



INTRODUCTION TO PLANT-STUDY



WILDFLOWERS



WEEDS



CULTIVATED CROPS

ANNA COMSTOCK'S

# HANDBOOK OF NATURE-STUDY

Handbook of  
Nature-Study:  
Wildflowers, Weeds and  
Cultivated Crops

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*White mountain laurel*

## How to Begin the Study of Plants and Flowers



THE only right way to begin plant study with young children is through awakening their interest in and love for flowers. Most children love flowers naturally; they enjoy bringing flowers to school, and here, by teaching the recognition of flowers by name, may be begun this delightful study. This should be done naturally and informally. The teacher may say: "Thank you, John, for this bouquet. Why, here is a pansy, a bachelor's button, a larkspur and a poppy." Or, "Julia has brought me a beautiful flower. What is its name, I wonder?" Then may follow a little discussion, which the teacher leads to the proper conclusion. If this course is consistently followed, the children will learn the names of the common flowers of wood, field and garden, and never realize that they are learning anything.

The next step is to inspire the child with a desire to care for and preserve his bouquet. The posies brought in the perspiring little hand may be wilted and look dejected; ask their owner to place the stems in water and call attention to the way they lift their drooping heads. Parents and teachers should very early inculcate in children this respect for the rights of flowers which they gather; no matter how tired the child or how disinclined to further effort, when he returns from the woods or fields or garden with plucked flowers, he should be made to place their stems in water immediately. This is a lesson in duty as well as in plant study. Attention to the behavior of the thirsty flowers may be gained by asking the following questions:

1. When a plant is wilted how does it look? How does its stem act? Do its leaves stand up? What happens to the flower?
2. Place the cut end of the stem in water and look at it occasionally during an hour; describe what happens to the stem, the leaves, the blossom.
3. To find how flowers drink, place the stem of a wilted plant in red ink; the next day cut the stem across and find how far the ink has been lifted into it.



*Colorado blue columbine aquilegia*



## How To Make Plants Comfortable



NOTHER step in plant study comes naturally from planting the seeds in window-boxes or garden. This may be done in the kindergarten or in the primary grades. As soon as the children have had some experience in the growing of flowers, they should conduct some experiments which will teach them about the needs of plants. These experiments are fit for the work of the second or third grade. Uncle John says, "All plants want to grow; all they ask is that they shall be made comfortable." The following experiments should be made vital and full of interest, by impressing upon the children that through them they will learn to make their plants comfortable.

*EXPERIMENT 1.* To find out what kind of soil plants love best to grow in— Have the children of a class, or individuals representing a class, prepare four little pots or boxes, as follows: Fill one with rich, woods humus, or with potting earth from a florist's; another with poor, hard soil, which may be found near excavations; another with clean sand; another with sawdust. Plant the same kind of seeds in all four, and place them where they will get plenty of light. Water them as often as needful. Note which plants grow the best. This trial should cover six

weeks at least and attention should now and then be called to the relative growth of the plants.

*EXPERIMENT 2. To prove that plants need light in order to grow.*— Fill two pots with the same rich soil; plant in these the same kind of seeds, and give them both the same amount of water; keep one in the window and place the other in a dark closet or under a box, and note what happens. Or take two potted geraniums which look equally thrifty; keep one in the light and the other in darkness. What happens?

*EXPERIMENT 3. To show that the leaves love the light*— Place a geranium in a window and let it remain in the same position for two weeks. Which way do all the leaves face? Turn it around, and note what the leaves have done after a few days.

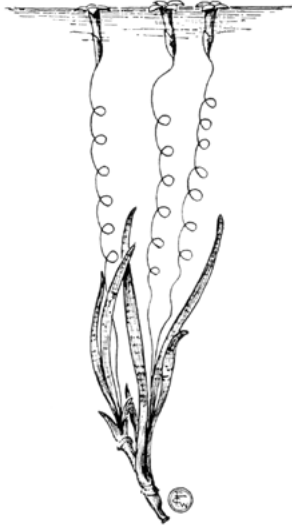
*EXPERIMENT 4. To show that plants need water*— Fill three pots with rich earth, plant the same kinds of seeds in each, and place them all in the same window. Give one water as it needs it, keep another flooded with water, and give the other none at all. What happens to the seeds in the three pots?

