

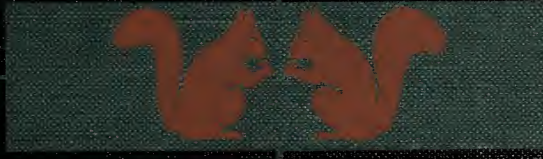


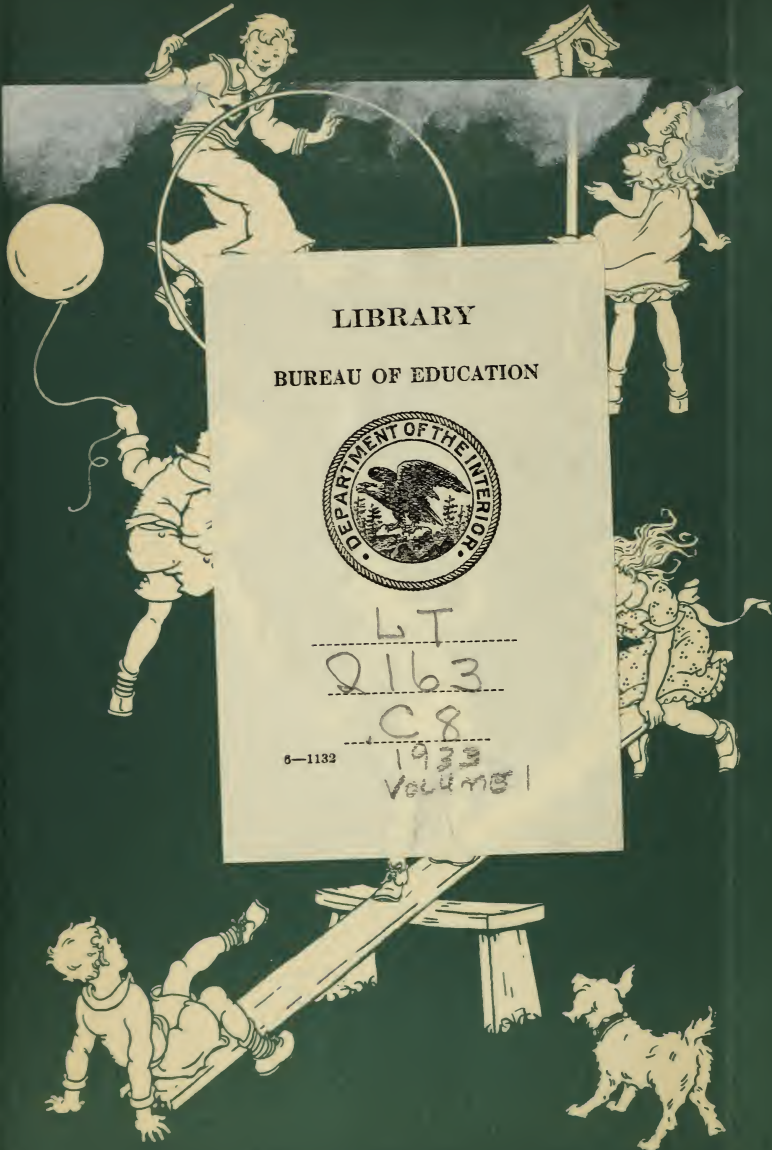
PATHWAYS IN SCIENCE  
WE LOOK ABOUT US



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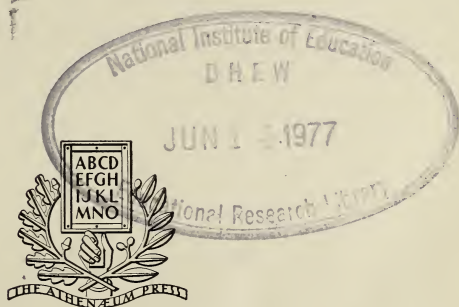
# We Look About Us

By GERALD S. CRAIG

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in Kindergarten—First Grade Education  
Teachers College, Columbia University*



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## Preface

"We Look About Us" is the first book in the series Pathways in Science.

It is planned to meet the needs of young children who are "looking about," touching, manipulating, experimenting, and asking questions in an effort to "find out."

The stories are for the most part actual records of the experiences of real children. The material represents a wide range of interests, many of which are given further consideration in the later books of this series. In each case the aspect of the experience which is most vital and significant at this stage of the child's development is emphasized. The child's learning, as should always be the case, is the result of "thinking through" a problem with the guidance of a teacher.

These stories will duplicate the experiences of many children, and for all children they will awaken interests. "Things to Do" or "Things to Think About" will help to direct these interests into worth-while activities which will result in the beginnings of scientific learning. For the most part the experiences recorded in these stories can be duplicated in any school. Very little material is required for this purpose, and it is material which should be included in every child's environment. The information given is accurate and simple, and just enough to answer the child's questions or to help him solve his problems, at the same time leaving him with a desire for

further observation and investigation. After "looking about" he may have an increased desire to "find out."

Special care has been taken to keep the text within the reading ability of first-grade children by checking the vocabulary with the Buckingham-Dolch Word List and with lists of words commonly found in primers. As he reads the book the child's vocabulary will be enriched by learning a number of terms used in science.

"We Look About Us" is accompanied by a teachers' manual which is designed to treat first-grade science in a professionalized manner.

The text conforms to the recommendations and the spirit of the Thirty-first Yearbook, Part I, of the National Society for the Study of Education and to the requirements of recent state and city courses of study in elementary science.

The authors wish to acknowledge their indebtedness to Dr. B. R. Buckingham for the encouragement and advice that he has given in this undertaking.

G. S. C.

A. B.

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# Contents

UNIT	PAGE
I. ALL AROUND US	3
THINGS THAT LIVE	5
THINGS THAT DO NOT LIVE	19
II. ANIMAL HOMES	31
AN ANIMAL HOME AT SCHOOL	33
ANIMAL HOMES IN THE OUT-OF-DOORS	42
III. AIR AND WATER	57
A JOKE ON THE BOYS	59
SAILING BOATS	65
THE SIPHON	74
WHAT HAPPENS TO WATER	78
IV. HEAT AND COLD	87
WINTER DAYS	89
THE SNOW MAN	100
THE SUN AND SHADOWS	110
V. WORKING WITH MACHINES AND MAGNETS	117
MOVING THE PLAYHOUSE	119
LOADING THE BOAT	127
THE MAGNET	132
VI. ABOUT ANIMALS	141
ANIMALS' TAILS	143
ANIMALS' EYES	155
VII. THE GARDEN	163
MAKING THE GARDEN	165
VISITORS COME TO THE GARDEN	176





**WE LOOK ABOUT US**



UNIT I

**All Around Us**

**Things that Live**

**Things that do not Live**





---

## THINGS THAT LIVE

### Animals

Tom and Jack are brothers.

They go to school.

They are in the first grade.

Mary is their friend.

She goes to school, too.





Tom and Jack and Mary have many friends at school.

Miss White is their teacher.

Miss White and the children have good times at school.

What do you think they do?



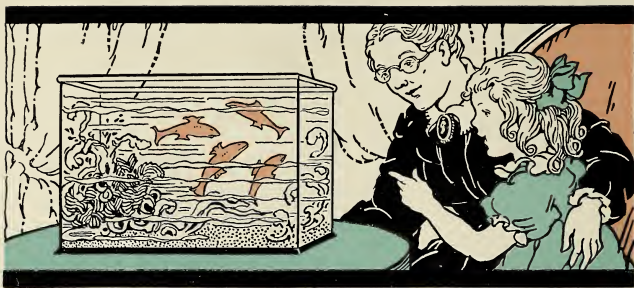
One morning the children found a surprise at school.

It looked like a glass box.

“What is it?” asked Tom.

“Who brought it?” asked Mary.

“What is it for?” asked Jack.



Miss White looked happy.

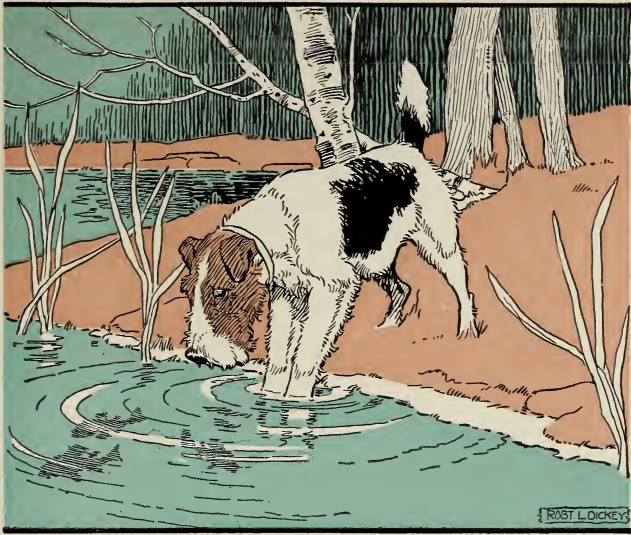
She said: "It is an aquarium. I brought it.

"I thought it would be fun to have some animals in school. So I brought the aquarium for the animals."

"My grandmother has an aquarium," said Alice. "But she does not have animals in it. She has fish in her aquarium."

Miss White laughed. "Yes, Alice, your grandmother has animals in her aquarium. Fish are animals," she said.

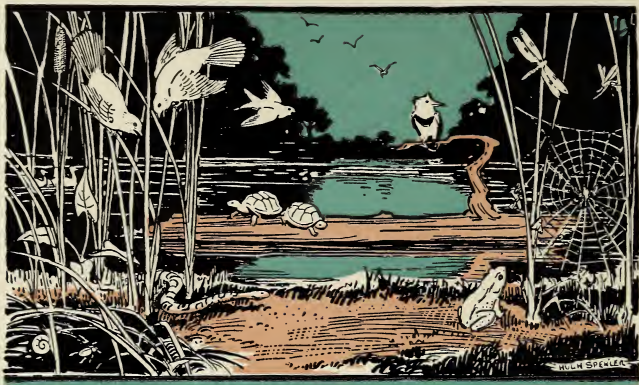




“Oh,” said Alice, in surprise, “are fish animals? They are not like cats and dogs.”

“No,” said Miss White. “Fish are not like cats and dogs. But they are animals.”

“There are many different kinds of animals. There are large animals and small animals.”



“Are birds animals?” asked Jean.

“Yes, birds are animals,” said Miss White.

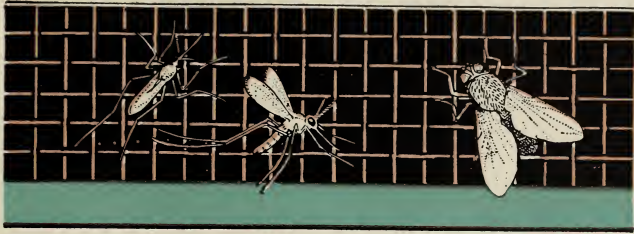
“What about snakes?” asked Tom.

“Are they animals?”

“Yes, snakes are animals, too,” said Miss White.

“What about frogs and toads and snails?” asked Mary.

“Frogs and toads and snails are animals,” said Miss White.



“I know something that is not an animal,” said Jack.

“What is it?” asked the children.

“A fly,” said Jack. “My father says flies are insects.”

“Your father is right, Jack,” said Miss White. “Flies are insects, but insects are animals. So a fly is an animal.”

“Do you know any other insects?”

“A mosquito is an insect, too,” said Jean. “We have screens on our house. Mother says they keep out insects. They keep out flies and mosquitoes.”



