UNIT II

THE REALM OF PHYSICAL THINGS

Summary - Outline

I. Introduction

II. How the realm of physical things differ from the other realms:
1) Plants are alive, grow, change and multiply. Physical things cannot.
2) Animals move, grow, are alive, change, multiply and have senses.
3) Man in addition is a religious creature. He can know God and praise Him.
4) Physical things have shape, size, colour, texture, matter and energy. The other realms have other special characteristics in addition to those of physical things.

III. Variety within the realm of physical things:
1) Physical things have four basic shapes: circle, square, rectangle, and triangle.
2) They come in various sizes: large, medium, small.
3) Physical things have colour, either a primary colour or a combination of these.
4) Physical things have texture: hard, soft, smooth, rough, wet, dry.
5) Physical things have weight.
6) Physical things can be found in one of three states: solid, liquid or gas.
7) All physical things have energy. The five types of energy are: heat, magnetism, electricity, sound and light.
8) There are natural physical things and man-made physical things.

IV. Man uses, develops and enjoys all these aspects of physical things. They can also be abused. Most energy when abused can be dangerous or destructive. The realm of physical things is interrelated with the other realms in many ways.

In a discussion of physical things in general and their common characteristics we are looking at an abstract side of physical things. Something like electricity is hard to see. We can see the electricity in use, in its concrete manifestations but we cannot see the electricity itself. Magnetism too can be seen in action but what essentially it is cannot be seen visually.

Children at the grades 1-3 level in most instances do not yet think abstractly. In presenting the concepts the teacher should present the concepts as concretely as possible. The children learn best by doing or by seeing rather than by mere telling.
I. Introduction

Topics such as magnetism, electricity and sound fascinate children. They are often asking, How? Why? Let them follow through their natural curiosity by finding out through exploration, and experimentation. Children learn best when they are interested. Use their interests and curiosity wherever possible. Children learn best by doing themselves. If possible, let them touch the materials studied, let them do the demonstrations, get them personally involved in the learning experience.

It is important to remember that there is more to a thing than its physical aspect. Wherever possible we should try to see the thing as an integrated whole.

Thus, lightning is more than just an electrical discharge. Children have feelings about thunder and lightning and these should not be ignored. Children have very imaginative ideas about what lightning is. Even though they may not be scientifically valid, they may have a very valid basis and may be interesting to deal with in art, literature or music. Also there is the numerical aspect. You can figure out how far lightning is away by calculating the time between lightning flash and the thunder. Thus wherever possible these aspects should be integrated to get a complete picture of the concept. Also there is much inter-relationship between the realms. Things do not exist in isolation and should not be dealt with as such.

As this is part of God's creation which He has given us to use, develop and preserve, to subdue it and have dominion over it, it is important for us to learn about and gain an understanding of this and what the implications of our task for this area are.

II. How the realm of physical things is different from the other realms

1. a) Things have size, shape and colour and can hit together.

b) Plants grow, change and multiply or produce other members of their realm like themselves. Physical things can only do these things when acted upon. They cannot do so themselves.

c) Animals grow, change, multiply, move and have senses. Physical things can be moved, but cannot move themselves.

d) Man hears God's voice and answers it in his way of life. Man is a religious creature. He must take care of all the other realms.

e) Things are non-living. All the other realms are alive. (This is a more negative differentiation - the positive attributes of physical things should be stressed.)
Overview:

III Variety within the realm of physical things.

1) They have four basic shapes: circles, squares, rectangles and triangles.

2) They come in various relative sizes: large, medium and small. Things seem smaller or larger depending on what they are compared to. We can make them appear larger or smaller through the use of binoculars, telescopes, magnifying glasses, and microscopes.

3) Physical things have various colours. The primary colours are red, blue, and yellow. Other colours can be made by combining the primary colours in different ways.

4) Physical things have a certain feel or texture: hard, soft, smooth, rough, wet, dry.

5) Physical things have weight which results from the varying amount of pull of gravity on each object. Weight does not depend on size.

6) Physical things can be found in one of three states: solid, liquid, or gas.
   **Solids** take up a certain amount of space. We can't put two solids in the same space. They have a definite shape of their own. We can't squeeze them into any other shape.
   **Liquids** take up a certain amount of space. Their shape changes with the containers in which they are placed.
   **Gases** don't take up a certain amount of space; in this case they take up as much as they can get. Thus they do take up space but not a definite amount. They take the shape of the container they are in when in a container.

7) All physical things have one of the various kinds of energy: heat, magnetism, electricity, sound and light. When two or more things hit together we can see energy at work. Energy changes or moves things.
   **Heat** results when two things are rubbed together. This is called friction. Most heat on the earth comes from the sun. Other sources of heat are fire and man-made furnaces (burning of fuel), or heaters, electrical heat energy.
   Heat energy moves from one substance to another by conduction, radiation or convection.
   **Conduction** - heat transfer from one part of the substance to another.
   **Radiation** - the sun and all hot objects send out infrared rays. Objects take up and absorb the rays.
   **Convection** - heat is transferred by currents of air. Hot air uses and cooler air moves in to take its place until it too is heated. Thus there is a continual stream of warm air.
   Heat, oxygen and fuel together cause fire. Removal of one of these extinguishes the fire.
   We get heat and light from fire. Fire out of control results in destruction.
III Variety within the realm of physical things.

7) Magnetism - A magnet is a thing which can attract (pull on) or repel certain other things. A magnet can be stone or metal. Magnets have different shapes. We cannot see magnetism but we can see it at work when it pulls two things together. A magnet has a north and a south pole. Like poles repel each other; unlike poles attract. This is a law God made for magnets. We can make a magnet.

Electricity - We can make electricity by rubbing certain things together. Our body has static electricity. We can see this when our clothes crackle and spark or when a comb after it has been pulled through our hair several times holds paper or can bend water. Before electricity could become a servant to man he had to find a way to make a steady stream of electrical energy. This kind of electricity is called current electricity. Current electricity flows from where it is produced - the powerhouse or a battery through wires. Man controls this electricity in his home etc. by turning the electric switches on or off and by plugging in appliances. This closes and opens the circuit causing power to run to the appliance or be cut off before it reaches the appliance. Lightning is static electricity jumping from one part of a cloud to another or from cloud to cloud. The electricity is produced by the swirling and rubbing of tiny droplets of water in the air and clouds.

Light - We get light from fire, a candle, a flashlight; To get this kind of light we must bring two things together; for fire and the candle flame we must strike the match and put it to the fuel; for a flashlight the flashlight and the battery must come into contact. Most of our light comes from the sun. Light is a kind of radiant energy. Light radiates: it spreads out from its source in straight lines. Light energy travels many times faster than sound energy (lightning and thunder). White light is composed of many colours which can be seen when white light is passed through a prism. Objects have colour because only certain wavelengths of light are reflected from the objects. The colours not seen are absorbed. Light travels faster without a media. The speed of light changes when it passes through solids, liquids and gases. This may cause refraction. Light may also be bounced back by smooth shiny surface. This is called reflection. Light passes through some substances. These are said to be transparent. Substances that do not allow light to pass through at all are called opaque. Sometimes light is scattered as it passes through so that we cannot see clearly through it—the substance is called translucent. Waxed paper is translucent. If light does not go through something it makes shadows.

Sound - Sound is a form of energy caused by things moving. Physical things cannot move by themselves so in order to produce sound energy the object must be hit. As the thing moves or vibrates it makes the material around it vibrate too. Thus the air around it vibrates. When these vibrations hit our eardrum we hear the sound. We call highness and lowness of sound pitch.
III Variety within the realm of physical things.

The faster the vibrations, the higher the sound. A sound is made louder by giving more energy to the vibrating objects, i.e., hitting it with more force. This makes more air vibrate. Vibrations pass more easily through liquids and solids than through gases. When sound energy hits something and bounces back again we hear an echo.

IV Inter-relationships with other realms.

Energy:

1) Heat warms soil and plants grow.

2) Heat is used to cook food and warm our homes.

3) Fire out of control may result in prairie or forest fires involving destruction of plants and animals or their homes, and man or his home.

4) Magnets can be used to make a compass which show us direction.

5) We use magnets to hold things together. Example - electric canopener.

6) Electricity helps man do work in many ways. It makes his work easier.

7) Light helps most animals and man to be able to see better.

8) Light helps a seed change into a plant and helps things grow.

9) We use sound energy for communication: telegraph, telephone, radio, Sirens and bells warn us to get out of the way or get up.

We enjoy the realm of physical things.

1) We enjoy variety in physical things.

2) We enjoy colour. It adds beauty.

3) We enjoy and appreciate heat. Think of what the world would be like without the sun's heat. Think about how you enjoy wiener roasts or sitting around a campfire and singing. Why do most children like playing with matches and fire?

4) Think about what your food would taste like if it wasn't cooked. Try eating them uncooked once.

5) Some of our games are powered by electricity or depend on magnetism. We can play with magnets.

6) We enjoy light. How would you like it if it were dark all day or cloudy? Sometimes we use coloured lights to decorate our homes or to make a dramatic presentation more effective. Why do we use coloured lights to decorate our homes at Christmas time?

7) We can appreciate sound. Most sounds that we appreciate are called music.
THE REALM OF PHYSICAL THINGS

Teacher suggestions:

1. Introduction:

a) Make a chart of the four realms. Review differences and similarities between each realm.

b) To learn more about God's plan for the realm of physical things make another chart. Let each child give examples or put pictures under the correct headings. Use the headings natural and man made things.

2. Four basic shapes:

a) Circles: find as many examples as you can of things that have this shape.

b) Squares: find examples of things shaped like a square. How can you tell the difference between a square and a circle? Circles are round. A square has four sides and they are always the same length. It has four corners. Point out the sides and corners.

c) Rectangle: show an example of a rectangle. How is it different from a square? The sides are not all the same length. Only those opposite each other have to be the same length. It has four corners. Find examples of rectangles.

d) Triangle: show examples. How is it different from a square? Only has three sides and three corners.

e) Have many examples of squares, rectangles, triangles, circles. Have the children put them in the appropriate pile.

f) Using the basic shapes have the pupils make a picture or design.

g) Show each shape and its three dimensional counterparts. Have the pupils tell how the three dimensional is different from the two dimensional.

h) Have the children make these shapes in their 3-dimensional form out of cardboard or bristle-board. They can be displayed as mobiles.

i) Make a circle, triangle, and square out of a rectangle.

3. Size:

a) Display objects of various sizes on a desk. Let the children place them under the headings: large, medium, and small. Now go outside and compare buildings, trees, telephone poles, cars, etc. in these same categories.

b) Look at an airplane in the sky. Does it look large or small? What does an airplane at the airport look like? Take the class into the school yard and discuss the size of one of the students. Now send him to the far end of the playground. Why does he look shorter? Is he shorter?
3. Size:

c) Look at him through binoculars. What do you notice now?

d) Look at parts of plants etc. Now look at them through a magnifying
glass. What happens?

d. To explain how things are magnified look at a hand lens and what it
does. Look at fish in a round fishbowl, objects in a jar. Lens:
What shape is it? Where is the glass thickest? Make a smoke box
to show how it bends light.
One side of the box must be open. Punch three holes in the front.
Make a door in the side. Put in the box a saucer containing burning
incense. Darken the room and shine a flashlight or slide projector
light through the holes. Notice how the rays of light travel (in
straight lines across the box).
Now hold a lens through the door in the path of the light.
What happens to the three rays?
Cut a heart shaped hole instead of the three little holes. What
shape do you see on the other end? Can you explain why?
Relate this to the slide projector and why pictures are put in up-
side down. Explain too why the farther away the screen, the bigger
the image. Refer back to diagram 2. The light rays have a chance to
spread farther apart.
To use your box as slide projector:
Cut a hole the size of the slides instead of the heart and hold the
slide in front. To get a clearer or larger picture use a longer box.

f) Another way of changing the appearance of the size of the thing:
Move a lens back and forth between a small electric light bulb
(or candle) and a piece of white cardboard until a picture shows on
the cardboard. If you cannot make a picture the bulb may be too
close to the cardboard to focus. Move the lens until a second picture
shows. Which picture is larger? Where is the lens in each case?
Move the bulb and cardboard farther apart.

g) Discuss what happens: Has the image on the slide or the candle changed
size? No, but we have made it appear larger. Also when we see
things from a distance they appear to be smaller. They have a fixed
size. Also in comparing sizes, large, medium and small are relative
terms depending on what they are compared to.

h) Draw 2 pictures showing the effect of distance upon size (example —
lighthouse and boat far away and close, an airplane on the ground,
and in the air).

i) Just for fun look at yourself in a spoon. What do you notice? Some =
places have huge convex and concave mirrors. The distortion of
yourself can be very amusing. Go to such mirrors if in the area
or if you have been and took pictures show them to the class.

j) To integrate with arithmetic or mathematics the size of things can be
measured. Have children measure the circumference of a tree by putting
a string around it and transferring the length of the string to a yard-
stick to find its actual length in units of measurement. Measure
the distance from one end of the room to the other.
3. Size:

k) We can measure things too tall to reach by measuring their shadows. Measure something you can reach and find the relationship or ratio between the thing and its shadow and transfer this to the object you are trying to measure. For instance, if you measure a pole and find it is 4 ft. and its shadow is 3 ft. Multiply the length of the second object’s shadow times 4/3 to get the length of the object in question.

4. Colours:

a) Why are there different colours?
White light is made of many colours. You can see these with a glass prism. Each colour has a different wavelength. When light goes through a prism each colour is bent a different amount. The colours that you see when they are separated by a prism are the same as the colours in the rainbow. Drops of water can act like a prism. The colours in the rainbow and the spectrum are the primary colours. Let the children try to separate the colours by using a prism or if this is not available use a sprinkler.

b) Give each pupil a sheet which has been ruled off into thirds. Paint the first block red, the second yellow, the third blue. Let the pupils experiment by painting over each colour with the other two. Ask: What new colours did you find? (orange, green, purple) By combining the three primary colours new colours can be made.

5. Feel or texture:

a) Place a variety of objects on a desk. Have the children feel these objects. Classify each under the following headings: hard, soft, smooth, rough, wet, dry. Some things fit under more than one category.

b) Have children bring in things for each heading.

c) Have children close their eyes and try to guess what each object is by its texture.

d) Using all these things have the children make a collage.

6. Weight:

a) Weigh various types of things of the same size in a balance scale. What happens? Weigh something very big and light—a piece of styrofoam, and a small heavy object—a brick. Which is heavier? Size does not determine weight.

b) Use various types of weighing devices: spring, bathroom scales, balances.

c) Same. Let one pupil come to the front and put an object on one side of the balance. Then have another child put something else on the other, trying to balance it.
7. Physical things can be grouped by size, shape, colour and feel.

