

**THE**  
**“LOOK ABOUT YOU”**  
**Nature Study Books**  
**BOOK II**



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Nature Study Books

BOOK II

by

*Thomas W. Hoare*

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## PREFACE

Every lesson herein set down has, during the author's many years' experience in teaching Nature Study, been taught by observation and practice again and again; and each time with satisfactory result. The materials required for most of the lessons—whether they be obtained from the naturalist-dealer or from the nearest hedge, ditch, or pond—are within everybody's reach.

There is nothing that appeals to the heart of the ordinary child like *living things*, be they animal or vegetable, and there is no branch of education at the present day that bears, in the young mind, such excellent fruit as the study of the simple, living things around us.

Your child is nothing if not curious. He wants to understand everything that lives and moves and has its being in his bright little world.

Nature Study involves so many ingenious little deductions, that the reasoning powers are almost constantly employed, and intelligence grows proportionately. The child's powers of observation are stimulated, and his memory is cultivated in the way most pleasing to his inquiring nature. By dissecting

seeds, bulbs, buds, and flowers, his hand is trained, and methods expeditious and exact are inculcated. By drawing his specimens, no matter how roughly or rapidly, his eye is trained more thoroughly than any amount of enforced copying of stiff, uninteresting models of prisms, cones, etc., ever could train it.

The love of flowers and animals is one of the most commendable traits in the disposition of the wondering child, and ought to be encouraged above all others.

It is the author's fondest and most sanguine hope that the working out of the exercises, of which this booklet is mainly composed, may prove much more of a joy than a task, and that the practical knowledge gained thereby may tempt his little readers to study further the great book of Nature, whose broad pages are ever open to us, and whose silent answers to our manifold questions are never very difficult to read.

T. W. H.





## CHAPTER I

# HOW PLANTS TAKE FOOD FROM THE SOIL, PART I

Uncle George had taught his little friends many things from what he called the Book of Nature, and what they had learnt made them eager to know more.

One day as Dolly, the boys, and Uncle George were in the garden they saw that a tulip, which the day before was in full bloom and strong, was now lying dead on the ground.

“Poor little tulip!” said Dolly. Both the boys were sorry too. They had watched it come through the ground like a blade of grass, open out its bud, and expand its bloom. Now all was over. The little flower would no longer enjoy the bright sunshine or the rain. It would no longer send forth its rootlets in search of the food it so much liked.

“Have you ever thought, Dolly, how the tulip, and indeed all plants, take their food from the soil?” asked Uncle George.

“I know they *must* feed in some way,” said Dolly, “or they would not grow. But I do not know how they do it.”

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“Should you like to know, Dolly?” asked Uncle George.

“Indeed I should,” said the little girl.

The boys were just as eager as Dolly to know about this, so Uncle George and the children went indoors for a lesson.

“I cannot tell you how plants take their food from the soil without first of all showing you what happens when water and soil are mixed together in a tumbler,” said Uncle George. “Tom will fetch me a tumbler, and you, Frank, bring me a little water.”

When these were brought, Uncle George put a spoonful of soil into the tumbler, and then poured some water on it. “Stir it up, please, Dolly,” said Uncle George, “and you may pretend you are going to make a pudding.” Dolly did so.

“Now let us put it aside for a few minutes, while we place the flowers we have gathered into the vases,” said Uncle George. “Then we will look at our tumbler of muddy water.”

How pretty the flowers were made to look! How fresh they were! and how pleasant was their scent! The children hardly thought of the tumbler, but Uncle George was ready now for the lesson.

“Look! look, at the tumbler,” said he. “Do you see a change?”

“Indeed we do,” said all the children in one voice.

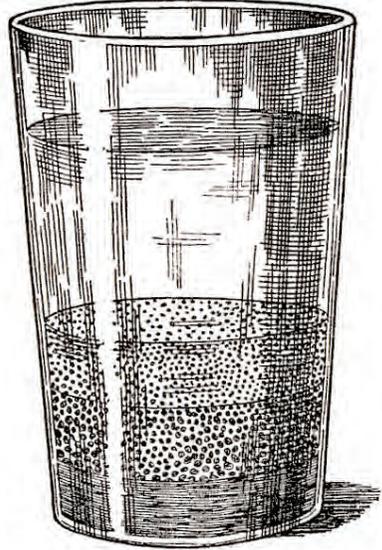
“The mud has sunk to the bottom of the glass,” added

## HOW PLANTS TAKE FOOD FROM SOIL

Tom, “and the water on the top is clear.”