“There are many other kinds of insects,” said Miss White. “Ants and bees are insects. And all insects are animals. There are many kinds of animals.”

“They all look different,” said Mary.

“Oh, yes,” said Jack. “Birds are animals and they have feathers. Bears are animals and they have fur. A giraffe is an animal and it has hair.”

Just then Jack saw an ant on the window sill.

“Here is a very, very little animal. Miss White, are there any animals smaller than an ant?” asked Jack.

“Yes, Jack,” said Miss White. “Some animals are much smaller. They are so small that many people have never seen them.”

“We have forgotten about the aquarium,” said Alice. “Are we going to get the animals today?”

“No,” said Miss White, “not today.”



### *Things To Do*



Make an animal book. Put in it pictures of as many different animals as you can find.





## Plants

“Let us talk about animals again,” said Jack. “I like to talk about animals.”

“So do I,” said Tom.

“It is strange, but nearly all things are animals,” said Jack.

“No,” said Miss White, “many things are not animals.”

“Is everything that is alive an animal?” asked Alice.

“No,” said Miss White. “I see something in this room. It is alive, but it is not an animal.”

“Alive, but not an animal,” said the children, as they looked around the room.

Then Alice said: “I see it. It is the plant on the window sill.”

“Yes,” said Miss White. “It is the plant. And I see another plant when I look out of the window.”

“Do you mean the tree?” asked Jack.

“Yes,” said Miss White. “All trees are plants.”

“Some plants are very big,” said Jean.

“We have a big tree in our yard. It is higher than our house.”



“I know that some plants are tiny,” said Alice. “We planted some grass seed in our yard. By and by it came up. But it was so tiny we could hardly see it.”

“My mother planted some flower seeds,” said Mary. “She thought they would not grow. Then one morning she found some little plants. They were so tiny that I could hardly see them.”

“There are plants that are smaller than that,” said Miss White. “You must look through a magnifying glass to see them.”

“What is a magnifying glass?” asked Jean.

“A magnifying glass makes things look large. It helps us to see things,” said Miss White.



“I wish we had a magnifying glass,” said Jack.

“My father has a magnifying glass,” said Mary. “I will ask him if I may bring it to school.”

“We could not live without plants,” said Miss White. “We eat plants every day.”

“We had some plants for lunch today,” said Alice. “We had carrots.”

“Rabbits eat carrots, too,” said Tom.  
“They eat lettuce and cabbage, too.”

“Robins always eat our strawberries,”  
said Jean.

“Cows and horses eat grass,” said  
Mary.

“Some fish eat the plants in the  
water,” said Miss White. “We eat  
plants, and a great many other animals  
eat plants.”



### *Things to Do*



Make a plant book. Put in it  
pictures of as many different plants  
as you can find.

## THINGS THAT DO NOT LIVE

One day the children were playing a game at school.

It was an animal game. It was Jack's game.

He said: "I am thinking of an animal that flies. What is it?"

"Is it a robin?" asked Mary.

"No," said Jack.

"Is it a bee?" asked Alice.

"No," said Jack.

"Is it an ant?" asked Jean.

"No," said Jack.

"Oh, I think I know what it is," said Tom. "It's a stone."

How the children laughed!

"Well, a stone flies in the air when I throw it," said Tom.

“But it is not alive,” said Jack. “So it is not an animal. I don’t think it is a plant, either.”

“Is a stone a plant, Miss White?” asked Mary.

“No,” said Miss White. “Stones are not plants or animals. They are not alive. Plants and animals are alive.”

The children forgot to play Jack’s game.

They began to talk about things that are not alive.

“Is air a plant or an animal?” asked Mary.

“It moves when the wind blows. It pushes when it blows. It is strong. Sometimes it nearly pushes me over.”

“Air is not a plant or an animal. It is not alive,” said Miss White.



“Many things are not alive. Water and air are not alive. The ground is not alive.

“Air and water move about. The water moves in the river. But it is not alive. Not everything which moves is alive.”

“There are many things in the world,” said Jack. “But only plants and animals are alive.”



## Stones

One day something happened on the playground.

The girls were playing games. Some of the boys were throwing stones.

A stone hit Mary on the arm.

When Miss White heard what had happened, she called the children to a meeting.

“How did Mary get hit?” she asked.

Jack said: “We were throwing stones



at a box. We did not mean to hurt any one. My stone slipped and hit Mary. I am sorry.”

“Where did you get the stones?” asked Miss White.

“We found them on the way to school,” said Jack.

“I like to find stones,” said Tom.

“So do I,” said Jack.

“It is fun to look for stones,” said Miss White. “I did it when I was a little girl.

“Let us not throw any more stones. We might hurt some one. I know something much better to do with them.”

“What is it?” asked the children.

“The next time you have some stones I will tell you,” said Miss White.

The next day many boys and girls brought stones to school.

“What a lot of stones!” said Miss White.

“There are large stones and small ones.

“There are round stones and flat ones.

“Some stones are rough, and some are smooth.

“Where did you get them?”

“I found mine in the garden,” said Mary.

“I found mine down by the river. It was near the water,” said Jack. “I saw lots of stones there.”

“I found mine in the yard,” said Tom.

“I found mine on the playground,” said Jean.



“What shall we do with them, Miss White?” asked Tom.

“Let us wash them,” said Miss White.

“Wash them?” asked the children in surprise.

“Yes,” said Miss White. “I should like to see how they will look when they are washed.”

Jack got a large pan of water.

One by one the stones were washed.



“Look at my stone! Look at my stone!” said Mary.

“It is beautiful.

“It has shiny spots on it. I did not see the shiny spots before.”

“I thought mine was brown, but now it is dark red,” said Jack.

“Mine is white, with a pink spot in it,” said Jean.

“What a pretty one!” said Tom. “Look! It has something shiny like diamonds in it.”

“Are they diamonds, Miss White?” asked Jean.

“No,” said Miss White. “There is something in that stone which we call mica. It is the mica that makes the stone shiny.”

“This stone is dark red on one side and brown on the other,” said Jack.

“I wonder what it looks like inside,” said Miss White.

“Do you want to see the inside?” asked Jack.

“Yes,” said Miss White.

Jack went to the work table. He hit his stone with a hammer. He had to hit it three times before it broke.



"It is red and brown inside, too," said Jack.

"Look, Miss White, I think it is pretty, don't you?"

"I want to see what mine looks like inside, too," said Tom.

"So do I. So do I," said the other children.

Some of the stones were very hard.



They were so hard that Miss White could not break them.

Some of the stones were very easy to break.

When Mary hit her stone, it broke into little pieces.

The pieces looked just like sand.

"Your stone is called sandstone," said Miss White, "because it is made of sand."

"I like the stone with black spots in it," said Mary.

"I like the white one with a red line running through it," said Tom.

"I am not going to throw my stone away. It is too pretty," said Jean.

"Let us keep the pretty ones. I like to look at them," said Tom.

"So do I," said Alice.



“Miss White, may we have a place for our stones?” asked Jack.

“Yes,” said Miss White. “I think stones are pretty. Other people may like to see them, too.”

“We’ll call it the First Grade Museum,” said Mary.



### *Things to Do*



1. Look for beautiful stones.
2. Look for flat stones.
3. Look for round stones.
4. Look for other interesting things.

## UNIT II

# Animal Homes

**An Animal Home at School**

**Animal Homes in the Out-of-Doors**



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## AN ANIMAL HOME AT SCHOOL

### The Aquarium

“Are we going to get our animals today?” asked Jean one morning.

“No,” said Miss White. “Today we shall get their new home ready.

“We must wash the aquarium. We must clean the sand. We must put clean water in it.”

Alice and Jean washed the aquarium. Then they dried it. They made it shine.

“Now our animals can see out,” said Jean.

Mary and Ann cleaned the sand. They put some sand in a pan. They put water in the pan too. They stirred the sand. This washed it.



“Now we are ready for the sand,” said Miss White. “Tom, you may put it into the aquarium.”

“How much shall I put in?” asked Tom. “Shall I make it half full?”

“No,” said Miss White. “Put in just enough to hold the plants. There, that is enough.”

“Here I come with the water,” said Jack.

He put a pail of water into the aquarium.

"That is not enough water," said Miss White. "Put in another pail."

So Jack put another pail of water into the aquarium.

"Now may we get the fish, Miss White?" asked Tom.

"No," said Miss White. "The water is too cold. It would not be good for fish. The water will get warm today because the air is warm.

"Tomorrow we shall buy the fish."

"Oh, good!" said the children.

"We shall buy plants too," said Miss White.

"And maybe we shall buy some snails and tadpoles too.

"Won't it be fun!"



## At the Store

The next morning Miss White and the children went to the store.

It was Mr. Smith's store. He was glad to see the children.

"Well, boys and girls, what can I do for you today?" asked Mr. Smith.

"We have an aquarium at school," said Mary. "We want to buy some goldfish."

"Very well," said Mr. Smith. "How many do you want?"

The children looked at Miss White.

"Our aquarium is large enough for two tadpoles, three fish, and three snails," said Miss White.

"Then we want three goldfish," said Mary.



“We want three snails,” said Tom.

“We want two tadpoles,” said Alice.

“Is there anything else?” asked Mr. Smith.

“We want some plants,” said Jack.

“Did you bring a jar to carry the fish in?” asked Mr. Smith.

“No,” said Mary. “We shall have to carry them in our hands. We will be very careful.”

“You should never touch fish,” said Mr. Smith. “They will die if you carry them in your hands. Fish must live in water.”

“What shall we do?” asked Tom.

Mr. Smith said: “I will give you a little pail. I will put some water in it. Then you can carry the fish to school.”

“How can fish live in water?” asked Mary. “How can they breathe? We can not live in water.”

“I can swim,” said Jack. “Father taught me to swim.

“I could not breathe under the water. He taught me how to breathe. I had to put my nose into the air.

“Do fish put their noses out to breathe?”



Mr. Smith said: "All animals need air. The fish is an animal. It needs air. It gets air from the water. There is air in the water."

"If there is air in water and a fish can breathe in water, why can't I?" asked Jack.

"You do not breathe like a fish," said Mr. Smith. "You have lungs. You breathe with your lungs."

“A fish has gills. It breathes with its gills. A fish can breathe the air in water, but it can not breathe in the air. Do you know why?”

“Yes,” said Jack. “A fish can not breathe in the air because it does not have lungs.”

“You are right,” said Mr. Smith. “A fish can not live out of water.”

Mr. Smith put water into a pail.

He put the fish in the water. He put in the snails and tadpoles too. He put the plants in a bag.

Miss White gave Mr. Smith some money.

“Good-by, children,” said Mr. Smith. “Come to see me again.”

“Good-by, Mr. Smith,” said the children.

The children went back to school.  
They put the plants into the sand.  
Now the plants could grow.

They put the animals into the  
aquarium.

The fish began to swim.

The tadpoles wiggled about.

The snails crawled on the plants.

They all seemed to like their new  
home.



### *Things to Do*



1. Why can a fish swim better than you can?
2. Watch a fish swim.
3. Watch a tadpole swim.
4. Do they swim in the same way?





## ANIMAL HOMES IN THE OUT-OF-DOORS

### Water Homes

One morning Tom was watching the animals in the aquarium.

The fish were swimming around and around.

A snail was going slowly up the side of the aquarium.



The tadpoles were on the sand at the bottom of the aquarium.

By and by the large tadpole began to swim.

Then Tom was surprised.

He called Miss White.

He called the children.

“Oh, look at our tadpole! He is growing into a frog. His legs are beginning to grow.”