Have many objects on a table, group them under each of these headings. Note that different things are grouped together under the size classifications than if they are grouped according to colour.

8. Physical things can be found in three states: solids, liquids, gas.

a) Solid:

Show an example of a solid - a block. Does it have a definite size and shape? Try to squeeze it into a ball. Does it take up space? Try to push another block into the same space this one is occupying. Feel a solid - How does it feel? Hard.

b) Liquid:

Show the children some water flowing from a tap. Put your finger into the stream of water. Does the water have a definite shape? How did it feel? Put the water into a container. Put some more water into another container. What shape does the water in each take? Emphasize the water takes the shape of the container it is in. Does water take up space? Put a rock in a glass of water. Why does the water level rise? (The water and the rock cannot occupy the same space at the same time.)

c) Gas:

Air takes up space. To show this you need a bottle, a piece of cotton or sponge, and a funnel. Put the funnel in the neck of the bottle. Put the sponge between the funnel and the bottle neck to block off the air. Pour water into the funnel very quickly. Some water goes on - then it stops. Why? Air is inside and it takes up space. Air and water cannot occupy the same space.

ii) Blow up a balloon.

What did we put into the balloon? Keep blowing. Why does it get bigger? Keep blowing until the balloon breaks. Why did it break? (The air needed more room.)

iii) To show that a gas takes up as much space as it can get, show how water vapour spreads into the air in all directions from its source.

To show each of these states of things review water in its three states.

9. Energy

Heat:

- To show two things rubbing together produce heat. Rub some steel wool across a piece of metal rapidly or a file across a knife. Have the children feel it. What type of heat transfer is this?
9. **Heat**

- How heat moves. Put a spoon in hot water. What happens? (The spoon gets hot and heat reaches your hand)

- Heat evaporates water. Put equal amounts of water in two dishes. Put one in a cool place, one in a warm place. Later - which jar has the most water?

- Put some ice in a saucepan and hold it over heat. What happens?

- Talk about the children's emotions toward fire. Some are fascinated, others are afraid. Don't ridicule any child's feelings. Have the children express their feelings in poems, stories, pictures.

- Fire needs fuel. Light a match and lay it in an aluminum foil pan. Why does the flame eventually die?

- Light a candle. Put a tin can over it. Why will the flame go out? Fire needs oxygen.

- Fire needs heat. How do we light a match? What does striking the match do? Hold a magnifying glass so that the light hits it. Hold a paper in front of the magnifying glass. What soon happens? Why? Why does pouring water over a fire put it out? Which of the three essentials for a fire is taken away? Try it (heat, some air)

- Have children make a list of ways we use fire. See who can make the longest list.

- Forest fires - fire out of control. Have children do research on forest fires. Causes, effects ways of prevention and controlling forest fires.

- Discuss how making a little fire ahead of the actual fire helps in controlling forest fires. Removes the actual fires' fuel.

10. **Magnetism**

- There are several fables about the discovery of magnetism. One story which is told: There was a shepherd named Magnes who sat on a stone one day and found that the iron tip of his staff stuck to the rock. He called the rock a magnet. After that, man treasured this special kind of rock. Read various versions. Have the children write their own version.

- Using two magnets with poles marked. Suspend each magnet by a string. Bring the north poles of both of them near each other. What happens? Bring the 2 south poles together. Bring the north pole of one close to the south pole of the other. What happens?

- Try attracting all kinds of objects around you with your magnet. Are they all attracted? What kind of things are attracted?

- Make your own compass. The compass is a kind of magnet. Magnetize a needle and attach it to a piece of cork. The needle always points north-south (paper arrow). No matter how you turn the string by which it is suspended the needle always points north.
10. **Magnets**

- Use your compass in finding what direction you would travel to go from the school to road, school to flagpole.

- Do some orienteering with the class. Make a sheet of instructions which the teacher should walk out first. For example, walk 270° N. for 17 paces. This can only be done with a compass. Which has a degree dial. This can be developed along a car rally idea.

- Try to attract things to your magnet through a piece of glass. Move the magnet around under a piece of glass and spread some sewing pins on top of glass. What happens?

- Make a list of other things in your classroom or at home that contain magnets. How do they help us? Some examples are electric canopeners, refrigerator doors, some cupboard doors.

11. **Electricity**

- Did you ever get a small shock when you touched another person, a radiator, or a water tap, or walked on a wool rug? When the Greeks saw these sparks they called it electricity, which comes from a word meaning amber. If you comb your hair in the dark you may see a spark.

- To see the effect of electricity try this: You will need a comb and a tap or a small stream of water. Pull the comb through your hair 30 or 40 times. Hold it near the water. It will make the stream bend a little. The comb will also pick up pieces of tissue paper. Electricity must be strong if the little bit from combing your hair will attract paper and bend a stream of water. Note that the electricity here is a result of two things "hitting" each other, which was a prerequisite for seeing energy at work. It is produced by scuffing your feet on a wool rug or rubbing your hand on cat's fur or the comb and your hair rubbing together.

- Watch lightning in a thunderstorm. Where does it start? What does it look like? Discuss your feelings about lightning. What does it remind you of? What do you think lightning is? Write a poem about what you think it is or draw a picture of a storm with lightning and thunder. Ginn Readers Blackout gives this explanation for children: "Lightning is a big electric spark. Sometimes it jumps between a cloud and the ground, sometimes between the clouds! The electric spark is hot. Its heat splits the air with a tremendous CRACK. When the spark has passed the air tumbles together again. So with each flash of lightning you can hear the crack or the rumble of thunder."

- How far away is lightning? Count the seconds between the flash of light and the rumble of thunder. A good way to count seconds is to say 'thunder' after each number:
  - one thunder - that's one second
  - two thunder - that's two seconds
  - three thunder - four thunder, etc.
  It takes five seconds for thunder to travel one mile. So if you count five seconds than the lightning is one mile away.
11. Electricity

- Light travels faster than sound. You will always see the lightning before you hear the thunder. Sometimes you see only the lightning and don't hear thunder. Then the lightning is very far away.

In this section don't talk only about the scientific aspect of what lightning is but deal also with the child's feelings and ideas about lightning. Also lightning is not only a scientific happening; it may be an art object for example. Let the students write stories and poems or draw pictures.

- To show current electricity you will need a dry cell or battery, a flashlight bulb, two 12-inch pieces of bell wire and adhesive or friction tape and a small board. Remove an inch of insulation from the ends of both wires. Wrap the end of one wire around the side of the bulb. Tape the battery to the board. Attach the wire to the top and bottom of the battery with tape across the centre. To complete the circuit touch the bottom of the bulb with the end of the remaining wire as shown. Now we have a complete or closed circuit. What happens to the light?

(picture)

One wire allows electricity to flow from one part of the dry cell to the bulb. The other wire allows them to flow from the bulb back to the battery. What happens when you remove the one wire again?

- In a complete circuit the electricity keeps flowing but we don't always want the bell ringing on the light on so we want a way to stop the current. A switch can do the job. All switches have a metal part that can be moved to make or break the circuit apart. If you can get some old switches to take apart you can set up a display to show how they work.

- Note that electricity still has to be controlled by man to be useful. Electricity if abused or not controlled can be destructive and harmful.

- Discuss how electricity can be dangerous. We can experiment with static electricity but current electricity is too powerful for us to touch. Never play with uncovered wires, switches, and plugs.

- Make a list of electrical appliances and compare how the same work was done before electricity and these appliances were invented.
12. **Light**

- Light travels in straight lines. Refer back to the smoke box experiment (discussed under physical things - Size #3e, under Teacher Suggestions).

- Light travels faster than sound. Talk about this concretely in terms of lightning and thunder. The lightning always reaches us before the crash of thunder. This is because light travels faster than sound. Refer back to electricity.

- Light travels faster through air, not so fast in water and even slower through glass, and not at all through some substances. Plain glass which lets light come straight through so we can see objects on the other side. These are called **transparent**. Translucent materials, for example frosted glass, bend the rays so objects on the other side cannot be seen clearly but there is light. **Opaque** objects don't let any light through.

You can test what materials are transparent, translucent or opaque by holding different materials in front of a lamp. Does the light come through clear enough to get a clear view of the light on the other side? If it does the material is transparent. If you can see light but cannot see the object on the other side it is translucent. If you cannot see light at all it is opaque.

Examples to try are clear glass, frosted glass, cellophane tissue paper, aluminum foil, writing paper, plywood. Make a record of what you find.

- How does a mirror "work"?

  Light can be reflected by smooth objects. Light behaves much like a ball, if you throw it straight down it bounces straight up but if hit at an angle it bounces off in the other direction at the same slant. If you stand straight in front of the mirror what do you see? However, if you stand at the left of the mirror and someone else at the right what do you see?

  A rough surface doesn't reflect an image because light rays hit at various angles so they bounce off in all directions. Try it with a rough shiny material if available (crumpled aluminum foil).

- Remember that the speed of light changes in different kinds of substances. Sometimes this makes your eyes play tricks on us. Look at a spoon in a glass of water. Why does this happen? (This is called refraction). The speed of light is different in the water and the air, this caused the light to change its angle at which it travels.

- White light is composed of many colours. To see the different colours in light, let it pass through a prism or look at a lawn sprinkler (see Colour #4a Physical Things).

- When light cannot pass through something it makes a shadow. Go outdoors and list things which make shadows. Go out on a sunny day and a cloudy day. Are there shadows on a cloudy day?
12. **Light**

Play a game of shadow tag. Make shadow pictures by putting your fingers in front of the light from a filmstrip or slide projector. Make up a short shadow skit. The actors should be in the light behind a sheet, the audience in the dark on the other side of the sheet. Draw your shadow at different times of the day. Why does it change? See Unit II.

- Teach a lesson on shading in art. Make silhouette drawings.

13. **Sound**

- Close your eyes and listen. Listen as many sounds as you remember. What kind of things made these sounds? Which sounds did you like. Do this several times in different locations to develop a sensitivity to sounds. Some sounds become so common we don't even notice them. Which sounds do you hear at night?

- Produce some noise by dropping objects, hitting things; then play some music. Crush some paper, blow up a paper bag and break it, beat a drum, bang the cymbals together, whistle. Ask the children which they think is music and why. How is noise different from music? How is the beat of a drum musical?

- How sounds are made:

Put a rubber band around a box that has one open side. Pull or "pluck" it with your finger. Watch it. What happens to the rubber band? What happens when it stops moving? (no more sound) This shows that sound is produced by vibrations or things moving. Move a book, fan yourself with paper, move your chair. What happens?

Note that to make each sound something had to come in contact with or hit the object producing sound. Put paperclips on a drumhead. Strike the drum. What does the drumhead do when it makes a sound? Hum a song. Touch your throat with your fingers lightly. How does it feel?

- Loud and soft sounds.

Hit the drum gently. Then hit it hard. What is the difference in the sound? Pluck the plastic pulled over the box a little, now pull it back farther. The harder it is hit or pulled the more energy you give the object, the more the air moves, the more sound there is or the louder the sound.

- High and low sounds.

Touch a card to the spokes of a bicycle wheel. Does the sound change as the speed of the wheel changes? How? Pull several more rubber bands of different widths over your open-sided box. Pluck them and listen to the sound. Put a pencil under the rubber bands to stretch the elastics. Pluck the long part of the rubber bands. Do you hear a difference? Pull the short part. What do you find? The sound should be higher the shorter the string or elastic. Higher pitched sounds are caused by causing the object to vibrate faster. How does shortening the string do this? On a guitar, how does tightening the string raise the pitch? How does putting your finger down on the string partway down the string raise the pitch? Which string produces the lowest sound, the thick one or the thin? (the thick—slower vibrations). Experiment with high and low pitch on a guitar.
13. **Sound**

- Get eight soda bottles. Put different amounts of water in each bottle. Put them in order from least to most water. Blow across the top of one of the bottles. You are making the air in the bottle vibrate. Which column of air makes the lowest sound (the longest - air has more room to vibrate - vibrations not as fast. Experiment with different amounts of water in the bottles. See if you can fix them so you can play the scale. How does a flute or a recorder use this principle (If you cover all the holes with your fingers you get the lowest pitch because the column is long. If you cover all the wholes except the one nearest your mouth you will get a high pitched sound because the vibrating length of the column is only as long as the distance to the first open hole.)

- How sound moves: Sound vibrations travel more easily through solids and liquids than through gases. How is this different from light? If you tap a pencil on your desk you hear the sound as it comes through the air. Put your ear to the desk and hit it just as hard again. You should hear it better. It is now coming to you through wood - a solid.

- Pound two stones together in a large bowl of water. Put your ear to the water. Does water carry sound? Sounds also travel through water and other liquids. If you swim under water and make a noise with your voice or hit a rock you can hear it clearly. Sound moves through air, it moves better through liquids and best to solids. Sound must have something to move through, the more dense it is, the more closely packed the particles or molecules of the substance, the better the sound travels. There is no sound in a vacuum.

- What is an echo? When sound waves hit a solid substance like a wall, three things will probably happen. Some of the sound may go through the wall, some may be absorbed or soaked up by the wall. If the wall is hard and smooth or flat, sound may be reflected or bounced back. To have an echo you must stand farther than 55 feet away from the wall. If you are closer than the sound waves bounce back fast enough to join the original sound.

- Sounds also have a certain quality, which tells you what produces these sounds, a cat or a dog, a flute or a recorder. You recognize your friends on the telephone by the quality of their voices. To see if you can differentiate sounds by their quality try this game. Have one pupil blindfolded. Another pupil says something to him or make a noise. Let the blindfolded person guess who it is. Another form of this game would be to have a pupil make some kind of noise with objects in the classroom. Have the pupils guess what made the noise.

- Use different things in the classroom to produce sounds as rhythm instruments. Tambourines can be made with pie plates and bottle caps, flutes using bottles with different levels of water, drums. Drive several nails into a board at different distances. Tap with another nail. The rest can just hit different objects. Play an accompaniment to a familiar song. Discuss why each of these things produce sound when they do.

- Make a tin can telephone. Make a hole in each of two cans. Put a string through the holes and a big knot in each end of the string. Keep the string tight and talk to someone through the cans. What happens when...
Sounds

Wind Song

When the wind blows
the quiet things speak.
Some whisper, some clang,
  Some creak.
Grasses swish.
Treetops sigh.
Flags slap
  and snap at the sky.
Wires on poles
  whistle and hum.
Ashcans roll,
Windows drum.

When the wind goes —
    suddenly
then,
the quiet things
are quiet again.

Lillian Moore

Colours

What is Pink?

