lights, but which, seen toward the sun, reflect a cheering silvery light. Such are not only the sweet fern but the hazel in a less degree, alder twigs, and even the short huckleberry twigs, also the lespedeza stems. This gives a character of snug warmth and cheerfulness to the swamp, as if it were a place where the sun consorted with rabbits and partridges. Each individual hair on every such shoot above the swamp is bathed in glowing sunlight and is directly conversant with the day god.

Why Spiders are Interesting

WILLIAM P. ALEXANDER

Instructor in Farm Nature Study in Cornell University

Spiders are wonderful creatures and cannot fail to inspire us with amazement if we but study them now and then, and learn something of their marvelous skill and remarkable habits.



An orb web laden with dew

Spiders have for long centuries been maligned, and looked upon with suspicion: all manner of mischievous work has been laid to these interesting creatures and superstition has created many a fantastic tale in which the spider played a leading role, much to the detriment of its good name, and popularity.

In ancient times the spider was supposed to envenom everything it came in contact with and was universally dreaded and despised, and we wonder if or not Shakespeare tried to vindicate this little creature when in the "Winter's Tale" he wrote:

"There may be in the cup
A spider steeped and one may drink,
depart,
And yet partake no venom."

However this may be, it is true even to this day that children are taught by ignorant parents to shrink from spiders as from a thing of evil, and *thus the superstition and delusion is kept alive and flourishing*. It is the writer's hope that Nature Study when it has become a country and nation wide institution, will do away with this and like fallacies by counteracting wrong influence in

the child mind that is absorbed at home where a careless statement often instills in the developing child a deep and lasting prejudice.

Not all the tales told of spiders, however, speak of evil, many are wholesome and extremely interesting: the story told of Robert Bruce in 1305, and its counterpart related of Mahomet when he fled from Mecca are of this nature and well known; less familiar is the like tale told of King Frederick II, who was saved by a spider falling in his cup of chocolate at the palace Sans Sonci in Potsdam: the drink had been poisoned by the cook, but before the monarch drank the spider fell from the ceiling into the cup, whereupon the king called for fresh chocolate and was preserved by so slight an accident. (The cook believing his treachery had been found out shot himself.) It is said that a spider beautifully painted now adorns the chamber in Sans Sonci, where this memorable event transpired.

The webs of spiders too, have played an important part in art, symbolically. The casement and open door was shown bedecked by the untorn web, and at sight of it we felt instinctively the aim of the artist: the symbol stood for the deserted house and there was no mistaking it.

Again the symbol is wrought, this time in the active hands of a fair woman, and the genius of a Veronese makes it read "industry" and here as before we find it no less significant.

But here I must leave the spider as a subject of bygone speculation to say something of the habits of this little animal as some of our greatest men and women know it today.

The "Spider Book" by Prof. John Henry Comstock, should be owned by every thinking person who in his or her nature owns a kinship to the great out of doors. Its pages are not for the child, but for the grown up children of healthy mind, and broad sympathies.

This book will expel the dread, awaken our keener sensibilities and cause us to realize that in the spider we are dealing with a creature fearfully and wonderfully made, endowed with strange and amazing peculiarities and instinct with cleverness equal to that of any living thing.

Let us mention but the web building habits of some of the highly developed Araneida, the web of the orb-weaver, the nest of Argiope or the trap door dwellings of the Tarantulas to prove that we are dealing with architects of no mean ability. I intend to say some-

thing more of the spiders' house building proctivities later, but first wish to relate a few interesting things of the spiders themselves.

If we are disposed to fear spiders we should probably show consternation if the great Bird Spiders of South America were common and entered our dwelling as do the harmless species of our more favored North. It is comforting knowledge for the more timid of us, that none of our northern spiders inflict venomous bites. The Tarantulas it is true are much feared in the parts they inhabit, not alone because they are large and formidable looking, but because it is well known that they do possess well developed poison glands, and will bite if molested. The posion however will do no more than cause an irritation and it is well to remember that the bite of the black fly will produce a like effect. There is but *one spider in the United States that is known to be actually dangerous*



Entrance to nest of a trap-door spider

and that is known as the Hour-glass spider or the Black Widow of the South.

In Texas, California and other regions of the Southwest a wonderful group of very large spiders are found that are known as the Trap-door spiders, or Ctenizinae.

Armed with a powerful pair of clawed appendages, that scientific men call chelicerae, these big fellows dig tunnels in the earth. They roll the loosened material up in small balls and fling it out of the burrow with their hind legs. That you may say is not very remarkable. Other animals dig burrows in the earth. The chipmunk makes a very neat one. But our spider has not yet finished his work, when the tunnel is completed to his satisfaction he, mason-like rough coats its walls with a coat of saliva, he then proceeds to line it very comfortably with a soft drapery of fine silk. Has he brought his task to consummation then? Not he: shall his dwelling be doorless, exposed to the uncertain outside world? Oh! no! Our spider with fastidious exactness fits to his

house a hinged door, that closes snug and perfect and on the under side of his door he makes two holes to receive the claws of the chelicerae by which he may hold it down in case some obnoxious intruder may seek to disturb his tranquility. Sometimes he does even more than this, wise and precautious fellow that he is; jutting off from his main chamber he digs an ante-room, also supplied with a door, into which he can retire with speed and security, in case his habitation is taken by storm or stealth.

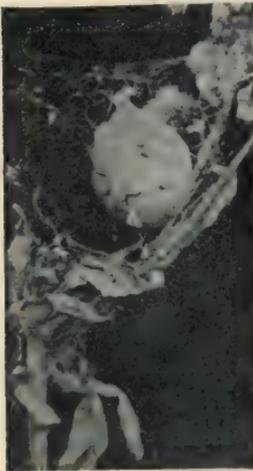
This is a crafty spider we must acknowledge nor is his craftiness one whit less than his adroitness. These large spiders hunt by night and during the day remain in peaceful repose, securely hid from any prying eye and little caring for the sun and his gracious beam.

Leaving the giants of the spider kind let us turn to the urchins of the order and examine a trait of precosity that the young of many species show, one that is extraordinary in the extreme. I refer to the ballooning habits of infant spiders that are often spoken of as aeronautic spiders. In all the natural world there is nothing more wonderful than this curious trait, so skillfully put to use, and often so signally successful. One may most naturally inquire why, how do spiders fly? The method is simple, but the instinct to put in practice, so amazingly developed in these creatures is difficult to account for unless indeed they have adopted the ballooning habit to ensure a wider dispersion of the species—as have the dandelions and thistles in providing their seed offspring with pappus air craft. How and when did this very terrestrial fellow solve the great problem of aerostation? We cannot answer this and must be satisfied with describing the flying spiders' way of riding the roving wind. We first note the wee chaps on some autumn day; the air is moving in long steady currents in some prevailing direction; they mount to the summit of a high object, lift the abdomen and spin out a long silken thread; this remains attached to the spinnerets and as it continues to lengthen the friction of the air upon the silk becomes greater than the weight of the spider and the tiny fellow is borne gently away on the breeze. Many of them have been seen hundreds of miles from land by travellers at sea, and this is the surprising part of the story; for man with all his marvelous devices for flying has hardly been more successful. It was the aeronautic spider that inspired the good gray poet Walt Whitman to write the following poem:

"A noiseless, patient spider,
I mark'd where, on a little promontory, it stood isolated:
Mark'd how to explore the vacant, vast surrounding,
It launch'd forth filament, filament, filament out of itself:
Ever unreeling them—ever tirelessly speeding them.

"And you, O my soul, where you stand,
Surrounded, surrounded, in measureless oceans of space,
Ceaselessly, musing, venturing, throwing, seeking the spheres to connect them
Till the bridge you will need be form'd—till the ductile anchor hold;
Till the gossamer thread you fling catch somewhere, O my soul."

The aeronautic spiders often attempt to fly in myriad numbers, this is shown more by their failures than by their successful performances. Very often the wind is too strong, or the air currents are directed downward and it is then that the purpose of our spider is thwarted; his silken filament is blown to the earth and scattered over clod and stone. In such numbers do they work at times and with such a squandering of silk that the ground is literally covered with it. Prof. Comstock describes such a scene in the Spider book in which he states that "the furrowed land of a ploughed field was covered with silk so completely as to resemble a sea of gossamer."



Egg-sac of *Miranda aurantia*

We will now turn to another interesting group of spiders that have developed a remarkable nest building habit, that for perfection can hardly be excelled. It is the group that spins the egg-sac that has all the grace and beauty of a finished vase. *Miranda aurantia* does this in extremely good taste, the finely molded nest daintily suspended in a spray of American Yew is before me on my desk even as I write. It is an exquisite creation. Formed entirely of brown silk, the pendant orb-like nest hangs among the leaves anchored by strands of strong silk, a thing to delight the eye, and to defy the wintry blast.

But this object of external beauty is in reality a theatre wherein an awful drama is being played, even now. *Miranda* before completing her charming house deposits a great number of eggs in the bottom of it. These as the winter progresses hatch and

her offspring straight away begins doing a most unnatural thing: being born with good healthy appetites and finding food scarce, they turn fratricides without compunction, and the stronger devours the weaker. When the warm spring sun warns the inmates of the nest that the great glad world is ready to be tried, but few come forth and these have grown strong to meet the battle of life at the expense of a great many little brothers and sisters.

In this fashion I might go on indefinitely, taking up one group after another; all are of about equal interest and well worth our close attention, but rather than do this I will again refer the nature lover to "The Spider Book" which treats every phase of this vast



A wolf-spider carrying her egg-sac

subject with great thoroughness. The writer knows only of the exceedingly interesting family Lycosidæ, or the Wolf spiders from the pen of Prof. Comstock; the narrative is absorbing; think of spiders

with the maternal instinct so highly developed, that they not only carry the large egg-sac about with them attached to the spinnerets, but when the young are hatched actually take them on their back from place to place caring for them until they become strong enough to break family ties and go out in the world alone.

Before closing I will say just a word or two of the silk of spiders. Most of us think of a spiders web when we see it undoubtedly as being cob-web or something of that indefinite nature. But this is not the case. The web of the orb-weaver is made up of at least two very different kinds of silk. Silk that is dry and inelastic, and silk that is viscid and flexible, the latter kind is amazing in its structure, and is the silk that catches the prey that happens into the web. The dry silk makes up the radii or support alone. The spiral is of viscid silk. Prof. Comstock has photographed this viscid silk and it will startle many to learn no doubt, that the viscid matter is strung on the fine silk like pearls in a very regular fashion and a picture of such a strand suggests strikingly a beautiful string of perfect pearls carefully graded.

The writer can only hope that this brief touching on so important a topic will stimulate an interest in others in this fascinating subject. He who will study "The Building of an Orb-web" with care, will be amply rewarded for his time and trouble.

The Real Note-book of a Real Boy

(Donald Farquhar, aged 11, Lawrence, Mass.)

We are indebted to Miss Edith Mank teacher of Nature Study in the school of Lawrence, Mass., who sends the following letter with the entirely original field notes of one of her pupils—Ed.

Dear Mrs. Comstock:

It might be interesting to you to know that this eleven year old boy first came to watch the insects. Last fall, when school opened I started a nature study club in one of our sixth grades near my home. Donald was in the room and went with us on our walks although to start with he had such a dislike for anything in the insect line that he had always carefully avoided coming in contact with them. After the first walk, however, when we went particularly to investigate some lady bugs in a thick bed of plant lice, Donald evinced an interest in the life of the insect world.

Because of the influenza epidemic our club was interrupted in its early stages but that did not interfere with Donald's awakened interest. During the weeks that we were having our enforced vacation from school his family was at the beach, and there, without any guidance he continued his investigations with only the aid of a younger brother. He became interested in the milkweed butterflies which were abundant at that time and he kept quite a number alive, feeding them every day with sugar and water. It was after I learned of this interest in butterflies that I realized he was showing an enthusiasm for learning about insects.

Due to the pressure of my own school work and more illness our club was not continued when school began again but Donald with some of his friends whom he organized into a club accompanied me during the spring on quite a few scouting expeditions besides the numberless hours he has spent in the fields by himself.

During the summer he has again been at the beach. The notes which he has kept, have been done wholly by himself for his own use and not until a few days ago had I even seen them although I knew he had kept some account of the things he saw. I have found the children and Donald in particular very observing and interested in the why and wherefore of what they see.

Yours sincerely,

EDITH MANK.

April 9th.—I went out with Miss Mank. We went over to Baker's. In the stream we got some very big Water Striders and four kinds of caddice worms. The water in this stream runs very fast. We caught a great many different things.

April 11th—I caught a back swimmer. I caught him up at the Cemetery Pond. Miss Mank and I went up to the Cemetery Pond. We caught some snails and a few beetles and some eggs that were on a leaf. We are going to keep them if we can. I caught a Back Swimmer. I caught a frog. Mother kicked the bottle over.

She looked but couldn't find the frog. We found him. I found a Potato bug.

April 12th—I put the frog in the Terrarium. I made a hole and put a dish in with water in it. I went over to the Cemetery Pond.



A Water Strider

I caught three water striders, three Back Swimmers, two Damselflies, six Dragon fly nymphs, three Water Boatmen, a lot of eggs, 18 beetles. In the afternoon I went over to Barker's with Miss Mank. We caught five big Water Striders. We put four into the Cemetery Pond to

see if we could introduce them there. I caught some more caddice worms and a few other things. We expect to put some caddice worms in the Cemetery Pond. I caught a moth coming home. I found a gall had come out. The only thing that looked like a fly was that feet had grown.



A Back Swimmer

April 16—I went over to Miss Mank's and brought her my gall. I found two other things. I have found that the dragon fly nymphs eat an insect we get at Barker's. It has grown four pairs of gills on each side of the body behind three pairs of feet which it keeps in constant motion. It has three tails on the tip of its real tail. It swims by folding and straightening its real tail.



A Water Boatman

April 18—I went over to Barker's with Miss Mank. We caught a supply of things

for the dragon fly nymphs and some water striders. We caught a lot of caddice worms and a few land things. We stayed from 9:30 to 12 o'clock. In the afternoon Miss Mank went over to Andover.

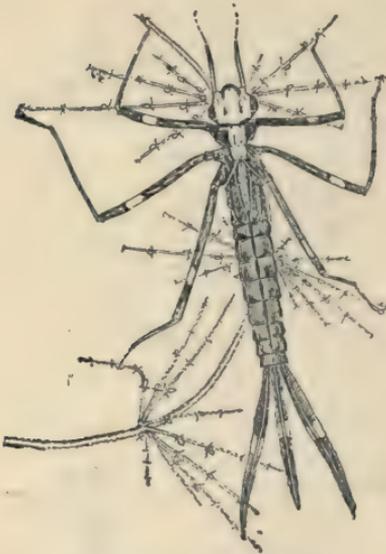


Caddice-worm

She gave me four pollywogs and three fairy shrimps.

April 19th—I went over to the Cemetery Pond and put the caddice worms and water striders in it. I took the fairy shrimps to school.

April 21st—I caught two beetles and a fly of some kind. I also caught an aster blue and a mourning cloak butterfly. Two of my fairy shrimps died.



Nymph of a damsel-fly
Outdoor Studies, Needham

April 22d—I went over to the Cemetery Pond. I let the Damselfly nymphs, Back Swimmers, and Beetles go. We, two other boys and I, caught some dragonfly nymphs, damselfly nymphs, snails, and beetles. I brought the butterfly I caught on April 21st over to Miss Mank's. We caught some land beetles and a moth.

May 8th—Ronald W. caught a moth that laid a few eggs in his hand. Then he put the moth in a jar and it laid over 30 eggs. He gave the moth to me and it

laid a few more. I gave 10 to Miss Mank. I brought my pollywog to school.

April 30—My two toads laid a lot of eggs.

WHAT I REMEMBER DOING BEFORE STARTING THESE NOTES

I didn't do much except to take two of the boys out every once in a while until I noticed that they seemed interested in hunting insects. Then I began going out with them every day. One day their mother went to Boston and came back with an insect net, etc. We were out in the fields and pastures every day only coming home to our meals. For a time I thought they would lose interest unless they went every once in a while but



The same nymph seen from above
Outdoor Studies, Needham

I expect that will wear off. One day we found a wild bee's nest. One of the boys caught a big swallow tail. I got stung. Mrs. Otis gave me a caterpillar she found on some parsnips. I made it eat carrot leaves. I caught five caterpillars like it on a wild plant. I made them eat carrot leaves. My other one keeps weaving and wandering around the room. I think something is going to happen.