“I see them,” said Mary. “I see a tiny leg on each side of his body.”

How excited the children were!

Mary and Jack wanted to watch the tadpole all day. They wanted to see his legs grow.

But Miss White said: “It will be a long time before the tadpole grows into a frog.

"When he is a frog we must make the aquarium a good home for him."

"What do you mean?" asked Jack. "Isn't the aquarium a good home now?"

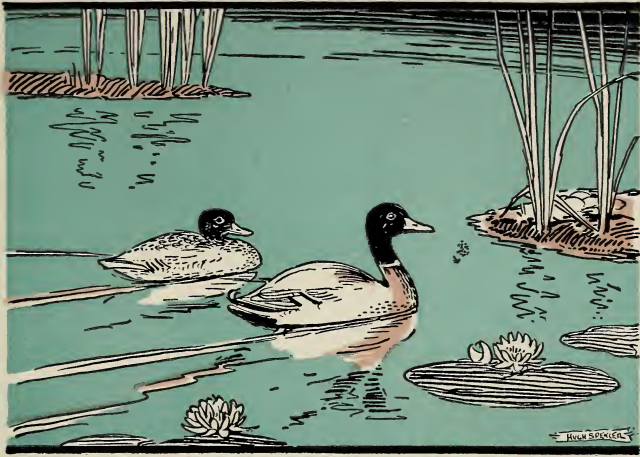
"It is a good home for a tadpole," said Miss White.

"A tadpole lives in the water all the time. But sometimes a frog comes out of the water. The aquarium will not be a good home for a frog."

"When he is a frog we can put a big stone in the aquarium," said Jack. "Then he can come out of the water and sit on the stone."

"Will the aquarium be a good home for him then?" asked Tom.

"Yes," said Miss White. "Frogs live both in water and on land."



“I know another animal that lives in water and on land,” said Jack.

“What animal is it?” asked Miss White.

“A duck,” said Jack. “Once I saw a duck’s nest. It was in the grass near a pond. The ducks were swimming in the water.”

“Ducks have skin between their toes. That helps them to swim.”

“I know another animal that lives in water and on land,” said Miss White.

Then she told them about the beaver.

Not one of the children had ever seen a beaver.

Miss White had a picture of a beaver. He was swimming in the water. His home was in the water, too. Some of it was above the water.

“That is where the beaver sleeps and makes his home,” said Miss White. “He can swim very well. He can swim better than he can walk. That is why he goes into the water when any one comes near.”

“My dog can swim,” said Tom. “Sometimes I throw a stick into the water. My dog swims after it.”



“Yes,” said Miss White, “a dog lives on the land, but he can swim too.”

“Some animals can not live on the land. Some animals can not live in the water. Some animals live in water and they live on land too.”

“We must not forget to make the aquarium a good home for a frog.”



## Homes of Ants

One day Miss White said, "Do you want to make another animal home?"

"Yes," said the children. "But what animal home may we make?"

Miss White smiled. "I should like to make a home for ants," she said.

"Oh," said the children. "That will be fun."



"I know where to find some ants," said Jean. "There is an ant hill on the playground. I saw many ants there yesterday."

"Very well," said Miss White. "Let us go to the playground."

"Mary, you may carry this glass jar. Tom, you may carry the spade."

Jean was right. There was the ant hill on the playground.

"Now, Tom," said Miss White, "take a spade full of soil from the ant hill. Put it into the jar."

There were many ants in the soil.

Tom put the soil in the glass jar. He put the ants in too.

The glass jar was filled with soil and ants. Mary carried it back to school.



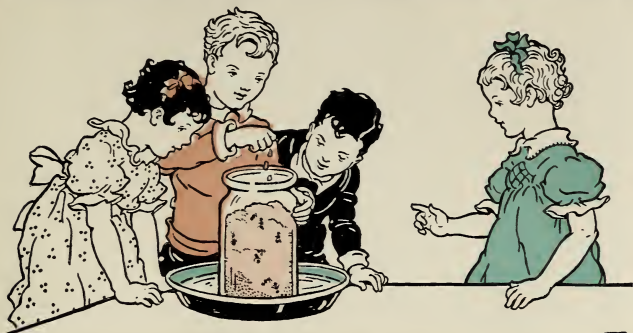


“Now,” said Miss White, “we must get a pan of water.”

“What do you want water for?” asked Tom.

“We want water so that the ants will stay in the jar,” said Miss White. “Ants can not live in water. We shall put the jar in the water. The ants can not go across the water. They will have to stay in the jar.”

Soon the ants were working hard. They made little holes in the soil.



lot

They made an ant hill in the jar.  
They were making a home.

“What else do we do?” asked Mary.

“We must give the ants food,” said  
Miss White.

The children gave them sugar and  
bread crumbs. The ants carried the  
food into their holes.

“Now the jar is a good place for  
them to live,” said Miss White. “It  
is as good as the playground.”



## Other Homes in the Ground

One day Miss White and the children talked about other animals that live in the ground.

"A woodchuck makes his home in the ground. He comes out to look for food. He eats plants," said Miss White.

"A chipmunk lives in the ground," said Mary. "One lives near our house. He comes out to look for food, too."

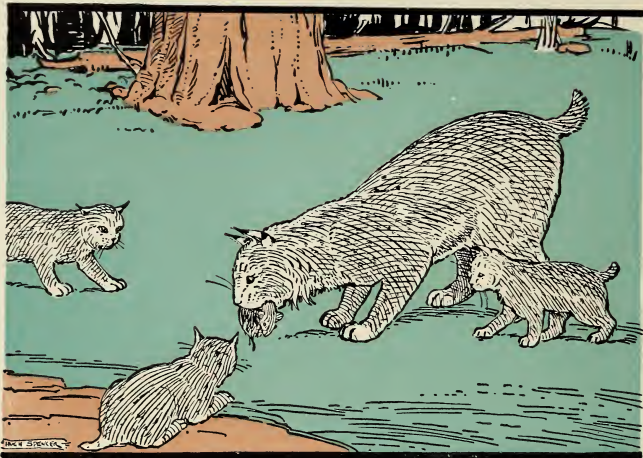
“Many animals live in the ground,” said Miss White. “Some make their homes. Others find holes to live in.

“Many snakes live under stones. When it grows cold, they go to sleep. They sleep in holes under big stones.

“The earthworm lives in the ground. After a rain he comes out of his house. The ground is too wet.

“When the cold days come, he goes deep into the ground. He gets away from the cold.

“The mole makes his nest in the ground. He makes the nest out of grass. He eats worms and insects that he finds in the ground. He does not need to come out of the ground for his food.”



## Homes Above the Ground

“Many animals live above the ground. They never go into the ground. They do not live in the water either,” said Jack.

Jean said: “Our cat lives above the ground. She lives with us.”

Miss White said: “Our cats are not wild. But there are wild cats. They make their homes in the woods.”

“Dogs live above the ground,” said Jack. “We have a dog. I am making a dog house for him. He can’t make his house.”

“A long, long time ago,” said Miss White, “dogs did not live with people.

“They were wild. They lived in the woods. Then they made their own homes. They dug holes with their feet. They lived in holes in the ground. •

“A long, long time ago horses and cows were wild. They did not live on farms.

“Horses did not work for man. Cows did not give milk to boys and girls. Now they live on farms.

“Animals that fly about live above the ground, too.”





## *Things to Think About*



Do you know some animals that can not live in the air?

Do you know some animals that can swim?

Guess these riddles.

1. It is an animal.

It can not live on land.

It can swim.

It has gills.

What is it?

2. It is an animal.

It has soft fur.

It lives above the ground.

It does not like the water.

What is it?

Make some more riddles.

**UNIT III**

**Air and Water**

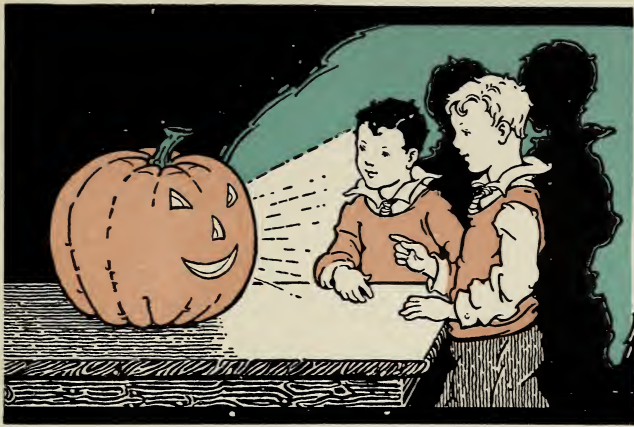
**A Joke on the Boys**

**Sailing Boats**

**The Siphon**

**What Happens to Water**





## A JOKE ON THE BOYS

It was Halloween. Jack and Tom had a jack-o'-lantern.

"Let us scare Father with the jack-o'-lantern," said Jack. "It is getting dark. He will soon be home."

Tom put the jack-o'-lantern on a table. Mother lighted the candle.

The jack-o'-lantern smiled at them. How funny it looked!

Jack and Tom hid behind a big chair. They waited and waited.

All at once the light in the jack-o'-lantern went out. The room was very dark.

"Where are you?" asked Jack.

"Here I am!" said Tom.

"Did you blow out the light?" asked Jack.

"No, I thought you did," said Tom. "It must have been the wind."

"I will shut the window and ask Mother to light the candle again," said Jack.

Mother lighted the candle.

Once more the jack-o'-lantern smiled with its funny mouth. Jack and Tom hid and waited for Father.

What do you think happened?

The light grew smaller and smaller and then went out again.

"There must be a Halloween goblin in this room," said Jack very softly.

"I am scared," said Tom.

"So am I," said Jack.

The two boys ran out of the room. Outside the door they met Father. He had just come home.

"What is the matter, boys?" asked Father. "Why are you running?"

"We are running from a goblin," cried the boys.

Then they told Father what had happened. He was not scared at all.

He said: "It can not be a goblin. There are no goblins.

"Let us go back and find out why the light went out.



“There must be a reason for it. There is always a reason for things that happen.”

They all went back into the room.

As soon as Father saw the jack-o'-lantern, he said: “I know why the light went out. It went out because it did not have enough fresh air. Fire must have air to burn.

“The eyes and nose and mouth of your jack-o'-lantern are too small. They do not let in enough fresh air.”

“Oh,” said Jack. “We did not think of that. We just wanted to make a funny jack-o'-lantern. Now we can't have fun with it.”

“Yes, you can,” said Father. “Just cut an air hole in the top of the jack-o'-lantern.”



Father helped Tom to cut the air hole. He lighted the candle again.

This time it burned brightly and did not go out.

“The next time that you want to make a jack-o’-lantern,” said Father, “remember this. Cut the eyes and nose and mouth larger.

“You must let the fresh air get in fast enough to keep the candle burning.”

“That is a good thing to remember,” said Jack. “If the candle goes out, a jack-o’-lantern is not much fun.”



*Things to Do*



1. Light a candle.  
Put a glass jar over it.  
What happens?  
Do you know why?
2. Light a candle.  
Put a small glass jar over it.  
Light another candle.  
Put a large glass jar over it.  
Which candle goes out first?  
Can you tell why?

## SAILING BOATS

### Making the Boats

Every one in Miss White's room was busy.

Jack was sawing wood.

Mary was hammering nails.

Tom was cutting cloth.

They were all making boats.

"I am going to put a large sail on my boat," said Tom. "I want a very fast boat."

"I wish we had some water in school. I should like to try my boat," said Jack.

"You may have some water," said Miss White.