The success of these four experiments depends upon the genius of the teacher. The interest in the result should be keen; every child should feel that every seed planted is a living germ and that it is struggling to grow; every look at the experiments should be like another chapter in a continued story. In the case of young children, I have gone so far as to name the seeds, “Robbie Radish” or “Polly Peppergrass.” I did this to focus the attention of the child on the efforts of this living being to grow. After the experiments, the children told the story, personating each seed, thus: “I am Susie Sweet Pea and Johnny Smith planted me in sand. I started to grow, for I had some lunch with me which my mother put up for me to eat when I was hungry; but after



*A terrarium. Various plants can be grown, and many kinds of insects, reptiles or amphibians can be perfectly at home in a terrarium that is suitable sized.*





*Eel grass, Vallisneria. A quiet-water plant, eel grass produces its male flowers under water, its female flowers bloom at the top. When mature, the male flowers float to the surface, where pollination occurs; the female flowers are then retracted to mature the fruits under water. This plant is the favorite food of canvasback ducks*

the lunch was all gone, I could find very little food in the sand, although my little roots reached down and tried and tried to find something for me to eat. I finally grew pale and could not put out another leaf.”

The explanations of these experiments should be simple, with no attempt to teach the details of plant physiology. The need of plants for rich, loose earth and for water is easily understood by the children; but the need for light is not so apparent, and Uncle John’s story of the starch factory is the most simple and graphic way of making known to the children the processes of plant nourishment. This is how he tells it: “Plants are just like us; they have to have food to make them grow; where is the food and how do they find it? Every green leaf is a factory to make food for the plant; the green pulp in the leaf is the machinery; the leaves get

the raw materials from the sap and from the air, and the machinery unites them and makes them into plant food. This is mostly starch, for this is the chief food of plants, although they require some other kinds of food also. The machinery is run by sunshine-power, so the leaf-factory can make nothing without the aid of light; the leaf-factories begin to work as soon as the sun rises, and only stop working when it sets. But the starch has to be changed to sugar before the baby, growing tips of the plant can use it for nourishment and growth; and so the leaves, after making the starch from the sap and the air, are obliged to digest it, changing the starch to sugar; for the growing parts of the plant feed upon sweet sap. Although the starch-factory in the leaves can work only during the daytime, the leaves can change the starch to sugar during the night. So far as we know, there is no starch in the whole world which is not made in the leaf-factories.”



*Birch trees. Although these birches grow in clumps, several trunks from a common root, observe that the trunks soon separate widely, thus providing abundant light for the leaves*

This story should be told and repeated often, until the children realize the work done by leaves for the plants and their need of light.

*“The clouds are at play in the azure space  
And their shadows at play on the bright green vale.  
And here they stretch to the frolic chase;  
And there they roll on the easy gale.*

*“There’s a dance of leaves in that aspen bower,  
There’s a titter of winds in that beechen tree,  
There’s a smile on the fruit and a smile on the flower,  
And a laugh from the brook that runs to the sea.”*

—BRYANT.

# How To Teach the Names of the Parts of a Flower and of the Plant

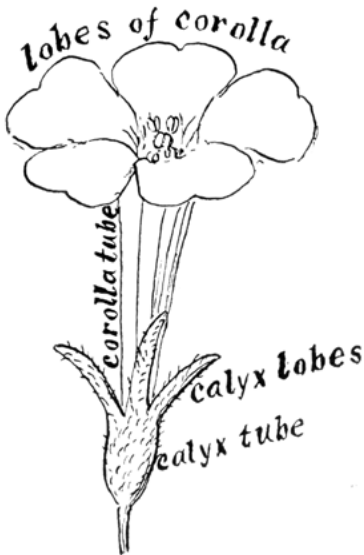


THE scientific names given to the parts of plants have been the stumbling block to many teachers, and yet no part of plant study is more easily accomplished. First of all, the teacher should have in mind clearly the names of the parts which she wishes to teach; the illustrations here given are for her convenience. When talking with the pupils about flowers let her use these names naturally:

“See how many geraniums we have; the corolla of this one is red and of that one is pink. The red corolla has fourteen petals and the pink one only five,” etc.