Uncle George poured some of the clear water into a clean flat dish. Then he took a spirit-lamp from a little cabinet, and heated the water in the dish with it.

The children watched to see what would happen. Soon a cloud was seen over the dish, and by and by all the water had gone.



*Glass of Mud and Water*

“But what is that at the bottom of the dish?” asked Uncle George.

“It looks like powder,” said Frank.

“And it must have been in the water all the time,” added Tom.

“And yet the water was clear,” said Uncle George. “Look once more.”

As he spoke, Uncle George took a glass of clean water from the tap. He put two large spoonfuls of salt in, and stirred it up. “You see,” he said, “the salt has gone from sight. Still the water is clear. Where has it gone?”

“Into the water,” said Tom.

Uncle George put more salt in the water, and stirred it up. He kept on doing this until the water would take

up no more salt, no matter how much it was stirred. This he called *brine*.



*Evaporating Salt Water*

“Now, Frank, please go and ask mother for a fresh egg,” he said, “and you, Tom, please bring me some fresh water in another glass.”

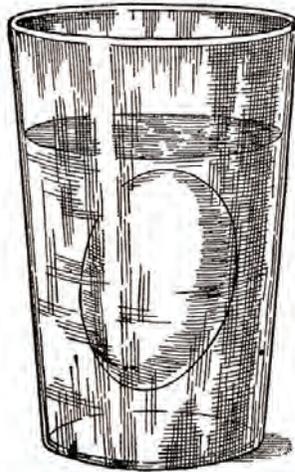
Uncle George placed the egg in the glass in which the salt had been put, and it floated in it. He then placed the egg in the glass of fresh water, and it at once sank to the bottom.

“Can you explain this!” he said.

“The salt water is heavier and thicker than the fresh water. That is why it bears up the egg,” said Frank.

“That is very good indeed, Frank. That is just the reason. The salt water or brine is *denser*, or heavier, than the other.”

Uncle George next took a glass tube with a thistle-shaped bulb at the end of it.



*Egg floating in Salt Water*

## *HOW PLANTS TAKE FOOD FROM SOIL*

Frank kept his finger on the small end, while his uncle poured some of the brine into the bulb. He next tied a piece of bladder skin over the bulb, and placed it in a glass of fresh water, so that the salt water in the tube was at the same level as the fresh water in the glass.

Then he took two small glass bottles. He filled one with fresh water and the other with brine, and tied a piece of bladder skin over the mouth of each. The one which was filled with brine he placed in a larger dish of fresh water. The other, that is the one filled with fresh water, he placed in a dish of brine.

“Now, children, we will go and have tea,” he said, “and when we come back we will see if any change has taken place.”

About an hour later Uncle George, Dolly, and the boys came back.

“Oh,” said Frank, “look, Uncle George! The water has risen up in the thistle tube.”

“Yes, how do you account for that, Frank?”

“Some of the fresh water has passed through the skin,” Frank answered.

“Now taste the water in the glass outside the skin,” said Uncle George. “It was fresh water when we put it in, wasn’t it?”

Frank did so. Tom tasted it too. Both boys declared that it was now salt.

“Where did the salt taste come from?” their uncle asked.

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“It must have come through the skin,” said Tom. “Then some of the salt water in the thistle tube has passed through the skin into the glass; and some of the fresh water in the glass has passed through the skin into the thistle tube. Can you tell me any more?”

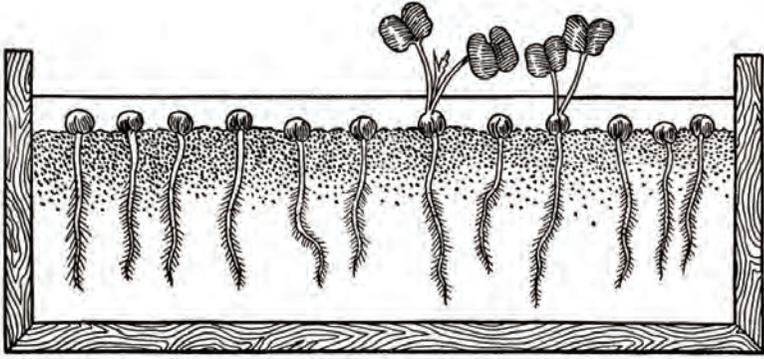
Frank thought for a little while and then said, “Oh yes, more fresh water than salt water has passed through the skin, because the salt water is now far up the tube.”