"I mean a lot of water, like a pond," said Jack.

"You may take the sand out of the sand box," said Miss White. "Then you may put water into it. We will use it for a water tank."

"Oh, good!" said Jack. "That will be as good as a pond."

Soon Jack's boat was finished.

"Now I will get the water," he said.

"My boat is finished, too," said Tom. "Isn't it a good boat, Miss White? Look at the big sail."

"It looks like a fine boat. But I should like to see it in the water," said Miss White.

"Now I will help Jack," said Tom.

The boys put ten pailfuls of water into the sand box.

"It's deep enough now," said Jack. "Let us sail the boats."



Jack put his boat into the water.

"I'll be the wind," said he.

He blew on the sail.

Whoop, whoop, whoop, went the wind.  
It pushed against the sail. The boat  
began to move.

When the wind blew, the boat  
moved. When the wind stopped, the  
boat stopped.



Mary's boat was ready now.

"Mine isn't a sailboat," said Mary. "I could not make a sail. I shall push my boat."

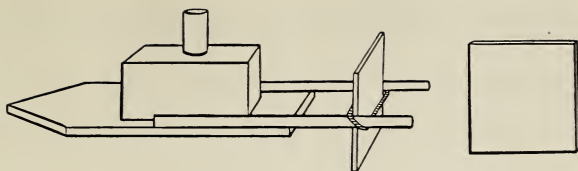
"How should you like a paddle wheel for your boat?" asked Miss White.

"A paddle wheel!" cried all the children.

"Yes," said Miss White. "Some boats have paddle wheels. When the paddle turns, it pushes the water. That makes the boat move."

"What makes the paddle turn?" asked Jack.

"In big boats a machine turns the paddle. I shall use a rubber band to turn the paddle on Mary's boat," said Miss White.



Miss White put a paddle wheel on Mary's boat.

She nailed a long, thin stick of wood on each side of the boat. The sticks were longer than the boat.

She cut a square piece of thin wood for a paddle. She held the paddle between the sticks. Then she put a rubber band across the sticks and around the paddle.

She turned the paddle backward. She turned and turned. The rubber band twisted when the paddle turned.

"I must hold on to the paddle," said Miss White.

She put Mary's boat into the water. Then she let go of the paddle. At once the rubber band began to untwist. The paddle began to turn.

Splash, splash, splash, went the water. The boat began to move. It went skipping through the water.

"Look at it go!" cried the children.

Soon it was on the other side of the tank.

"May I make the boat go?" asked Jack.

"Yes," said Miss White. "You may make the boat go. Then Mary and Tom may have a turn."

"I am going to make a paddle-wheel boat tomorrow," said Jack.

"So am I," said Tom. "It's more fun than a sailboat."



## The Race

The next day Tom and Jack made paddle-wheel boats.

Jack called his boat the *Eagle*. Tom called his the *Speed King*.

“Let us have a race between the *Eagle* and the *Speed King*,” said Jack. “Wind up your boat, Tom. Don’t let the paddle go until Mary says ‘Go.’”

"Are you ready?" asked Mary.

"Yes," said the boys.

"One, two, three, GO!" said Mary.

Away went the boats! Which boat do you think won the race?

Tom's boat reached the end of the tank first. The *Speed King* won.

"Let's have another race," said Jack. "I think I can make my boat go faster."

"Are you ready?" asked Mary.

"Yes," said the boys.

"One, two, three, GO!" said Mary.

Away went the boats. Splash, splash, splash, went the paddles.

The *Eagle* won the race. It went faster than the *Speed King*.

"How did you make your boat go so fast?" asked Tom.

“I played a joke on you,” said Jack. “I put two rubber bands on my boat. Two rubber bands are better than one. They made my paddle turn faster. That made my boat go faster.”

“I am glad you found out about it,” said Tom. “I’ll put two rubber bands on my boat, too.”

“This is fun,” said Jack. “Let’s have another race.”



### *Things to Do*



1. Put a cork into water. Does it sink?

2. Put a nail into water. Does it sink?

3. Put a piece of paper into water. Does it sink?



## THE SIPHON

The water in the tank was very dirty.

One morning Miss White said: "Children, we must change the water. We must take out the dirty water. Then we can put in fresh water."

Jack got a cup and a pail. He took a cup of water and put it into the pail.

"This will take a long time," he said.

"There is a much better way to take out the water," said Miss White. "It is called siphoning. I will show you how to do it.

"You may put the cup away, Jack. We shall not need it.

“You may keep the pail. Put it on the floor near the tank.”

Miss White went to the table. She came back with a rubber hose. It was about four feet long.

She put the hose into the water.

Both ends of the hose were under the water.

“See the bubbles!” she said. “That means that the air is going out of the hose. Water is going into the hose. I don’t want air in the hose.

“Now the bubbles have stopped, so I know that the hose is full of water. I am going to squeeze the hose at both ends. The water can’t get out. I must hold the hose tightly.

“I shall put one end of the hose in the tank. It must be in the water.

“The other end I shall put into the pail. The pail is on the floor. It must be lower than the water in the tank. Everything is ready. Now I shall stop squeezing the ends of the hose,” said Miss White.

“Look!” said Tom. “The water is going from the tank. It is going through the hose into the pail.”

“That is an easy way to get the water out of the tank,” said Jack.

In a few minutes the pail was nearly full of water.

The children were excited.

“How shall we stop the water?” asked Jack.

Miss White took the end of the hose out of the tank. The water stopped going into the pail.



“I’ll empty the pail of water,” said Jack.

“Now can you empty the tank without my help?” asked Miss White.

“Yes,” said Tom. “I can use the siphon. I remember just how you did it. I think it is fun to sail boats. But I think it is just as much fun to siphon the water.”



## WHAT HAPPENS TO WATER

It had been raining all the morning. Mary grew very tired of staying in the house. There were many things she wanted to do outdoors.

Just before lunch the rain stopped. How glad Mary was!

“Oh, Mother,” she said. “May I go outdoors to play after lunch?”

“You may go out when the sidewalk is dry,” said Mother.

Mary had her lunch. Then she went to the window and looked out.

The sidewalk was still wet. So Mary went and played with her dolls.

By and by she came to her mother again and said, "Mother, may I go out now?"

"See if the sidewalk is dry," said Mother.

Mary looked out of the window.

The sidewalk was dry.

"The sidewalk is dry, Mother," she said. "It's strange, but it was wet before, and now it is dry. Where did the water go?"

"Some of it ran off into the ground," said Mother. "And some of it evaporated."





“Evaporated! What does that mean, Mother?” asked Mary.

“Evaporated means that the water went into the air,” said her mother.

“Into the air!” said Mary in surprise. “If I put some water out of doors, will it go into the air?”

“Yes,” said Mother. “But it will evaporate in the house too.”

“I should like to try to evaporate some water,” said Mary.

“Very well,” said Mother. “Here is a bowl which you may use. Fill it with water and put it on the window sill.”

Mary put the bowl of water on the window sill. Then she sat down quietly by the window.

“What are you doing, Mary?” asked Mother.

“I’m watching to see the water go into the air,” said Mary.

Mother laughed and said: “If you watch all day, you will not see the water evaporate.

“Run out and play now. Look at the water in the bowl again tomorrow.”

The next morning Mary looked at the bowl of water on the window sill. She was surprised.

There was not so much water in the bowl as there had been the day before.

The next day she looked again. There was hardly any water left.

The next day the bowl was empty.

“See, Mother!” said Mary. “There isn’t any water in the bowl. It has evaporated. I should like to try it again.”

“Very well,” said Mother. “I think it will be more fun to have two bowls of water this time.”

“Why do you think it will be more fun to have two?” asked Mary.

“Wait and see,” said Mother.

Mary helped her mother to find two bowls. They were exactly the same size.



Mother and Mary put water in both bowls. They put exactly as much water in one bowl as they did in the other.

Then Mother said: "I will put my bowl of water on the window sill. You may put yours on the radiator. Let us wait until tomorrow to see what happens."

The next day Mary went to look at the two bowls.

Then she called: "Mother! Mother! come here, come here. The water in my bowl is all gone. Only a little of yours is gone!"

Mother came in.

"Well, Mary, did you find out something new?" she asked with a smile.

"The water in my bowl evaporated faster than yours," said Mary.

"Yes, but do you know why?" asked Mother.

"No," said Mary. "Please tell me."

"Your water had a better place for evaporation," said Mother. "It was warmer on the radiator than it was on the window sill. Heat makes water evaporate faster. That is the reason the water is gone."

"Then I am going to put your bowl of water on the radiator, too," said Mary.

"Very well," said Mother. "Now, run into the bathroom and wash for dinner."

In a minute or two Mary called, "Mother, I know something else."

"What is it?" asked Mother.

"When I washed my face this morning, my wash cloth was wet," said Mary.

"Now it is dry. I know where the water went. It went into the air."

"You are right," said Mother. "If you keep your eyes open, you may find out many more interesting things about evaporation."





## *Things to Do*



1. Take two pans exactly the same size. Put exactly as much water in one as you do in the other.

Put one pan in a sunny place. Put the other pan in the shade.

See what happens.

2. Fill a pint bottle with water.

Put a pint of water in a large pan.

Will the water in the bottle evaporate as fast as the water in the pan?

3. On a very cold day put a pan of water out of doors.

Does the water evaporate? What happens to it?

UNIT IV

**Heat and Cold**

Winter Days

The Snow Man

The Sun and Shadows



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## WINTER DAYS

### A Cold Day

One cold day Tom and Jack were going out to play.

“Put on your sweaters under your coats,” said Mother. “It is colder today than it was yesterday.”

“How does Mother always know when it is cold? She has not been out of doors today,” said Tom.

“I don’t know,” said Jack, “but she is always right about it. Let’s ask her.”

“You haven’t been out of doors today, have you, Mother?” asked Jack.

“No,” said Mother, with a smile.



“Then how do you know that it is colder?” asked Tom. “You always know when it is cold.”

“I have two ways of knowing that it is growing colder,” said Mother. “When I shut your window this morning, I felt a strong wind blowing from the north.”

"I was cold. I felt colder than I did yesterday morning.

"Then I looked at the thermometer.

"It is hanging just outside the window. It tells me exactly how cold or how warm it is."

"How does it tell you?" asked both boys at once.

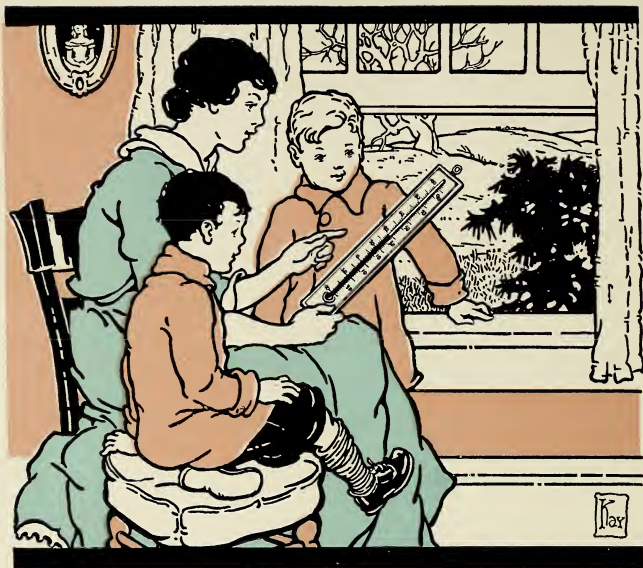
"Do you see the line in the middle of the glass tube?" asked Mother.