July 16—It rained today but I was glad it did as I had something to do. My caterpillar made a button of silk and got his hind pro-legs caught in it and then made two silken buttons up near his head. He then passed a thread over his back from one side to the other. I think he is going into his pupal stage. I watched him almost all day but nothing happened.



Donald

July 17—One of my other caterpillars is beginning to weave and wander around. My caterpillar went into the chrysalis this afternoon. Now it is a greenish color with the back yellow. I caught seven butterflies today and two moths.

July 18—Three of my caterpillars are hung on the side of the glass. Uncle Russel came and gave me three moths. I guess I forgot to

write that I put some dead clams out in the back yard. I went out and found a burrier beetle but he got away.

July 25th—The boys and I made up a show. The first thing was a lecture given by me. One of the boys came on the stage with a net and said: "I've got one, I've got one" and he let a butterfly go. It went around the room once and then went out

a window. Then the boy said, "I would like to introduce the lecturer for the morning, Donald Farquhar." I then came on the stage and bowed. I told about insects. How to tell a Bug from a Beetle and things like that. Then I showed the Bumble Bees' Honeycomb and my collection. The lecture lasted over one-half an hour. After that there was a two act play. Five grown-ups and five children came, that is not counting the actors. We made sixteen cents.

July 26th—We had the show two times to-day.

July 27th—We had the show one time to-day. We made 30 cents out of it to-day. I was

July 27th—We had the show one time to-day. We made 30 cents out of it to-day. I was almost through my lecture and was doing the best yet when I began to feel sick when all at once I dropped on the stage. Mr. Perkins caught me and took me out in the open and gave me a glass of water. After that I wanted to go on but they would not let me. It was very hot and no air can get at the stage because of the scenery. I needed the fresh air.

August 3—The first caterpillar I had that went into a chrysalid came out as the Eastern Swallowtail to-day. The chrysalis is the same shape but is a different color. The caterpillar stayed in the chrysalid stage 17 days.

News Notes

Professor L. H. Bailey spent the summer and early autumn in England and Scotland working in the herbaria of Kew and Glasgow with a view to ascertaining the types of the original wild plants of our present horticultural and garden species. He had difficulty in getting passage back to America and was finally obliged to take steerage accommodations in a Sewdish ship and he says the steerage was liberally garnished with wardrobe trunks of people who were glad to get any accommodations whatever from Europe to the United States. There were no emigrants on the ship.

Dr. E. Laurence Palmer, of the Iowa State Teachers College at Cedar Rapid, has been called to the chair made vacant by Professor Tuttle's resignation, and is now in charge of the Rural Leaflet. Dr. Palmer is a Cornell graduate and is favorably known to the readers of the REVIEW through his interesting articles.

The Choosing, Stocking, and Caring for an Aquarium

GLADYS KEPNER

Lena, Illinois

The aquarium is an excellent means of teaching Nature Study, for it furnishes concrete material for imagery required by modern methods of teaching.

It is a problem that can, with co-operation of teacher and pupils, be established and maintained in the schoolroom without much work and strain on the part of any participant. It will interest children in nature and will furnish specific knowledge of their environment; their attitudes will change from a desire to destroy life to a sense of reverence for all living things, which is a fundamental in moulding moral character. By a study of the aquatic life the



An inexpensive and durable aquarium

children will come to realize a new fascination in outdoor life, which is a quality bearing direct connection with the question of health. Many children have experienced little or no sense of care and responsibility at home, this is an opportune way of having them bear a small burden without their realizing it as such. Then, too, in nature study, as in all other studies, the facts must be brought into one's experience; and by seeing the aquatic life in its natural and artificial homes, the various changes, life-histories, adaptations, and controls, the children come to *know* it is a real, concrete study. It broadens their minds to know that these cycles have always been going on, but that they are learning of them only now.

In order to reap these benefits, the best means for observation must be acquired. With some aid, the children can be brought to understand the precautions necessary to be taken in choosing an aquarium for school room purposes. First, put a small plant or leaf in a tumbler of water, and have them see that convex glass makes the plant appear magnified and ill-shaped. This eliminates the cylindrical aquarium. Next place the plant in a deep dish or small wooden box. This will illustrate the disadvantages of the all-wooden or all-metal aquaria. If possible, secure a rectangular glass dish or even a small bottle, put the plant into it, and notice the advantages of this shaped vessel over the others. Then have the class consider where the aquarium had best be placed, taking, light, warmth, and convenience into account. Also consider upon what it is to be placed, this determining its size somewhat. If there is a manual training department in the school, or better yet, if the boys of the class take Manual Training, the making of the aquarium should be transferred to that department. Or, if it is necessary to purchase an aquarium, the Central Scientific Supply Company of Chicago carries an excellent line of all school laboratory supplies.

Two types of aquaria will be found useful in any school. The permanent ones are those intended to continue through a season; and temporary ones, those which are used for study purposes, or carrying the plants and animals from the pond. A low glass dish is best for study purposes; and a Mason jar, pail, or clean can, may be used for transferring. Any child is able to procure some one of these. Thus interest is made to grow in the individual because he feels he has taken part in choosing the most suitable aquarium and he knows why it is suitable.

While the aquarium might be looked upon as a difficult problem to get into working order, by utilizing every opportunity to stimulate the childrens' interest, and by excursions, the solution is made comparatively simple. Many times the children can give valuable suggestions. These may often seem trivial in content; but they should never be slighted. Self-expression is nowhere more easily obtained than in "setting up" the aquarium. First, have the children enumerate the things they think essential, and ornamental. If there is no sand about the school building, the teacher may ask the children to bring some from home, or, if possible, to collect some along a river bank. They must procure enough to cover

the bottom, two or three inches deep. It should be washed by covering it with water, stirring it around, and then draining off the water; repeat this until the water is clear. The first water may be poured in and the sand allowed to settle; but later, when the plants are in, the children must be brought to see that the sand particles and the delicate roots must not be disturbed, and that when ever water is added, it must be siphoned in. This phase may be worked out in the elementary physics class, or even in an "opening exercise" period.

It is best to plan the trip to the pond or river for either after school or on a Saturday. The teacher must show no partiality by choosing her attendants. She must either ask for volunteers, or ask the entire class to go. The utensils necessary for the trip are a long-handled dipper,—a butterfly seine answers the purpose very well,—and a few pails or cans to put the collection into. During the walk to the pond the teacher should endeavor to interest the children in their surroundings; they may anticipate what they will get, where they will get it, etc. When they know where to look and what to look for, they will, with eagerness, search the banks for snails, frogs' eggs, toads' eggs, minnows, various plants, and the like. As much as possible, the several plants and animals should be kept separate; and of course they must be kept in water. After the party has returned to the schoolroom, special care must be taken in placing the plants. Teach the children *never* to put their hands in the water, but to use a pair of tongs to place the plants, arrange stones, and remove any foreign matter. Putting the hands in the aquarium is a mistake fatal to the prosperity of its inhabitants, and measures to prevent it must be taken immediately. After a few hours the animal life may be introduced. The teacher should, in an intelligent and interesting way, explain to the children the changes that have taken place and what to expect to take place in the life forms within the aquarium. This will give them a clue as to how to study these forms; and with the influential interest of the teacher, they will eagerly watch, note, and study the constant changes. It is a good plan to bring some rivalry into the other studies by allowing any child with a perfect lesson or quickly completed number paper, to pass to the aquarium and watch its inmates during school hours. Thus, by actual contact with the plant and animal life in its natural environment, the co-operation of the teacher and pupils in attempt-

ing to reproduce that same environment, and a study of the transferred organisms, vitality, concreteness, and staple interest are firmly attached to the aquarium; and the greatly desired, immediate end is reached.

At this point, perhaps it is necessary to go into detail in the nature study class about the various forms of life within the aquarium.



A Mason jar aquarium

Let us take, for instance, the development of the toad from the egg. A study of the frog is just as good except that the toad reaches its adult stage by the latter part of June, when most schools close. The children can help find these toad eggs, the latter part of April, as a jelly-like string or rope, generally tangled and wound around the water plants or sticks at the bottom of the pond near the shore. The teacher may have the class individually examine these, in a watch-glass using a microscope. A minute or two might profitably be taken from the regular nature-study lesson each day to note changes taking place, without detracting from the study of the day. The day the first eggs hatch, and for several days following, it would be well to take the entire class period to study the new tad-poles. A general discussion,

with leading questions, such as "How do they eat?" "How do they breathe?" etc., will arouse the children's curiosity. Then with the aid of the microscope, the children might try to solve these questions; but, no doubt, they will need considerable help to see and fully comprehend the functions of the circular disk representing the mouth, the gills, etc. The teacher should endeavor to arouse daily interest in the aquarium by asking questions that require thoughtful observation; for instance, "Are there any signs of breathing?" Then there follows a great series of changes, each one a revelation to the learning child; for example, the appearance of the eyes and mouth, the disappearance of the gills and tail, growth of legs, etc. These gradual changes give the teacher a marvelous chance to make the aquarium an out-

standing success; and it makes the nature-study lessons different from any the children have ever had. Thus each plant and animal has an interesting history, many not so long and intricate, which children can trace out along with the life-history of the toad; and the children will get a definite foundation upon which to base future observations, and a keener insight into life in general.

The children may be taught to look for adaptations, family characteristics and variations, controls, etc., in plant and animal life, which are very important factors for a thorough understanding of nature. Care and thoughtfulness of the life procured at the pond must be taken while getting it, while transporting it, and when establishing it in the aquarium. The children should feel responsible for the prosperity of the aquatic life, and should look upon the teacher only as an assistant and supervisor. Not only will their interest be more intense, but their love for all living things will become more keen. "Where sympathy is, cruelty is impossible," and one comes to feel the spirit of these beautiful lines from Coleridge's "Ancient Mariner":

"He prayeth best who loveth best
All things both great and small;
For the dear Lord who loveth us
He made and loveth all."

This sympathetic attitude should be called out as early as possible. "Pond scum" is the chief food of the young tadpoles; if this is not available at all times a tulip leaf makes a good substitute.

What child won't be willing and eager to help these little creatures who have been taken away from their real home? If the weaker tads are not getting enough food, why not take those back to the pond where they can get plenty? The children will recognize this as kindness rather than cruelty to the weaker ones. This promotes good fellowship, and fosters the sense of taking care of and protecting the weaker forms of life,—including, foremostly, younger children. Thus the children come to recognize the discrepancies, deficiencies, necessities, and controls within the aquarium, and are materially benefited by the experiment.

The study of the aquarium as a requisite to nature-study is a broad field which already has a good foundation but which needs to be fully developed and carried out in every school curriculum. Aquaria are kept in all well-equipped schools, and the benefits

derived from their correlation with history, physiology, language, literature, and geography are countless. They have been to many a child, and grown-up people as well, the first incentive to awaken love for nature, particularly among those living in the larger cities, whose opportunities for out-of-door observations are necessarily limited.

“Oh the gleesome saunter over fields and hillsides!
 The leaves and flowers of the commonest weeds—
 The moist, fresh stillness of the woods,
 The exquisite smell of the earth at daybreak,”

“In paths untrodden,
 In the growth by margins of pond waters.”

The Poppies of Flanders Fields

Lt. N. M. GRIER, U. S. A.

“In Flanders fields the poppies blew
 Between the crosses, row and row
 That mark our places.”

Two kinds of poppies grow in Flanders and Northern France, one kind at least being as numerous as any of our common weeds. The one seen most frequently is *Papaver Rhoeas*, a gorgeous red flower, which may become fully as luxuriant as any of our California poppies. The other is evidently a variety of *Papaver somniferum*, having white or violet petals with a dark patch at the base. It is by no means as common as the red kind, there are apparently a dozen of the red to one of the violet or white. *Papaver somniferum* is grown to some extent commercially in the central regions of France for opium, while in the northern part and in Germany, an oil made from seeds of both kinds is much prized for salads and is also in demand for artistic oil paintings. Both of these poppies respond to every type of terrestrial environment, and stunted as well as exceptionally large flowers may be found.

The devastation wrought by the war in these countries is understood to some extent in America, but one will never fully appreciate the ruin until he sees it for himself. Champagne for example, is a section of France once with a wonderfully fertile soil well adapted for wine making grapes, the result of hundreds of years of intensive cultivation and fertilizing. Anywhere from two to four feet beneath it originally was the chalky stone underlying a large

part of Western Europe. The barrages completely destroyed the fertile top soil, and the region is now a white waste, dazzling to look upon in the sunlight, and with the remains of trenches and fortifications dividing it into irregular plots. Even with the constant aid of the elements, it will be years before it will be habitable for man again, but the hardy weeds, surviving every discouragement man has given them from poison gases to the ruthless tread of the tanks, have already regained their footing, and in the luxuriance of their growth the poppies make the only pleasant things to look upon.

They are every where, but appear to like to consort, forming borders along the roads, and especially along the parapets of the trenches where the piled up chalky soil is thickest. Here they grow their best, and I have often speculated as to why this might be, but can only suggest that the raised parapet may tend to catch the kidney shaped seeds when the wind swaying the long stalk, causes the capsule to discharge them; or perhaps it is the preference of the plant for this exceptionally sterile soil for among the rubble of the tragic ruin of the Rheims cathedral this scarlet flower is by no means uncommon. And many a complacent "doughboy" with the numb, goahead feeling of battle banished, looks with a shudder at the poppies growing thickly on the mounds with crosses—it is all too vivid a reminder of life blood spilt.

The Winds

The north wind brought a soul to earth,

The east wind called him to roam,

The south wind lured him and tried his strength,

And teased him and wearied him, till at length

The west wind wafted him home.

—MARY STARBUCK in *Treasured Nature Lyrics*.

Abimelech

NETTIE I. YOUNG

Elm Grove, W. Va



Abimelech

Oh dear! What could I do about those dreadful eggs? The little square of paper with the little specks on it was certainly harmless looking, but just the same I knew that trouble loomed ahead. What would my family say? Would they greet me with open arms, or would they look all the

horror I felt? When one's friends with enthusiasm hands one a family of pets, one cannot say, "I do not want them." So with a smile and a "thank you very much," I accepted the paper, and with fear and trembling carried home to my family about fifty silk worm eggs.

My people looked all the disgust I had anticipated. They did not want them any more than I did, but they were afraid to say so, and to please me they took them just as I had done and decided that they would care for the wretched little things and never for a moment pretend that they were not wildly crazy about their task.

The eggs hatched immediately, and with great interest we stood over the small box and watched these little black specks come to life.

Then the question came of food, and how it should be prepared. There did not seem to be any way, so we took the leaves of the mulberry, and instead of crushing them as we should have done, we put them in the box just as they had come from the tree, and from the way the worms ate, we supposed we had done the proper thing.

At first we could not hear them but it was not many days before they made a great racket as they nibbled away leaf after leaf.

The silk worms lived in Mother's room for nobody wanted them. My sister would not have them with her, goodness no! as for me,

I was only home part of the time, so of course I could not have them in my room, but then, with us as with all families, Mother had to receive that which was not wanted by anyone else, so day and night, as we passed Mother's door, we would hear the steady crunch, crunch, crunch.

Each day the worms ate the equivalent of their weight and as we carried in leaves by the basket full we could not help but become interested in the sleek, fat little creatures. We really did not want to show our interest as we were just a little ashamed but we were all caught watching them so much we at last had to admit that we did so because we wanted to.

As they grew most of them looked alike, but a few seemed to have a little individuality, and those we named. There was one worm that always seemed to get the best leaves and the best place to stand. He always took the lead in every thing, and so we named him "Abimelech".

One day much to our distress, Abimelech would not eat. What could be the matter with him? We had grown to love him so we were very much worried. As the family stood over the box wondering what they could do for his comfort Abimelech did a marvelous thing. He had decided that he wanted some new clothes, so he just stepped out of the old ones waiting for Mother Nature to supply the new, and then he went on munching as before.

Of course the other worms had already chosen Abimelech for their leader, as they could not help themselves, and so one and all followed suite and stepped out of their clothes too. Poor Mother Nature was busy for a day or two, but at last she had them all properly clothed and we ceased worrying, realizing that worms, like people had their eccentricities. The whole family was busy from now on, gathering leaves to feed these ravenous children.