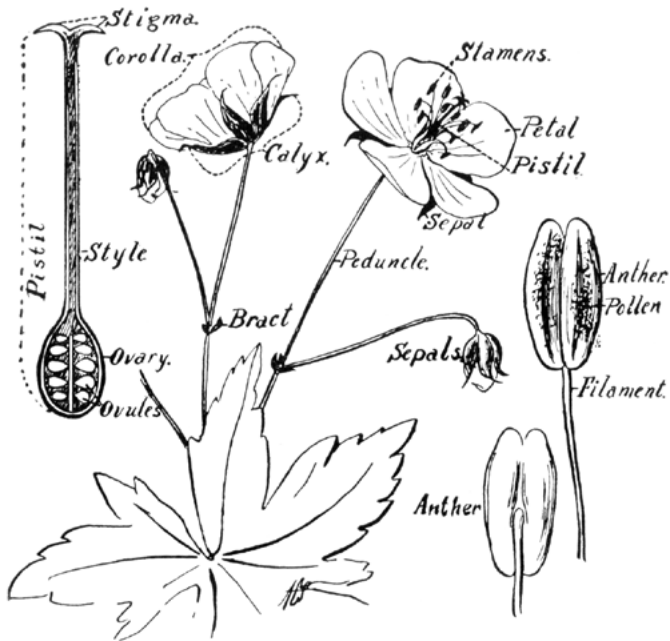
“This arbutus which James brought has a pretty little pink bell for a corolla.”

“The purple trillium has a purple corolla, the white trillium a white corolla; and both have green sepals.”



A flower with petals united forming a tube, and with sepals likewise united.

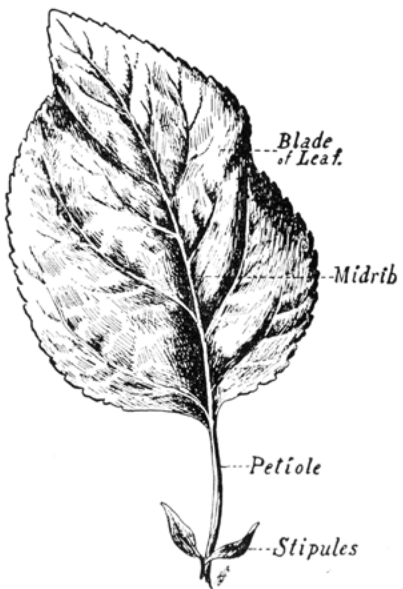
The points to be borne in mind are that children like to call things by their names because they are *real* names, and they also like to use “grown up” names for things; but they do not like to commit to memory names which to them are meaningless. Circumlocution is a waste of breath; calling a petal a “leaf of a flower” or the petiole “the stem of a leaf,” is like calling a boy’s arm “the projecting part of James’ body” or Molly’s golden hair “the yellow top” to her head. All the names should be taught gradually by constant unemphasized use on



A flower with the parts named

the part of the teacher; and if the child does not learn the names naturally then do not make him do it unnaturally.

The lesson on the garden, or horseshoe geranium with single flowers, is the one to be given first in teaching the structure of a flower since the geranium blossom is simple and easily understood.



A leaf with parts named.



*Pomegranate fruit*

## Teach the Use of the Flower



FROM first to last the children should be taught that the object of the flower is to develop seed. They should look eagerly into the maturing flower for the growing fruit. Poetry is full of the sadness of the fading flower, while rightly it should be the gladness of the flower that fades, because its work is done for the precious seed at its heart. The whole attention of the child should be fixed upon the developing fruit instead of the fading and falling petals.

*“In all places then and in all seasons,  
Flowers expand their light and soul-like wings,  
Teaching us by most persuasive reasons,  
How akin they are to human things.”*

—LONGFELLOW.



*Honey bee collecting pollen from a flower. The bee can carry pollen from one flower to another*

## Flowers and Insect Partners



It is undoubtedly true that while the processes of cross-pollination and the complicated devices of flowers for insuring it can only be well taught to older pupils and only fully understood in the college laboratory, yet there are a few simple facts which even the young child may know, as follows:

1. Pollen is needed to make the seeds grow; some flowers need the pollen from other flowers of the same kind, to make their seeds grow; but many flowers also use the pollen from their own flowers to pollenate their ovules, which grow into seeds.

2. Flowers have neither legs like animals nor wings like butterflies, to go after pollen; so they give insects nectar to drink and pollen to eat, and thus pay them for fetching and carrying the pollen.

I taught this to a four-year-old once in the following manner: A pine tree in the yard was sifting its pollen over us and little Jack asked what the yellow dust was; we went to the tree and saw where it came from, then I found a tiny young cone and explained to him that this was a pine blos-



*Butterflies are also great pollinators*

som, and that in order to become a cone with seeds, it must have some pollen fall upon it; and we saw how the wind sifted the pollen over it and then we examined a ripe cone and found the seeds. Then we looked at the clovers in the lawn. They did not have so much pollen and they were so low in the grass that the wind could not carry it for them; but right there was a bee. What was she doing? She was getting honey for her hive or pollen for her brood, and she went from one clover head to another; we caught her in a glass fruit jar, and found she was dusted with pollen and that she had pollen packed in the baskets on her hind legs; and we concluded that she carried plenty of pollen on her clothes for the clovers, and that the pollen in her baskets was for her own use. After that he was always watching the bees at work; and we found afterwards that flowers had two ways of telling the insects that they wanted pollen. One was by their color, for the dandelions and clovers hide their colors during dark, rainy days when the bees remain in their hives. Then we found the bees working on mignonette, whose blossoms were so small that Jack did not think they were blossoms at all, and we concluded that the mignonette called the bees by its fragrance. We found other flowers which called with both color and fragrance; and this insect-flower partnership remained a factor of great interest in the child's mind ever after.