What is pink? a rose is pink.
By a fountain's brink.
What is red? a poppy's red
In its barley bed.
What is blue? the sky is blue,
Where the clouds float through.
What is white? a swan is white
Sailing in the light.
What is yellow? pears are yellow,
Rich and ripe and mellow.
What is green? the grass is green,
With small flowers between.
What is violet? clouds are violet
In the summer twilight.
What is orange? Why, an orange,
Just an orange!

Christina G. Rossetti
Unit III
THE REALM OF PLANTS

Introduction

Outline

I. The Realm of Plants
   A) How all plants are alike
   B) Variety within the realm of plants
      a) Variety in appearance
         b) Variety in odor
         c) Variety in parts of plants
         d) Variety in how plants grown
         e) Variety in living places
   C. Interrelationship with other realms
   D. Plants change with the seasons

II. Man groups the plants
   A. Classifying plants
   B. Focus on Trees

III. Man's task
   A. Man enjoys and uses plants in many ways
   B. Man develops plants
   C. Man cares for plants and man is non-caring

Teaching Suggestions

Creation Story

A. The realm of plants: experiments on needs of plants and how plants grow
B. The realm of plants
C. Man groups the plants
D. Man uses, develops and cares for plants

Poems

Bibliography
I. Introduction—The Realm of Plants

Why study plants? Look at the creation story (Gen. 1:11, 12 and Gen. 1:29). God has given man all the plants. What has man done and what is he doing with plants? How has he opened up this realm? What are the possibilities that the plant realm allows (God's plan for the organic realm)? What are some of the vast variations within the plan for plants?

The outline is for the teacher and not for the pupils. It is intended to show some directions in which the abilities and interests of the pupils can be developed. The approach with the pupils should be as concrete as possible—seeing, smelling, touching, using plants via experiments, direct observations, manipulations, walks, visits etc. The teaching suggestions are intended as approaches to help the students discover and develop some of the ideas outlined for the teacher.

Students need not deal with all the topics mentioned. He need not be a catalog of facts. The topics should be used to allow the student to gain some knowledge of what the realm of plants is. This involves much more than the facts put down in many science texts. It includes some feeling of how great a variety there is in the realm and how plants can be used and enjoyed in many of man's activities, how they are interrelated with all of man's living.

Many topics mentioned in the outline of this unit are worked out in detail elsewhere e.g. when the focus is on man and his technical forming. They are included here to show the interrelatedness of the curriculum... If there is a special interest at a certain time that is. Perhaps a better time to develop it than when it is discussed in the teacher's outline.

Not all the pupils need to take the same route, not learn the same examples and facts. But they all need to learn the over all framework which makes the details meaningful.

I. The Realm of Plants

A. How all plants are alike
1. Plants grow, change, multiply
2. Plants differ from physical things
3. Plants need air, water, light, soil
4. Many plants have roots, stems, leaves, flowers.

B. Variety within the realm of plants

(a) Variety in appearance
1. shape: spreading, pointed, slender, etc.
   e.g. spruce, elm, rosebush, tulip, daisy, vine
2. size: microscopic to huge
   e.g. bacteria, mosses, violets, bushes, trees, giant Sequoia
   one of 272 feet has 600,00 board feet of timber enough to build 30 six-room cottages of 20,000 board feet each.
3. color: shades of green, coloured leaves and stems, colors of flowers.
(b) Variety in odor: rose, pine tree, skunk cabbage

(c) Variety in parts of plants

1. Variety in stems
   Stems support the leaves and flowers
   carry food and water to the rest of the plant
   (water and minerals; dissolbed food produced by plant)
   store food (e.g. cactus)
   Stems are woody or non-woody (herbaceous)

   Plants can be reproduced from stems: cuttings, underground stems, runmers
   Stems vary in size (length, thickness).

2. Variety in roots
   Roots support and anchor the plant
   absorb water and minerals
   store food

   Roots can be in soil, air or water
   Some roots have a big main root (taproot - turnip, carrot); some are threadlike (fibrous - grasses); some grow on stem (eg. prop roots of corn); some take food from other plants (parasitic - mistletoe).

3. Variety in leaves
   Leaves make food from air (carbon dioxide) and water.
   Air is taken in in small holes on the underside of the leaf.
   Oxygen and moisture go into the air

   Leaves vary in shape: oval, heartshaped, long and narrow, palm like; points can be sharp or round, edges may be smooth, wavy, indented.

   Leaves vary in color: silver poplar, fall colors

   Leaves vary in size

   A leaf has veins to carry water to all its parts. The veins have 3 main patterns: parallel (lilly of the valley); pinnate - like a feather (elm); palmate - like a hand (Norway maple).

   A leaf may have one blade (simple leaf) or have a number of separate blades (compound leaf).

   There are many kinds of leaves:
   - broad leaves which turn colors before falling off
   - leaves of grass: grown from bottom (can mow grass)
   - needle leaves
   - leaves that protect the plant: bud scales, cones of spruce
   - leaves that keep the plant warm: skunk cabbage
   - leaves that can prick and scratch: thorns of roses, cactus
   - leaves that trap insects: venus flytrap, sundew
4. Variety in Flowers

Flowers have the parts that produce seeds.
The parts of a flower are petal, sepal, pistil, stamen.
The dust on the stamen is pollen.
Many plants are named for the flower: shooting star, cream cups, pink lady's slipper.
Flowers vary in color.
Flowers vary in the number of petals they have.
Flowers vary in size. (The largest is an Indonesian Flower with petals 1 1/2 feet long and an inch thick).
Flowers vary in odor.
Flowers vary in the length of time they bloom.
Flowers vary in the time of blooming: e.g. spring, summer, fall.

Flowers vary in growing places.

a) woodland flowers: rich soil (decaying wood and leaves), bloom early in spring before sunlight is too strong or in summer when leaves of trees allow little sunlight to reach them. e.g. columbine, jack-in-the-pulpit, bloodroot, trillium, etc.

b) mountain flowers: bright flowers to attract the few insects living there, woolly fuzz on some leaves and stems, store food in underground parts, growing season is short so they produce seeds quickly.

c) desert flowers: bright flowers to attract insects, flower quickly after a rain. e.g. saguaro, yucca, prickly pear etc.

d) wet places: covered with waxy slimy substance that is water resistant. e.g. water lily, marsh marigold, swamp milkweed

e) roadside, field and prairie e.g. goldenrod, oxeye daisies, black-eyed susan

f) tropical (wet warm areas)

5. Variety in Fruit

Fruits contain the seeds.
Fruits vary in the number and size of their seeds.
Fruits vary in appearance: size, shape, fleshy, dry, hard, woody.
E.g. bean, grape, cucumber, orange, nut, coconut

Fruits vary in taste.
Fruits vary in smell.
(c) Variety in parts of plants

6. Variety in seeds

Many plants make seeds. Some make seeds in flowers and some in cones. Within the seed is a tiny plant called an embryo. Some seeds contain food for the young plant - 2 food parts like the bean and pea or 1 food part like corn kernel, rice or wheat.

Seeds vary in size.
Plants vary in the number of seeds they produce.
Seeds vary in shape.
Seeds vary in the amount of water they need to germinate.
They vary in the amount of time they take to germinate.
Seeds vary in how deep they should be planted in the soil.
Seeds vary in how they are scattered.

1. Some drop to the ground.
   a. Nuts (drop and roll away)
   b. Fruits (including the seeds from fruits which have been eaten by animals or by people).

2. Some travel on the wind.
   a. Dandelion and milkweed (parachute seeds)
   b. Maple and ash (winged seeds)
   c. Tumbleweeds (rolled over the ground by the wind)

3. Some travel on the water
   a. coconuts
   b. seeds dropped from plants growing near the water

4. Some are carried by animals and people
   a. On animals' coats and clothing of people
   b. On birds' feet and logs
   c. By squirrels or chipmunks

5. Some are shot from the plant.
   a. violet
   b. Jewelweed

Seeds need the right conditions to be able to grow. Often many seeds are produced but only a few will have the right amounts of soil, water and light to grow. Many seeds can lie dormant a long time and then will grow when the conditions are right e.g. in desert after rain.

(d) Variety in how plants grow

Plants can grow from seeds. Some grow quickly (rye, grass, bean, radish) and some slowly (grapefruit, lemon).

New plants can grow from stems and leaves:
- underground stem (tuber-potato, iris, cattails)
- bulb (onion)
- cuttings (ivy, geranium)
- leaf (African violet, snake plant, walking fern)

New plants can grow from roots e.g. sweet potato, dahlia.
(d) Variety in how plants grow

Plants grow from spores. These are plants that have no flowers, make no seeds (ferns, mosses, mushrooms). Spores are (microscopic) tiny. They start growing into plants where it is damp and warm.

Man grows new plants by grafting (e.g. rushbushes) on other stems so they bloom faster, don't have to wait for roots to grow.

(e) Variety in living places (where plants grow)

1. Plants grow in gardens, woods, marshes, meadows, along roadside, in farmer's fields.

2. Plants in hot dry places: Many plants have large thick stems. When the rains come these stems stretch and store water. The stems shrink as the plant uses water. Plants have spiny leaves or no leaves. Stems often do the work of leaves. There are no large leaves because water would evaporate too quickly from them. Many have waxy coverings on stems and leaves. Some have 2 kinds of roots: deep into the ground for moisture and those that spread out near the top of the ground, shallow to absorb moisture during the short rainy season. Plants are able to grow very quickly during the short rainy season; they blossom and form seeds. The seeds lie dormant until the next rain comes. Most plants are small. E.g. saguaro, barrel cactus, prickly pear.

Hot wet places: plants are large and close together. Leaves of many plants are broad, shade one another. Water evaporates from the surface of the leaves. E.g. rubber trees, orchids

cold places: Evergreens grow to timber line. Mosses and lichens grow on rocks. The growing season is short so seeds are produced quickly. Some plants have wooly fuzz on leaves and stems. Food might be stored in underground parts.

Water: Plants that float at or near the top of fresh water to obtain sunshine; often have long stems. E.g. seaweeds (kelp) in salt water.

C. Interrelationship with other realms

Plants need air, water and minerals from soil. Plants need different amounts of each. Different kinds and sizes of plants grow where there are different amounts of water and minerals available. E.g. rock garden, vegetable garden.

Plants depend on animals: e.g. to scatter seeds, to spread pollen, for food. Some plants eat animals.

a. Sundew plant: a fly sees leaves shining with drops that look like honey. Fly lands on leaf and its legs are held in the sticky drops. Hairs bend over the fly and it smothers.

b. Venus-Flytrap: on each leaf are 6 hairs. An insect touches the hairs and the leaf snaps shut.
C. Interrelationship with other realms.

c. pitcher plant: if insect crawls too far inside the pitcher leaf it can't get out. It falls into rainwater at the bottom and drowns.

Plants depend on man: e.g. scatter seeds, cultivation.

Animals depend on plants: food, homes.

Man depends on plants: food, shelter, clothing, medicine, etc.

D. Plants change with the seasons.

Spring: leaf buds and flower buds open; we see many shades of green as plants begin to grow again; seeds sprout; sap runs in sugar maples.

Summer: plants produce fruit and seeds; plants store food; man harvests plants.

Fall: buds are produced which will open the following spring; seeds mature and are scattered; leaves turn colors and fall off; annuals turn brown and shrivel; perennials lose much of above ground structure. Food making time is over; no more water passes from trunk to leaves. A layer of cork forms between the stem of each leaf and the twig on which the leaf is growing. This prevents sap from escaping when leaf falls. Green color fades (loss of chlorophyll) and we can then see the yellows and browns that are also in the leaf. The reds and scarlets are due to chemical changes. Leaf fall is necessary to conserve water in the winter when the plant cannot obtain a regular water supply from the soil.

Winter: evergreens can keep needle leaves because they have waxy coats (prevent large loss of water).

II Man classifies plants

A. Man Classifies Plants

1. a) Plants with flowers: these plants make seeds in flowers.

b) Plants with cones: Plants that make seeds in cones are called conifers. Conifers do not have flowers. Conifers have leaves that are needle-shaped. Because they stay green all year round conifers are called evergreens.

These two groups have seeds. Other groups of plants do not have seeds.

2. Seeds can be divided into 2 groups:

a) Seeds that have 2 food parts (dicotyledons) e.g. beans

b) Seeds that have 1 food part (monocotyledons) e.g. corn
II Man groups plants

A. Man Classifies Plants

(To help place plants that pupils bring in, see and question about the complete outline of plant classification is given below.)

- Plants
  - Plants that do not make seeds
    - Ferns
    - Mosses
    - Lower Plants
      - algae
      - fungi
      - bacteria
      - Mushrooms
      - molds
      - yeasts
  - Plants that make seeds
    - in cones
    - in flowers
      - dicot
      - monocot

3. Gardeners often group plants according to the length of time they live.

a) perennials - come up each year without replanting; produce flowers and fruit.

b) annuals - live for only one growing season

c) biennials - take two years to grow and mature; in first year growth is mainly in the root and in the second year growth is in the top; the seeds form, and then the plant dies.

4. Plants can be grouped into green and non-green. Green plants make their own food. Non-green (no chlorophyll) cannot make their own food but live on other living plants or decaying plants and animals.

B. Focus on Trees

I. Trees are plants. They grow, change and multiply. They need air, water and minerals from the soil.

The roots of trees are long, deep growing. They anchor the tree, absorb water and minerals from the soil through root hairs.

The stems of trees grow much thicker than the stems of other plants. They are wood and not green, called trunks. Trunks transport minerals from the roots to the leaves and food from the leaves to all parts of the tree. Stems support the branches and twigs. Bark on the trunk keeps water in and protects the inner parts from insects.
B. Focus on Trees

I. The leaves of trees make food from air and water. Air is mostly taken in on the underside of the leaves. Moisture and oxygen go into the air.

Most trees grow from seeds. Trees will grow from seeds that fall in a place where there is enough water and heat to cause it to sprout. Seedlings need heat and light from the sun and water from rain or from under the ground.

II. There is great variety in trees: shape, size, leaves, living places, type and color of bark, seeds, cones, fruit.

III. Trees can be classified as

1. Broad leafed (deciduous): leaves are broad-leafed, lose leaves in the fall. Classified as hardwoods in forestry.
   Examples: walnut, hickory, birch, elm, ash, maple, oak.

2. Coniferous (evergreen): the slim sharp leaves look like needles.
   Evergreen shed a few leaves all during the year, do not lose all their leaves in the fall. Classified as softwoods in forestry.
   Examples: pine, spruce, fir, hemlock, cedar

   Seed grows in cones. There are 2 kinds of cones: pollen cones and seed cones. Pollen cones are smaller and are grouped in bunches.
   Wind carries pollen to buds in the seed cones. When the seeds are ripe they fall out from between the scales of the cones. The seeds are not enclosed in a covering.