We not only had them to feed, but every day or two find a new box in which to keep our treasures for they rapidly out grew one home after another. We began with a little box two inches square and by the time that Abimelech and his brothers and sisters were two weeks old, two suite boxes were hardly large enough to hold them. Three times Abimelech changed his clothes. Why we never could see, unless it was with worms as with small boys, the clothes were outgrown. At the end of five weeks we began to watch for Abimelech to leave the sunshine, and make for himself a little house in which he was to stay for a period of ten days.

Something must have happened for Abimelech did not seem to want to leave us even for a short time.

At last he grew restless and started to wander from one end of the box to the other hunting for something we knew not what. Finally he stopped in the best corner and swung his head around and around and as we watched, we saw that a long golden thread was coming from his mouth and was being fastened at right angles in the corner. With interest we watched and the threads kept coming faster and faster until Abimelech had made for himself a golden tent.

We watched as long as we could. At last the tent cover became so heavy that it was impossible for us to see him at work any longer and we had to guess at the rest. Would he make it as it should be made? He had not been taught to weave, he had never even seen another worm work for he was the first in the box to want his own home. Even had he been the last it could not have been otherwise for poor Abimelech was blind.

He had now reached the third stage of his life and we knew that for a few days we would see him no more. The other worms hearing what Abimelech had done, decided as usual to follow him and make houses for themselves too, until the boxes became little settlements composed of houses haphazardly arranged. We watched the box with longing hoping that the worms would soon reappear.

One day a great fluttering was heard, and on looking we saw that Abimelech was no longer the worm that we had grown to know and love but a beautiful white moth. His body was soft and downy. His antennae were long and feathery, his wings were wet but we knew they would become dry and strong enough to carry him hither and thither that he might see the beauties of the world for the first time. For Abimelech now had eyes. I put my finger in and let him crawl upon it, and as he stood there, holding tightly to it, he waved his wings gently to and fro. It was marvelous how quickly the wings dried and I was afraid if I kept him on my finger much longer that he would fly away, although I knew that he would probably not fly until night. I wanted all the family to see him and so I carried him through the house on my finger. After they had seen and admired him, I took him back to my room.

Do you know how hard it is to deliberately hurt those you love? I had felt Abimelech holding to my finger and felt the flutter of

his wings and the warm life that was there. So a very hard task was before me. I wanted him always and I knew his life would be short. Silk worms do not eat and in a day or two he would have battered not only his wings to pieces but also his poor little life away. There was just one thing to do and with trembling fingers and a lump in my throat, I unscrewed the top from the cyanide jar and gently put Abimelech in.

We often look in the little mahogany case where Abimelech sleeps beside the beautiful skein of golden silk and as we look we think of the happy hours we spent in feeding and caring for him.

The Cider Vat

By ISABEL VALLÉ

'Tis dusk, but to the vat still clings
 One wasp, adream and mellow;
 Forgotten, friends and foes with stings
 And nest and mate. . . rash fellow!
 He does not know t'is damp and dark,
 Past sun-lit clouds he soars, a lark
 Up in the Blue!
 If he but knew
 The spider folk are waiting round
 For tangle-foot and tipsy;
 Let him but once fall to the ground,
 Poor little striped gipsy,
 They will not handle him with mits,
 But drag him down in tiny bits
 Back from the Blue!
 If he but knew
 Who, dizzy falls from daring heights
 Ne'er balance may recover;
 The rosy pathway cider lights
 Leads to the brink . . . and over . . .
 An apple 'twas at dawn of time
 That drew man back from the Sublime,
 Down from the Blue,
 If he but knew!

The Witch Hazel

FLORENCE E. WHITE

Yorktown, N. Y.



Witch hazel

This flower is indeed the last of the "floral sisterhood," since we find both flowers and fruit on the same branch in October and November. Just when the leaves are about to be shed it breaks forth into bloom making November like April. To me it is one of the most interesting of our wild plants and I am not surprised to find that so many writers think so too.

The witch-hazel has a most interesting history both in name and legend. In the first place it is wrongly named. The early settlers in America found something in its foliage or

or habit of growth, suggestive of the English witch-hazel, to which it is in nowise related, so they transferred the old English name to the newly discovered American shrub; being influenced probably by the same love for the home words which prompted them to call the red-breasted American thrush a robin. The English witch-hazel is not a hazel but an elm (*Ulmus montana*) and got its name because its foliage resembled somewhat that of the hazelnut tree (*Corylus americano*). The English witch-hazel is supposed to possess magic powers in detecting hidden springs and ores, also for the detection of witches, hence the popular name. The procedure for the detection of springs is as follows. A forked twig is chosen whose Y stands north and south; for the rising and setting suns must have sent their rays through its prongs as it grew. The leaves are removed then the twig is grasped by its two forks with the Y stem thrust forward. When the stem turns down it is a sign that water is below and can be reached "if you go deep enough." The American witch-hazel has the scientific name of *Hamamelis*

virginiana an ancient name with no obvious application to the plant. The common term witch comes from Saxon *wych* meaning sprawling, or drooping or weak probably referring to the sprawling low habit of growth. It is said that the Oneida Indians first taught the whites concerning its medicinal purposes. The twigs and leaves are distilled with alcohol to make the healing extract used for cuts and bruises.

The formula used by the United States druggists is as follows:

Hamamelis roots and twigs	10 lbs.
Water	20 pts.
Alcohol 6%	1½ pts.

Place roots and twigs in still, add water and alcohol and allow to macerate 24 hours. Distil 10 pts. by applying direct heat or by steam.

The witch-hazel is a shrub although some writers choose to class it with the trees. It usually grows from six to twelve feet high although under some conditions it has been known to reach a height of twenty feet; it is found on the sides of deep ravines and edges of woods. Its bark is smooth except for lenticels and dark greyish brown. Its wood is tough and fibrous and white with a yellowish softer heartwood. The leaves are alternate and have flower'-buds at their axils. They are almost round, bluntly pointed at tips and rough. The sides are unequal and the edges are scalloped. The veins are straight and prominent on the underside of the leaf. "The witch-hazel leaves are likely to be apartment houses for insects," especially those making galls. One of the most common is a gall, shaped like a horn or spur on the upper side of the leaf. If torn open this will be found to contain a community of little aphids.

The witch-hazel blossoms are found at the axils of the leaves, usually in clusters of three or four on the same short stem. They follow a four-fold plan, i. e., the calyx is four lobed, four petals like narrow yellow ribbons. (In the bud these are rolled like a watch-spring). There are four fertile stamens alternating with four scale-like imperfect ones. The anthers are very interesting in that they each have two doors which fly open as if by magic to let the pollen out. Only the pistil varies from the four-fold plan, the ovary is two celled and two styled. As has been mentioned before the flowers wait until October or November before opening. The witch-hazel is an exception to all rules. When the crisp autumn weather warns all plants to prepare for winter these immediately

burst into bloom. "You almost feel as if the yellow flowers had made a mistake," says Mrs. Danna and Julia E. Rogers mentions them as "Little weazened faces peering at one from all angles of the twig with their yellow cap strings flying in the wind."

Often the petals dry like shavings and stay on till spring. There is no growth in the ovary until spring so there does not seem to be much gained by this autumn blooming. In the spring the witch-hazel is the most inconspicuous of all shrubs. Its leaves look old and dingy compared to the bright new leaves of other trees. This is due to tiny rusty hairs which cover the leaves and which are of special interest to botanists because each branches into a star-shaped top. Another reason for its being inconspicuous is that there is no sign of bloom until fall while all other shrubs are blossoming profusely.

Another interesting thing about the witch-hazel are the seeds and the way they are distributed. The fruit or ovary is a nut with an outer velvety green-brown husk—an inner hard shell and two brown smoothly polished seeds in close fitting cells. The fruit, when husk is opening, bears an odd resemblance to a grotesque monkey-like face with staring eyes. The fruit, not being bright colored and juicy or good to eat, and not likely to tempt either boy or bird to carry it off, and not having hooks with which to steal a ride, or sails or wings with which to fly, it must find some other way. This is what it does. When a frost comes the tiny jaws or sides open and the husk in drying presses hard against the shiny black seeds which are thus sent out with such force that they go many feet, sometimes as far as 45 feet from parent plant. Really they are shot out into the world. This is rather a rough way of handling the young and not a very common habit among plants. The wild geranium and touch-me-not do so however. The fruit takes a full year to ripen and is ready to be discharged in the fall when the flowers come. Wm. Hamilton Gibson wrote of the witch-hazel "I had been attracted by a bush which showed an unusual profusion of bloom and while standing close beside it in admiration I was suddenly stung on the cheek by some missile and the next instant shot in the eye by another, the mysterious marksman having apparently let go both barrels of his little gun directly in my face. I soon discovered him, an army of them,—in fact a saucy legion, all grinning with open mouths and white teeth exposed and their double-barreled guns loaded to the muzzle ready to shoot whenever the whim should take them."

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DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN
ELEMENTARY SCHOOLS

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Editorial

THOREAU, NATURALIST

In September we had the good fortune to make a pilgrimage to Concord and the haunts of Henry Thoreau. We found a seat on the cairn which marks the place where his hut stood in the woods near Walden Pond and experienced a happy surprise to discover how truly beautiful is this famous lakelet and its surroundings. The hilly shores were brilliant with autumn foliage; the same pines and oaks and jays and chickadees were there as of yore. Surely Thoreau chose well the spot in which to prove that the spirit hath greater need for growth than hath the body for luxuries.

It is difficult to say whether or not it was fortunate for Thoreau that he lived and breathed the atmosphere of transcendental philosophy along with the air of the Concord fields and woods. Through his close associations with Emerson, Alcott and others he was forced to develop a philosophy of life and stoutly defend it; and because it was a wholesome philosophy of simple needs and close companionship with Nature, the world received it and gave heed. Thoreau's reputation was first gained because he was a philosopher and a writer of good literature. However, no one who is acquainted with all of his published works at present, can for a moment doubt that his theories were forced upon him by his neighbors—not by agreeing with him but largely through disagreeing.

In a somewhat critical article by John Burroughs in the *Atlantic Monthly* for June he says, "Thoreau was not a born naturalist but a born supernaturalist." Before Thoreau's Journals were published in their entirety we might have agreed with this statement; but now we dissent most emphatically. In the complete works of Thoreau given to the world by Houghton, Mifflin Co. in 1906 there are 20 volumes. Five of these consist of the works published during the author's lifetime, one is given to his letters and fourteen are filled with the contents of his Journals. In

reading these Journals the conviction is forced upon the reader that Thoreau was first and last essentially a naturalist. We doubt if there exists in print any other such body of careful observations on every phase of Nature as is found in these fourteen volumes. They are a veritable mine of minute and accurate observations.

Thoreau lived before the era of specialists and he had no tomes written by them which he might consult to give him extended information concerning birds, trees, plants and animals as does the naturalist of today. Whenever he could find scientific authority he used it to the fullest extent; he consulted the works of the veteran entomologist, Harris, concerning insects and he used the botanics of the time to get scientific names of plants and trees; but the value of the Journals lies in his own careful notes often illustrated graphically by drawings,—the ideal field notebook.

It is true that the human element enters into the Journals in an engaging manner. He was interested in what his neighbors did and said; no one can read these journals and believe Thoreau was "crusty" except perhaps when he was commenting on the arguments of his philosopher friends. His human interests were general and democratic. Ellery Channing said of him "He came to see the inside of every farmer's house and head, his pot of beans and mug of hard cider." The evidence of this interest in people keeps the reader's heart warm while perusing these five thousand pages of notes. Had these been published first Henry Thoreau would have been known to the world as an authority on the life of the woods and field and ponds and streams and he would have been consulted by scientists whose habit it has been to regard his writings with a certain pharisaical contempt as "Literary Natural History"; for he was a true naturalist first and a literary natural philosopher second. In reading the Journals one is impressed by the fact that very few of the pages were written with any thought that they would ever be printed. He saw what was and noted it and that was the end of it. That he understood and valued his observations is shown by a letter he wrote shortly before his death to a young friend. He said, "I have not been engaged in any particular work on Botany or the like, though if I were to live I should have much to report on Natural History generally." When near to his death, a friend called to talk to him about the life beyond, and he answered "One world at a time, please." This answer was not flippant; he had given his life and thought to seeing and understanding this world and had gained a reverence for worlds that his friend failed to understand.

News Notes

GENERAL

The Savings Division of the U. S. Treasury Department has issued a one act play—"Stamps to Keep" by Henrietta F. Dunlop—which is planned to make the pupils think of the advantage of thrift. It can be procured by applying for it.

The National Geographic Society of Washington has a wealth of pictures from photographs of all parts of the world, which have appeared in the Geographic Magazine. Miss Jessie Burrall who is an experienced teacher of geography has been appointed Chief of School Service and is arranging these pictures on separate sheets so that they may be used by teachers of geography all over the country. This teaching geography by pictures is a great work and of the greatest possible value. Teachers should address directly The National Geographic Society, Washington, D. C., School Service Dept.

The American Longfellow Society has produced a moving picture of Evangeline for Schools. It is presented by the Fox Film Corporation. Of this production *The National Review of Motion Pictures* states:

"This is an undoubtedly sincere and faithful screening of Longfellow's famous poem. It should appeal to all classes, young and old, who have a perception for the dramatic, the significant and the beautiful. It is treated with imagination and artistry, and is remarkably successful in making live the period of the story and in creating reality in the characters."

CALIFORNIA

The San Diego State Normal School has issued a most interesting and helpful curriculum of study—especially will the course outlined for Nature Study and Agriculture interest readers of the REVIEW. It is full of valuable suggestions for nature work with the fauna and flora of the Pacific Coast. Professor William T. Skilling and his assistant, Miss Ethel Cunningham are to be congratulated in evolving so complete and interesting a course.

Last winter the California Nature Study League arranged to support a lecturer to make a circle of resorts of Lake Tahoe in the California Sierras. Applying to the University for such a lecturer the State Fish and Game Commission offered to do the work provided the Nature Study League would use their funds to provide nature study libraries to be opened at each of the resorts. The work was a success beyond the wildest dreams of its promoters. It included walks under Dr. H. C. Bryant as nature guide during sunlight hours. In the evening there followed campfire talks, lantern slide lectures, and moving pictures of wild life. When meetings were held in the Auditorium not only was all standing room taken but frequently crowds stood at the windows and doors to hear what they could of the talks.

The Nature guide was used as leader in directed play. Among the games were the "bark feeling game" and the "herb smelling game" in which blind-folding played a part and other games based on wood craft.

The books in the libraries were also in constant use. The experience proved that there is perhaps no better time of awakening interest in the "wee beasties" and other creatures of out-of-doors than when people are out of the bread-earning environment and are so relaxed that they are responsive to the wonders of the out-of-doors.

Cornell Notes



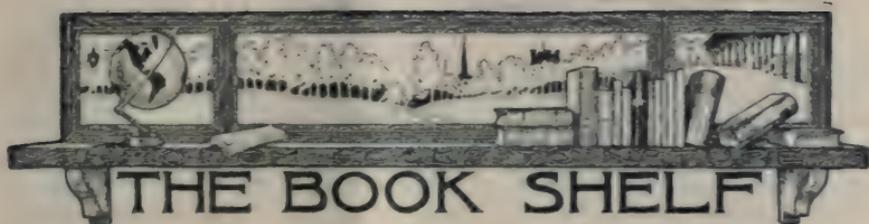
Cornell Summer class in Nature-Study laboratory
Mrs. Comstock with summer-class in Nature Literature

Mrs. Susan Sipe Albertis gave a course in school gardening at the Cornell Summer Session which closed with an exhibit of the gardens, and a charming play given by the children who had made the gardens.

Professor Kennedy of the Ohio State College, Columbus, gave a course on the insects of the garden, especially planned to aid the teachers of gardening by getting them acquainted with the six legged friends and foes that they must know in order to do their work intelligently.

Professor Wm. G. Vinal of the R. I. State Normal at Providence delivered a most helpful lecture before the teachers of the Nature Study classes at Cornell in August.

Professor Tuttle who did such helpful work for the Teachers of the State as editor of the Cornell Rural School Leaflet, left Cornell to enter service in the war. He was recently married to Miss Amorita Culver and is making his home on his ancestral home on Long Island.



Manual of American Grape Growing. U. P. Hedrick, Horticulturist of the New York Agricultural Experiment Station. Published by the Mac-Millan Company.

This new addition to the Rural Manual series edited by L. H. Bailey is indeed a valuable piece of work, for tho there have been many good books on grapes, still a new one which includes the new varieties, the up-to-date methods of growing and the latest ideas on the various phases of the subject, has been much needed in this rapidly advancing industry and this latest addition fulfills the lack in a satisfactory manner.