“Quite right, my boy. Now let us look at the small bottles. The skin on the one filled with brine is swollen out like a ball, while the water in the dish tastes salt. The skin of the other is drawn far in, showing us that much of the fresh water which it contained has passed out. If you taste the water in this bottle, you will find that a very little of the brine in the dish has passed into it through the skin.

“Now what we learn from these things is really this—that when two liquids, a heavy and a light one, are separated by a thin skin, they *both* pass through the skin. The heavy liquid passes through slowly, and the light liquid passes through quickly.”

Uncle George then placed some small seeds on a piece of wet blotting-paper. He turned a glass tumbler upside down, and placed it over them.

“We will leave these for a few days,” he said.



*A Box of Mustard Seeds*

## CHAPTER II

# HOW PLANTS TAKE FOOD FROM THE SOIL, PART II

A whole week went by before Uncle George was ready for the next lesson.

At last he called the children and said to them—“Tom, will you please fetch me the seeds which we put on the wet blotting-paper under the tumbler? Frank, bring me two leafy branches from a rose-bush in the garden and, Dolly, please fetch two glasses from the kitchen.”

Now there was nothing the children liked better than to help their Uncle George, and all three rushed off at once to do his bidding.

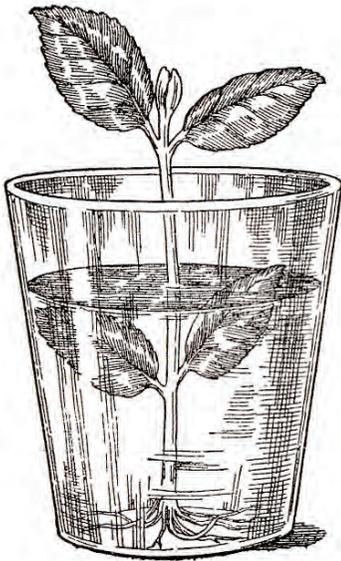
While they were away Uncle George himself went into the garden, dug up two young plants, and brought them to the children in the study.

“Now, children,” said Uncle George, “we are ready

to begin our lesson. Fill one of the glasses with water, Frank, and put one of your leafy rose branches in each glass—one branch in water and the other in a dry glass. Can you tell me what will happen to the branches?”

The children had many times seen what had happened to flowers when the maid had forgotten to put water in the vases, so that Tom readily said, “Yes, the

one in the dry glass will wither, while the one in the water will keep fresh for some time.”



*Sun-flower Plant in Water*

“How do you know that?”

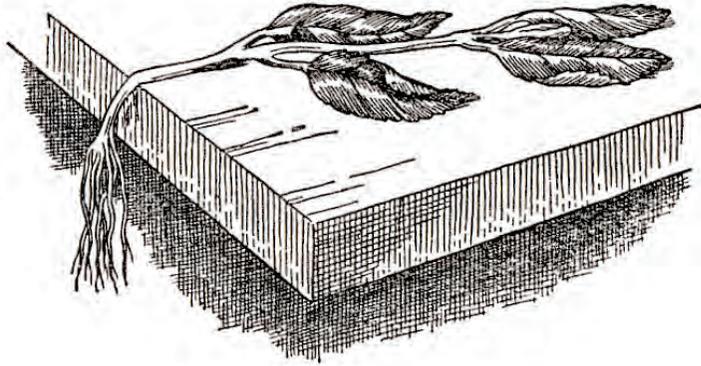
“Because it always happens, Uncle,” said Frank. “Why, sometimes the flowers we gather in the wood are faded before we get home. They often come back to life when put in water.”

“You are quite right, Frank,” Uncle George replied. “See, here are two young sun-flower plants, which I brought in from the garden. I placed one in water. The other I left lying on the table. The one on the table is dead. What does this show us?”

“That plants require water,” said Tom. “That whenever you cut off their water supply they die.”

“Quite right, Tom. We shall see by and by that plants

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*The Sun-flower, faded*

are always giving off a great deal of water to the air from their leaves. Where do they get this water from?"

"It must be from the soil," said Frank.