IV. Uses of trees

1. Examples: oak - furniture, fences, flooring, tool handles
   mahogany - furniture, paneling, decorative objects
   fir - buildings, paper, rayon
   pine - paper, rayon, paneling, building

2. See uses of plants, enjoyment of plants, development of plants for further information. Section III.


III. Man's Task

A. Man Enjoys and Uses Plants in Many Ways

1. Many enjoy the beauty of plants
   fragrance of roses; majesty of the oak; gracefulness of the willow in the wind; colorfulness of maples in fall; dew drops on rose petals; greeness of leaf buds opening in spring.
2. Man enjoys plants in his recreation
   a) Hobbies: gardens, flower arranging, studying a certain group of
      plants in detail, collections of plants or group of plants in
text, collections of plants or parts of plants, photography
   b) Camping in parks and woods
   c) Hikes, walks, biking in parks and woods.

3. Plants help provide for man's physical needs.
   a) Shelter: wood is used for houses and furniture paints, varnishes,
turpentine
   b) Clothing: cotton, linen, hemp, jute, rayon

Cotton: flowers of the cotton plant are a delicate white; they
turn pink and fall to the ground. The base of the flower is the
seed pod. It grows and pops open. Each seed has many fluffy
white cotton fibers. The seeds are combed out by a machine
(cotton gin) that looks like a round comb with many teeth.
(spinning, weaving, — in the past now)

Flax: Plants are pulled before they are quite ripe. Seeds are
removed. Flax is placed in water until it is rotten (rotted)
which takes 10-14 days. Fibers are spread out to dry (10-14 days
again). Fibers are combed. Several strands are twisted to form
linen thread (spinning). This thread is wound of spools. The
making of linen is ancient...4000 year old mummies (Egyptian) have
been found wrapped in linen cloth.

Rayon: a man-mad fiber, made from the cellulose fiber of wood pulp
or cotton.

c) Food:
Fruits and nuts of trees—cacao, walnuts, coconuts, coffee, grape-
fruit, apples
juices of trees—maple syrup and sugar
juices of plants—sugar cane, sugar beet
stems of plants—asparagus, turnips, sweet potatoes
flowers of plants—broccoli, artichokes, cauliflower
spices—clove and caper buds
wine—dandelion and elderberry blossoms
leaves of plants—cabbage, lettuce, spinach
seeds of plants—grains; rice, wheat, corn for flour, cereal, nuts
seeds of plants—vegetables such as beans, peas, pc pers, melons
oil such as sunflower, soybean, coconut spices such as mustard,
black pepper, nutmeg

4. Man uses plants for decoration and landscaping
   a) in gardens, parks
   b) inside homes
   c) flower arranging: color, number, spatial arrangement

Flowers should suit each other and the setting (colors of room,
table) and the container should be of suitable size, shape and
color (e.g. low container for short flowers). Try to arrange
flowers to correspond with growing habits (e.g. long stems in high
vases, varying stem lengths). Heavy dark flowers should be near the
base and light colors and delicate shapes at the top. Make diagonal
cuts with a sharp knife, not with scissors. Keep the flowers out of
drafts and away from heat. Withered flowers can be wrapped in wet
newspapers or the stems might be put underwater for some time.
4. d) Trees to provide shade.

5. Man uses plants in music, poetry, painting, literature
   e.g. sunflowers still life by Vincent van Gogh
   poem "Trees" by H. Behn

6. Man has used plants in myths
   e.g. fairy ring mushrooms
   wood nymphs
   mistletoe: for Druids 2000 years ago in Britain mistletoe was a symbol of the spirit. It had no root in earth. They held ceremonies under the large oak tree on which mistletoe grew. For Scandinavians and their enemies it was a plant of peace beneath which they settled their quarrels. From this comes the tradition of kissing beneath the mistletoe.

7. Man uses plants in festivals and customs.
   e.g. leis in Hawaii, tulip etc. festivals
   certain plants are associated with certain days (lily with Easter; poinsettia, mistletoe with Christmas) Evergreen Christmas trees.

8. Man expresses his thanks, joy, sorrow, love, sympathy, friendship, regret with plants.
   e.g. at funerals, weddings, on anniversaries, birthdays, on graves and monuments, for sick in hospitals

9. Man uses plants as aids in communication and distribution.
   e.g. stamps, newspaper, paper, for books, telephone poles, railway crossties.

10. Man uses plants in worship literature.
    e.g. parables.
    Parable of sower and seeds (From Gin Light and Life Reading Series)
    Blackout

    "The Parable of the Seeds and the Soil"

    One day Jesus was sitting in a boat near the Lake of Galilee. Soon many people came to hear Jesus. He stood up, and this is the story he told.

    "A farmer went out to plant some seeds. As he dropped his seeds, some of them fell upon hard ground. Birds snatched them away, so these seeds did not grow.

    "Other seeds fell upon rocky ground where there was little soil. These seeds grew fast, but because there was no soil for their roots they did not live.

    "Still other seeds fell into the woods. These seeds, too, tried to grow, but the woods choked them.

    "Some seeds, however, fell on good soil. Before long these seeds grew into fine plants. In time the farmer had a rich harvest."

    Jesus then went on to tell the people what this story should mean to them.
10. Jesus told them that the seeds are like the Word of God. Some people hear the Word of God but pretend not to hear it. These people are like the seeds that fall upon hard ground. The word of God is snatched from them.

Another man may be happy to hear the Word of God. But when he meets some people who laugh at him, he closes his ears to the Word of God. His mind is like the rocky soil where God's Word cannot take root and grow.

Still another man hears the Word of God when his mind is filled with other thoughts. Some thoughts are like the weeds that choke out God's Word.

Another man, however, may hear the Word of God and think about it. He will try to do what God our Father wants. Here, the Word of God falls upon good soil, and this man will have a rich harvest in heaven.

11. Man uses plants as symbols:
- e.g. laural leaf - symbol of victory (Greeks)
- olive branch - peace (United Nations emblem)
- oak branch - symbol of strength, glory, honor (Roman war heroes received crowns of oak leaves)
- rose, forget-me-not - love
- lily - purity
- Emblems such as maple leaf on Canadian flag, provincial flowers (e.g. Ont. trillium)

12. Other uses of plants
- Perfumes and soaps
- Drugs and medicines: saffron and opium from flowers
- molds (penicillin)
- Dyes
- Firewood
- Printer's ink and artist's colors
- Rubber
- Cellophane

13. Study a plant product in some detail.
- e.g. sugar (maple, cane, beet)
- rubber
- chocolate
- paper
- coffee
- flour
- bread
- tea: e.g. the plant, where grown, processing, different qualities, different prices, different packagings making a cup of tea to drink, tasting social customs
B. Man develops Plants

1. Experimenting with plants to produce new varieties:
   e.g. cross pollination of closely related plants to produce many
   varieties as with tulips; developing wheat seeds best suited
   for particular soils and climates, spring wheat and winter
   wheat, wheat that is resistant to a particular disease, wheat
   for milling and baking, wheat that has a high productivity.

2. Grafting:
   e.g. grafting a tree with good fruit on stock which produces stronger
   roots and grows rapidly.

3. Growing plants from cuttings or slips:
   cutting off growing parts and placing them in wet sand or peat moss
   since they grow sooner than if grown from seeds.

4. Man brings plants from one area to areas where they do or did not
   naturally grow. Man cultivates these plants and many of these crops
   are dependent on protection given by man.

   History of some cultivated crops:
   e.g. tomatoes come from a small-berried, partly cultivated weed native
   to Peru; spinach probably originated in Persia etc.

5. Man preserves food from plants to use when there are no plants pro-
   ducing the food.
   e.g. process of canning (home, factory)
       dehydration (removing water from food)
       frozen foods

6. Man grows plants in regions that are too dry by developing a system
   of irrigation and in non-fertile regions with the aid of fertilizers.

C. Man cares for plants and man is non-caring

1. Man works with plants on farms
   a) fruit farming: type of fruit grown, climate needed, tools work
      the year round—girdling, pruning, spraying, beehives, spraying,
      heater, planting, thinning, sprinkling, propping, picking, marketing,
      packing plants, processing (e.g. juices)
   b) market gardening
   c) wheat farm

2. Man grows trees and harvests them.
   Logging
   Sawmill
   "Pulp and paper
   Work of lumbermen years ago and now

3. Man produces paints and flowers in large quantities to sell.
   seed firms
   nurseries
   flower shops
4. Man pollutes water with his industries:
   e.g. pulp and paper
caneries washing sprays off fruit
Some industries treat water they use chemically before dumping it back in the river.

5. Man is careless about forests: forest fires, cutting down too much of the forest supply, removing forest cover.
Man works on prevention of forest fires.
Work of forester.
Work of forest ranger.
Reforestation for future supply of wood products, for food and shelter for insects, birds, mammals.
Roots of trees hold soil in place and leaf cover provides for slow absorption of water.
Sick, diseased trees are weeded out to make room for new growth.
Reforestation for crops of trees: Trees need 25-100 years to grow after planting. Tiny seedlings (e.g. spruce, pine) are grown in seed beds and left there for 2 years. They are lifted from seed beds to be planted in fields by machine. The machine makes a slit in the ground. The planter sits at the back and puts a seedling in each slit. The slanted wheels press the soil around the roots.

6. Man has aided soil erosion by removing the plant cover.
Man is planting in regions where soil is being eroded.
He plants trees etc. as windbreaks to prevent soil from being blown away.
Plants that are weeds, pests in one area may serve as land cover in another.

7. Development of weather forecasting to help farmers protect and plan for crops.
e.g. placing heaters under fruit trees in orchards to prevent blossoms from freezing.

8. There is poor distribution of plants and plant products so that there is waste in one area and want in another.
Development of dry and non-fertile land by means of irrigation and fertilizers.
Increased use of machines to increase output.
Sharing tools and information: better seeds and new types of crops, new and improved techniques.
Sharing products.
Mass production of products.

9. Setting aside areas as national parks for all to enjoy.
Making special gardens so all can see and enjoy the great variety of plants e.g. botanical gardens.

10. Special interest clubs
   e.g. Garden clubs: information for flower growers, plant seeds in parks, vacant lots, along roadside. Canadian Horticultural Council, 219 Queens St., Ottawa.

11. Bringing plants into an area where they become pests or bring diseases.
Plant quarantining: care in transporting plants from 1 country to another.
Laws which forbid bringing plants from 1 country to another.
Teaching Suggestions

Creation Story: Gen. 1:11,12 and Gen. 1:29

Gen. 1:11,12 God said, "Let the earth produce vegetation: seed-bearing plants, and fruit trees bearing fruit with their seed inside, on the earth". And so it was. The earth produced vegetation: plants bearing seed in their several kinds, and trees bearing fruit with their seed inside in their several kinds.

Gen. 1:29 God said, "See, I give you all the seed-bearing plants that are upon the whole earth, and all the trees with seed-bearing fruit; this shall be your food. To all wild beasts, all birds of heaven and all living reptiles on the earth I give all the foliage of plants for food.

Teaching Suggestions

A. The Realm of Plants - Experiments on Needs of Plants and How Plants Grow.

Put the experiments on work cards. If the cards are numbered the pupil can put the numbers of experiments he has done on a chart beside his name. He should describe the results, record what happens, make diagrams etc. and keep these in a folder. He should learn to do his records neatly and clearly. For students who can not read the teacher could read the work card to a group and then let them work on it from there. (The parts in brackets should not be typed on the student work cards.) It should probably be done as class project. For first grade as much as possible should be in diagram form instead of written in words.

1. (To demonstrate that plants need soil).
   Materials needed: pebbles, jar, garden soil, flowerpot, seeds.
   Put some pebbles, bean seeds, water in a jar. Do not let the water in the jar get too low. Also plant some bean seeds in a pot filled with good garden soil. Keep soil moist. Observe what has happened after four days, one week, three weeks. Record what happened, using labelled drawings on newsprint folded in four.

2. (To demonstrate that plants need good soil)
   Materials needed: identical jars or flowerpots, bean seeds or plants (soak beans/or overnight to speed germination), soil-sand for one jar, clay for one jar, humus for one jar, heavy paperbag, plastic bag. Plant bean seeds in each of the following: sand, clay, humus. Observe the immediate results of plants in different soil. (Results: the sandy soil absorbs water faster than clay; clay soil will hold more water and hold it longer; humus is loose, holds air and moisture.) Guess what will happen to soils for the following week. Can a plant have too much water? How do the roots of plants grow in sandy soil? in clay soil? in humus? How can one enrich the soil? How can one aerate the soil? Do all plants need the same kind of soil?
A. 3. (Plants need water.)
   Place two plants in the sunshine. Water plant A every day; do not water plant B.
   Would the same result be possible with different kinds of seeds?
   Is it possible to give a plant too much water? How can you tell if a plant is receiving enough water; too much water?

4. (Plants need light; plants grow towards the light.)
   Place one plant in direct sunlight. Cover the other pot with a paper bag.
   Would happen if the paper bag were switched in the middle of the test period. What would happen if heavy, clear cellophane were placed over one plant instead of an opaque paper bag?

5. (Plants need air.)
   Place one plant anywhere in the room, tie a plastic bag over another plant.

6. Germinating seeds of various kinds
   Put some absorbent paper such as blotting paper or toweling on top of a small piece of glass. But the seeds on the top of the paper. Orient the seeds in different directions to see if this makes any differences in the way they grow. Place another piece of glass on top of the seeds.
   Fasten the two pieces of glass together with string or rubber bands.
   Place an edge of the glass and paper into shallow water. Since the paper is absorbent, water will travel up it to the seeds. What comes out of the seed? What direction do the roots grow? What happens if the glass plates are turned after the seeds have started growing? What direction do the shoots grow? How long does the plant continue to grow? Then what happens to the plant?

7. Plant different seeds to compare the length of time for germinating.
   Use fast germinating seeds such as rye, grass, bean, radish and slow germinating seeds such as grapefruit and lemon. Make a chart to record germination times.

8. (To show that plants need air, sunlight and water.) Take 4 bean plants you've grown...as nearly alike as possible:
   1) in the dark but give it water
   2) in a glass jar with some water in the bottom. Seal the jar to keep out the air.
   3) give air and sunlight but no water
   4) give air, sunlight and water
   Which plant grows best?