Both the commercial and amateur grower will find his questions answered in a clear and comprehensive manner. The following are the headings of the chapters—The Domestication of the Grape; Grape Regions and their determinants; Propagation; Stocks and Resistant Vines; The Vineyard and its Management; Fertilizers for Grapes; Pruning the Grape in Eastern America; Training the Grape in Eastern America; Grape Pruning on the Pacific Coast; European Grapes in Eastern America; Grapes under glass; Grape Pests and their Control; Marketing Grapes; Grape Products; Grape Breeding; Miscellanies, Grape Botany; Varieties of Grapes.

There are over thirty large plates of varieties and over fifty figures covering many points of interest. This book should prove of great value to all grape growers, large and small.

The Project Method in Education. A book that suggests the desirability of placing all school work upon a project basis. By Mendel E. Branon, Professor of Geography and History, Harris Teachers College, St. Louis, Mo. In Library of Educational Methods. Cloth. 282 pages. Price \$1.75 net. The Gorham Press, Boston.

Probably no topic is being more generally discussed in educational circles than the project method. Many educators and teachers have asserted that it is desirable and possible to place the entire school work upon a project basis. This stimulating book is a pioneer in the project field.

According to the author's viewpoint a purposeful unit of activity in which the individual engages whole heartedly is a project. A school project, in addition, should be desirable and graded so that rapid, desirable progress will be made. To secure real projects for the children, the teacher must strongly motivate her work. The failures in project teaching, it is asserted, are due to the inability of the teacher to get the pupil to adopt the problem involved in the unit of activity, as a real personal problem.

The author brings out clearly the desirability of centering the work about a series of problems. He deplors the device of capping the old outline organi-

zation with a problem, but insists that the problem should arise out of the child's experiences and should include only pertinent topics in its solution. In a project-problem four steps are recognized: (1) Preparatory step, involving materials out of which a problem is raised; (2) Problem raised and concisely stated; (3) Materials secured and interpreted; (4) Problem solved or materials summarized. With increasing ability the problems should be correspondingly more difficult.

The following topics are suggestively treated: the history of the development of project work; the relations of the project method to instincts; the social basis for the project method; the significance of motivation; teaching by projects; learning by projects; the project-question; the project-exercise; the project-problem; manual projects; mental projects not involving manual activity; the reorganization of the course of study; the preparation of the teacher.

The author is a practical school man and has taken his illustrations from actual experiences. The book is full of inspiration for every teacher, who wishes to keep in close touch with the practical changes that are being rapidly effected in the school curriculum.

J. A. D.

Trees and Shrubs in Winter. William Trelease, Professor of Botany in Illinois State University and formerly director of the Missouri Botanical Gardens in St. Louis. Published by the author, Urbana, Ill.

This compact little book is the right size to slip into one's pocket when one goes hiking in the woods and fields during autumn and winter. It is a companion volume to Dr. Trelease' "Plant Materials of Decorated Gardening" and equally well packed with terse, genuine unadulterated information. It is rich in illustrations which are of great help in identifying trees and shrubs by the leaf scars. It deals with 326 genera belonging to 93 families. The book contains many keys for determining species and families, and is scientific and reliable in the highest degree and it surely will prove to be of great value to students of botany and to landscape gardeners as well as to others who desire to acquire knowledge of our American trees and shrubs.

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Cooty, a Pet Coati

ALFRED E. EMERSON, JR.

Tropical Research Station, British Guiana

He came to us one day, dragged in by an Indian in a merciless way.

"Ha, Kippache! What you want for him?"

"Four dollars."

"Too much, I give two dollars," and after a short time the Indian went away with his two dollars and left to our care a little jungle inhabitant with a long inquisitive nose, and bright little beads of eyes. We gave him a wide berth, having a suspicion of all jungle creatures with jaws, and his plaintive little squeaks failed to draw us. However, we finally decided the twine around his neck was too sharp and we must either place him in a box or invent another method of holding him. A little leather collar was finally decided upon and quickly constructed. Then the great question arose as to how we were going to put the collar on. It was plainly a case that required nerve and quickness. We approached as closely as possible, then one of us made a quick grab, and amid loud shrieks and squeaks we put the collar around his neck, fastened it tightly with a string attached and backed away in time to escape what we thought would be a furious charge.

I shall never forget that scene, the holding of the shrieking little animal by all the strength we could muster, and his wild struggles and waving of legs. Since that day I have taken the collar off and put it on while he stayed in my lap, without any trouble; for, the day after that episode, we found to our surprise he was very friendly and tame and ever since he has crawled about on us, played with us, and formed a great part of our amusement and has won his own place in our affections.

Before I go further, I must explain that he really isn't a he, but is a "her." However, we adopted him for a he and his wild kitten-

like playfulness seems quite masculine, so "he" he shall remain as long as he is our pet.

His main charm is never failing playfulness. You clap your hands. He jumps a foot clear of the ground and cavorts about like a bucking broncho in a tiny way, first running away from you and the next minute, charging you at a tremendous rate of speed; he runs up your leg and tucks his head between his legs, with his hands over his nose, indicating scratching is required immediately. If you hesitate a second, up comes his head and beady eyes in a quick interested way; and if this fails to call forth the needed response, nibbling is the last resort. We called him Kippy for some time from the Indian name, but finally it evolved into Cooty. It is hard to explain just why "Cooty" fits him so exactly. Maybe it is because of his real name—Coati, or the association with scratching or the suggestion of some thing cute or both; but at any rate "Cooty" has remained with him.

"Cooty's" nearest relatives in the United States are the raccoons; but he differs by possessing a long nose which is well adapted for digging after grubs and insects, for which purpose he uses his strong little claws; he is an efficient destroyer of the large termite nests which are found in the South American jungle. He climbs trees well, shinning up and coming down backwards, his tail, being used as a brace, although it is not prehensile. He eats everything that can be imagined from rice to "all-day-suckers." Any fat, juicy insect is a wonderful treat and he smacks his lips after biting it apart and swallowing it. His actions with hairy insects are very amusing and exactly similar to the habits of the skunk. If the morsel is a large moth, he first breaks off the wings as unworthy of a Kippachee's menu, and then rolls the body on the ground until every hair is off. During all this seeming rough treatment the soft body of the moth is not broken in the slightest. It then disappears amid smacking of lips, down the mouth which is under the nose, where it ought to be, of course, but considering the nose it seems be placed in a peculiar way, similar to that of suckers. Cooty's main ambition in life is to be scratched. He prefers all places at once, but usually is satisfied as long as you use both hands continually.

One night we were all sitting at our desks in the laboratory with the windows open when we heard his plaintive squeaks, and upon looking out the window, there was Cooty on a ladder leaned against

the bungalow and vainly trying to reach us with his waving paws. His string had broken and, given this great freedom, he had attempted to reach the source of scratching as quickly as possible. He had missed the steps but the ladder was the next best approach so he had used that. He has escaped many times since but never goes away from our clumps of bamboo. We do not keep him tied in order to prevent his escaping but only to keep him from annoying us while at work. At first we thought an iron ring on the end of his string would prevent his being too much trouble and at the same time give him freedom; but this kept getting tangled up in so many things, that we were forced to keep him tied; but he seems happy at present with a dead tree to climp upon and with a long enough string to give him quite a range of activity.

Cooty reminds me more of a small bear than of a raccoon, in spite of his ringed tail. His walk and ways of sitting and standing are very bear like. His various positions of scratching himself often throw us all into convulsions of laughter. Sometimes it is one foot or the other, and quite often he sits up and turning his body he scratches at his side with both hands. Aside from us, his chief playmate is his tail. This he plays with, bites and has even been seen to pick it up and carry it off in his mouth, his hind feet walking every which way trying to keep up with the tail.

Cooty's hundreds of funny little antics and unfailing cheerfulness have so entered our lives in connection with our studies, that he shall remain with us to the end of our stay. Although we send our other animals, many of them nice pets, away to the Bronx Park, we cannot give Cooty up. Some day, maybe, Cooty will be there too, a long way from his jungle home; but that day will only come when none of us are able to stay in British Guiana and something must be done with him.

The Night-Fairies' Rendezvous

Dr. E. EUGENE BARKER

Insular Experiment Station, Porto Rico

It was the writer's privilege for several years to live beside a deep, wooded ravine. Tall trees of willow and hemlock arose out of the gorge at the back of his house until they overtopped the roof itself. Close by the west side of the house stood a Norway maple, detached from the forest but often visited by the little creatures who lived in the deeper woods.

It was in a crotch of this tree that a fig-basket was fastened to hold nuts and crumbs, and to its branches were tied pieces of suet. The tree itself, in the early summer produced winged seeds, and sometimes its sweet sap leaked thru the bark. Was it any wonder, then, that this tree with its hospitable fare attracted the woodland folk and soon became a popular dining resort? No fashionable hours were customary here, but meals could be had at all times. Chickaree, the red squirrel, always came for an early breakfast, and if he found his next-hole neighbor had gotten there before him, the sweet morning air was apt to be defiled by "squirrelous" profane vituperations which they hurled at each other. Little Downey, and the Chick-a-dees were more courteous but Dame Nuthatch was always rather garrulous, and when she found the house-sparrows frequenting the dining-place her outraged pride gave vent to decidedly snobbish, indeed, often aggressive objections to their presence.

And so this tree restaurant was frequented continually from dawn until dusk by the neighboring folk of the forest. It was after the shades of evening had fallen, however, and the plebeian patrons of the day had retired that the real aristocrats came to dine,—little gray fairies of the night—and to continue their revels until daybreak. These little folks are commonly known as flying-squirrels and are seldom seen by men because of their nocturnal habits. One who has learned to know their call, however, can often hear them over head in the treetops of the darkened forest.

So it was, that having learned where peanuts and crackers were always to be had, they came nightly, winter and summer to feed. A stick placed from the windowsill afforded an aerial bridge to "Peanut Castle,"—a shelf by the window where food was always placed for all comers.

When the window was open they did not stop here, but came inside to explore the writer's desk and bookcase for the source of supplies.

Turning on the evening light was usually a signal that the inn-keeper and lord of the castle was at home, and soon their presence in the trees outside was made known by a squeaking, chipping sound. A few words of welcome supplemented by the sound of cracking peanut shells usually brought one of them inside; eager jaws would seize the nut and away would scamper the little fellow bearing the prize in his mouth. In his haste, however, he always paused long enough to turn the nut endways and ensure a secure grasp before he plunged into the air and away.

It doesn't take a squirrel long to eat a peanut and soon he would mount to the top of a willow tree, volt down to the trunk of the maple and then in less time than it takes to tell, would be up and across to the windowsill shelf again, eager to seize another nut from my fingers.

Always gentle in manners and trusting, these beautiful little creatures won my heart the first time they came to me. None was ever very timid and in time two of them came to be quite venturesome. Many a studious evening was made sociable by the little fellows scampering in and out of the window, exploring the desk or climbing up and down the window-curtains and even running up and down my shoulder and onto the top of my head to secure the desired nut.

Altho innately more gentle than the rowdy reds, these squirrels too, seemed to be unsociably disposed, and to resent the presence of others of their kind, so that, altho I was on friendly terms with four or five of them, I could not entertain more than one of them at a time.

The movements of the flying squirrels are extremely quick, and their agility in the air is quite remarkable. Many times I have seen one tumble off the windowledge, turn a somersault in midair, and recovering himself, land on the lower trunk of a maple ready to scramble up again. The flat tail seems to serve as a rudder, and they have the ability, apparently, to swerve to right or to left in their "flight." Their aerial powers are quite limited, nevertheless. The length of their flights is always conditioned by the height from which they can launch themselves into the air, because their angle of descent is very steep. They can never fly upward or even horizontally, but only downward.

It was with genuine regret that the writer moved away from the house by the ravine and the maple tree, and thus ended his friendship with these creatures, so gentle, so beautiful, so trusting; these little "brothers of the wild."

Grizzly

BRET HARTE

Coward,—of heroic size,
 In whose lazy muscles lies
 Strength we fear and yet despise;
 Savage,—whose relentless tusks
 Are content with acorn husks;
 Robber,—whose exploits ne'er soared
 O'er the bee's or squirrel's hoard;
 Whiskered chin, and feeble nose,
 Claws of steel on baby toes,—
 Here, in soltitude and shade,
 Shambling, shuffling, plantigrade,
 Be thy courses undismayed!

Here, where Nature makes thy bed,
 Let thy rude, half-human tread
 Point to hidden Indian springs,
 Lost in ferns and fragrant grasses,
 Hovered o'er by timid wings,
 Where the wood-duck lightly passes,
 Where the wild bee holds her sweets,—
 Epicurean retreats,
 Fit for thee, and better than
 Fearful spoils of dangerous man.

In thy fat-jowled deviltry
 Friar Tuck shall live in thee;
 Thou mayest levy tithe and dole;
 Thou shalt spread the woodland cheer,
 From the pilgrim taking toll;
 Match thy cunning with his fear;
 Eat, and drink, and have thy fill;
 Yet remain an outlaw still!

The Chamois at Home

PETER ANTONY MATTLI

Göschen Alp, Switzerland

The silence was suddenly interrupted by the report of a gun; an event unusual enough in these high and lonesome regions to immediately attract our attention and to make us forget our tea, now ready, which we had so fondly anticipated during the last hour of our climb.

Did he get it? Did he miss his mark?

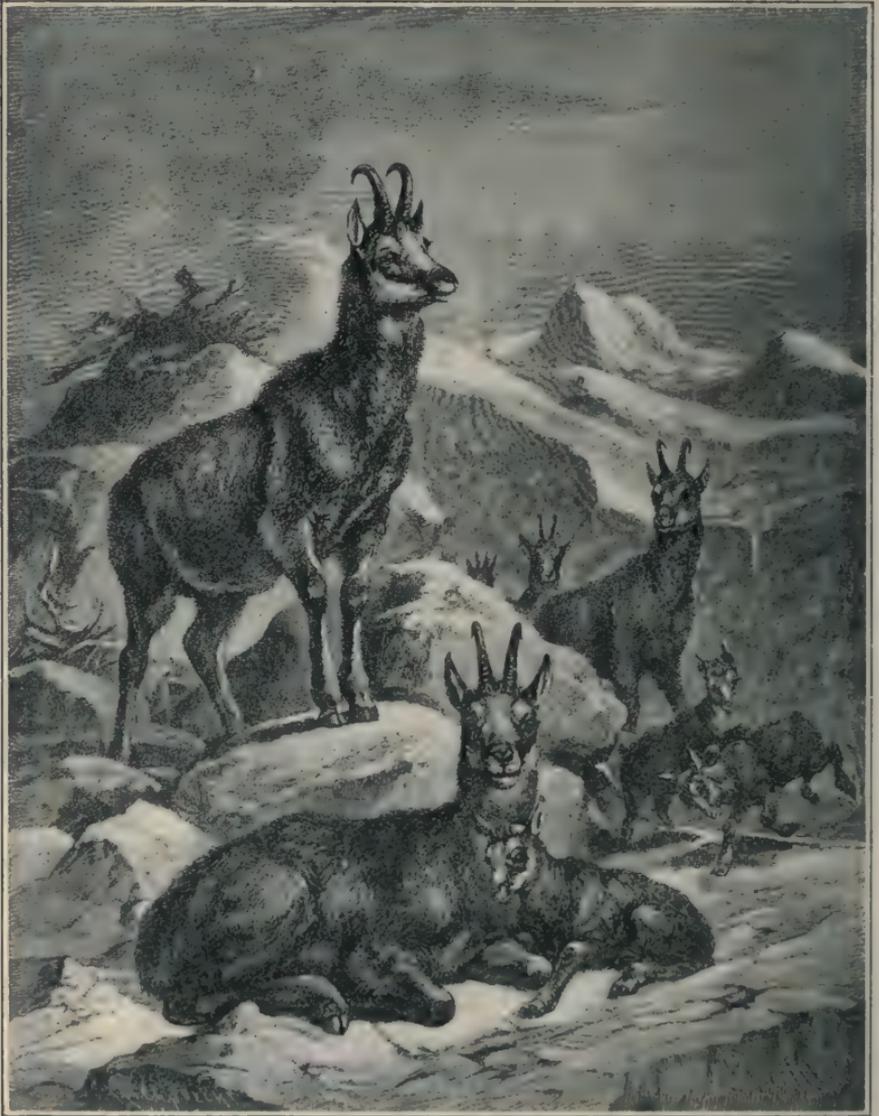
The field-glass! The field-glass, cried Jack and having rescued them from the bottom of my knapsack, he began to examine a rather large incline of rocks and cliffs which formed a part of the opposite mountainside. For, as he quite aptly remarked; that was the only place where a chamois could make a living; the rest of that mountainside being covered with steep rugged icefields and glaciers which indeed completely surrounded that particular rock formation and seemed to make it absolutely impossible for anything but birds to approach it.