"Yes," said the boys, "we see it."

"When it is cold, that line goes down. When it is warmer, the line goes up. The numbers on the side tell me how cold or how warm it is," said Mother.

"I should like to see the line move," said Jack. "Shall we have to wait until it gets warmer?"





“Oh, no,” said Mother.

She opened the window and took in the thermometer. In a minute the line began to go up.

“Look, Jack, look!” cried Tom. “It’s going up! It’s going up!”

The line went up and up until it reached the number 68.

“That shows how warm our room is,” said Mother. “It is just right.”

Mother put the thermometer out of doors again. At once the line began to go down.

Jack and Tom wanted to watch it, but Mother said, “No, it is time to go out to play.”

## Fun with the Thermometer

The next day Mother went to the store. When Tom and Jack saw her coming home, they ran to meet her.

“What did you buy?” asked Tom.

“I bought something to eat. And I bought a present for each of you,” said Mother.

“A present! What is the present?” asked Tom and Jack.

"Guess!" said Mother.

"Is it something that we can eat?" asked Tom.

"No," said Mother.

"Is it something useful, or is it something to play with?" asked Jack.

Mother laughed and said, "You may play with it, and you will find it useful too."

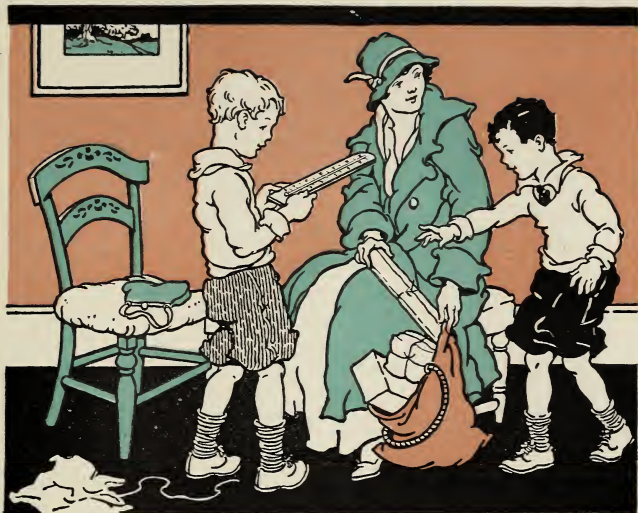
By this time Mother and the boys were at the house.

Mother was opening her packages.

"Here is some bread," said Mother. "Here are some vegetables for lunch. And here are the presents."

She gave a package to Tom. And she gave a package to Jack.

"What can it be?" said Jack, as he took off the paper.



“A thermometer!” cried both boys.

“Now you can find out many things about heat and cold,” said Mother.

“Oh, thank you very, very much, Mother!” said Jack.

“I thank you, too,” said Tom.

“I’m going to put my thermometer out of doors,” said Jack.

“So am I,” said Tom.



Mother took her thermometer into the house. Then she let Tom hang his in its place.

She put a nail outside another window for Jack's.

The next morning the boys wondered what the thermometers would say. They looked at all of them.

Mother's thermometer said 68.

Tom called out, "Mine says 40."

Jack said, "Mine says 32."

"That is strange," said Tom. "Our thermometers are both outdoors. I should think they would say the same thing. One of the thermometers isn't any good."

Just then Mother came into the room.

"No, boys, the thermometers are all right," she said. "Don't you know why one thermometer says 40 and the other 32?"

"No," said the boys.

Then Mother said: "It is morning. Tom's thermometer is hanging on the east side of the house. Jack's is on the west side. Does that help you?"

"Oh, I know, I know!" said Tom. "Mine is in the sun, and Jack's is in the shade."



"The sun comes up each morning in the east. It makes the east side of the house warmer. That is why my thermometer says 40 and Jack's 32."

"Will it be warmer on the west side in the afternoon?" asked Jack.

"That is something for you to find out," said Mother.

What fun the boys had with their thermometers! They looked every day to see how cold or how warm it was.

They watched the thermometer in the house too. When the line went higher than 70, they turned off the heat. When it went lower than 68, they turned on more heat.

When spring days came, the line in the outdoor thermometer went higher than it did in the winter.

The boys could hardly wait for summer to come. They wanted to see the line go up and up. They hoped that some day it would go up to 100!



### *Things to Do*



1. Put a thermometer outdoors in the shade. *Do not move it.*

Look at it in the morning. Look at it at noon. Look at it in the afternoon.

What have you found out?

2. Find the coldest room in the house. Find the warmest room.

3. Look at the thermometer at the same time every day for a week.

Each day write down what the thermometer says.

Which day was the warmest?

Which day was the coldest?

## THE SNOW MAN

It snowed all day and all night. Everything was covered with snow.

The next morning Tom and Jack walked in the snow. It was very deep.

"Let's make a snow man," said Jack.

"That will be fun," said Tom.

He ran for a shovel. He began to pile up the snow.

"I know another way to make a snow man," said Jack.

"How?" asked Tom.

"Just watch me," said Jack.

First he made a snowball. He put the snowball on the ground in the snow. Then he rolled it over and over.

Every time the ball rolled over, it got bigger. It got bigger because more snow stuck to it. Wherever it went it left a bare path.

It grew bigger and bigger. By and by it was very large. It was very heavy too. It took both boys to roll it.

Then Jack said: "It is large enough for the body of the snow man. Let's roll it into the middle of the garden. Tom, you may make a smaller ball for the head. I will make the arms."

Both boys worked very fast. Soon the head and arms were ready.

Tom tried to put the head on the snow man. He could not do it. The head was not very large, but it was heavy and slippery.

Tom could not lift it up alone. It took both boys to put the head on top of the large ball.

They made the head stick to the body by pushing the snow together.

Then they put an arm at each side of the body. They made the arms stick to the body by pushing the snow together.

They found a piece of red cloth for a mouth. They found two pieces of coal for the eyes.

Tom made a little round snowball for a nose.

At last the snow man was finished. It was bigger than Jack. The boys were pleased with it.

They had worked hard to make the snow man.



They were very tired and hungry.

They were glad when Mother called them in for supper.

After supper Tom said: "I'm tired. My eyes will not stay open."

"I'm tired, too," said Jack. "Let's go to bed soon."

That night it was very cold. The wind blew very hard. The windows rattled, and the house rocked.



When the boys were going to bed, Tom said: "The wind is very strong. Do you think it will blow our snow man down?"

"Yes, I think it will," said Jack.

The boys were so tired that they went to sleep at once. They did not hear anything. They did not even hear the windows rattle.

When they awoke, the sun was shining in the window. Jack and Tom jumped out of bed and ran to the window.

There was the snow man in the yard. They were surprised to see it standing there.

Jack said: "The wind did not blow it down. Our snow man is very strong."

By and by Mary and George and Billy came by. They were going to school. They saw the snow man in the yard.

"Look at the snow man," said Mary.

"Who made it?" asked George.

"We made it," said Tom and Jack.

They thought it was a very good snow man.

"Isn't it a big one!" said Mary.

"Yes, and it is strong, too," said Jack.

"It is so strong that nothing can break it down. Last night the wind tried to blow the snow man over, but it could not do it."

Tom and Jack came home from school at noon. They ran to look at the snow man.



“It looks strange,” said Tom.

“I know what is the matter,” said Jack. “The nose is gone. Some one has been touching it.”

“Who do you think has been here and touched it?” Tom asked.

But, just at this minute, out fell a coal-black eye.

“Who did that?” asked Tom. He looked around.

“No one,” said Jack. “It is just the sun. It is so warm today that the sun melts the snow. That makes the nose and eyes fall out.

“The sun is doing something that the wind could not do.”

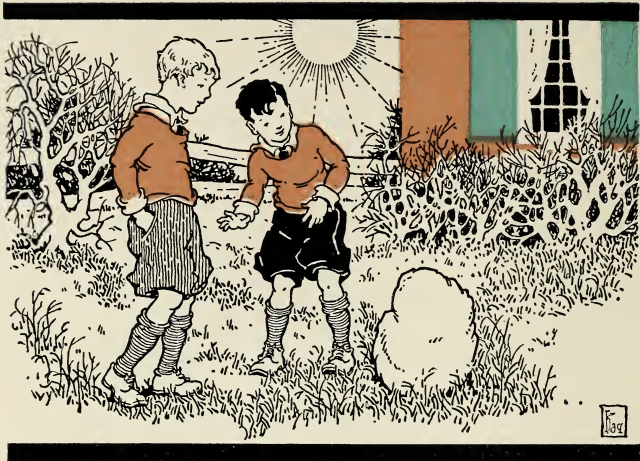
Jack made a new nose for the snow man. Tom put in the eyes.

The next day the sun melted the snow. Off came the nose again. Out came the eyes again. The snow man was not so large now.

It did not get smaller on cold, cloudy days.

But there were many warm, sunny days now. On the warm days the snow man got smaller and smaller.

By and by it did not look like a snow man, but like a piece of ice.



At last Jack and Tom looked out of the window one morning, and there was no snow man! All they could see was a wet spot in the grass.

“Well, this is the end of the snow man,” said Tom.

“No,” said Mother. “The snow man turned into water. Do you know where the water went?”

“No,” said Tom, “please tell us.”

“Some of the water went into the ground,” said Mother. “Some of the water evaporated. That means it went into the air.

“Maybe it will come back again in rain. Oh, no! This is not the end of the snow man.”



*Things to Do*



1. When it is snowing, catch some snowflakes on a dark cloth and see how beautiful they are.

2. After a snowstorm look for bird and animal tracks in the snow.

3. Fill a pan with snow and bring it into the house. What happens to the snow?

Next day put it out of doors again. What happens?



## THE SUN AND SHADOWS

"It is too cold to go out to play," said Miss White one cold morning. "We will have recess inside."

"What shall we play?" asked Jean.

"How should you like to play something new?" asked Miss White. "How should you like to play moving pictures?"

"How do we play it?" asked Jack.

"First we must have a bright, sunny day," said Miss White. "This is just the right kind of day."

"We shall need a screen to show the pictures on," said Mary.

"I have a sheet for a screen," said Miss White. "Who will help me to put it up?"



“I will! I will! I will!” cried the children.

“I’ll have Tom help me because he is so tall,” said Miss White.

Tom and Miss White put a rope across one side of the room.

Then Miss White pinned the sheet to the rope. The sheet was in front of the east windows.

The sun was shining in the windows. The sunlight came halfway across the room. The sheet was in the sunlight.

“Now,” said Miss White, “we are ready. Who will make the first picture?”

At first no one said a thing.

Then Mary said, “I should like to make a picture, but I do not know how to do it.”

Miss White said: "Go behind the screen, Mary. Stand in the sunlight near the sheet."

Mary went behind the sheet.

The children could not see her. But they could see her shadow on the sheet.

Every time Mary moved, her shadow moved. The children clapped their hands.

Mary made a bow. The shadow made a bow, too. The children clapped and clapped.

"I should like to make a picture," said all the children at once.

"We'll take turns," said Miss White.

Jack played a joke. When he went behind the screen, he put on Mary's coat and hat.



He walked across the room. The shadow walked across the sheet. The children thought it was Mary's shadow. They saw the shadow of Mary's coat and hat.

Tom went behind the screen. He danced a jig. His shadow danced, too.



The greatest fun of all was when Jean put on Miss White's hat. What a funny picture to see the shadow of Miss White's hat on Jean's shadow!

"Can any one tell what makes the shadows on the sheet?" asked Miss White.