*Pollen on a bees leg as it visits flowers*

*“Roly-poly honey-bee,  
Humming in the clover,  
Under you the tossing leaves,  
And the blue sky over,  
Why are you so busy, pray?  
Never still a minute,  
Hovering now above a flower,  
Now halfburied in it!”*

—JULIA C. R. DORR.

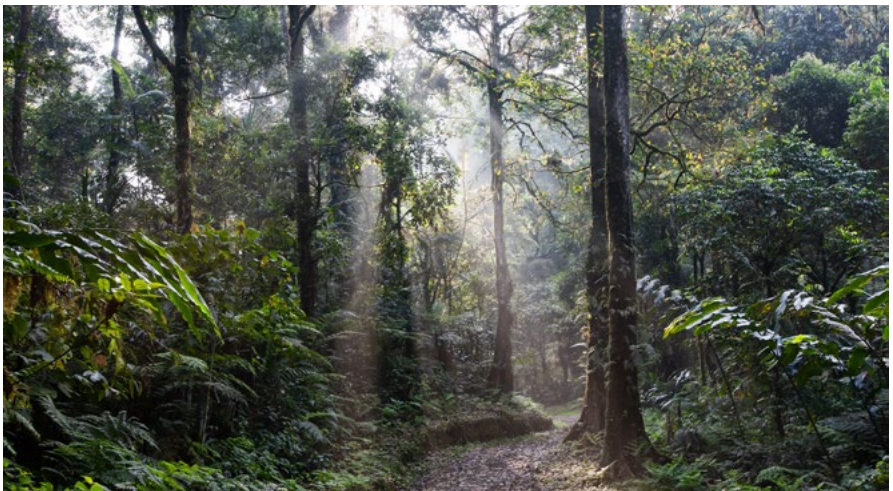




## The Relation of Plants to Geography



HERE should be from first to last a steady growth in the intelligence of the child as to the places where certain plants grow. He finds hepaticas and trilliums in the woods, daisies and buttercups in the sunny fields, mullein on the dry hillsides, cat-tails in the swamp, and water lilies floating on the pond. This may all be taught by simply asking the pupils questions relating to the soil and the special conditions of the locality where they found the flowers they bring to school.



*The plants found in a mountain forest (top) and a rainforest (above) are very different*



*Newly germinated plants. See the seed shell still stuck to the tips of the original leaves*

## Seed Germination

Less than three decades ago, this one feature of plant life once came near “gobbling up” all of nature-study, and yet it is merely an incident in the growth of the plant. To sprout seeds is absurd as an object in itself; it is incidental as is the breaking of the egg-shell to the study of the chicken. The peeping into a seed like a bean or a pea, to see that the plant is really there, with its lunch put up by its mother packed all around it, is interesting to the child. To watch the little plant develop, to study its seed-leaves and what becomes of them, to know that they give the plant its first food and to know how a young plant looks and acts, are all items of legitimate interest in the study of the life of a plant; in fact the struggle of the little plant to get free from its seed-coats may be a truly dramatic story. (See “First Lessons with Plants,” Bailey, page 79). But to regard this feature as the chief object of planting seed is manifestly absurd.

The object of planting any seed should be to rear a plant which shall fulfill its whole duty and produce other seed. The following observations regarding the germination of seeds should be made while the children are eagerly watching the coming of the plants in their gardens or window-boxes:

1. Which comes out of the seed first, the root or the leaf? Which way does the root always grow, up or down? Which way do the leaves always grow, no matter which side up the seed is planted?



*Seeds can be germinated almost anywhere. Here an egg carton has been used*

2. How do the seed-leaves try to get out of the seed-coat, or shell? How do the seed-leaves differ in form from the leaves which come later? What becomes of the seed-leaves after the plant begins to grow?

*References—* First Lessons with Plants, L. H. Bailey; First Lessons in Plant Life, Atkinson; Plants and their Children, Dana; Plants, Coulter; How Plants Grow, Gray; How Plants Behave, Gray.



*A hazelnut seedling*