But chamois, as everybody knows, are good climbers and show a curious predilection for even such wild inaccessible regions and the right kind of an Alpine hunter will yet find it possible to get through where other men would declare it impossible.

Jack located the animal before long in the upper part of the incline just mentioned. Passing horizontally over the narrow brow of a wall which made a sheer drop of some 1500 feet to the valley below, it evidently intended to reach a chasmlike gully or split, which somewhat further to the right separated that mountain in two and dropped from the upper icefield to the valley at an angle of about 80 degrees.

Jack predicted that the steepness of that chasm together with the wall below and the overhanging glacier above would oblige the chamois to return and run into the hunter.

But that this was not to be the case, became evident before long. Jack was all excitement; he might have made a splendid cheer leader; he yelled at us at every move and jump of the animal, from the moment it entered that chasm, in a manner worthy of an auctioneer, never for once realizing that we without glasses were absolutely incapable of seeing it, much less to observe its feats.



The Chamois at home
(After an engraving in *Our Living World*)

"Now there it goes, there it goes, see it, see it!" yelled Jack, "Now it has entered the gulley"—"Where"?, interposed my other friend—"Why on top—on top next to the icefield,—what a jump! It comes down like a snowslide. Now it bounces to the opposite side, now it strikes the rock, bounces into space again—turn sideways—lands upon a ledge some 10 inches wide leading through the rockwall, now it comes to its end, jumps straight down about 30 feet in another ledge, turns towards the gully, which is now very steep and very narrow almost like a chimney, jumps from against one side-wall of the gully over against the other rushing downward at a tremendous speed—now it has reached the base.

"There it crosses over to the icefield down in the valley! Do you see it coming over in our direction?"

I actually could make it out now, thanks to the thin layer of fresh snow that covered the glacier. It looked like a pin point and seemed, as Jack had pointed out, advancing in our direction. It began to take size and shape very rapidly and we soon were able to discern its movements with our unaided eyes.

Our position from the point of view of an observer, was ideal. We were situated on the opposite side, about 600 feet above the glacier that filled the valley below.

It now headed directly towards our knoll and if it failed to get our scent, a thing not very unlikely; it was going to pass within 200 ft. of us, a fact which I could easily predict owing to the surrounding rock formation, which would make it much harder for the animal to go through at any other point. I began to ask myself how long it would take it to climb that knoll, for having used 45 minutes myself, I was curious to see how man and chamois would compare. I wondered whether we could do it in as much snow.

It was a beautiful sight to watch it speed along on this level icefield. It reminded one ever so much of a race horse, though its movements were more graceful and surely much more elastic. Its head was slightly thrown back, its leaps even and curved and its movement rhythmic. It just reached a glacier; a crevasse; would it stop? would it try to cross it? We had passed along that same "schrund," some three hours earlier and estimated its width at that point 20 or 30 ft. A schrund is a split in the ice sometimes one hundred feet deep.

The animal took in the situation at a glance and without stopping to consider matters bounced over in one big beautiful curve. A

few more jumps and it reached the base of the knoll upon which we were watching and slowly left our field of observation. Just how it managed to pass from the ice to the mountains is still a riddle to me, for we had spent fully two hours doing that same trick and had to use our ice-axes and ropes very liberally for the chasm between the glacier and the mountain was more than 35 ft. in width and unusually deep. I regretted that our position behind the knoll did not bring that part within our vision.

The chamois reappeared about two minutes later at the very brow of our knoll not more than 300 feet below us. I don't think it had seen us yet, nevertheless it stopped short all of a sudden, stretched its neck full length, took a sniff of the air, gave a loud whistle, stamped with its feet, wheeled around, raced down the knoll in a westerly direction, hence exposed to our view, bounced over to the icefield and in some 15 minutes disappeared among the snow covered peaks of the western mountain range.

The chamois is the only representative of the antelopes found in central and middle Europe. It is readily distinguished from all others by the short and cylindrical black horns, rising for a considerable distance vertically from the forehead and then bending sharply backward and downward in a hooklike manner. The chamois is goatlike in appearance but much fleetier and more graceful in its movements.

The color of the chamois in winter is a chestnut brown, white or pale in the face with the exception of two black stripes from below the eye to the corner of the mouth. The horns are of a beautiful black and marked with transverse rings and longitudinal striations. The weight of the animal is upwards of a hundred lbs. Its habits seem to be similar to those of the Rocky Mountain sheep. The chamois are wonderful climbers and live in the highest Alpine ranges, though one kind, a heavier and more massive animal dwells within the timber line.

Nobody could, without seeing the chamois in its wild state, get an adequate conception of its extreme agility and nimbleness. The chamois of the Zoo does in no way give a truthful impression in this respect. To appreciate these points one has to see them in their wild state rushing down some almost perpendicular mountain-side or crossing gullies, streams, or chasms. They seem to be born for the mountains and made for these wild and desolate regions. And they know the dangers of the icefield and the falling icemasses.

They can read danger signals as well as the most expert mountaineer and they quickly respond to new situations and dangers.

Though extremely shy of man and avoiding him like a pestilence they will at times when cornered run up to his very nose and jump over his head before he has even time to fire at them. And they lose no time in deciding a case. They return the moment they realize that they have entered a blind valley. There is no aimless running around, no waste of time, no trying to get out by some impossible way. One cannot but marvel at their quick flashlike decisions.

I once watched four such animals enter a very narrow pass hemmed in by two rock walls and giving into a broad expanse beyond which, however, upon subsequent examination proved to be without any exit being hemmed in by almost perpendicular walls. The chamois stopped the moment they got a full sight of the situation, wheeled around and passed within 10 ft. of me, I being in full sight.

I know of no picture more charming than chamois at play. To witness it is worth a lot of effort; they behave for all the world like acrobats and tumble over and over in sheer joy and happiness. I remember but one such case that I had a chance to witness and that was many years ago. It was in the upper parts of the Swiss Alps well above the timber line, we came upon two of them quite unexpectedly and they failed to see us, thanks to our position. We were some 300 ft. almost perpendicularly above them looking down over the horse-shoe shaped mountain ridge which surrounded the glacier below, upon which they were playing.

This icefield was almost level though somewhat inclined. Its lower extremity dropped off quite suddenly and formed a sheer wall of many hundred feet. Their play consisted in what you might call a race ended by two or three sommersaults and was repeated over and over again.

The animals would begin by frolicking up to the farthest end of the icefield, playing, teasing each other as they went along, arrived at the rockwall, they would turn around, face downward and at a given moment run down at a tremendous speed, thus nearing the lower end at a very appalling pace. At the moment, however when you thought that they would dart down over the abyss they suddenly turned their performance by a complete sommersault landing squarely on their feet and coming to an abrupt and complete

standstill facing the other way at the very edge of the chasm. Sometimes, however if that sommersault ended their mad race some 15 or 20 ft. away from the edge, they were quite apt to repeat their sommersault thus coming a little, though not much, nearer to it.

It is very unusual, though, to observe such a scene. These animals are ever watchful and possess a keen sense of smell and a power of vision which is almost unbelievable. Hunters know that and are careful not to take any whiskey along when going hunting. It is well however, that the chamois has such keen senses or else there might be no more chamois left. But as conditions are, it still holds its own despite the modern fire-arms and an increased activity among those who hunt it. Fortunately many of the authorities have passed protective laws which, while not yet putting the animal entirely on the taboo list for hunters, nevertheless makes life a great deal safer for these beautiful and interesting creatures.

In Memoriam

In this number of *THE REVIEW* appear two articles, accepted some time ago the writers of which have since passed through the mysterious portals that lead to the beautiful life to come.

Mae Creswell was educated in Iowa State Teachers College, the Lakeside Laboratory, Iowa State University and Cornell University. At the time of her death she held the position of Critic Teacher in Iowa State Teachers College. Possessed of a refined and attractive personality, Miss Creswell had also the true scientific mind and was a most excellent student in the biological sciences. She was a keen observer and loved the out-of-doors and beyond most of us she had the power of expressing in most felicitous words those things which her eyes had seen.

Helen H. Humphrey was educated at Pomona College, California, and took graduate work at Cornell University. She was an earnest and industrious student and had a childlike quality of mind which coupled with her love for nature especially fitted her for a life of happiness in her beloved California. An accident caused her death early in the summer.

The Pocket Gopher

MAE CRESSWELL

Cedar Falls, Ia.

A waste field, dead stalks of weeds and grass, here and there among the gaunt stems small humps of fresh dirt. A clover meadow level, green and smooth except a number of small mounds of earth that look as if some careless person had dropped a bushel or so of soil in a place at irregular intervals over the field. A closer survey of those piles of dirt shows that they are not carelessly dropped masses but are cones built up somewhat like volcanic cones having a rim and a downslope toward the center. One or two still show soil moist on the surface proving that the dirt has been exposed to the sun but a few minutes.

Who did it? How catch the offender? 'Tis a task worthy the skill of a detective and will require many of his tactics. Don clothes the color of dead grass and sit patiently in sight of the fresh mound but concealed as much as possible and you may be rewarded by the sight of the maker at work or such of him as appears above ground. The only sure way to see him in the open is to handcuff him in a steel trap and pull him forth, a most unwilling and savage prisoner. Keep your shoe toe from his teeth. Leather is a small obstacle to these, his useful weapons.

You find him a squat-legged, square built almost neckless rodent with a flat broad head, tiny beady eyes, small inconspicuous ears, and a short naked tail. He is some ten inches in length from the tip of his snout to the back of his round stout hams with not more than three inches more to be added for the tail. The soft thick but short hairy coat is a grayish tawny brown. These features are not the ones that challenge your attention. As unusual as the elephant's trunk are the toenails on this creature's forefeet. They resemble the enormously long finger nails said to be the mark of a Chinese gentleman in former days. But these nails have the usefulness of the elephant's trunk rather than the hindering tendencies of the Chinaman's adornment. Look at them carefully and you will see that each of the five toes is armed with a long curved claw or nail. The one on the middle digit is fully an inch and three quarters long, the next ones a trifle shorter and the outer ones nearly an inch in length. The middle one is also the broadest. Besides these nails there is also a fringe of long stiff

hairs standing out from the upper sides of each toe. The palm as might be expected, is broad and flat.

In walking in soft ground the claws curve upward but do not bother him much. But put him on a board or cement walk and he must turn his feet outward and walk on his wrists to get along. Let him loose in the garden and you will see how he uses these huge nails. No, you won't either! A half dozen rapid movements accompanied by a shower of dirt and half of your prisoner is hidden by Mother Earth. How did he do it? Those claws work with all the precision and effectiveness of a steam shovel, but far more expeditiously. The only difference is that they scrape downward and backward, pushing the dirt under the body, giving to the hind feet which are also armed but with smaller claws, the task of pushing it back of him.

There is another point of his exterior anatomy that looks interesting, but it is too close to those fierce looking front teeth to make investigation. You had best visit a museum specimen for that. There you will see that these teeth are four in number and protrude from his furry lips in a fashion that proclaims that no dentist ever put a gold harness on his too prominent incisors. Each of his two upper teeth bear two lengthwise grooves which is his identification mark in this rogue's gallery. He is known as *Geomys bursarius* or pocket gopher. The name leads you to examine him still more closely. Again you find some peculiar whims in his physical make up. On each side of his mouth is a queer fold that you noticed on your living specimen. Use the eyes in the tips of your fingers and you will find these folds are the outer edges of a pair of pockets, one on each cheek; they extend back to his shoulders and are an inch and a half broad; they have a fur inside as well as outside and have no other opening than this one on his cheek. Does he carry dirt in them? That shower behind his legs shakes that hypothesis, unless he carries it out of his burrow in them. More use for your dingy suit and more wearisome waiting.

Muscles are so tired that you positively cannot be quiet another instant when a mass of soft dirt begins to emerge from this open mound. It is being pushed by his forefeet being held sidewise. Eyes appear above the surface. You are sighted. No more work at the opening this morning. After waiting in vain you go home to dinner and return to renew your vigil only to find the opening carefully closed full of soil and a fresh mound some six feet farther

on with its opening also closed. Dig it open and you will find a smooth burrow some four inches in diameter and extending horizontally to a depth of five to fifteen inches. The chain of mounds leads you to dig still farther until you are convinced that they all belong to the same runways. Often they are many yards in extent and turn and wind and branch with no seeming plan. More days in spying will show that one gopher is accountable for the twenty-five or thirty mounds on an acre or so of ground. They are all dirt from connected runways, some broader than others and some grass lined for a nest. He dwells alone and seldom leaves his excavations. Roots and hard soil are cut with his chisel teeth as he excavates with his forefeet. His squat body and short legs fit him for just such a life occupation, but how about that slender naked tail? Whist! Backward he runs at an amazing pace, his sensitive tail acting as eyes or rather feelers for him.

What is there for him to eat? O, yes, the clover and alfalfa roots were cut off at the top of his burrow. Here are pieces of them in this side gallery. What is this? Small potatoes, pieces of larger ones, bits of parsnip, carrot, clover leaves and stems with bits of other succulent plants. A half bushel or so stored in his various galleries. No shortage of food supply for him! Methinks those mounds of soil in the garden unravel the mystery of a promising row of sweet potatoes that failed to meet expectations. They were thick and finely formed at the top but seldom over two inches long and the lower surface looked gnawed. Winter time does not stop his activity as fresh mounds under the snow testify. Raspberry canes sans earthly support and young apple trees and other young trees minus their roots tell how he lived. Many a young orchard in the Missouri Valley is seriously injured by his ravages.

You have given up all hopes of ever seeing him when he is gathering clover leaves, when just about dusk, he slips stealthily from his burrow and moves straight to a bushy clover plant. He bites off the clover leaves and seems to be brushing his cheek with his claws. He moves so rapidly that in the dim light you cannot see what he is doing. O, for the power to move noiselessly and unseen! There he comes slipping back to his burrow. Cheek pouches are greatly distended and, yes, it is,—a clover leaf sticks out of one. Now is the mystery of those fur lined pockets solved? Of course, a fur pocket that could not be turned inside out is no good for a dirt carrier.

September and October warn him to get out his winter overcoat, so he begins at his nose and sheds his thin tawny summer hair for a new softer, thicker, darker coat. The last of October sees it nearly off and the new one on. A curious line marks the region of the change. November brings added fur to provide against winter chills, but this coat does not push the former one off but only grows in among it.

Spring days come and he leaves his burrow to go courting but does not remain in the burrow of his mate long. Perhaps solitary existence has so unfitted both for gopher companionship that divorce is the only sensible or plausible settlement. Should you chance to meet him abroad some day, and it's apt to be a glowering one, he will display his ugly spirit in a pugnacious manner, snap his teeth and give low quick hisses. Better let him have the path,—your shoe is too thin to dispute it with him in his present mood.

You may be an unwilling spectator to his demise should a big owl or marsh hawk pass that way, for those who have studied the food of these birds in the regions west of the Mississippi, say that they catch many of them. Others of his enemies are weasels and big bull snakes, also the farmer with his steel trap and arsenic seasoned parsnip. The weasel with his wonderful agility and wicked fangs could worst his more awkward victim but how is the battle carried on with sluggish, good-natured Sir Bullsake? Reports say his snakeship invariably comes out victorious, by simply swallowing Mr. Gopher. One Nebraska observer reports that when digging for a missing trap, he found the trap attached to a gopher's foot protruding from a bull-snake's mouth. He had swallowed the gopher but couldn't extend his jaws sufficiently to engulf the trap. Upon releasing the trap, the snake's jaws closed and no gopher existed. That farmer gives bull snakes free rent in his clover and alfalfa fields and orchards. Dame Rumor says he has been known to carry a bull snake carefully out of his corn field for fear of injuring it while cultivating the crop.

The damages that farmers complain of most are the mounds which clog the sickle bar of the mower, the old tussocks that leave the meadow rough and smother the grass beneath them and the danger of a horse being seriously injured by breaking thru into their burrows. Orchardist and gardener lay in wait for the gophers because of their liking for the roots of young trees and the damage they do to root crops, melons, pumpkins and squashes.