9. How will plants grow if they are turned upside down?
   Use a geranium...fit a piece of cardboard or cloth around the plant.
   Fasten to the flowerpot so that the soil will not fall out when the pot is inverted. Turn plant upside down and support it so that the leaves of the plant do not touch the table. The plant can be watered through the drain hole in the bottom of the flower pot.

Observe the plant as it grows. What happens to the leaves? What happens to the stem? Later, after the experiment has been completed, break the flower pot and see if there has been any change in the way the roots grow.
A. The Realm of Plants

10. What happens to a plant when it is very cold?

Get 2 plants of the same kind. Put one in a very cold place (outside if it is cold or in the refrigerator). Keep the other plant in a warm place. Leave both plants for one day.
What happens to the plant in the cold place?
What happens to the earth in both pots?
Make pictures of what you see.

11. Grow grass seeds on a sponge. Place the sponge in a shallow dish of water. Keep the sponge damp. Sprinkle grass seed over the top of the sponge.

12. (Effects of light and lack of light).
Keep 3 daffodil bulbs in darkness for a week. Plant in separate flower pots. Place one in full light, one in indirect light, and one in the dark. Record the results.

Get 2 plants such as geraniums. Put the plants in small pots and let them grow for a week or more. After both plants are growing well cover one with a paper bag. Keep the soil of both plants moist but not wet. After a week take the paper bag off. How does the plant look?
Put the bag over the plant and leave it for another week.
How do the plants look at the end of the new week?
Do the 2 plants look the same?
Which plant is greener? Why?

Variations: cover just one or two leaves with black paper or put one plant in a closet instead of covering it with a bag.

14. Measure the growth of the plant - how many inches first week, second etc.

15. Compare corn and bean seeds. Compare their growth. At each stage draw the 2 plants as you see them.

Put corn seeds and bean seeds in water.
Put some seeds on cotton, sponge or paper towels. Keep moist.
After 7 days: see if something is growing in the corn seed.
Open a bean seed; find the little plant and the 2 food parts.
Keep the rest of the seeds wet.
After 11 days: find the little corn plant and the one food part.
Find the little bean plant and the 2 food parts.
After 15 days: look at all the parts of the corn and bean plants.

16. (To show that a thick leaf holds water better than a thin one e.g. Saguaro cactus...water lily leaf).

Soak two handkerchiefs and spread one out-representing the thin leaf, and bunch the other-representing the thick leaf or stem. Observe which one dries first.
A. The Realm of Plants

17. How does a bean plant grow?
Soak 20-30 beans in water. Open some of the beans the next day. What do you find inside?
Fill 2 flower pots or deep dishes with good soil. Plant some beans in each pot. Keep the soil moist in both pots but do not add too much water. Keep the pots near a window, or put them where they can get light. What comes out of the soil after a few days?

Let the plants in both pots keep on growing. As the plants become larger, turn one of the pots each day so that all sides of the plants get light from the sun. Do not turn the other pot. What do you notice about the ways in which the plants in each pot grow?

Carefully dig 2 or 3 plants out of the soil. Wash the soil from the roots, then look at the parts that once were bean seeds. What do you notice about the way the plants began to grow?

18. Stems absorb water.
Take a white carnation with a stem about 4 inches long. Split the stem up the middle for about two inches. Put ½ in a small glass of blue ink, the other half in a small glass of red ink. The glasses are placed side by side. (Soon the ink will rise and color the flower—half red and half blue.

19. (Plant sap usually has sugar dissolved in it...the food it makes. Water in the soil goes into the roots toward the sugar water.)
Make a hole in each of 2 carrots. Put sugar water in one carrot. Put the same amount of fresh water in the other. Set the carrots in fresh water. After a few hours, see which carrot has more water. Where did the water come from?

20. How plants get water.
Color a tumbler of water with red food coloring or ink. Place a celery stem in the water. Examine the celery stem every hour or so to see how the coloring has moved up the stem.

Plant seeds in wet sand. Keep them in a dark place until they have yellow leaves. Then water them with red ink. Find the paths of the water in the plants.

22. (Plants need light).
Leave a board over a piece of grass for a few days. What happens? (Use an inconspicuous spot because the plants will turn yellow. They have no light to make new food).

23. To study water absorption.
You need 2 freshly cut twigs with leaves on them. Put one twig in a jar with some red ink and the other in a jar with some water. Let stand overnight. What do you observe? Cut the twig open with a sharp knife. Peel off some of the bark. In which part of the twig does water rise? In what parts is there no colored water? How deep a hole would be made in the maple tree to obtain maple sap?
A. The Realm of Plants

24. Growing a new plant from leaves.
Place leaves from begonia plant in water. New roots will grow.
Plant in soil.
Place one large leaf of a begonia upside down. Look for the large
veins on the back of the leaf. Cut the veins in the middle. Place
the leaf upside down on dam soil. Use toothpicks to hold the leaf
down. It should not have too much sun. Give it some water. A new
plant will grow at the cuttings.

Pick a leaf from an African violet, a leaf with stem attached.
Fill a dish with damp sand and push the stem of the leaf down into
the sand. Cover the dish with a glass jar. (Roots will grow down
into the sand from the base of the leaf).

25. Growing plants from roots.
Put pointed end of sweet potato in a glass of water.
Cut 2 inch pieces off top ends of carrot and/or beet roots.
Stand pieces in a shallow bowl with pebbles and water in it. Pebbles
help hold pieces in place.

Cut potato into pieces with an eye or sprout (bud) in each piece.
Plant pieces in flowerpot or outdoors.

Place ivy cutting in water.

Cut a piece of stem from a geranium. Place cutting in glass of water
in a sunny place. When roots grow place in flowerpot.

Study runners of strawberry plants. What is the function of runners.

27. Growing plants from bulbs.
Cut an onion that is ready to sprout. Find the beginning leaves of
the new plant and the stored food.
Put an onion bulb in shallow glass dish. Put pebbles around the bulb
to keep it standing up. Add just enough water to cover part of the
bulb and keep the water at this level. Put in a warm place so that
roots can begin to grow. After that bring into bright sunlight so
that new green leaves can grow.

Bring in a cake of yeast. Drop the yeast into a large container of
warm sugar water. (Next day notice that there is a much larger amount
of yeast. Since yeast does not produce its own food, it is put in
sugar water.)

29. Growing plants from spores.
To grow spores on a damp piece of bread...leave bread outdoors all day.
Place in a glass jar with wet blotter at end of the day. Screw on metal
cover so bread will stay damp. Put in a warm dark place. Keep blotter
wet. After several days look (should find blue and black mold).
Dampen a piece of old cloth and roll up in a piece of heavy paper for
several days. Be sure cloth stays damp. Put in a warm dark place.
Look after several days (should find mildew).
B. The Realm of Plants: How plants are alike, Variety in realm of plants, 
Interrelationship of realms, Plants change with the seasons.

1. Let pupils examine an artificial with a real plant.

2. Make charts showing the leaf, stem, root, flower and leaf of a plant. 
e.g. apple tree...tomato 
Mount them next to each other on the bulletin board. This should 
bring out the similarity in structure and the variety within the 
structures.

3. What different kinds of roots do plants have? Examine roots of 
e.g. grass, tulips, onions, carrots, dandelions, corn, beans etc. 
How are they alike? How are they different? Make diagrams of the 
different kinds you find.

4. Look for buds on all kinds of trees and plants. 
Take photos of different kinds of buds. Make pictures of them. 
Show slides of a bud opening. Go to see the buds on a certain tree 
every day to notice the developments. Take a picture of these buds 
every day. Pupils might pick a tree they pass on the way to and from 
school. The class may visit a tree on the schoolgrounds or nearby.

5. Record the plants that grow in your yard. Make a class survey of 
these plants. This activity can be carried out with the plants in 
the school yard. Class might do this together with the teacher. 
Then those who are interested may carry out this activity for their 
yard at home.

6. Bring in a wide selection of plants from many different growing places. 
Can children guess where they are from...how they are especially suited 
to that area.

7. Go out to as many of these places as possible to examine the plants 
growing there (lawns, fields, rocks, water, forest). Some plants 
may have to be brought in from home. Desert plants may be found in 
some greenhouses or in a botanical garden if there is one nearby. 
Use magnifying glasses to examine plant parts closely.

8. Show filmstrip, films and pictures of plants living in other 
environments...e.g. tropical rainforest. 
Let children suggest how these plants are suited to where they live.

9. Examine seed catalogs to see the variety available.

10. Look at the directions on garden seed packages to see e.g. how deep 
to plant seeds in soil, length of time to germinate, special care 
required, etc. Look at the seeds: compare size, shape, color.

11. Study a corn cob. Each kernel is a seed. 
This can be done with many vegetables and grains.

12. Make a seed collection. (individual or group activity) Label with name 
of plant...some may wish to include other information or drawings of 
plant.
B. 13. Make a class seed display. Pupils should pay attention to arrangement, clear labelling.

14. Count the number of seeds in e.g. dandelion, milkweed, pumpkin, etc.

15. Bring a large variety of seeds to class... (pupils can do the collecting as well). Let students suggest how each seed might be scattered. Let students group the seeds together that are scattered similarly.

16. Make charts showing how seeds are scattered. Labels could be used or diagrams or actual samples might be mounted.

17. Write stories about seeds.
   e.g. - The traveling seed / all that happens to it.
   - Choose a seed e.g. dandelion plant. Tell what different possibilities there are for the seeds including some seeds that grow into new dandelions... what are the conditions it needs to be able to grow - these should come out in the story.

18. Go out on a walk to find seed and seed pods.

19. Pantomine: Pupils be seeds... grow slowly, push blade up from under leaves. Windy day - swaying. Storm - bend. etc.

20. Display of fruit.

21. Why do Plants have fruit?

22. Bring various types of fruit (or have pupils bring them).
   Note shape, color, odor, taste.
   Find the seeds. Crack some open... find part from which new plant grows.
   Plant some of the seeds.

23. Scavenger Hunt after some familiarity. Give group cards with plants or parts of plants they are to find. Stress care in collecting.
   With rare plants they are only to find and write down where it is to be found.

24. On a walk note the shape of plants, particularly trees.
   Use in an art exercise.

25. Make a class collection of plants. To make plant mounts use shallow cardboard boxes of any desired dimensions. Put a piece of glass or cellophane to fit the cover of the box (½ inch margin along all sides cut out with sharp knife). Place enough cotton in box to nearly fill it. Arrange the specimens and label.

26. Some classes may have an opportunity to have a little garden of their own.
27. Each can choose a special spot of their own that they can visit frequently.
   On each visit they can record changes in that place...e.g. new plants
   blooming. Gradually they should have a record of all the plants in that
   spot. Diagrams and pictures can be added to the records.

28. Let pupils make a terrarium. A terrarium is a land habitat for living
    things. Terrariums can be set up to simulate desert environments, bog
    conditions, or woodland situations. (Small animals can be included).

    Materials needed: a container with glass sides (aquarium, large jar if
    only small plants are used); pebbles or broken pieces of flower pots;
    pieces of charcoal; soil as in habitat of plants; plants.

    Wash the glass jar or tank. Place pebbles or broken pieces of flower
    pots at the bottom and some charcoal on top of this. (Charcoal will
    help absorb gases that may be formed in terrarium.) Place 2 inches of
    soil on top of this. Put in the plants. Water the plants and place
    a cover over terrarium, not completely closed off.

    What is the effect of temperature on plants and animals. Keep a record
    of the temperature in the terrarium. Move it to a warmer place (or
    light bulb oven). Watch for changes. Try not to do permanent damage
    to the plants. Return to original place. What happens?

    What is the effect of humidity on plants. The plate kept over the
    terrarium will help retain the moisture that would be lost because of
    plant transpiration. Notice drops of water form on the glass plate.
    Where do these drops of water come from? (The terrarium needs little
    water since it uses the evaporation which condenses as moisture on the
    underside of the lid.) What happens when the plants grow so that leaves
    touch the sides or top of the terrarium?

29. Write a story about a day in the life of a plant.

30. Write the life story of a plant. This is good to show the interrelation-
    ship of the realms.
    e.g. an oak tree: an acorn falls where it has enough moisture, light and
    minerals to grow. Seedling. Fawn crushes it but it grows again. Full
    grown. Birds nest in it. Raccoons live in a hole in a branch. Covered
    with moss. Man comes to cut it down, or it is struck by lightning, etc.

31. To show interrelationship of realms make charts as below:

    Use diagrams or labels

32. To note the seasonal changes in plants: walk to the same place every
    season. Record in words, pictorially. Do a water color picture while
    at that place with each giving his impression of the season there. Take
    photos in each of the seasons of same places.

33. Poem, "Our Tree" by M. Chute focuses on the changes in the tree in 4 seasons.

34. Draw e.g. cherry tree in the four seasons.

35. Visit a bush all spring; record the changes with diagrams. e.g. leaf buds
    opening, flower buds opening.
C. Man groups plants.

1. Leaf collections: do not collect too many; pick the complete leaf (it separates from twig easily at petiole—little stem); do not break the twig. To preserve green leaves press them by placing them flat with a weight over them, between absorbent papers.

2. Spatter printing of leaf
   Materials: white or colored construction paper (9" x 12"), old toothbrush, scissors blade, large leaf with distinctive outer edge, poster paint with consistency of thick cream (color to suit color of background), pins to fasten leaf points, newspaper.
   Procedure: Place background paper on newspaper. Pin leaf or leaves on. Dip brush in paint, shake off extra paint. Stand a few feet from the leaf. Rub scissors blade or thumb nail against the bristles of the brush away from the leaf so paint will splatter back. Cover the entire surface. Strength of color upon the print depends on amount of splattering. Remove actual leaf.

3. Make monoprints with the imprints of leaves, roots, stems. In arrangement of roots and stems, line rhythm can be taught. As a whole, it would work as a design exercise. This is done by arranging these in water base or oil base block printing ink which the children roll on glass sheets. Paper is laid over the imprints. Rub the back of a spoon over the paper pressing down on the print.

4. Turn leaf over. Cover it with tissue paper. Rub a pencil over the vein pattern.

5. Aluminum foil plate design: Place a leaf on the inside surface of the plate (smaller than inside circle of plate). With a heavy hairpin or nail trace around the outline of the leaf. Remove actual leaf and put in the veins.

6. Blueprint of leaf or leaves: Place a piece of glass on a piece of stiff cardboard. Fasten these together at the top with a piece of adhesive tape. This is the printing frame. Lift up the glass cover and place a piece of blueprint paper face up on cardboard. Lay leaf, leaves or fern to be printed on top of blueprint paper. Cover with glass top. Expose the frame to the sun for a few minutes. Remove blueprint paper and soak print in a pan of water. (This last step brings out the blue color of the print and makes it permanent. You will need to experiment with length of exposure...depends on strength of sunlight).