"It must be," said Uncle George. "If we keep a plant in a pot without watering it, it soon dies. All the water it contains will by and by travel up to the leaves. It passes out through tiny pores in the leaves into the air. If no more water comes up from the soil, the plant withers and dies. The roots of plants search the soil in all directions for water. And in this water there is but little plant-food. We saw this when we boiled away the clear water which covered the soil in the glass.

"If we boil away some water from the tap, we shall find some solid matter left behind in the dish. Thus we see that in order to get a *small* quantity of food, plants take up a *great* quantity of water from the soil. Most of the water is sent into the air from the leaves. But the food stuff remains in the plant, just as it did in the dish.

"Now I am going to show you how this water gets

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into the plant. Look at these little seeds on the damp blotting-paper!

“Each seed has a small plant with a long root, and small, stout green leaves. Look at the roots and tell me what you see?”

“They are covered with silky stuff,” said Frank.

“Yes. Now take this glass, which will make things look bigger than they really are, and look at the roots once more.”

“The silky stuff is a number of fine hairs,” said Frank.

“That is quite right, Frank,” said Uncle George. “These are the *root-hairs*. Each of these hairs is a long bag or sac, of very thin skin. It is filled with a liquid called *sap*, which is slightly denser, or heavier, than the water in the blotting-paper. Now, do you see how a plant takes food from the soil, when it is growing in the garden or in a field?”

“Yes, I think I do,” said Frank. “The water in the soil contains very little plant-food. The water inside the tiny sac contains very much.”

“And what have you to say, Tom?”

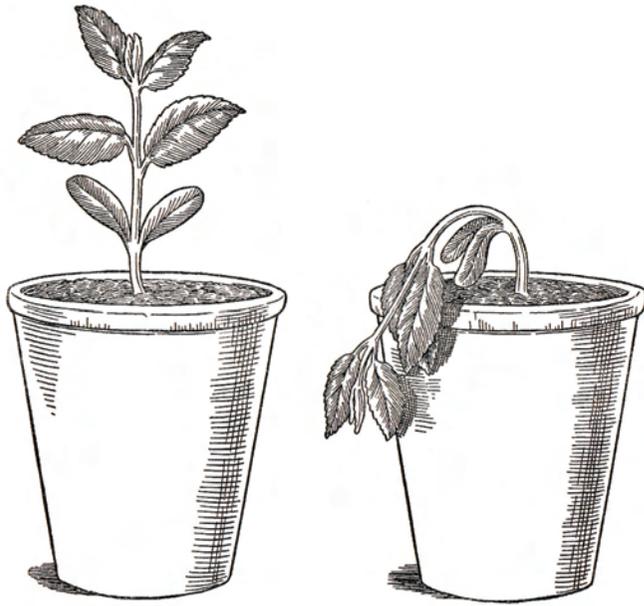
“One of these liquids is denser than the other,” said Tom. “Both are separated by a thin skin. The lighter liquid outside the sac will pass into it quickly, while the heavier liquid will pass out slowly.”

“Bravo! Tom!” said Uncle George. “I couldn’t have given a better reply myself. The water from the soil passes in quickly. The sap from the inside of each

## *HOW PLANTS TAKE FOOD FROM SOIL*

root-hair passes out slowly. If they were both of the same density, neither would pass through the skin. If the water in the soil were the denser, then the sap would pass out so quickly that the plant would soon be robbed of its water.

“Here are two young plants, each growing in a small pot. I want you to water them, Tom. Water one with salt and water (brine), the other with tap-water.”



*Plants watered with Fresh and Salt Water*

Tom did as he was asked.

“See,” said Uncle George, “the one which you watered with brine is drooping. It is bending over the pot. That is because the water outside its root-hairs is denser than that which is inside the plant.”

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“How does the water get up from the roots to the leaves?” Frank asked.

“Just in the same way as the oil travels up the wick of the lamp. Water will always travel up through small spaces.”

Uncle George poured some red ink into a saucer, and dipped the corner of a lump of sugar into it. The red ink ran up into the sugar until it was red all over. Next he took a bundle of very small glass tubes, and dipped the ends of them in the ink. The ink ran up the tubes, filling them to the top.

“Inside every plant,” Uncle George went on, “there are thousands of long tiny tubes, up which the water travels. In fact the *veins* of a leaf are just bundles of tubes, something like the bundle I hold in my hand.”