Pocket Gopher

Often a fine looking pumpkin is completely hollowed out by this thief who enters it from beneath.

Seldom has Old Mother Nature made an animal more fitted for underground dwelling than this one,—the body just fits the runways, no long legs or tail to be in the way; a head placed right in front of the shoulders without the bother of a neck; tiny close fitting ears; a sensitive tail; sharp strong cutting teeth and broad grinders; a wonderful digging apparatus; a fur that is close, smooth and warm; last but not least, those capacious pockets. One might think it would possess the earth, but only two or three young are produced each year, and active enemies work toward their extermination. Every farmer boy who has ever attempted to add to his personal exchequer by agreeing to rid his father's farm of gophers for a stated sum, can testify to the wit and persistence necessary to overcome their cunning. Little is yet known of this surly, solitary miser. His life and his deeds challenge your study.

Cities

LEW R. SARETT

Urbana, Illinois

Too many faces, too many tongues,
Too many smiles that lie,
Too many shuffling feet that beat
And fiercely hurry by!
I'm sick of the town and the grovelling throng
In the city's brawling night;
Of the gimlet eye and the bawdry lip
Of the luring sybarite!

Oh, for the face of the honest sun,
And the tongue of the singing rill;
And the patter of gladsome feet in the street
That leads to the purpling hill!
Oh, for the balm of the brooding dusk,
When, one by one, with His rod,
My Father lights the friendly lamps
In the slumbering City of God!

The Virginia Deer

GEORGE H. RUSSELL

Winthrop, N. Y.

Deer are widely distributed over the face of the earth, and include a great number of species. They are to be found in most parts of the world, except in desert regions, where they seem unable to pick up a living as do some of their cousins, the antelopes.

So far as is known there are no deer in Africa or Australia, their place in Africa being taken by the antelopes. In Central Asia there are several large and handsome forms resembling the red deer in shape and in the character of horns, and others that are more like the American elk or wapiti. In North America several species are found and in South America, there are often well marked but comparatively small and insignificant forms of deer.

Those in Eastern North America are separated into several geographical varieties and represented westward to the Pacific by other closely related races.

The Virginia deer in one or other of its varieties was originally spread abundantly over our country, but the encroachments of agriculture upon the wilderness, the inroads of the lumberman, the fire which ever travels in his wake and the spread of towns and cities have driven the deer from a large portion of their former range and sadly decreased their numbers elsewhere.

At the present time there are comparatively few deer left in this country. Red and fallow deer are, however, still to be found in the Highlands of Scotland, and in a few districts of England and Ireland, but if they were not carefully protected they would soon die out.

The Virginia deer are at present found chiefly in the Eastern parts of the United States, extending from Canada into Florida, and varying in color at different places and seasons. In New England, within the last few years, these beautiful creatures have returned to dwell again in the haunts of their ancestors, wherever the destruction worked by civilization has not been too severe.

They are present in spots from which they were supposed to have been driven forever. Not the pampered stock bred in game preserves, but the sturdy descendants of the native wild deer, that the red men hunted thru rough forests, when the whole country belonged to them alone. It would certainly be hard to find a

creature leading a happier, more carefree life, than our wild deer of the present time.

After generations of persecution and terror, reduced to lonely individuals hiding afraid in distant forests, chased by dogs and shot at by man, fearful of greeting one of their own kind even, lest it prove an enemy in disguise, they are allowed once more to enjoy the land in safety. They may now call to each other in the twilight without fear of betraying themselves to the hunter and roam the country over in families or alone as suits each one the best.

What does it matter to them, that in certain countries, they may be hunted for a few weeks each year. Who would not be willing to be shot at occasionally during so short a period, with the chances in favor each time of getting away untouched, if in return he could enjoy such splendid freedom thruout the rest of the year? They now have probably fewer natural foes to contend with than almost any other creature.

The Virginia deer is a comparatively small animal, about the size of the fallow deer, altho the bucks are heavier. Its length is probably six feet while the height at the shoulder is a trifle over three feet and the length of the antler 20 to 24 inches. The color is very beautiful. A bright chestnut above in summer, with a black band on the chin; the throat, underparts and inside of legs white. The tail, which is very long for a deer, is brownish above and white underneath. When startled or alarmed, the animal has a curious habit of waving this member back and forth as a flag. In winter the upper parts of the animal are yellowish gray with white about the eye. This is true kahki color as is shown by the number of hunters in kahki coats who are shot by mistake each year during the hunting season. The ears are long and delicately made, the eyes are large, dark and beautifully soft in expression.

The horns or antlers are what serve principally in distinguishing the deer. These magnificent weapons of offense and defense, with which the male deer are as a rule provided during part of the year, are perhaps the most striking feature of the animal. The antlers come outward and then upward, the tips curving in toward one another. There is a short upward spike near the base beyond which the beam gives off two upright branches, making three nearly equal prongs. At no point does the antler branch dichotomously. These are shed and renewed each year. The so called "spike horns" or antlers without any branches belong to an animal about

a year old. The two branched horn belongs to a deer about three years old and so on. Very rarely indeed a female will develop spike horns covered with velvet.

The new horns appear on the deer in the Adirondacks about the middle of May; as they rapidly elongate, they harden from below upward. They are for a time quite soft and are provided with a downy covering known as the "velvet." The "velvet" is a skin supplied with blood vessels to carry nourishment to the growing tissue. As the growth is completed, the blood supply to the velvet is checked and it withers and ravel off. Each succeeding pair of horns is as a rule more and more branched, so that a large number of "points" indicates to the hunter an old individual.

The fawns are without these beautiful ornaments which render the full grown deer one of the most graceful and impressive of all four-footed animals. The young, as is usual with the deer family, are thickly covered with white spots, which vanish as they grow older. As a rule, the female deer bears two fawns and these are born in the month of May. They are very quick in learning to walk and run. The little fawn is prettiest when he is about a month and a half old; the sides are spotted with white, the face is delicately shaded with deeper and paler color, and the eyes are unusually large and expressive. The dainty creature is the very embodiment of gracefulness in movement as well as appearance; nothing is more charming than the airiness of his little leaps over the uneven turf, and he is perfectly surefooted. He is very inquisitive and depends on his agile legs for escape if anything should prove dangerous.

The long thin legs of this deer are admirable adapted for rapid movement, and with the exception perhaps of some of the antelopes, there is no animal, that, making allowance for its size, can compare with it for speed. A glance at a timid deer shows that all of his faculties are on the alert: the head is erect, the broad ears are turned in the direction of danger, the eyes are intently peering, the nostrils are distended and in motion, and an uneasy forefoot is poised for a run. For grace and beauty of form, the deer is surely unsurpassed—, its stately carriage giving it a style not possessed by any other animal.

At the coming of fall, the hair grows twice as thick as it was at midsummer. His coat is shed gradually twice a year, in June and September. For food, it lives on young twigs especially those of

the black birch,—foliage of arbor vitæ, hemlock and yew. Digging thru the snow with his hoofs, he feeds upon wintergreen and many other green things like mosses and lichens. Early in the spring he gradually works his way toward the shores of lakes and finds there pickerel weed, lily-pads and spatter-dock. From spring to autumn his food consists of numerous herbs, grasses, aquatic plants, leaves of shrubs and trees, and berries of mountain ash and dwarf cornel. By the middle of September the deer in the Adirondack region desert the water courses and retire to more secluded parts of the forest.

The stags when hard pushed are desperate fighters. They are very shy during the period when the antlers are growing, for they are helpless if attacked, since their new antlers are extremely sensitive and tender. Often a pair of rival stags lose their lives in desperate encounters thru the locking of the antlers. They are unable to separate and both miserably perish of exhaustion and starvation.

Deer usually wander about, feeding all the morning, following a more or less direct course according to the lay of the land. Along the foot of a ridge by the edge of a swamp is a favorite feeding ground and they like to trace the windings of a trout brook between low hills. In the middle of the day, they lie down to rest, in the lee of a thick clump of evergreens, where they can watch their tracks for any enemy that may be following them. Before lying down, they make a practice of going back a little distance on their tracks to make sure that they are not followed. Snow on the ground enables one to see the tracks a long way ahead. When alarmed, the deer goes flying off among the trees showing just the white flash of the tail as he disappears.

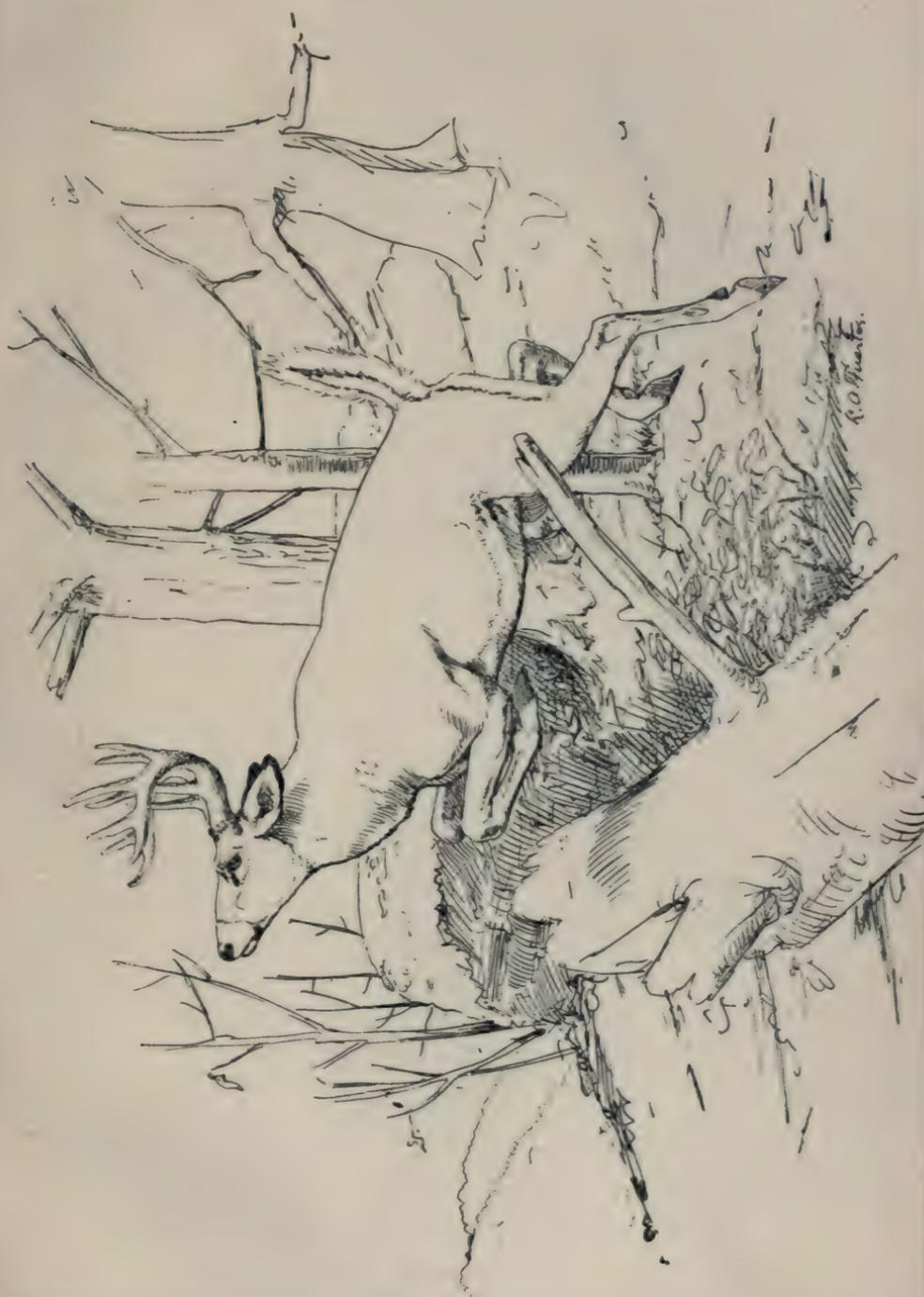
In most European countries, the hunting of deer has for an indefinite period been regarded as the sport of kings. So carefully, indeed were they protected in England, that anyone killing a stag in the king's forest without permission was liable to be put to death. To go out into the forests with the fixed intention of killing anything so beautiful and harmless as a deer, seems brutal and heartless any way you care to look at the matter. One, who has once looked into the liquid eyes of a young fawn or those of its mother and afterwards destroyed one of them, burdens his conscience with a sort of questionable guilt for the rest of his days. Yet the kindest hearted men do so every fall and tho they may learn to hate themselves for every deer they have shot, they cannot

give it up and seem to look forward just as eagerly to the next year's shooting, for there is no other sport to be compared with deer stalking in the autumn woods in the estimation of sportsmen.

Wise laws passed for deer protection have yielded good results more quickly than the most sanguine could have hoped. The laws allow the hunting of deer only at a certain season in the fall and then for only a few weeks. Schuyler Mathews says, "A short time ago there were many complaints coming from farmers, in Vermont and New Hampshire because the deer had made some havoc in the cornfields. I don't know how much of an excuse such complaints were to secure a modification in the strict game laws of both states, but I suspect the average farmer was anxious to get a better chance at a deer. At present the laws are so comprehensive and effectual that the deer has a chance at the farmer, a fact of such slight consequence that I think we have no sufficient reason to regret it."

It is said that in some parts deer are really making decided nuisances of themselves by foraging on the farmers' crops. Of this another writer says, "I trust it is not a far look ahead to the time when it will be true of them where I live. When I see them enjoying all the splendid freedom of wind and sky over the brown pastures or bounding away with tails in the air, I feel that of all the creatures driven away by the early settlers—no other could be so welcome a returner as the wild deer—even if he does prove in a way destructive."

Venison is most palatable and is highly valued for food by the natives of the countries inhabited by deer. Mathews tells of early days (1867) in the Adirondacks when there was little choice of meats at the hotels and camps; there being only pork and venison. On this occasion the bill of fare was like a delightful "theme with variations"—thus: Breakfast, Venison-roast, broiled or fried. Dinner, Venison, fried, broiled or roast. Supper, the same. Later in 1887 on another trip thru the Adirondacks, he found no such word as venison on an elaborate menu with the picture of a deer at the top. At the present time it is usually served during the hunting season—in plenty at certain hotels,—that is, it is then served *under the name of venison*. However I have heard a rumor on different occasions that at certain places—at almost any time of the year—one by ordering plain "roast beef" one is served with probably the finest "roast beef" he had ever yet tasted. However, in my opinion, the law is not violated half as much as some people think, for there are ever watchful guides in the woods who



R. O. Hunter.

look out for the interests of the deer and, fearing nothing, these guides often arrest hunters and large fines result usually.

Although I have never been hunting for deer in my life,—still I have seen them on different occasions. Last summer while fishing on Joe Indian lake in the Adirondacks I saw three different deer come down to the lake to drink and feed upon the lily pads there. There are many first class hunters in my home town and every fall a goodly number of deer are brought in. On one occasion I saw as many as eight to ten deer hung up in a row when a picture was taken of the successful hunters and their game. When in High School on several occasions deer were seen to cross the school grounds and make for some woods a short distance away, a sight to remain long in our memory.

***When the Deer Come Down to Drink**

ARTHUR GUITERMAN

When the deer come down to drink,
Their antlers shake the dark wild cherries;
The moss in which their small hooves sink
Is gemmed with scarlet partridge-berries.

They glide where waves of bracken veil
Some fallen forest king's disaster,
Or Indian-pipe are clustered pale
On stems of moonlit alabaster.

The bucks with proud heads lead the way
Through rocky glade and ferny hollow;
The does, with dappled fawns that play
As softly as their shadows, follow.

Among the oaks a squirrel chirrs;
A porcupine—the lubbard!—lurches
With rattling quills among the firs,
A blue-jay scolds among the birches,—

Then all is still. A furtive mink
Alone steals up through brush and cumber
To watch the deer come down to drink
And feed where water-lilies slumber.

*Printed here by special permission of Harper Brothers, publishers of "The Mirthful Lyre." Mr. Guiterman's most recent volume of poems.



Photo by Verne Morton

Pet Chipmunk filling his cheek pouches with hickory nuts
From *The Pet Book*

Our Pet Chipmunk Uncas and His Relatives

JAY R. TRAVER

Willoughby, Ohio

One of the most interesting subjects in the whole field of nature-study is that of the adjustment of different animals and plants for the particular mode of life they lead. Not the least interesting of the many groups which may be studied in this connection are the smaller mammals, many of them familiar inhabitants of our fields and woods.