7. Leaf transfer: rub one side of a leaf with crayon. Cover the entire surface of the leaf. Place the leaf with the crayon side down on paper or silk. Cover with paper. Press with a hot iron. The hot wax makes an image of the leaf on the paper or cloth.

8. A growing leaf collection: as soon as leaf buds begin to burst start a collection of leaves. Keep adding leaves every few days from the same trees until the leaves have become fully formed. (Each tiny leaf has the same general shape and features the day it comes out as it will have a month later when it is nearly 10 times larger). Place the leaves between newspapers and put heavy books on top.
8. Change the papers each day until the leaves are dry. On a slip of paper write each leaf's name and the date collected. You may wish to collect leaves every day for the first few days and then a couple of times a week. (Most leaves take about a month to reach full growth). Trees often have flowers ahead of the leaf growth. You may want to collect the blossoms. Evergreen trees can be included...new yellow, scaly, stemlike growths at the ends of the branches. When the leaves are dried mount them with glue on lightweight cardboard or in a scrapbook. You might leave a blank page in the scrapbook at the end of each leaf group so that you can add the colorful fall stage.

9. Bring in groups of leaves, seeds, bark. Let pupils see if they can match those that belong to the same tree. (Examples that might be used: pine, maple, catalpa).

10. Collections: nuts
    branches to show types of evergreen needles
    wood samples
    bark

11. Walks to study trees: see trees in various stages of growth. Can you find seedlings? How does the tree in the open compare with the same tree growing closely surrounded by others?

12. Study a group of tree seeds. How might the various seeds be transported over large areas. The seeds should be studied for clues.

13. Make tree silhouettes. Go outside to where the trees are and sketch with charcoal on white paper.

14. Why do trees grow to a much greater height than grass? Look at both outside to find out (sturdier stem, not die in winter time, etc.)

15. Can the class plant a small tree or seedling which they can watch grow during the years they are at that school?

16. Study molds with hand lens. Do the same with mushrooms. Can you see the spores?

17. Shake a pollen cone in a paper bag. Open the bag carefully. Look for pollen with magnifying glass.

18. Make a spore print. Get a mushroom. Cut off the cap and place it gently on a piece of light-colored paper. Cover the mushroom with a dish and leave it for a day. Gently lift the dish and the cap. The spore print was made by the thousands of spores that fell from beneath the mushroom cap.

19. Seeing faces in leaf scars: when a leaf falls it leaves a scar where it was attached. Study with a hand lens. Look just below the buds. (Looks like faces of camels, horses, monkeys. e.g. oval faces of elm, sleepy, winking; trembling aspen-heart shaped with round eyes and flattened noses). Do some artwork with these expressions.
D. Man Uses, Develops and Cares for Plants

1. Visits to: canning factory
   farms
   greenhouse—care of plants
   nursery
   flowershop—variety, how flowers are preserved
   flower arranging
   grocery store (plant products)
   lumberyard—see wood products
   museum (nature)

2. Talks by resource people
   e.g. florist on arranging of flowers, nursery worker on grafting
   from any of the above

3. How many different plants do you eat?
   Keep a record of the food you eat this week. Make a chart showing the
   name of the plant and the part of the plant.

4. Floral arranging; practice with garden flowers.
   Work with spatial arrangement of shapes that might represent the flowers.
   Combine with color.

5. Make an inventory of the things in your houses that are tree products.

6. Trace the origin of certain foods you eat to green plants.
   e.g. milk and eggs.

7. Displays: of vegetables, of fruits, of flowers, of food products
   The vegetables might be grouped according to the part of the plant that
   is eaten.
   The grouping might be based on color.

8. Do charts to show uses of plants. Have students group the uses? Various
   groupings can be discussed.
   (Grouping might be based on part of plant used, or on the use e.g. food,
   drink, shelter, etc.)

9. Open a can e.g. fruit. Note that it is vacuum sealed. All have some.
   How did the fruit get here? How did it get in this form in a can?
   Why? What other ways does man have of keeping foods from spoiling?

10. Why do we use wood?
    Get three boxes. Fill one with iron objects, one with small stones,
    and one with blocks of wood. Which is the lightest? Drop some of each
    into water. What happened? Which can be nailed? Which is easiest to
    cut? which is easiest to smoothen? (Use file, hammer, saw).

11. Stories of lumberjacks.
    Tall tales...Tall Tale America, Walter Blair, N.Y.: Coward-McCann.

12. Make a class collection of myths, traditions and interesting customs that
    have to do with plants.
D. 13. Study prices of fruit and vegetables: fresh, canned and frozen. This can be done on a visit to grocery store or students check when they shop with parents.

14. Groups list jobs that involve plants. After making a joint list groups should group them in various ways. Pupils might list jobs that have to do with recreation and plants, food and plants etc.

15. On a walk...find all the signs of erosion. e.g. tree roots exposed, fence post bare, gully beside steps.

16. Poems "What do we plant?" Henry Abbey
"Trees" Harry Behn

17. Molds and drugs: obtain a sample of soil from a wooded area, preferably moist with bits of leaf mold. Add a little water, and put in a warm dark place after covering it tightly. After a few days observe the molds formed. Soak a piece of bread in water and place in a tightly covered dish in warm place for a few days. Observe the changes that occur. Tiny plants growing there help make penicillin.

18. Flowcharts, paper filmstrips: to show the steps in making a food product e.g. bread; making paper; the work on a fruit farm. Use simple diagrams, pictures, labels.

19. Check product package to see where the food is grown, what it is made from. e.g. flour, sugar, cereals.

20. Tubes and fibers of wood: tear a bit of newspaper. Hold it near a light and look at the torn edge with a strong magnifying lens.

21. Obtain a package of non-sterile absorbent cotton. This cotton is almost like the cotton plant. Ask children to suggest ways in the cotton could be turned into thread...idea of twisting and pulling.

22. Make a monthly work calendar. e.g. fruit farm

23. Trace the origin of certain fruits and vegetables.

24. Compare the processing of sugar from maple sap, sugar beets, and cane sugar.

25. Graphing: to show production of products e.g. where tea is produced and how much each country produces. Country $x = \frac{1,000,000 \text{ lb.}}{\text{Country}}$

26. Pictorial map to show origin of cultivated plants, where different crops are produced.

27. Practice conservation in collections. Don't break branches; no trampling of plants; leave rare plants.
D. 28. Charts to show all the uses of a product.
e.g. balloons (elastic), raincoat (waterproof), sofa (soft) tape
( adhesive), tire (tough), plug (electrically resistant) flooring.

29. Study plant fibers: Cut off the end of a celery stalk. Split the
stalk. Examine with a magnifying lens. Look at other plant fibers.
Get some stems and stalks from several different kinds of plants. Pull
them apart the long way. You will find fibers in almost every plant.

POEMS
What do we plant? Henry Abbey

What do we plant when we plant the tree?
We plant the ship, which will cross the sea,
We plant the mast to carry the sails;
We plant the planks to withstand the gales—
The keel, the keelson, and beam and knee;
We plant the ship when we plant the tree.

What do we plant when we plant the tree?
We plant the houses for you and me.
We plant the rafters, the shingles, the floors,
We plant the studding, the lath, the doors,
The beams and siding, all parts that be;
We plant the house when we plant the tree.

What do we plant when we plant the tree?
A thousand things that we daily see;
We plant the spire that out-towers the crag,
We plant the staff for our country's flag,
We plant the shade, from the hot sun free;
We plant all these when we plant the tree.

Trees Sara Coleridge
The Oak is called the King of Trees,
The Aspen quivers in the breeze,
The Poplar grows up straight and tall,
The Pear-tree gives pleasant shade,
The Willow droops in watery glade,
The Fir tree useful timber gives,
The Beech amid the forest lives.

The Little Rose Tree Rachel Field
Every rose on the little tree
Is making a different face at me!
Some look surprised when I pass by,
And others droop — but they are shy.
These two whose heads together press
Tell secrets I could never guess.
Trees  Harry Behn

Trees are the kindest things I know,
They do not harm, they simply grow

And spread a shade for sleepy cows,
And gather birds among their boughs.

They give us fruit in leaves above,
And wood to make our houses of,

And leaves to burn on Hallowe'en,
And in the Spring new buds of green.

They are the first when day's begun
To touch the beams of morning sun,

They are the last to hold the light
When evening changes into night,

And when a moon floats on the sky
They hum a drowsy lullaby

Of sleepy children long ago...
Trees are the kindest things I know.

Paper I  Carl Sandburg

Paper is two kinds, to write on, to wrap with.
If you like to write, you write.
If you like to wrap, you wrap.
Some papers like writers, some like wrappers.
Are you a writer or a wrapper?

Paper II

I write what I know on one side of the paper
and what I don't know on the other.
Fire like dry paper and wet paper laughs at fire.
Empty paper sacks say, "Put something in me."
What are we waiting for?"
Paper sacks packed to the limit say, "We hope we don't bust."
Paper people like to meet other paper people.

Our Tree  Marchette Chute

When spring comes round, our apple tree
Is very full of flowers,
And when a bird sits on a branch
The petals fall in showers.

When summer comes, our apple tree
Is very full of green,
And everywhere you look in it
There is a leafy screen.

When autumn comes, our apple tree
Is full of things to eat.
The apples hang from every branch
To tumble at our feet.

When winter comes, our apple tree
Is full of snow and ice
And rabbits come to visit it...
We think our tree is nice.
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Unit IV THE REALM OF SENSORY CREATURES

Introduction

Outline:

I. The Realm of Sensory Creatures
   A. How all animals are alike
   B. Variety within the realm of animals
   C. Interrelationships with other realms
   D. Sensory creatures change with the seasons

II. Man Names and Orders
   A. Mammals
   B. Birds
   C. Fish
   D. Amphibians
   E. Reptiles

III. Man's Task
   A. Man enjoys and uses sensory creatures in many ways
   B. Breeding and training sensory creatures
   C. Man cares for animals and man is non-caring

Teaching Suggestions:

   I. Creation story
   II. The realm of animals and the variety within this realm
   III. Grouping of animals
   IV. Man enjoys, uses, develops, cares for animals

Bibliography:

Introduction:
Why study sensory creatures? Man has been given dominion over the animals that God has created. In this curriculum area that means learning the nature of animals, the interrelationship of animals with the physical realm and the organic realm, how man has and is fulfilling his responsibilities in this area of creation.

Introducing the unit using Gen. 1:20-24, 28 and Gen. 2:18-20 (also Psalm 104) will help determine the basic perspective of awe and responsibility that underlies and motivates the learning to know about animals.

The term sensory creatures is used instead of animals because many young children do not consider birds and fishes to be animals. The term animals can be used once it has become clear what is to be included.

The unit is intended for grades 1-3. The concepts have been grouped in an outline for the teachers. It is not to be brought to the students in that form.
THE REALM OF SENSORY CREATURES

Summary of outline of unit:

I. The realm of sensory creatures
   a) How animals are alike
   b) Variety within the realm of animals
   c) Interrelationship with other realms
   d) Sensory creatures change with the season

II. Man groups animals
    a) Mammals
    b) Birds
    c) Fish
    d) Amphibians
    e) Reptiles

III. Man enjoys, uses, develops and cares for sensory creatures
    a) Man enjoys and uses
    b) Man develops
    c) Man cares and is noncaring

Where possible concepts have been arranged in order of difficulty. To give some examples: grade one will work with how animals are alike but not likely with animal groupings; grade one might note the various shades of animals whereas grade two or three could include protective coloration; grade one might think of animal living places as land, air, and water while a grade three could take a more ecological approach and study the typical plants and animals in areas such as desert, sea, etc.; grade one might discover the variety of food eaten, a next level could work with the variety in ways of eating and a third level might focus on food chains; grade one might work with care of pets and farm animals while a next level extends this topic to include other ways of caring. The concepts worked with depend on the ability and interests of the students and of the teacher.

The very basic ideas of what animals are, the great variety within the animal realm and the variety of ways man has found to enjoy and use animals can be approached in many different ways via various science and social studies activities, via poetry, art, stories etc. One child can learn something via a science activity while another learns the same thing via music.

The child experiences life as a whole and not as so many subjects. This means subjects should be allowed to merge freely. If a teacher has the basic outline in mind she should be able to help children integrate their experiences...to find the general principle that relates the activities.

The child should end up with a sense of awe and appreciation and enjoyment—not a catalogue of facts. The children do not all need to know the same facts. They need not learn everything at the same time. All children do not learn in the same way nor at the same age. This means the curriculum should be more open-ended...not a list of concepts that must be "covered" in grade 1 or a list of activities that should be carried out. If a student is particularly interested in studying a certain area or concept he should be encouraged and guided in doing so. If students bring in insects they can study appearance, movement, sound and eating of these insects, even though the formal grouping is not included in the grade 1-3 outline. If a student is ready and wants to study the formal grouping he should do so.
Pupils need to have firsthand concrete experience as much as possible. Let them do themselves. Let them work on their own a great deal with (guidance where needed). For example, in making dioramas of different living places don't use the dioramas as application after telling or showing the typical plants and animals of the type of region but try to visit one area (e.g. woods, pond) and then let groups work at finding out the rest themselves.

Try to have students ask their own questions on what they observe and will be observing. Then what they see, read, etc. will say something to them. For visits pupils can prepare a list of questions they want to ask or a list of things they want to look for.

The teaching suggestions are suggestions. If you have better ones use them. Pupils may have alternative ways of doing things. Not everyone needs to do the same activity. Different abilities and different interests will require that there be various activities. Even on visits, e.g. to a pond, not all need to have the same task or activity to carry out.

The pupil needs to learn to evaluate his activity-what did it mean to him, what did he learn, would he do it the same way again, what else does he need to examine and learn about in this area. This type of evaluation is more important than a testing of facts.

The novel and the unusual appeal to these students. They should have opportunities to meet the unusual in for example the variety in the animal realm (largest and smallest mammal, unusual fish and birds, etc.).

A class subscription to several magazines can serve as a constant source of stimulation, topics of interest, and approaches to concepts.

The literature list given is only a beginning list.

A. How all Animals are alike.

1) Animals move, grow, have senses (smell, hear, see, taste, touch)
2) Animals differ from organic things (movement)
3) Animals differ from physical things
4) Animals need food, water, air.

B. Variety within the Realm of Animals.

1) Variety in appearance: a) shape
   b) size
   c) color- i) many different shades
      ii) camouflage, protective colouration
2) Variety in sound
3) Variety in movement
4) Variety in food: a) variety in what is eaten
   b) variety in how food is eaten
   c) food chains
5) Variety in senses: a) priorities, e.g. seeing-eagle for food, hearing-bats, smell-dog, taste-insect (butterfly looking for food), touch-cats' whiskers
   b) built-in fears
B. Variety within the realm of animals.