“Yes, I think I can,” said Jack. “We stand in the sunlight. The sunlight can not shine through us, and that makes the shadow.”

“Do you know anything the sunlight can shine through?” asked Miss White next. “We could not have played shadows today if the sunlight had not come into our room.”

“I know!” said Mary. “It shines through the window glass.”

“Yes,” said Miss White. “That is one reason why houses have windows.”

“This has been fun,” said Tom.

“May we play shadows again tomorrow?” asked Mary.

“Yes,” said Miss White. “You may.”

The next day the children did not play shadows. Do you know why?

There was no sunlight coming in the windows.

“We can’t play shadows today,” said Mary. “The sun isn’t shining.”

“The sun is shining today, Mary,” said Miss White. “But you can not see it because some big dark clouds are between us and the sun. That is why it is so dark today.

“We shall have to wait for another bright, sunny day.”



*Things to Think About*



1. What makes your shadow so long in the morning?
2. What makes your shadow so short at noon?
3. Is your shadow long or short in the afternoon?



UNIT V

**Working with Machines and  
Magnets**

**Moving the Playhouse**

**Loading the Boat**

**The Magnet**





## MOVING THE PLAYHOUSE

The children had made a playhouse in the yard at school. They liked the playhouse. It was a pretty little house.

They had fun making it. They had fun playing in it.

When spring came they wanted a garden too.

"The only good place for a garden is where the house stands," said Miss White. "The rest of the yard is in the shade."

"I wish the playhouse had wheels on it. Then we could move it like a doll carriage," said Alice.

"Let's put wheels under it," said Tom.

"Don't be foolish!" said Mary. "Who ever heard of a house on wheels?"

"Even if they did, we could not move it," said Alice.

"Once I saw some men moving a house," said Tom. "I watched them a long time. I think I know how to do it. Tomorrow we can try moving our playhouse."

The next day Tom and Jack came to school with some long broomsticks.

“What are the broomsticks for?” asked Alice.

“I’ll show you,” said Tom, “if you and Jack will lift one end of the playhouse.”

Alice and Jack tried to lift the playhouse. They tried and tried, but they could not do it. It was too heavy for them.

More children came and helped, but they could not lift the house. It was too heavy.

“I know how we can do it,” said Tom. “One time I saw Father lift a heavy stone with a crowbar. It was easy.”

“What is a crowbar?” asked Alice.

“It is a long iron stick,” said Tom. “We have no crowbar. But we can use one of the broomsticks for a crowbar.”

He put one end of the stick under the playhouse. Then he put a stone under the stick.

He pushed down on the end of the stick, and up came the house.

“Oh!” said the children. “How strong you are, Tom!”

“No,” said Tom, “I am not stronger than you are. The stick and the stone helped me.”

“It looks easy to do. And it looks like fun,” said Alice. “Please let me try.”

Alice tried, but she could not lift the house.





“Oh, dear,” said Alice, “I am not strong enough to do it.”

“Yes, you are strong enough,” said Tom. “You did not do it right. You pushed down on the middle of the stick. You must push on the end.”

Alice tried again. She pushed on the end of the stick. Up came the house! She was very happy.

“Isn’t it funny,” said Alice. “I push down on the stick, and the house goes up.”

Miss White came to see what the children were doing.

“That long stick with a stone under it is a lever,” said Miss White. “People use levers to help them to lift heavy things. I am glad you have found out how to use them. Levers are very useful.”

Tom had found out how to lift the house. It was easy now to put the broomsticks under the house.

Mary and Alice and Jean took turns in lifting the house. Tom and Jack put the broomsticks under it.

“Now,” said Tom, “with these wheels under the house we can move it.”



All the children pushed the house. It rolled along on the broomsticks.

As soon as a stick rolled out at the back, the boys put it under the front of the house. Then the children pushed it a little farther.

The children liked moving a house very much. They moved it all over the yard.

At last Miss White said, "Now you must find a place for the house."

"Where shall we put it?" asked Jack.

"Let us put it under the apple tree," said Mary.

"Yes, that is a good place for it," said Jack.

The children rolled the house to the apple tree.

Now the sticks had to be taken out from under the house. The lever was used again to lift the house.

Soon the house was on the ground.

"I think it is fun to move a house," said Alice.

"So do we," said all the children.

"Now you can make your garden tomorrow," said Miss White.

## LOADING THE BOAT

"ALL ABOARD! ALL ABOARD!" called the captain.

Jack was the captain. His boat was made of a large box. He and the other boys and girls had made it at school.

The boat was loaded with boxes. There were big boxes and little boxes.

What fun the children had putting the boxes on and off the boat!

By and by Tom said, "I am going to get a present ready for a boy who lives in China."

He filled a box with stones. He nailed a cover on it. He tried to put the box on the boat. It was too heavy. He could not lift it.

Jack and Mary and Alice tried to help him. They could not lift it. The box was too heavy.

"I'll help you to do that," said Miss White.

The children thought she was going to lift the box into the boat. But she did not.

She said, "Tom, see if you can find a long, wide board."

Tom found a board. It was long and wide.

Miss White said: "Put one end of the board on the boat. Put the other end on the floor near the box."

Tom put the board in place.

"That is a gangplank," said Jack. "All boats have them. That is how people get on the boat."





Then all the children took turns walking up the gangplank.

"It is easier than climbing over the side of the boat," said Alice.

"Miss White, when are you going to help us?" asked Tom. "Are you going to put the box into the boat?"

"No," said Miss White, "I won't need to lift it. You can push the box up the board."



"It will be easier than lifting it over the side of the boat," said Jack.

"Let us try to push the box up the gangplank. I saw Father put a heavy box on the truck that way."

Some of the children came and pushed the box up the gangplank. It was easy to push the heavy box up the gangplank.

Miss White said, "The gangplank is a machine."

"How could it be a machine?" asked Jean. "It is not an engine."

"Things that help us to work are machines," said Miss White.

"The gangplank helped us to get the box into the boat. It was easy to push the box up the gangplank. The gangplank is a machine."

“Then the long stick we used to lift the playhouse was a machine,” said Jack. “We could not lift it by ourselves. When we used the stick, it was easy.”

“You are right, Jack,” said Miss White. “Your stick was a machine.

“Machines help us to do things. They make our work easier.”



*Things to Think About*



1. Does your mother use machines in the kitchen?
2. Does your father use any machines in his work?
3. When you go for a walk look for men who are using machines to help them to do their work.



## THE MAGNET

Tom and Jack were going to make a playhouse. They had some boxes and some boards. They were going to nail the boxes and boards together.

“May I help, too?” asked Mary.

“Where is your hammer?” asked Jack.

“I have no hammer,” said Mary.

"Then you may carry the box of nails. That will help Tom and me," said Jack.

Mary was happy. She carried boards and boxes too. She got everything the boys needed.

"Please give me some nails, Mary," said Tom.

Mary ran fast with the nail box. She did not look where she was going. She stumbled over a board.

Down she fell! Away went the nails. It looked so funny!

Tom and Jack and Mary laughed and laughed.

"Who will help me to pick up the nails?" asked Mary.

"I will," said Tom.

"I'll help, too," said Jack.



“But where are all the nails?” asked Jack. “I can find only a few of them.”

“Oh, here they are,” said Mary. “They have fallen down the cellar-window hole.”

The hole was about two feet deep. It was in front of the cellar window. It let air and sunlight into the cellar. The hole was covered with iron bars.

Mary said, "Let us go down into the cellar and open the window."

"We can not get into the cellar," said Jack. "Mother is away. The cellar door is locked."

The children looked down into the hole.

"I think I can reach the nails," said Jack.

"I will try, too," said Tom.

They put their arms through the bars. They tried and tried to reach the nails.

"We can not get them," said Jack. "Our arms are too short."

At last Mary said: "I'll get my big brother, Billy. His arms are longer than ours. Maybe he can reach the nails."



"Maybe he can," said Jack. "Please go and ask him to come."

Soon Mary came back with Billy.

The children stood near the hole.

Billy got down on the ground. He put his arm through the bars. He could not get the nails. His arms were too short.

"What shall we do?" asked Mary.

"I know," said Billy. "I have an idea."

Then he ran off home.

He called to the children: "I'll be back. I'll be back soon."

"I wonder what his idea is," said Tom.

"Maybe he is going to get his father. His arms are longer than Billy's," said Jack.



"But Father is not at home," said Mary.

By this time Billy was back. He had a long string in his hand. On the end of the string was something bright red. It was heavy. It looked like a little horseshoe.

"What is that?" asked Jack.

"I know," said Mary. "It is a magnet. Billy got it for Christmas."

"What are you going to do?" asked Jack.

"Just watch me," said Billy.

Billy went to the hole.

He held the end of the string in his hand. He let the magnet down into the hole. It went right on top of the nails. Then he began to pull it up again.

"Oh, look! look!" cried Tom. "A lot of nails are sticking to the magnet. They are coming up."

Billy pulled the magnet to the top. There were eight nails on it. They held on to the magnet. Billy had to pull them off.

"Do it again! Get some more nails," said Tom.

"Please let me do it," said Jack.

"Very well," said Billy. "You may all have a turn."

Jack let the magnet fall into the hole. Then he pulled it up again. This time there were six nails on the magnet.

It was great fun.

Sometimes the smallest nails jumped to the magnet and held on.



Tom tried to get the biggest nail. He touched it with the magnet. It moved and rolled over. But it would not hold on to the magnet. Tom could not pull it up.

“My magnet is not strong enough for that big nail,” said Billy.

“Now it is my turn,” said Mary. “I see a pencil down in the hole. I’m going to get it.”

Billy laughed and said: "You can try. I know the magnet will not pick up the pencil."

Mary tried and tried.

"You are right, Billy. I can't get the pencil," said Mary.

"Good-by, I must go now," said Billy. "You may have my magnet to play with for a few days."

"Thank you very much for letting us use your magnet," said Tom.



### *Things to Do*



1. Have you a magnet? Go around the house with it and see how many things the magnet will pick up.

2. Put a needle, a pin, a nail, and a hairpin in a pan of water.

Will a magnet pick them up?

UNIT VI

**About Animals**

**Animals' Tails**

**Animals' Eyes**





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## ANIMALS' TAILS

### The Cow's Tail

Tom and Jack lived in the city.

Uncle Joe lived on a farm.

One summer the boys went to stay for a few weeks on Uncle Joe's farm. It was the first time they had ever been on a farm.

They had seen elephants and other animals in a circus. But they had never seen a cow or a pig.

The first day they were at the farm Uncle Joe said: "Do you want to come to the barn with me? I am going to milk the cow."

Tom and Jack went with Uncle Joe to the barn.



Uncle Joe said, "Come in, boys."

Tom and Jack did not want to go in. They were afraid of the cow.

"Are you afraid of the cow?" asked Uncle Joe.

"Yes," said Tom.

"Do not be afraid," said Uncle Joe. "The cow will not hurt you."

Tom and Jack went into the barn. They stood near the door.

They watched Uncle Joe milk the cow.

They saw two little streams of milk going into the pail.

They heard a swish — swish — swish as the milk fell into the pail.