Chipmunks are quite common in many places, and make engaging little pets, being easily tamed with a small amount of effort. The chipmunk is usually seen on or near the ground, although he is quite capable of climbing. He does not, however, feel so completely at home in the tree-tops as his close relative the squirrel; on a windy day when the branches are blowing wildly about, the chipmunk clings close to the branch and ventures out for nuts with many signs of care and hesitation in his manner. Meantime the squirrel will swing carelessly from tree-top to tree-top, apparently quite heedless of the wild commotion around him. When chipmunk does venture to get a nut, he carefully sidles down the branch again, removes the shell and quickly stuffs the kernel into his cheek pouch.

A tame chipmunk is a very interesting little pet, from which many instructive lessons may be learned. From the study of one little fellow called Uncas, these observations were made: The chipmunk is a rodent; that is, his teeth are fitted for gnawing, the front ones or incisors, being the most prominent; Uncas ate a great variety of food, including bird seed, breakfast foods of uncooked sorts, toast, orange, apple and nuts of many sorts. He was kept in a large squirrel cage for convenience in studying his habits, and seemed very much at home in his strange dwelling place. A mailing tube fastened across one side of the cage was his bed. Two holes had been cut on the upper side, one near each end; these holes served as entrance and exit, tho Uncas generally kept one hole blocked up and had but one entrance. When tired he would run quickly into the tube, which was partly filled with cotton for his bed, seize a bit of cotton in his mouth, come out again with it, and almost at once dive down again into his tube, then for a few seconds there would be muffled shuffling and scratching heard, from inside

the box, then silence. On one particular occasion Uncas came out of his bed at 10:15, played about briskly for 15 minutes, and then as briskly went to bed again. He had not come out at 10:55, nor would he respond to continued tapping on the mailing tube, other than by discontented scratching.

When first awakened, he was especially active and cunning. After eating he would always go to the water dish for a drink, and would then climb back upon one of his various perches to make his toilet. He washed his face first, much as a cat does, through licking his fore paws, then rubbing them on his face. First he rubbed his mouth, then his nose, gradually working up over and above his nose, licking his paws anew between each rub. He had a habit of scratching his head above the eye with his hind claws, then putting the paw in his mouth and scratching again, repeating the performance several times; the rest of the body was scratched and washed in the same fashion. His tail he combed with teeth and claws.

Uncas had, like all chipmunks, five toes on the hind feet and four toes and a stub on the fore feet; when holding food up to eat, this stub was nearest his sharp teeth. Might it not well be, that the shortness of this toe was a prevention from biting it when thus eating? The food was held between the fore feet when eating, Uncas meantime sitting up on his haunches. He was very neat in his personal habits, using one corner of his cage exclusively for excrement, and frequently washing and combing his whole body. Fresh water is a requisite which must not be overlooked in the care of a caged chipmunk;—he must have it to live.

The wheel in the cage afforded him much amusement. He delighted to leap into it, whirl it rapidly for a few seconds, and just as quickly stop it, apparently using some effort, other than merely to stop propelling it. He was an accomplished acrobat, climbing about on the supports and the bars of his cage with great dexterity, often hanging head downward or performing a circle about one of the bars. When drowsy he would sit on one of the supports with nose close to the board with a dreamy, far away expression in his eyes; then quick as thought, plunge into the mailing tube for a mouthful of cotton, out at once and in again for a nap.

The chipmunk is fitted for life on the ground, and never feels perfectly at home in trees, although to be sure he frequently ventures up them. His fur is soft and not very long. The striking

black and white striping on his back serves as protective coloring; when he sits perfectly still on a stone, it takes sharp eyes indeed to make out the outline of his body. His tail is less bushy than that of his relative the squirrel, for he lives on the ground and a bushy tail would more easily accumulate soil particles. His eyes are remarkably bright and beadlike, his teeth particularly the incisors, very sharp; he is a clever nut hunter, and is very original in finding hiding-places for his nuts. One of the most interesting things about him is the large pouch in each cheek, in which he can carry a surprising number of nuts at once. It is probable that the soil from his burrow is also carried away in these pouches. He clucks like a cuckoo when hunting nuts, and can also chatter, but makes much less noise than a red squirrel.

His burrow, in the bank or side hill sometimes or even on the level ground, is quite narrow at the entrance, and usually close to a root or stick, so that it is difficult to dig down into it. A little below the entrance it widens out into a room, where the chipmunk sleeps. There are usually two or more openings to his burrow. He hibernates during the winter, storing up food for himself in this chamber below ground. About November he retires to his nest, and is not seen again till the following March. Besides the ample supply of nuts, corn and other food, one part of the room is well bedded, that his long winter nap may be comfortable.

Since the chipmunk has no special means of protecting himself against his numerous enemies, save the burrow into which he may run, it is evident that he must be in almost constant danger. Yet the great number of chipmunks which abound everywhere show that these little fellows are adequately holding their own against all odds. Probably the protective markings on the back and the habit of standing motionless when an enemy is sensed have much to do with their success in life.

The chipmunks' special adaptations for the life that he leads are his rather small tail, teeth fitted for eating nuts and other hard food, front feet with one toe merely a stub, his cheek pouches, and his protective color scheme and the habit of storing food for winter. Let us compare the chipmunk with his relative the squirrel, a brother rodent. Here we find a creature distinctly more at home in the tree tops than on the ground, never venturing far from the protective trunk of a tree when it does become necessary for him to visit the ground. The squirrel's fur soft and rather thick, is pro-

tection against the colder weather. His tail is large and bushier than that of the chipmunk, so fluffy as to be a truly beautiful object. Like the chipmunk he uses his fore paws as hands, to hold food and to wash and smooth his fur, the same stub of a toe on the fore foot is seen here, a similar adaptation for safely eating his food.

The squirrel's movements are indescribably quick, and it is indeed a pretty sight to see two or three of them apparently playing tag with each other in a tree. Even the gray, fox, and black squirrels, which are larger than the much more common red, seem equally quick in their movements. Black squirrels are nearly extinct in many parts of the country, and it was with great joy that I watched a dozen or more of these graceful "fur-bearers" enjoying life in a small park where they were zealously protected. Fox squirrels particularly can be quite readily tamed, especially if they live in some park, where every passer-by is almost sure to have a present somewhere about his person, in readiness for the little fellows. They soon learn to come when called in a certain manner, and will clamber up even onto the shoulders of those who feed them most frequently.

In climbing about in a tree the squirrel spreads his legs as far apart as possible, grasping the trunk firmly with his sharp claws. He has certain highways of travel definitely established in his tree-top world, and ventures out of these roads only with great caution. On familiar ground however he seems fearless, and dashes along at a terrific pace, leaping from the limb of one tree to the limb of an adjacent tree, and seeming quite as much at home near the tips of the branches as up nearer the firm trunk. He goes up and comes down a tree always head first, and generally, on the side of the tree away from the observer.

The squirrel like all rodents, has large and strong incisors, fitted for eating nuts, and these teeth must be continually used in gnawing, or they become so long that he cannot eat at all. He is very clever in extracting the meat from the hardest nuts, making two or more small holes over the sections of the nut meats within. He has no cheek pouches in which to store extra food, but has a habit of hiding nuts which he does not need immediately, under leaves or roots, or often in the ground. With his sharp fore claws he digs a little hole puts the nut in and pats the earth down hard, fairly standing on his head to make sure that it is carefully buried.

In spring the squirrel is particularly fond of young green leaf

buds, and clings to the tip-most branches of the maples, eating the buds and perhaps the young keys. In autumn he eats the seeds from pine cones and hunts nuts of all sorts to store away for his winter food. In eating he holds his food like the chipmunk, sitting up on his haunches with his bushy tail curled over his back.

The red squirrel becomes a dingy reddish gray in color, almost inconspicuous when he sits huddled up on a bare branch, looking very like a part of the tree; but his coat becomes brighter as spring approaches and is distinctly red all during the summer. His home is a hole in some big tree, and here the baby squirrels, from four to six in a litter, appear in April. The hole also serves as a store house for food during the cold winter months, tho he comes out on sunny days to find the food he has stored in other trees also.

The red squirrel seems to be almost continually scolding someone for something. You cannot go thru a wood without hearing four or five of these saucy fellows hurling invectives at you from some near-by tree. His scolding voice is at first guttural, and then changes so suddenly to a falsetto key that it is quite amusing.

The flying squirrel is fitted for jumping from one tree to another over considerable distances, because of a membrane stretched loosely between the fore and hind legs, which serves him somewhat as would a little parachute. All squirrels will, if compelled, jump considerable distances, always spreading their legs far apart and extending their tails as much as possible, to offer resistance to the air and break the force of their fall. It has been said that squirrels will cross streams on bits of floating bark, relying on the current or perhaps also on the breeze, the bushy tail held aloft acting as a sort of sail. The special adaptations to life which the squirrel exhibits are his bushy tail, rodent-like teeth which are continually growing, his sharp claws, lithe body and limbs, quick movements and protective coloration.

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Notes on the Blacksnake

HELEN H. HUMPHREY

Claremont, Calif.

The blacksnake is a long slender snake with a very long tail. It cannot be said to be domesticated, although I once knew a minister who kept one on the hay in his barn, and always laid it to one side with the pitchfork when he got hay down, and was quite provoked when a new hired man killed it. He kept it to kill the mice in his barn.

The blacksnake eats birds and birds' eggs, mice and frogs or other small animals which it swallows while they are still alive; it has been called "an omniverous serpent." It climbs trees for birds' eggs and hypnotizes its live prey. This summer I was on a farm and the little eight year old boy came in very much excited and said, "Grandma, there is a snake in the nest next to the setting hen." The grandmother knew the ways of blacksnakes and knew it would try to hypnotize the hen so that it could get under her and steal the eggs. So we all went out armed to kill the thief. Two nests had been made in an orange box turned on its side, placed upon another box five feet high so the snake had to climb to get in it. When we got there, we found the snake and hen both looking at each other very intently around the partition between them, with their heads very near together. The snake was so large that it completely filled the nest as it lay coiled up within it. We killed it; in the middle of its body there was a large lump; then we discovered that the glass nest egg was gone; and then we discovered where it had gone—the snake had swallowed it doubtless regarding it as a real egg. This proves that this snake swallows its food whole with small regard for anything but appearances, and digests it at leisure; if this one had swallowed all the eggs under the setting hen, it could not have moved at all rapidly until it had digested them, as one can easily see. One often hears the saying, "I feel like a snake" after one has eaten a large meal.

The blacksnake is usually diurnal in its habits, although it is out at night sometimes. I know, because one came into our house one night. One summer morning when my sister and I were small, we arose late after every one else was up and working. We were in the upper hall looking at a muddy skirt of mother's which was hung

over a chair, when my sister said to me, "Look, there is a snake in that box!" It was a box of books with only a few left in it. She said it very calmly; I thought she was only joking, as she often made that statement. When I looked lo and behold! there was a blacksnake over three feet long. I was frightened and began to scream, that frightened her so she began to scream. Mother heard us and came home to see what was the matter. Then the hired man came and killed the unwelcome visitor. Mother had been annoyed with a mouse in her room for a long time, but after that night she never heard it again. So we think it must have spent the night in her room and caught the mouse, as blacksnakes are known to be good mousers. To get in it had to climb a tree, come across the porch roof and crawl in through open slats of a blind.

The home of the blacksnake is generally in the edges of meadows, which are fringed with brush, to which it can dart for safety. It lives on the ground mostly although it climbs trees readily for food such as birds' eggs of which it is very fond; this snake is solitary in habits. If you find one, they say its mate is somewhere around, but otherwise I have never heard of two or more being together. They have no regular home, except during the winter, when they hibernate in holes in the ground usually singly.

The blacksnake's head is very interesting, as so many of its features are so different from those of other animals. Its ears are not visible, and are very slightly developed, being very primitive. There is no tympanic membrane developed, so the ability to hear is very slight. But snakes are very sensitive to vibrations, which probably takes the place of hearing. When we see the small beady eyes of sanke, we find it hard to realize that the eyelid is fused over the eye, and that the snake sees through a transparent portion of it. The mouth is more accommodating than it is in the animals with which we are familiar. The right and left halves of the lower jaw are not firmly united and the jaws are loosely attached to the skull and are connected by an elastic ligament. There is a groove in the jaw so the tongue can be thrust out even when the mouth is closed; the tongue is long, slender and deeply notched. The teeth are sharp and recurved, being adapted to force food into the throat. In the case where we found the glass nest egg in the blacksnake, the egg was larger than the head of the creature, and was certainly an extraordinary mouthful. But the bones of the skull in the snake are so arranged that the jaws are extremely mobile, which permits

the swallowing of objects four or five times the diameter of the neck. Since the snake is such a very long animal it has to have a very large number of vertebrae, some have over 400; they also have a large number of ribs.

The tail of the blacksnake is a very important part of its body, it is very long; this is a fact although from its general appearance one cannot tell where the body leaves off and the tail begins. It is all behind the true ribs, but as they are not visible, one would say it is all behind the abdominal scutes, which form a single row of broad scales. The blacksnake's tail helps it to move rapidly, since it braces itself with the tail when it runs.

The whole body of the blacksnake, head, body and tail are covered with scales, which are "smooth and satiny." They act as a splendid protection against obstacles in rapid movement. The adults are uniform slaty black above and beneath, the chin and throat are milky-white. The extent of the white varies with specimens from different localities. Those in the southern states have a good deal more of white than those in the northern states. The young are pale gray with large brown blotches on the back and numerous black spots on the sides. The second summer these markings become less distinct, and the third year they are entirely black.

The blacksnake is very quick in its motions, darting to a place of safety the minute it sees anyone. It is not a constrictor.

The blacksnake lays about a dozen eggs in June or July, usually under a stone or in moist soil. These eggs are elongated and cylindrical in shape. They are snow-white and with a tough, leathery shell. These eggs grow before the young hatch. Ditmars gives an example, where the eggs were $1\frac{7}{8}$ " long and $\frac{1}{16}$ " in diameter when laid on July 16. July 20 they were 2" long and $\frac{7}{8}$ " in diameter. August 15, increased in size, especially in diameter, becoming globular rather than cylindrical. They hatched on September 4th. The little snakes were $8\frac{3}{4}$ " long and $\frac{3}{16}$ " in diameter.

The blacksnake is wary and escapes from its enemies by its very rapid running to some place of safety; it belongs to the Racers and lives up to the reputation of its family by moving with lightening-like rapidity. It can go in very small openings, as well as being a very quick and agile climber.



S. D. Purves.

Grizzly Bear

The Grizzly Bear

LOIS I. WEBSTER

Stanley, N. Y.

The grizzly bear is one of the most interesting of the larger animals. His size and strength, combined with his almost human intelligence, makes him also one of the most feared. In North America his range stretches from the Rocky Mountains of Utah to Alaska. Closely related varieties occur in the Southern Rockies, while a northern ally ranges from Hudson Bay to the Mackenzie and northward.

In appearance the grizzly is heavy and lumbering. The total length of a good specimen is 6 ft. 6 inches. His rough shaggy fur is especially long on the shoulders and flanks and usually it is brownish yellow, darker on the back and legs, the long hair shading into reddish brown. There are many varieties in coloring depending apparently upon the locality. The front claws are much longer than the hind ones and strongly curved. In the spring, when Bruin first awakens, and emerges from his winter den his feet are very tender and he spends much time sucking his paws. This was once believed to be due to hunger after the long fast. His snout also is tender and sensitive at all times, probably to assist him in feeling out the ants which he licks up with one sweep of his big tongue.

In the spring before the mother leaves her winter den, the young are born. They are hairless and very small,—not much larger than chipmunks. Their eyes are closed and their ears are nothing but small lumps. Their mother licks them continually for many days. Aristotle believed that cubs were licked into shape by this process and that without it they would not be well formed bears. When they begin to run around and play they look extremely like adults. The puppy coat is retained as the first winter coat but it is moulted off in masses in early spring.

Some hunters assert that the Grizzly can successfully compete with any other animal. The strength of the forearm is tremendous and combined with the heavy claws makes a formidable weapon. A Grizzly has been known to kill and drag off a bull bison of 1000 or more pounds. However, bear diet is not confined to big game. Mice, insects, berries, wild plums, green fodder in the meadow, toadstools, fish and honey are some of the most prized delicacies of bruin diet.