6) Variety in growth: a) baby animals, sizes of baby animals
   b) life cycles of animals e.g. bird, frog
7) Variety in homes: e.g. homes built by beaver, birds, squirrels, ant, etc.
8) Variety in living places: a) land, water, air (creation story)
   b) farm, zoo
   c) desert, sea, river, tropical forest, woodlands, grasslands, polar regions
   - typical animals and plants
   - especially suited to the area
   e.g. Arctic fox—thick fur, short ears and tail; desert: long ears and tail to lose heat, ability to store water

C. Interrelationships With Other Realms
1) Animals depend on physical environment
   Animals need air, water
   Dead animals help in formation of soil
2) Animals depend on organic things
   Food; Homes: e.g. nest in tree, nest materials
   Oxygen
3) Animals also help sensory creatures
   e.g. seed dispersion (hitch-hikers, cat and dropping seeds, burying nuts) spreading of pollen.

D. Sensory Creatures Change with the Seasons

Spring: nest building, babies of all kinds, migrating animals return, hibernators are up, loss of hair, cocoon to caterpillar

Summer: some animals estivate (sleep through summer to escape heat) e.g. lungfish, some snails

Fall: caterpillar to cocoon
   hair grows thicker
   animals store food in holes, etc. or on body, migration of birds and animals such as caribou, deer, elk, hibernation

Hibernating animals:
Mammals: skunk, woodchuck, bear, bats
   sleeps, rest, warm bodies, fur helps keep warm
Reptiles: garter snake, copperhead and rattler, skunk, spotted turtle, water snake, lizard raccoon
   as cold as soil and air
   scales
Amphibians: frog, toad, cold as water or soil around them smooth skin
Fish: sunfish, under ice, air, from water, bodies as cold as water, scales, move slowly under ice
Migrating Animals: Some come out on warmer days: frog, fox, turtle.
II. MAN GROUPS THE ANIMALS

Introduction:

Animals which are alike in important ways can be put into the same group. The animals of one group may be different in other ways. In each grouping: examples, characteristics, movement, care of young, homes, coloration, senses, growth, food. Each choose one example to study in detail.

A. Mammals
1. Characteristics: only kind that has hair
   young are born alive, and are fed milk made in the body of the mother
   breathe air through lungs
   warm-blooded (temperature constant)

2. Care of young: most young are helpless, parents feed and protect them, e.g. pretend to be injured, lead enemy away from nest, musk oxen from circle with young in center, etc.

3. Movement: wide variety

4. Coloration: often for protection e.g. fawn
   may change with season e.g. weasel

5. Homes: wide variety e.g. den-bears, wolves
   burrows-foxes, chipmunks, groundhogs
   lodge-beaver, muskrat
   no home-wild horses
   hollow tree-squirrels

B. Birds
1. Characteristics: feathers
   bills but no teeth
   2 wings, 2 feet
   hatch from eggs
   breathe through lungs

2. Egg: eggs have porous shells with tiny holes to let air through
   chick in chicken egg needs 21 days to hatch
   white speck on yolk of egg is beginning of a young bird
   young bird needs food-eats the white and yolk of egg

3. Types of feet:
   swimming feet - ducks and lions have webbed feet
   which they paddle through water;
   climbing feet - woodpeckers have sharp, curved claws
   that help them to climb and to clutch the bark of trees; two toes point forward, two point backward;
   perching feet - all songbirds are perching birds;
   three toes point forward, one points backward; perching birds clamp their toes around a branch to keep from falling off;
B. Birds

3. Types of feet:
   grasping feet - hawks and owls have sharp, curved claws, or talons, with which they grasp prey. They use these strong claws to crush their victims, and to carry them away;
   scratching feet - turkeys.

4. Feathers:
   In the centre of the feather is a strong, stiff shaft. The feather is made up of tiny hairs hooked together.
   Three kinds of feathers:
   a) large wingtip feathers attached to the tips of the wings
   b) smaller feathers attached to the remainder of the wings
   c) down beneath outer feathers
   Chicks and baby ducks are covered with down when hatched. These are the birds which run around as soon as they are hatched. Others, as robins, have no feathers when they hatch, and must stay in the nest for some time.
   Birds keep warm in winter by fluffing out their feathers. The feathers keep warm air next to the bird's skin from escaping.
   Birds spend many winter nights in evergreens, which protect them somewhat from the wind.
   Birds molt or shed feathers at least once a year.

5. Types of beaks:
   chisel beaks - woodpeckers have beaks shaped much like chisels. They use them to cut holes in trees to find insects and to build nests.
   spear beaks - Herons have long spear-like beaks that can be used to catch fish.
   cracker beaks - Finches and sparrows have strong beaks used for cracking the hard shells of seeds they eat.
   spoon beaks - Pelicans gather fish and insects from shallow water.
   strainer beak - Ducks dive, heads down, tails up, for their food. The extra water runs out of beak at the sides (strainer).
   hooked beak - Birds of prey, owl, hawk, eagle.

6. Care of young:
   Male and female birds care for their young. (exception - cowbird)
   Birds have a small number of young.
   Male and female birds take turns sitting on eggs until they hatch, because eggs must be kept warm.
   Both feed their young.
   Young ducks and chicks do not need to be fed as ie. young robins do, they leave the nest as soon as they hatch.

7. Movement:
   Birds fly, walk, run, or hop.
   Birds can fly because of hollow bones (light).
   Feathers hold air between them.
   In flight they stretch neck, tuck in feet, (streamlined).
8. Coloration:
Underside of the body is often light coloured. When in flight they are hardly visible against a light-coloured sky, from the top they are dark against a dark-coloured earth. When sitting on a nest a bird can hardly be seen against the background. Males are more colourful than females.

9. Senses:
sight - very good
Eyes are on side of head for wide-range vision.

10. Homes:
Nests of wide variety. Show pictures of a robin's oriole's, eagle's duck's nest.
The duck's nest is only a hollow in the ground, lined with grass or feathers.
Birds of a certain kind always build nests of one certain kind only.
Not taught, but inborn.
Birds have nests for only a short time. When the baby birds are grown up and leave the nest, the nest is deserted.
The birds live without a nest until the next spring.

C. Fish

1. Characteristics:
   1) Most fish have shingled scales for protection.
   2) Fish have gills for breathing. The water fish live in has air in it. Fish take the air out of the water. Water enters the mouth, it passes over the gills where the oxygen is taken out of the water. The water runs out through the gill openings. Fish cannot take oxygen out of the air as mammals and birds do have lungs.
   3) Fish hatch from jelly-covered eggs. Fish eggs have no shell.
   4) Fish have fins to use in swimming: chest fins for steering tail drives it along streamlined body.
   5) Fish are coldblooded. They take on the temperature of the water they are in. If the water is warmed up, their temperature goes up, they breathe more times per minute. If the water is cooled, their body temperature goes down, they breathe fewer times per minute.
   Why does a fish feel cold when you touch it? The water it lives in is cold.

2. Care of young:
Fish do not care for their young. They lay a large number of eggs, thousands at a time, only a few will grow into adults. They lay their eggs into a narrow opening between stones for protection.

3. Coloration:
Fish are darker on top. When looking into the dark water, a fish cannot be seen too easily.
Fish are lighter on underside. Animals below them cannot see them as easily against a light sky.
4. No homes.

5. Senses:
   sight: eyes on side of head—can look in all directions. No eyelids. No one, not even fish can see much under water. For food they depend on their sense of smell.
   smell: Fish move their nostrils not for breathing, but for smelling. They have a keen sense of smell.
   hearing: very good.

6. Life cycle of the salmon:
   In a river in British Columbia live many young salmon. When they are two years old, and about 5-8 inches long, they start on a long trip to the Pacific Ocean. They live in the ocean for two years; during that time many of them are killed by larger fish, but those which live become fullgrown.

   1) When salmon are fullgrown at four years, weighing 25 pounds, and measuring about three feet, the female salmon is ready to lay her eggs. She will not lay them in the ocean, but wants to lay them in the river where she was born (inborn).

   2) A male and a female salmon start on the long journey back to the river in British Columbia, where they were born. This is migration. Salmon live part of their life in salt water, part in fresh water.

   3) Recall how water runs down, towards the ocean. The salmon, therefore, have to swim upstream, perhaps for hundreds of miles.

   4) Many waterfalls may be in their way, but salmon can jump as high as ten feet by swimming under water as fast as they can, than rising and jumping (and that without legs!)

   5) After weeks or months of travelling, they reach the river where they were born. They arrive there late summer or early fall. Now the female lays her 8,000 to 10,000 eggs, and the male salmon lays sperm over the eggs. For the eggs to become young salmon both eggs and sperm are needed. The place where salmon do this is called their spawning ground. The salmon die after spawning. Birds lay eggs many times, but salmon lay eggs only once.

   6) The young salmon grows for a while, but stops growing during the winter.

   7) The salmon in the egg starts growing again in the spring, and forms a yolk sac, then it bursts out of the egg.

   8) The little salmon, now out of the egg, gets its food from the yolk sac for six weeks, then the sac is empty and disappears.

   9) The young salmon then eats insects and other small animals for two years, then it leaves for the Pacific Ocean. In the ocean it lives for another two years, then, when it is fullgrown, it returns to the river and lays eggs. Cycle complete.
D. Amphibians - living a double life - frogs, toads, salamanders.

1. Characteristics:
   a) Amphibians are cold-blooded (see fish)
   b) Amphibians have smooth skin without scales.
   c) They breathe with gills when they are young, with lungs when they grow up.

2. Way of Life:
   a) Amphibians lay large number of eggs; they do not care for their young. Toads in strings, frogs individually.
   b) Amphibians have long legs and are very good jumpers.
   c) Amphibians have webbed feet for swimming.
   d) Amphibians eat many harmful insects.
   e) A frog can make loud sounds because of the air sac in its throat. Before it sings, the air sac fills with air, like a balloon. When it sings, the air sac makes the sound louder.

   P.S. A turtle lives on land and in the water, but it is not an amphibian, because young turtles breathe like adult turtles, through lungs.

3. Life cycle of the frog:
   Three stages - egg, tadpole, frog.
   Frogs look one way when they are young, another way when older.
   a) In spring frogs lay jelly-covered eggs in water.
   b) The young that hatch are called tadpoles. For a few days they eat food stored in their own bodies, then they eat tiny plants that grow on rocks in the water.
      (Notice on worksheet how they cling to plants.)
   c) Tiny fringes grow from their bodies, these are the gills used for breathing. Later they develop inside gills and outside gills disappear.
   d) Back legs appear, front legs appear, tails disappear.
   e) Gills are replaced by nostrils and lungs. They now can live on land.
   f) Frogs and toads sleep through the winter in the mud near or at the bottom of the pond.
   g. In spring frogs and toads wake from wintersleep and lay a large number of eggs in the water.

E. Reptiles: snakes, lizards, turtles, crocodiles, alligators.

1. Characteristics:
   a) cold-blooded
   b) bodies are covered with scales or a hard shell
   c) breathe with lungs through all of life
   d) lay large number of eggs with leathery shell, not jelly-covered as fish, nor hardcovered as the bird. Some snakes (garter snakes) keep their eggs in their body until they hatch.
E. 2. Way of Life:
   a) Snakes eat frogs, toads, mice, etc.
   b) Turtles live both in and out of the water, but breathe only above water. Recall how a turtle's head pops up out of the water, then the turtle disappears again.
   c) Do not take care of young.
   d) Snakes swallow food whole. They can unhinge their jaws to swallow eggs or animals much larger than their own heads.

F. Two large groups of animals:
   animals with backbone - vertebrates
   animals without backbone - invertebrates

All animals in the five classes are alike in one important way. Each one of them has bones. Each one of them has a long row of bones along its back, called the backbone.

The five groups we studied all have backbones. Other animals do not have backbones.

Is a spider a mammal, a bird, fish, amphibian, reptile? None. Then it does not have a backbone.

All animals are divided in two large groups: animals with backbone, add animals without backbone.

The backbone is made up of many smaller bones.

III. MAN'S TASK

A. Man enjoys and uses Sensory Creatures in many ways.

1. Enjoying animals:
   a) animals as pets: Why do we have pets? play, care for
      What kind of pets do we have? (which animals are suitable, why)
      How do we care for pets? (food, exercise, attention, play equipment)

   b) animals in the zoo: Why do we have zoos?
      All animals need man's care but animals taken out of their natural environment need special care from man.

   c) animals in circus

   d) animals in nature: in parks, woods, lakes, etc. all around us.

2. Animals help supply man's need for food
   e.g. cow, reindeer, bees, goats, camels, fish - meat, milk, cheese, honey, etc.

3. Animals help supply man's need for clothing
   e.g. (seals), silkworms, cow, (alligator): duck, fur, silk, leather, eiderdown, etc.
   Develop in detail a product made from animals: e.g. leather-raising animal, how to get it, tanning industry, uses.
A. 4. Animals help man do his work
   e.g. horse, dog, elephant, camel, Llama, — herd, transport, pack

5. Animals are used for man's health
   e.g. experimentation, vaccines

6. Animals in literature
   e.g. Aesop's Fables: The Crow and the Pitcher
       The Fox and the Stork
       The Goose that laid the Golden Egg
   Hans Christian Anderson, The Ugly Duckling

7. Animals in legend and superstition
   e.g. stork brings babies

8. Animals in music "Carnival of the Animals" Saint-Saens

9. Animals in painting and sculpture

10. Animals in worship

11. Animals in symbols
    e.g. dove—peace, owl—wisdom, Bald eagle—U.S. national bird, in Great Seal, turkey—Thanksgiving, lamb—Easter

B. Breeding and Training Sensory Creatures

1. Breeding of animals
   Pick animals as parents to produce offspring with the desired characteristics.
   What are these characteristics?
   e.g. cows to give more milk, livestock that resist diseases, horses that run faster, tastier meat etc.
   Economic aspect is dominant in most cases.
   Some cross breeding has been done,
   e.g. horse + donkey = mule
   Purebreed dogs, etc. (pedigree)

2. Producing animals in quantities
   e.g. chicken hatcheries
       fish hatcheries

3. Training of animals
   - dog as herder
   - circus animals
   - pet
C. Man Cares for Animals/Man Misuses and is Noncaring

1. Care of pets

2. Care of farm animals: food
   - shelter
   - health: veterinarian

3. Cruelty to animals
   - Society for prevention of cruelty to animals (Humane society)
   - Dog Pound

4. a. Extinction or near extinction of animals
   - Some animals have become extinct because of man's activities
     (desire for feathers, fur; hunting)
     - e.g. passenger pigeon, Carolina parakeet.
   - Some animals became rare: whooping crane, California condor, Bald Eagle.
   - Some animals were in danger of becoming extinct until man began to care: beaver, seal, African grassland animals.

   b. Protective laws:
     - Laws that prevent hunting of certain animals: Bald Eagle, koala bear;
     - Laws that limit hunting season;
     - Laws that limit catch of fish, number of bears shot etc.

   c. Work of game-warden.