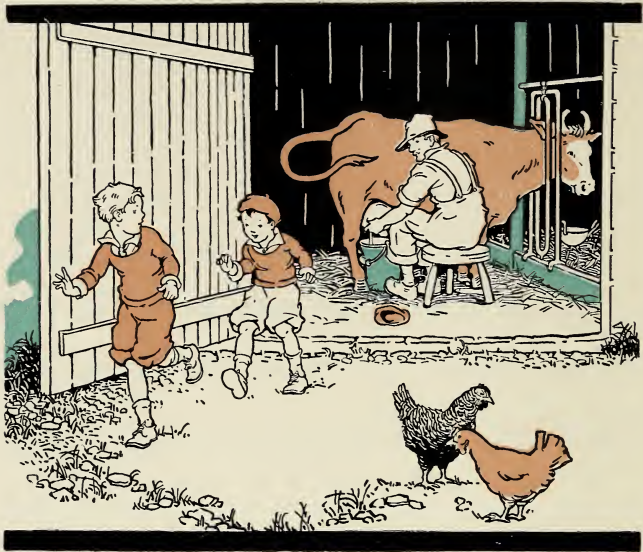
They forgot to be afraid. They came nearer and nearer.

All at once something slapped them. It slapped each boy on the face.

It knocked Tom's cap off. The cap nearly fell into the milk pail.

Tom and Jack were scared. They jumped back. Then they ran as fast as they could. When they got to the door, they looked back.

There was the cow standing quietly. There was Uncle Joe milking. He was laughing too.



“What is the matter, boys? Why did you run away?” he asked.

“We were slapped,” said Jack.

“Who slapped you?” asked Uncle Joe.

“I don’t know,” said Tom, “but I felt it.”

“Come in again and see who did it,” said Uncle Joe.

The boys came in slowly.

Uncle Joe said: "Do not stand so near. Look at the flies on the cow's back. They are biting her. Watch the flies and see what happens."

In a minute whisk went the cow's tail. Away flew the flies.

"Now, do you know what slapped you?" asked Uncle Joe.

"Yes," said Jack, "it was the cow's tail. She was chasing the flies."

"A cow must stand still to be milked," said Uncle Joe. "If flies bite her she can not stand still."

"Is that why animals have tails?" asked Tom.

"No, Tom," said Uncle Joe. "Many animals use their tails to chase flies. Some tails are useful in other ways."

"How are they useful?" asked Tom.

"After the cow is milked, I'll tell you about some interesting tails," said Uncle Joe.

## The Cat's Tail

The cow was milked. Uncle Joe had no more work to do.

He said, "Now I'll tell you about animals' tails."

Jack and Tom sat down by Uncle Joe. The big black cat came too.

Uncle Joe said: "I'll begin with the cat's tail. He has a long tail. He finds it useful."

"How does it help him?" asked Jack.

"Have you ever tried to walk on a fence?" asked Uncle Joe.



"Yes," said Jack. "It is hard work."

"What do you do with your arms?" asked Uncle Joe.

"I hold them out to keep from falling off," said Jack.

"That is just what the cat does with his tail," said Uncle Joe.

"He holds his tail out and swings it from side to side. It keeps him from falling.

"He uses it when he climbs too. That is one reason why he is a good climber.

"Watch a cat when he climbs. See how he swings his tail from side to side."





## The Beaver's Tail

"A beaver has a useful tail, too," said Uncle Joe. "It is broad and flat.

"Beavers live near the water. When a beaver sees or hears an enemy, he hides under the water. Before he hides he slaps his tail on the water. He does this to let other beavers know that an enemy is near.

"Slap, slap! When other beavers hear that sound, they hide, too."



## The Porcupine's Tail

"One day I was walking in the woods," said Uncle Joe. "My dog, Rover, was with me.

"By and by Rover began to sniff. He smelled an animal. He put his nose to the ground and followed the smell of the animal.

"He went away into the woods.

"Soon I heard a great crying and barking.

"I went to see what had happened. I did not get there in time to see the fight.

"I met Rover coming back. Poor Rover was very unhappy! He had three large porcupine quills in his nose.

"Then I knew what had happened. Rover had had a fight with a porcupine. And the porcupine had got the best of poor Rover.

"The porcupine has quills in his tail.

"When he has a fight with an enemy, he hits with his tail. The quills come out easily, and they stick into the enemy.



“That is how Rover got the quills in his nose. Now he stays away from porcupines.

“Sharp quills hurt, so all animals are afraid of porcupines.

“Isn’t that a useful tail?” asked Uncle Joe.

“Yes, it is,” said Tom. “I should like to see a porcupine. If I meet one in the woods, I hope he won’t hit me with his tail.”



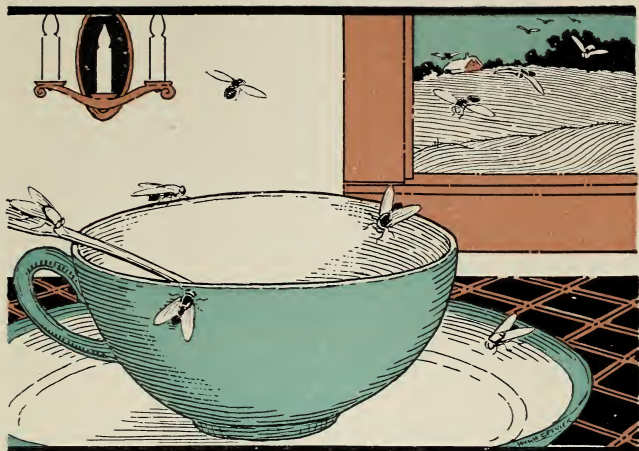
## The Squirrel's Tail

"The squirrel has a useful tail," said Uncle Joe. "It is as large as his body.

"Did you ever see a squirrel jump from one tree to another? His tail helps him do this.

"When the cold days come, the squirrel goes to sleep. He uses his tail for a coat. He wraps it about his body. It keeps him warm."





## ANIMALS' EYES

### The Fly

Buzz, buzz, buzz!

“There is a fly in the house. Swat him, Jack, before he walks on the food,” said Mother.

Swat, swat, swat!

“Did you get him?” asked Mother.

Jack tried again.

Swat, swat, swat!

"No," said Jack. "He saw me coming every time. Does he have eyes in the back of his head?"

"A fly has a large eye on each side of its head," said Mother.

"I saw the two big eyes," said Jack.

"Those two big eyes are made up of many little eyes," said Mother.

"Each little eye looks in a different direction. That is why a fly sees all around him at once.

"He has so many enemies that he needs to have good eyes. He needs to see in all directions.

"Sometimes when I am going across the street I wish I had eyes like a fly. I need to look in all directions at once."





## The Snail

“Most animals have the kind of eyes they need,” said Mother. “I know of one animal that has his eyes on the ends of stems.”

“What animal is it?” asked Jack.

“This little animal has one foot. He carries his house with him. His house is a shell,” said Mother. “Now do you know what it is?”

“It’s a snail,” said Jack.

"Yes," said Mother, "it is a snail."

"Why does a snail need to have his eyes on stems?" asked Jack.

"He has many enemies, too," said Mother.

"The snail does not have eyes that see in all directions, like the fly. But he can move the stems in all directions. He can even see around a corner.

"Sometimes the snail sees an enemy. Then he pulls himself into his shell."

## The Mole

A mole is a little animal.

He makes his home in the ground. He digs in the ground to find worms to eat.



He does not need to see very well. He has tiny eyes, but he is nearly blind. His eyes tell him when it is light and when it is dark. That is all he needs to see.

If a mole comes out of the ground, he is not safe. His enemies may catch him.

When he comes out of the ground, his eyes tell him that it is light. Then he hurries under the ground again. He is safe in the ground.

## The Cat

A cat has very good eyes. She can see when it is dark, and she can see just as well when it is light.

Cats like to find their food. At night a cat tries to catch mice. In the daytime she tries to catch birds.

When a cat wants a mouse, she sits in the dark. She sits near a mouse hole.

By and by a little mouse comes out of the hole. It does not see the cat. It does not know that the cat is near the hole.

The cat can see very well at night. She sees the mouse. So the mouse gets caught. Then the cat has a good supper.

In the daytime the cat tries to catch birds. Birds come to the garden for worms. So the cat goes to the garden.

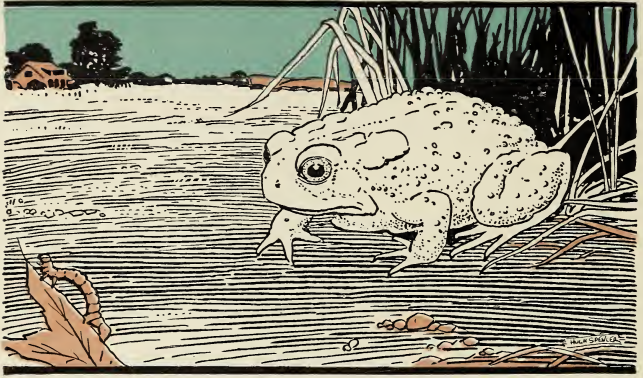
She sits very, very still. She waits until a bird comes near her. Then she creeps up quietly and springs at the bird.

Many times she does not catch it. Do you know why?

Birds have good eyes, too. A bird has an eye on each side of its head. It can watch for enemies on two sides. That is why it is hard to catch it.

Most animals have eyes that help them.

Some animals, like the cat, have eyes in the front of the head. They try to catch other animals for food.



Some animals have eyes on the side of the head like the birds. These animals do not wish to be caught. Their eyes help them to see their enemies.

## The Toad

The toad lives on the ground. His enemies are usually above him. So his eyes are on the top of his head.



**UNIT VII**

**The Garden**

**Making the Garden**

**Visitors Come to the Garden**



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## MAKING THE GARDEN

### The Earthworms

The boys wanted to make a garden.

Mother said: "You may have some of my garden. Father has been working in it. The ground is not too hard."

Jack and Tom got their spades and a rake. They went to work in the garden.

First they turned the ground over with the spades. They found many stones in the ground. They put all the stones in a pile outside the garden.

"Stones are not good in a garden," said Jack.

The boys found many worms in the ground, too.

“What shall we do with the worms?” asked Tom.

“Take them out,” said Jack. “We don’t want any old worms in our garden.”

So Tom put all the worms in an old can.

By and by Father came to see the garden. He saw the pile of stones.

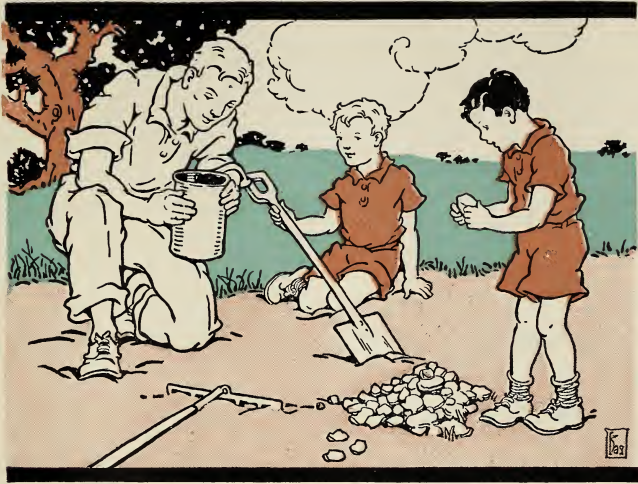
“Good,” said Father. “I see that you have taken out the stones. You will have a fine garden.”

Then he saw the can of worms.

“Are you boys going fishing?” he asked.

“No,” said Jack, “we are making a garden.”

“Why did you take the worms out of the earth?” asked Father.