The habits of the bear are absorbing in their interest. When a grizzly establishes himself in a certain district, he reaches to his full height and leaves his huge claw marks on several trees. It is claimed by some writers that other bears will measure the marks on these trees; if they can reach higher than the bear who made the scratches they set off in search of conquest. If they cannot reach the first claw marks they respectfully leave the domain of the bigger bear unmolested. This habit is observed among other animals, and may explain why a cat standing on its hind legs stretches up a tree and claws the bark.

Bruin's fondness for sweets leads him into many queer places. The camps of the lumbermen are often ransacked in search of molasses; if it is a barrel, the head is knocked in and then the whole barrel rolled out of doors in order to get every drop. If the molasses should happen to be in a jug, it may be carried to the den to be licked often, in memory of the one-time contents. In robbing a bee tree, the bear endures many bee stings before he can get a taste of the honey. But he persists because he knows that once the honey is exposed the bees will leave him alone and attempt to rescue what is possible of their store.

There are as many interesting accounts of encounters with bears as there are people to relate them. In spite of his large size and lumbering gait, a grizzly can walk as noiselessly through a forest as a cat, and can run as fast as a good horse. No bear will touch a dead man, and this knowledge is often useful when a man is surprised and has no chance of escape. As long as he lies motionless he is said to be safe, but we confess we should like the evidence of a witness who had tried it.

As a fisherman the bear is expert. Noiselessly taking up his position on the shore or a log, he waits with unending patience for the approach of a fish. With one swift scoop of his paw he has his prey out of the water. He has also learned how to make frogs jump from the lily pads and will spend hours in annoying them, just for the pleasure of seeing the splash. Along the stream, during the spawning period, the bear watches over some shallow place to scoop up fish that get stranded on the stones.

Bears are very playful and love to romp and roll around like huge puppies. The cubs are taught early to box and become quite adept. If captured while young they make excellent pets and there are many incidences in which they have been taught to do as many tricks and to conduct themselves as tamely as a dog. Once they learn to trust a man their faithfulness is permanent.



The Raccoon.

The Raccoon

GEORGE B. HAPP

Port Jervis, N. Y.

In a fluffy brownish gray coat, the raccoon looks much like a large, plump cat. However, when facing it, its dark splotched face, and when turned, its dark ringed tail aid to tell its identity.

The rather coarse fur of the back, tinged with yellow, the long hairs black tipped, the lighter gray below with long hairs white tipped, and a medium long bushy tail with six or seven bands of dark brown or black alternating with grayish or yellowish white to curl about for extra warmth, serve to keep him snug and warm through the winter as well as covered with a handsome coat through the rest of the seasons.

The black on both cheeks and around the eyes joining a black streak from the forehead to the nose, all against a grayish white background, the black pointed nose, dark eyes, and erect ears, lower back black and whitish above, express sometimes droll playfulness, at other times alert watchfulness. The raccoon is determined and courageous if necessary, however he is also ready for a frolic as those who have had him as a pet have found, where his intelligence and lively interest have made him a general favorite. His five-toed fore and hind feet, the fore feet short and rounded, the hind feet longer, are constantly active, examining everything within reach; with them the raccoon is dextrous and nimble as a monkey. The palms of the feet are very sensitive and aid in distinguishing objects.

The raccoon lives along the wooded shores of streams and lakes. Here its habit of carefully washing and rewashing every morsel before eating is very interesting; this is signified by its scientific name "lotor" or washer; the coon may be seen backed against a log or tree trunk, the food grasped in the hind feet while bits are brought to the mouth with the fore paws. It swims readily if forced to, but usually does not venture farther than the water's edge. Here in the shallow bottom and beneath stones, it finds fresh water mussels, crayfish, frogs, and sometimes fish. In August the luscious ears of ripening corn lead coons to the corn fields. Their troublesome habit of injuring more than they use has caused them to be regarded as harmful by the farmer at this season. It is now that the "wicker" of the raccoon is heard on still nights; a long

drawn quavering "Who-oo-oo-oo," something like the soft mellow note of the screech owl but more squally.

The hind foot of the raccoon makes a track in the soft earth, or roadside dust, or snow that is shaped almost like a miniature human foot with its distinct heel. The fore feet make tracks in pairs, a few inches apart. When walking, the coon steps flat footed; when running, however, he goes on his toes like a dog. The skunk's track is somewhat similar, also having a distinct heel mark, but the toes are not separated as in the raccoon. The woodchuck's track is smaller and shows the thumb mark by the side.

The home of the raccoon is preferably a hollow limb in a tall tree top, or a hollow stub standing or on the ground, or even a hole in a cliff or niche in rocks if none of these are available. Here or in an abandoned nest of squirrel or hawk or even atop a gray barked limb, he spends the daylight hours, for the raccoon is essentially a night traveler, returning to the same retreat usually on the following day.

After the sumptuous foraging of the late fall, the raccoon is in a plump condition to spend his hibernation which begins at the arrival of cold weather. This is usually spent in the den of the past season, where a family of six or eight sometimes remain together. Their rest is apparently quite unchanged during the severe weather; a few warm days often tempt them forth, but they scurry back again at the next cold wave. In the early spring they appear, quite emaciated, and wander forth across the fallen leaf carpet and snow patches while the branches overhead are still quite bare.

The den is the nursery where the young, which looking like kittens; are born they stay there from April or May to June, occasionally appearing at the entrance on bright days to take a sun bath or greet a returning parent, for the father raccoon quite regularly assists the mother in taking care of the family. Later in July they venture forth accompanying their parents in single file, watching and obeying their actions and instructions in excursions to the borders of swamps and streams, and become generally acquainted with coon lore and the part they are to take in woodland events. They sometimes take side excursions but return again to the family shelter, usually remaining together until the following spring.

Although having his home and spending most of the daylight hours in the tree tops, the raccoon moves about much more slowly than does the marten and squirrel. On the ground he shuffles

about in a bear like manner, indeed resembling his relative the Bear in many ways.

The raccoon, *Procyon lotor*, ranges in the wooded parts of eastern North America from Canada and the Rockies to Panama with another species along the Pacific coast.

Burrowing Raccoons

By L. B. CUSHMAN

North East, Pa.

Owing to the scarcity of trees suitable for homes, raccoons hereabouts are occasionally found burrowing in the ground, like woodchucks. George Baker, our fur dealer, tells me the skins of burrowing coons are inferior in quality of their fur. Why this is so is not clear, unless it be that being out of their natural element and surroundings, they are perhaps never in that pink of condition they would otherwise maintain.

Adverse circumstances, like disease, tell on the coat of domestic animals, and naturally they would similarly affect wild ones. It is not that conditions in the ground are not as favorable as those of any other place for the production of fine fur. They doubtless are. The fur of the beaver, otter, skunk, mink and other fur-bearing animals with homes in the ground would indicate this.

The change from a home in a hollow tree to one in the ground would naturally mean a difference in temperature, ventilation, humidity and often of light. So complete a change in surroundings would naturally be expected to lead to results more or less disastrous.

The future outlook for the festive little coon is not bright. The forests are being rapidly cut off, and it is contrary to his nature to be compelled to resort to a hole in the ground for a home.

Autumn Portents

The amber foam creams from the cider flacons,
Backward the shadow of the ground-hog shrinks,
The lanes creak with the laden harvest wagons,
And the fur thickens on the owl-eyed lynx.
The hunter sees cold mist about the moon,
And in the bottom-lands, at morn,
The print of tiny, thievish, fairy hands
Where the raccoon last night went stealing corn.

HERVEY ALLEN—in *Life*.



Woody Woodchuck

Photographed by Helen Riley

Little Woody Woodchuck

A true story for primary pupils by

HELEN RILEY

When I was a very little fellow, mother woodchuck left me one day, and I think something must have happened to her for she never came back. I was frightened and was hiding, when a lady came by and picked me up and brought me home to live with her family. They were very good to me and I talked to them when they fed me fresh clover, and nice warm bread and milk. But they kept me in a box which I did not like at all, so I was always getting out, only to be put back in again. Soon they saw I would not run away, and I was allowed out all the time. Then I was so happy I ran, rolled, jumped and played on the floor just like a kitten.

I grew so fast that I was soon big enough to take care of myself. I chose a place for my bed and made it comfortable with paper, and when I wasn't sleeping I would go out into the fields to eat

clover. But I always listened very carefully. When I heard a noise, I would stand up; and if it were a dog or something I did not know, I would run as fast as I could to my hiding place. Sometimes when I wanted to go into the cabin, the door would be closed; so I dug the clay from between the logs and made a door of my own, so I could always be sure of getting in and out. I also dug a hole under the cabin and went to it during the day. When I heard my friends calling "Woody, Woody, Woody," I came, for they always had some wild strawberries or something very good to eat, then I would play with them. I would bite their fingers, roll over and keep running in and out my hole. On cold days I loved to go in the cabin and stretch myself out on my back as flat as a pancake under the cook stove and warm myself.

Once I went on a trip and stayed for several days. I explored all the deserted cabins and wood piles in the neighborhood. I had one narrow escape. Some boys chased me, I hid in a wood pile; they tore the wood pile down and when they found me I growled so viciously that they were afraid to touch me. Indeed after that I never allowed any strange boys to pick me up. When I returned home I was most contented. I spent most of my time eating and digging my hole deeper and carrying in paper and roots for my bed. I was getting very fat and when it got cold and snowy, I went to sleep and slept all winter long. In the spring I awoke and came out. I think my friends were looking for me for there was some one there who stroked me and fed me a cracker.

A New Periodical from India

In Far India the land to which we have always looked to teach us mercy to animals there has been recently established a new periodical, *The Indian Humanitarian*, which is the official organ of the Bombay Humanitarian League. It is edited by Chaganlal P. Nanavaty. It is published monthly and costs \$.75 a year post paid. The address is 309 Shroff Bazar, Bombay. These first numbers are full of interest from cover to cover for animal lovers. Some of the subjects discussed are Animal Sacrifices, The Innocent Subjects of Sport, Suggestions for Cattle Relief Work in Famine, Help for Humane Legislations in the Councils. This periodical deserves permanent success both for the ideals which it upholds and for its interesting and valuable subject matter.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN
ELEMENTARY SCHOOLS

Published monthly, except June, July and August. Subscriptions price, including membership in the American Nature Study Society, \$1.00 per year (nine issues). Canadian postage, 10 cents extra, foreign postage, 20 cents extra.

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Editorial

DECEMBER

The month of peace on earth and of beautiful woods.

Peace-on-Earth

For a year the world has supposed itself to be out of war and busy making peace. Most of us have been forced to the conclusion that it is a peace of the jungle rather than of civilization that we have been verging towards,—the peace maintained by tooth and claw. But let those of us who have studied Nature's laws take comfort from analogy. Action always brings reaction, and the inertia of great force can be overcome only by time and natural friction after the propelling power has ceased. Nothing can come to a natural end without somehow involving the beginnings of other things. For four years we have witnessed supreme effort to save what seemed most worth while to the human heart; for one year that human heart has seemed to be seething and bubbling over with selfishness and discontent. Fighting ceased toward the enemy then turned its forces inward; the inertia of war found its slow stopping place in the emotions of man. It was all natural and inevitable but we know that somewhere in the confusion and chaos are the beginnings of peace, unselfishness and sweet reasonableness.

December Woods

December has a charm all its own especially before the snow covers all. The browns and the grays of the woodlands are melted into a soft purple that makes a fit setting for the emerald fields of wheat, the red stubble of buckwheat or the fading green of pastures. The russet of the scarlet oaks affords harmonious relief to

the black green of the hemlocks, or the blue green of the white pines. The red cedars stand like living exclamation points in the upland pastures; and the sumac long since stripped of its brilliant foliage now proudly holds aloft its wine colored panicles on its pale gray stems to show that it still has red blood in its veins. The witch hazel throws a network of branches beset with starry flowers athwart the dark background of the deep woods. The pale gray bark of the beech matches the clouds above; the poplars stand stiff and at attention clothed in khaki while the birches show pride in their tatters as does the sycamore in its patches. The mosses under the feet are green and soft and the leaves blown into windrows greet our feet with happy rustlings. Who dares to say that the sere and fallen leaf is sad! It is the merriest of all things. Its work is now done and it plays with the winds and makes new and intimate acquaintances with other leaves in the lee of knolls and fences where they all whisper cozily of the snow blanket that is soon to cover them. The noisy squirrel, the shy grouse, the sociable nuthatches, the cheery chickadees and the bluffing crows all welcome early winter. It is an exquisite season that etches bare branches against skies of varied gray or the crimson glow of sunrise and sunset and it grants full measure of beauty to the eyes of the true seer.

Program of the Meeting of the Nature-Study Society of America

To be held in St. Louis, December 30th, 1919, in the Soldan High School, 11 A. M. to 5 P. M.

Address of the retiring President, Dr. S. H. Schmucker.

The Relation of Nature-Study to the Work of Boys' and Girls' Clubs. Theodosia Hadley, Instructor in Nature-Study in Western State Normal, Kalamazoo, Mich.

The Results of Additional Science Tests in the Grades. Dr. Eliot R. Downing, University of Chicago.

How the Cornell Rural School Leaflet Hopes to Teach Conservation through Nature-Study. E. Laurence Palmer, Professor in Rural Education, Cornell University.

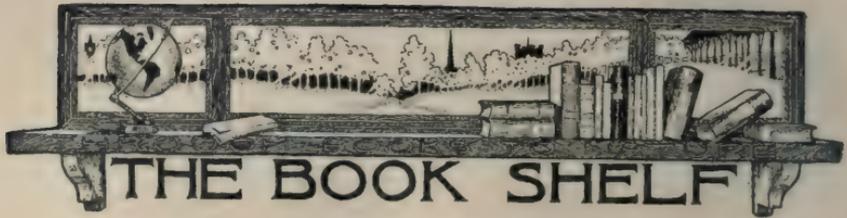
Nature Literature in Relation to Natural Science. Professor Lewis M. Dougan St. Louis, Mo.

The Increasing Use of Nature-Study in Teaching Geography. Anna Botsford Comstock, Assistant Professor in Nature-Study, Cornell University.

The Relation of Elementary Science in the 7th and 8th Grades to Nature-Study Professor B. G. Shackelford of the St. Louis Public Schools.

Informal Talks by Liberty Hyde Bailey and others.

Business meeting which will include the report of the Editor of THE NATURE-STUDY REVIEW and the election of Officers.



God's Wonder World by Cora Stanwood Cobb, the Beacon Press, Boston.

This is a remarkable book written for use in Sunday schools,—a book for religious instruction designed to help the child of nine or ten years to observe the wonders of the world intelligently and to feel their religious quality. The introduction of Nature-Study in the Sunday school has not been an easy task. Every teacher who has tried it has felt that there should be religious instruction accompanying it, some definite teaching to make the child reverence the Maker of this wonderful universe. It has been difficult to accomplish this without making the lessons too "preachy." However, the author of this volume has accomplished the desired combination, most successfully. Each lesson begins with an appropriate verse from the Bible for memorizing, then is given the purpose of the lesson with suggestions for the teacher and for work for the pupils; then follows an opening talk which may be read or told during the class period. Supplementing this teacher's book are leaflets for the children, forty of them, beautifully illustrated, each containing an interesting story about the subject of the lesson and with blank sheets for mounting specimens or for making drawings and an outline for work for the pupil to report upon later. There is also a lesson outlined in Bible study. While the whole course is planned for children of nine it can be used most successfully with younger or older pupils. The scope of the lessons is shown by the following titles: "Beauty in God's world: The clouds, Earth's garment of green, The blossoming plants, Plants sowing their seeds, The trees, How plants live together, The earth our storehouse, The ants, The spider, The Bees, Moths and butterflies, Toads, bats and owls, Humble helpers, The birds, Animal friends, The dog, Beavers, As it was in the beginning, The work of the rain, The work of the rain: Brooks and rivers, Snow, ice and frost, Minerals and crystals, Earth's underground storehouse, God's wonderful mountains, Life comes upon the world, Fossils, How our coal was made, More wonders from Nature's Book, The story that a scratched rock tells, Man comes upon the Earth, Man's progress: The working hands and Thinking Mind, Man's progress: Growth in religion, Man's progress: The written word, The story of steam, The story of electricity, Searchers after Nature's Truths, God's gift of sunlight, The solar system, The stars, and The torch bearers."

This volume and its leaflets should be in every Sunday School in the United States—for they are full of inspiration, interesting facts and religious feeling to both teacher and pupil.

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