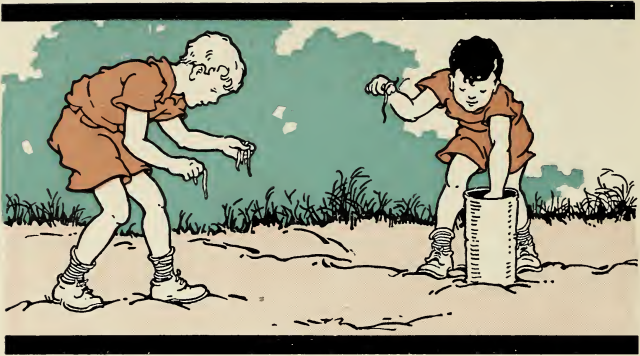


“Because we want a good garden,” said Jack.

“But these are earthworms,” said Father. “They are friends of a garden. They dig their way around in the earth.

“They eat some of the earth. This makes the ground soft. This helps plants to grow.

“If you want a good garden, put the worms back.”



So Tom and Jack put the worms back into the garden. At once the worms crawled into the ground again.

“It’s the first time I ever heard that a worm was a friend,” said Tom.

“Are all worms good for gardens?” asked Jack.

“No,” said Father. “Not all worms are good for gardens, but the earthworm is a friend of everyone who has a garden.”



## Planting the Seeds

Jack and Tom worked hard in their garden. They spaded the earth. Then they raked it.

Now came the most fun of all. It was time for the boys to plant the seeds.

"I want to plant vegetable seeds," said Jack.

"I want to plant flower seeds," said Tom.

"Let's plant vegetable seeds and flower seeds," said Jack.

So they planted radishes and beans in one half of the garden.

They planted marigolds and zinnias in the other half.

They planted the seeds in rows.

They covered the seeds with earth  
Then they patted the earth down  
carefully.

At the end of each row they put  
up a stick. On the stick was the name  
of the seeds in the row.

“Now we can remember what we  
have planted,” said Jack.

Jack and Tom put away the spades  
and the rake.

The next day it rained.

“I am glad we have our seeds  
planted,” said Jack. “The rain will  
make the earth wet. That will help  
our seeds.”

The next day the sun was shining.

“I am glad to see the sun,” said  
Tom. “The sun is making the earth  
warm. That will help our seeds.”



Every day, rain or shine, Tom and Jack looked at the garden.

One morning they saw a crack in the earth. The next day the crack was larger. The next day they saw some little plants coming out of the crack in the earth.

“They are radish plants,” said Tom.

“Yes, they are radish plants,” said Jack. “Let’s go and tell Father.”

In a few days the bean plants began to grow.

The zinnias and the marigolds were slow. By and by they began to grow, too.

Tom and Jack had planted the seeds in rows. So the plants grew in rows.

There was a row of radishes.

There was a row of beans.

There was a row of marigolds.

There was a row of zinnias.

## Weeds

One day the boys went to look at the garden.

They found many little new plants. These plants were not in rows. They were growing all over the garden.

“What are these plants?” asked Jack.

“Who planted them?” asked Tom.

Father saw the little plants that were coming up all over the garden.

He said: “They are weeds. They planted themselves. The seeds have been in the earth all winter. Now that spring is here they have begun to grow, too.

“If you want to have a good garden, you must pull out the weeds.



“Weeds take food and water from the earth. They grow fast and leave no room for other plants.”

“Let’s pull out the weeds,” said Jack.

The boys worked hard all morning pulling out weeds. When the weeds were all out, the boys’ garden looked beautiful.



"I'm glad the weeds are all out," said Tom.

"So am I," said Jack.

"Come and see our garden now, Father," said Tom. "The weeds are all out."

"They are all out now," said Father. "But tomorrow you will find more weeds."

"There are many, many seeds of all kinds in the earth. Many of them will grow."

"If you want to have a good garden, you must pull the weeds every day. We call this weeding the garden."

"Weeds are not friends of a garden," said Tom. "We are not going to have them in our garden. We will weed our garden every day."

## VISITORS COME TO THE GARDEN

### Insects

One morning Jack and Tom were weeding the garden.

“Oh, look,” said Tom, holding up a zinnia plant. “I found this plant lying on the ground.”

“We must have broken it when we were pulling weeds,” said Jack. “We must be more careful.”

By and by Father came out to the garden. He saw the zinnia plant lying on the ground. He knew what had happened.

He said, “You have another enemy in your garden.”

“Where is it? Where is it?” asked the boys.



“Take a stick and dig around the plant,” said Father. “I think you will find the enemy.”

The boys dug carefully. Soon they found a fat gray insect curled up like a ball.

“Is this the enemy, Father?”

“Yes,” said Father. “It is called a cutworm. It cut your zinnia plant.

"There are other insect enemies in your garden, too. See all the tiny holes in the leaves. Some insect did that."

"What can we do about it?" asked Jack.

"Birds eat insects and worms. You can invite birds to your garden," said Father.

"That is a joke," said Jack. "How can we invite birds?"

"You can put up bird houses," said Father.

"I should like to have robins in our garden," said Tom.

"They do not use bird houses," said Jack.

"I should like to have birds of all kinds in the garden," said Tom.

"Many birds will come to your garden if you have a bird bath in it," said Father.

"Birds must drink water. Sometimes it is hard for them to find water. They get very thirsty. If you have water in your garden, birds will come to get a drink. They will take a bath, too.

"Then they will look in the garden for something to eat. Many birds eat insects. They will find a good dinner in your garden."

"We must have a bird bath," said Tom.

"Is a bird bath hard to make?" asked Jack.

"No," said Father. "You can make one easily. I will help you."

## The Bird Bath

The next morning Jack asked, "Shall we make the bird bath today?"

"Yes," said Father. "I am ready. We need a bowl or a pan. Let us ask Mother for one."

"May we have a bowl or a pan for a bird bath?" asked Jack.

"Yes," said Mother. "Here are some bowls. You may have any one you like."

"This one is too small," said Tom.

"This one is too deep," said Jack.

"This bowl is just right," said Father. "It is large, but not deep. Birds do not use a deep bath."

So they carried the bowl out to the garden.



"Let us put it in the middle of the garden," said Tom.

"Yes, that is a good place," said Jack.

"Now, boys," said Father, "dig a hole. Make it as large and as deep as the bowl. Put the bowl in this hole."

Tom put some pretty stones around the bowl. Jack put some water in it.

"You must put in fresh water every day," said Father.

"Now the bird bath is made," said Jack.

"It looks like a little pond," said Tom. "I hope the birds will come to it."

"We must go away," said Father. "Birds will not come while we are near."

## Birds

"Now let us watch for birds," said Jack.

"I wonder what kind of bird will come to our bird bath first!" said Tom.

After a while they heard a bird singing in the garden.

"That sounds like a robin," said Jack. "Let's go and see."

It was a big robin. There he was, hopping around the bird bath. He took a drink of water. Then he took another and another.

He hopped into the bowl. He splashed around in the water. His feathers got very wet.

What a good time he had!

After the bath the robin shook the water from his feathers. Then he began to hop around in the garden. By and by he flew away.

“Look, he has something in his bill!” said Jack.

“It is an insect,” said Tom. “Good! I hope he will come back for more.”

In a few minutes there were two robins in the garden.

They were looking for insects. They did not eat the insects. They flew away with them.

In a little while they came back again. They did this many times.

“I think they are a mother robin and a father robin,” said Tom.

“They must be taking food to their baby birds,” said Jack.



“I should like to see the baby robins,” said Tom. “I wish we could find their nest.”

“Maybe we can find it. Let us watch and see where they go,” said Jack.

The boys sat very still and watched the robins. Time after time they flew away with insects.

“I think the nest is in the apple tree,” said Jack. “Robins like to live near people.”

By and by Jack and Tom found the robins' nest. It was in the apple tree. There were three baby birds in the nest.

“It is no wonder that the father robin and the mother robin are so busy finding food,” said Tom.

In a few days, more and more birds found the bird bath. There were robins and wrens and sparrows and bluebirds.

“The birds like the bird bath,” said Jack. “They come all the time. Their nests must be close by.”

At first the birds came to the garden alone.

In a few weeks they came with their baby birds. It was fun to watch the birds hopping about.

They came to get a drink of water.

They came to take a bath.

They came to find a good dinner in the garden.

## Toads

One morning Tom and Jack were sprinkling the garden.

They found a large toad. It was nearly the color of the ground. It sat very still. The boys almost did not see it.

“Well,” said Jack, “are you a friend? If you are a friend, you may stay in our garden. If you are not a friend, you must get out.”

“How are we going to find out?”  
asked Tom.

“We’ll ask Father,” said Jack.

But Father would not tell them.

He said, “We will let the toad tell  
you.”

“Now you are joking,” said Jack.

“No, I am not joking,” said Father.

“Come out to the garden.”

Tom was so excited he ran ahead.

“Take care, you will scare the toad,”  
said Father.

“I didn’t scare him,” said Tom.

“He is sitting in exactly the same  
place.”

“Where is the toad?” asked Father.

“There he is,” said Jack. “He is  
near the largest zinnia plant.”

The toad had not moved.



Father said: "Sit very, very still. Watch the toad."

The boys sat very still and watched.

By and by out came the toad's tongue very, very fast. Back again went the tongue just as fast. It happened so quickly that the boys hardly saw it.

"Did you see that?" asked Father.

"Yes, I saw his tongue come out," said Jack.

"What did it do?" asked Tom.

"Look at the holes in the leaves of the plant near the toad," said Father.

"Those holes were made by little insects. Some insects eat leaves. If they eat all the leaves, the plant will die.



“Toads eat insects. When the toad put out his tongue, he caught an insect.

“He is sitting there now waiting to catch more.”

“He’s a friend! He’s a friend!” cried Tom and Jack. “He may stay in our garden.”

## Bees and Butterflies

Every day Jack and Tom went out to the garden.

Every day the garden was changed. The plants were getting taller. They had more leaves.

One day Jack said, "Look, Tom, there are buds on the marigold plants."

"There are buds on the zinnia plants, too," said Tom. "In a few days we shall have flowers."

Not many days after that the garden was beautiful with flowers. Father and Mother came to see how pretty it looked.

"I see you have more insect visitors here," said Father.

"Do you mean the bees and the butterflies?" asked Jack.

"Yes," said Father. "I see a bee. It is crawling into a flower to get nectar.

"Nectar is sweet. The bees and the butterflies eat it."

"Then Jack and I are their friends," said Tom. "We made a garden full of flowers for them."

"Yes, that is right," said Father; "but butterflies and bees are friends of the garden, too."

"What do they do for the garden?" asked the boys.

"This is what they do," said Father.

"There is a yellow dust called pollen in each flower.

“There are some little ovules in each flower, too. These ovules are tiny little eggs. These ovules or eggs grow into seeds if pollen falls on them.

“This is how bees and butterflies help the garden. They crawl into the flower to get nectar.

“Their bodies brush against the pollen and shake it down into the flower. Some of the pollen falls on the little ovules, and they begin to grow into seeds. The seeds grow and get ripe.

“The ovules in many flowers must have pollen from another flower of the same kind to make them grow into seeds.

“Bees and butterflies carry pollen from one flower to another.



“When a bee or a butterfly crawls into a flower to get the nectar, some of the pollen sticks to its body. Then the bee or the butterfly flies to another flower.

“As it crawls in to get nectar the pollen is brushed off. It falls on the little ovules in this flower. They begin to grow into seeds.

“You see, bees and butterflies are good friends of your garden.”

“I did not think there was so much to know about a garden,” said Jack.

“Tom and I call it our garden because we made it. But it would not be much of a garden if the birds and the toads and the bees and the butterflies did not help.”



*Things to Think About*



1. How many kinds of animals have you ever seen in a garden?
2. How many of these animals were friends of the garden?
3. How many of these animals were not friends of the garden?