5. a. Taking away or destroying animal homes
   - Carelessness in causing forest fires
   - Not leaving places for animals when building cities, roads, etc.
     - e.g. no resting place for migratory birds
     - no spawning beds left for fish
     - dams blocking route of salmon to spawning ground
   - Pollution

   b. Killing off certain animals or bringing new ones into an area may upset a balance.
     - e.g. rabbits brought into Australia
     - killing of foxes may lead to too many of animals eaten by fox.

   c. Refugees, sanctuaries, wildlife preserves, provincial and national parks:
     - Protection of breeding places and resting places on migrations
     - Protection of living places (homes)
     - No hunting, left undisturbed

   d. Fish and Wildlife services:
     - Carries out activities such as banding of birds to learn about their length of life, travel routes, etc.
     - Information for public

   e. Bird Clubs and other societies:
     - Clubs for people especially interested in particular animals.

   f. Work of forest ranger
C. 6. a. Pollution of home and food sources:
Cities pollute water by dumping sewage.
Industries dump wastes in water: e.g. poisonous chemicals, pesticides that canneries wash off fruit;
Water used by industries and dumped back into river may be heated too much for animals, also decrease of oxygen;
Detergents pollute water (phosphates help growth of algae, no oxygen left for animal growth);
Trees are cut and land cover is taken away in places where they are needed to prevent soil erosion;
Smoke, smog pollute the air;
Pesticides etc. used to kill harmful animals (esp. insects) kill off other animals.
  e.g. spraying a cornfield against corn borers may save crop, but birds eat poisoned insects, water may drain to river and kill fish, useful insects (such as bees pollination) may be killed, poison in on the crop;
Oil spills cause death of water animals.

b. Prevention of pollution...conservation of animal homes and food sources:
Building sewage disposal plants;
Industries treating their waste products chemically to make them harmless;
Planting trees to prevent soil erosion and flooding;
Stream and lake improvement: provide gravel spawning beds, brush shelters, fish ladders;
Restocking streams with fish;
Use of natural enemies in fighting unwanted harmful animals (biological controls);
Dredging rives of filth and silt.
TEACHING SUGGESTIONS

I. Creation story

Gen. 1:20-23 And God said, "Let the waters bring forth swarms of living creatures, and let birds fly above the earth across the firmament of the heavens." So God created the great sea monsters and every living creature that moves, with which the waters swarm, according to their kinds, and every winged bird according to its kind. And God saw that it was good. And God blessed them, saying, "Be fruitful and multiply and fill the waters in the seas, and let birds multiply on the earth." And there was evening and there was morning, a fifth day.

Gen. 1:24 And God said, "Let the earth bring forth living creatures according to their kinds: cattle and creeping things and beasts of the earth according to their kinds." And it was so. And God made the beasts of the earth according to their kinds and the cattle according to their kinds, and everything that creeps upon the ground according to its kind. And God saw that it was good.

Gen. 1:28 And God blessed them (man and woman) and said to them, "Be fruitful and multiply, and fill the earth, and subdue it; and have dominion over the fish of the sea and over the birds of the air and over every living thing that moves upon the earth."

Gen. 2:18-20 God brought them (beasts and birds) to the man to see what he would call them; and whatever the man called every living creature that was its name. The man gave names to all cattle, and to the birds of the air, and to every beast of the field...

II. The Realm of Animals and Variety Within the Realm

1. Children like big contrasts and the unusual. This can be used effectively in teaching the variety in the realm of animals. e.g.: largest and smallest mammal, bird; largest ears-African elephant has ears up to 4 feet across; chameleon's tongue is as long as its body, etc.

   a) Make several sets of cards, half of cards have pictures of animals and the other half have names. Let individuals match them.
   b) A poor reader might call the names as a more able one flashes the card with the picture.

3. Puzzles using animal names.
   a) Some pupils can make crossword puzzles for others using the animal names.
   b) Puzzle might be in this form: a _ _
      Fill in animal names.  a _ _ _
      Letters at beginning may be given...all the same letter or mixture. Clues might be given with no beginning letter in the actual puzzle.
II. 4. Variety in color.
Have fun with shading colors. Use different media: colored chalk, crayons, pencil crayons, paint.

5. Color as Protection.
a) Rudyard Kipling's Just So Stories: read to class or listen to record with the stories.
b) Find pictures in magazines and books etc. which depict protective coloration. If the teacher has a few available so that the children understand the idea, they can look for other examples.
c) Cut two paper rabbits, one of brown paper and one of white paper. Place them in turn on white and brown paper. Which color would the rabbit (Arctic) be in summer, which in winter?
d) Art work: work with blending a design into background via the colors used in design and background.

a) Ask children in how many different ways they can move. Have different students act out the ways, e.g. walk, run, hop, skip, climb, swim, slide. Go to animal movement: have a child act out a way in which some animals that move in this way.
b) Look at pictures and filmstrips and films to see animal movement.
c) Art work: try to depict the animal in motion.
d) Study movement of home and school pets.
e) Watch grasshoppers outside or catch with a small net and bring into classroom in a large jar. Also watch him eat.
f) Watch ants move. Put cookie crumbs and sugar crystals in jar and watch ant transport them.
g) With hand lens look at caterpillar and earthworms move.
h) Study some extremes: e.g. gazelle - caterpillar.
i) Read and act out the story of The Turtle and the Hare.
j) Poem, Jump or Jiggle, E. Boyer (separate sheet).

7. Foods.
a) 6 e and f.
b) Make a chart grouping animals into two groups:
   Animals that eat plants       Animals that eat other animals
   (Feedable animals in your area)
c) Take class out to feed ducks, winter birds, etc.
d) How animals get their food—use action words
   e.g. bears snatch, anacondas squeeze, spiders trap,
        robins pull, turtles snap, kingfishers dive,
        giraffes reach, anteaters lick, eagles grab
   These are suggestions. Pupils can give their own action words.
   They may be able to add to the list by giving more animals and how they get their food.

8. Food chains:
Let each pupil or each group begin with an animal (some suggestions are rabbit, garter snake, prairie dog, coyote etc.). How does this animal fit into the community of living things? Can they build up the whole chain?
II. 9. Animal Sounds:
   a) On walks with children or visits to zoo, farm etc. note and if possible record animal sounds.
   b) Play records with animal sounds.
   c) Teacher records animal sounds...can students name the animals?
   d) Poem, Frogs, Helen Wing (separate page)

10. Sizes of animals:
   a) Have students measure on floor or sidewalk outside the lengths of different animals. This gives them a better idea of actual size than to say the animal is 2 feet long.
   b) To make idea of relative size clearer have students choose three animals, draw them, arranging in order of size. For those capable of it...try to draw according to scale at least to a certain degree.
   c) Compare sizes of baby animals e.g. similar to in a).

11. Animals and their babies:
   a) Make a stencil with pictures of adults and babies in mixed order. Let pupils cut out, match and paste on sheet of paper. Write names of animal underneath. List more difficult names on blackboard, e.g. cow-calf.
   b) Baby animals is a good theme with which to develop describing words (emotional, feeling words) e.g. cuddly, soft, furry, gentle, helpless, fluffy, etc.
   c) Language activity on animals: names of male, female, young, group.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Male</th>
<th>Female</th>
<th>Young</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>whale</td>
<td>bull</td>
<td>cow</td>
<td>calf</td>
<td>herd</td>
</tr>
<tr>
<td>lion</td>
<td></td>
<td>lioness</td>
<td>cub</td>
<td>pride</td>
</tr>
<tr>
<td>chicken</td>
<td>cock</td>
<td>hen</td>
<td>chick</td>
<td>flock</td>
</tr>
<tr>
<td>cat</td>
<td>tom</td>
<td>puss</td>
<td>kitten</td>
<td>clowder</td>
</tr>
<tr>
<td>goose</td>
<td>gander</td>
<td>goose</td>
<td>gosling</td>
<td>flock/gaggle</td>
</tr>
<tr>
<td>cattle</td>
<td>bull</td>
<td>cow</td>
<td>calf</td>
<td>herd/drove</td>
</tr>
<tr>
<td>hog</td>
<td>boar</td>
<td>sow</td>
<td>piglet</td>
<td>herd/drove</td>
</tr>
</tbody>
</table>

12. Growth of animals:
   Pupils who have baby animal as pet might keep record of weight and length. Record every e.g. two weeks, or month. Report to class. Should be baby animal as there is little change of this type in adult. Study chick in different stages of development within egg. Visit chicken hatchery.

   Let each or group make paper filmstrip to show life cycle of different animals. Pretend to be a young animal. The mother animal leaves. How do you feel? What will you do? Write. (The story should be quite different depending on whether the child has chosen a mammal, amphibian, etc.)

   The activity could be used in this way as well: after studying mammals the child writes the story and again after studying e.g. reptiles. Let him put the two stories together. This should make very clear to him the differences in care of young.
II. 13. Age of animals

Interested students could make a time line to compare length of life of various animals. They should make a list of the animals they want to include and their ages. Then the scale should be decided e.g. 1" = ___ year(s)

```
<table>
<thead>
<tr>
<th>Animal Name</th>
<th>Length of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 yr.</td>
</tr>
<tr>
<td></td>
<td>2 yr.</td>
</tr>
</tbody>
</table>
```

14. Variety in living places:
   a) Have a group choose an area (desert, sea, river, tropical forest, woodlands, grasslands, polar regions). Make dioramas showing the typical animals and plants (organic things) in each area. Have books, magazines etc. available to help students extend their knowledge sufficiently to do the project.
   b) Where would many desert animals make their home? You need a flowerpot full of dry soil, a ruler and two thermometers. Poke a hole in the soil about 4 inches deep. This will be like a little tunnel. Put one thermometer in the tunnel. Put another thermometer on top of the soil. Put it just far enough for the earth to cover the bulb of the thermometer. What is the temperature at each place? Put in the sun. Every two minutes write down the temperature. How much difference is there? Would a deeper tunnel make a greater difference?
   c) Ginn, Light and Life Series, "Listening Tree", tells about visiting a pond, activities to carry out, equipment needed, chart of some pond life and their needs if taken back to the classroom.
   d) Pupils might be encouraged to get to know one place well. It should be a place of their own choosing, a place he can visit quite often. He could record throughout the year (diary fashion) his visits. He could learn about the plants, trees and animals that come or live at the place. He could do diagrams and take pictures, etc.

15. Summarizing variety in the animal realm:
   a) Let class make a bulletin board...each doing an animal. They can plan which animals and what information they want to include. (Can be as simple or complicated as desired) Put titles across the top of the board...first name and then categories such as movement, food, home, babies, living places, etc. Students can fill in across on his animal by cutting out pictures, drawing, or putting in labels.
   b) Make a cartoon strip of a day in the life of a particular animal.

16. Riddles:
   Let children make up their own riddles about animals.
II. 17. Photography:
Pupils and teacher can build up picture collection of animals. Have students become aware of surrounding. What makes a good photograph? Ideas discussed here can be applied in art work.

18. Turnabouts to bring about characteristics of animals: What if snails were as ferocious as tigers, turkeys were as slippery as snails, eels were as cuddly as rabbits, mice were as strong as horses. Add more...

19. Making animals with materials from junk box.

20. Migration and hibernation:
a) Combine with map work to show the route that particular birds follow.
b) Something told the Wild Geese, Rachel Field (separate sheet.)

b) Make own paper filmstrip (scroll) on topic of seasons...following a particular animal through the four seasons. A group might put all their fall scenes after each other, then all winter scenes, etc. If used as a group project group might plan so that they have different animal groupings represented. They might also try to have different ways of preparing for winter incorporated.

22. Seasons murals:
Let pupils see film strips, films, picture books etc. on the changing seasons. In their mural they should incorporate the changes in physical things, organic things and sensory creatures. e.g. birds flying south with typical fall scene as background (leaves falling, being raked, turning colors, seeds blowing, grass turning brown, sun lower, squirrel storing food, people with sweaters). Each pupil has an own main focus with changes in the other realms which strike them.

23. Seasons:
Do three-dimensional scenes using natural materials (grass, leaves, twigs etc.) as much as possible.

III. GROUPING OF ANIMALS

1. Characteristics of a group/groups:
Give each pupil (or small group) two pictures. Reports on likenesses and differences (oral or written). This can be used to show variety within a grouping...then use e.g. two mammal pictures. It can also be used to discover differences between groupings...then use e.g. one bird and one mammal picture, one reptile and one amphibian.

2. To show the great variety within even one group of mammals make a class scrapbook of dogs.

3. Each pupil can become an expert on his choice of animal within the grouping. How does the animal fit in the grouping (e.g. why is it a mammal). How does this animal add to the variety in animal realm. Include writing, drawing activities. In visiting a zoo etc. he should pay special attention to this animal.
III. 4. Have a large group of pictures on cards. Lay cards in proper grouping.

5. Birds:
   a) Hang up several branches. Draw, color, cut out different birds to put on the branches.
   b) Have pictures of male and female bird. Let pupils match them.
   c) Birds-oily feathers.
      Need: newspaper, oil, a ruler, string and water.
      Cut two small pieces of newspaper. Rub oil on one piece. Attach them to a ruler to make a scale. Balance them by snipping pieces from the heavy side. Dip both sides into water. Lift them out of the water. Which side is heavier? Why? What would happen to a water bird's feathers if they were not oily? (The feathers would not shed water; therefore, they would be too heavy for easy movement through the water.)

6. Bird's egg:
   Study a chicken egg. Crack an egg, peel a few chips of the shell. Notice membrane beneath it. Air can pass through it. Open egg and turn yolk into a dish without breaking. With hand lens look for white speck on the yolk (beginning of young bird).

7. Aquarium:
   Observation of animals in aquarium. Pupils can help plan the aquarium. They will need to find out the requirements of the animal: plants, food, water temperature etc. For the materials that need to be bought take some students to pet shop.

8. Start a picture collection for each grouping. New animals can be added as class members learn about them.


    Frog is green on top, sits on green plant to catch flies. He is white underneath. Fishes and birds eat frogs. Take two sheets of paper, one dark and one light. Take outside and hold over your head. Which one is harder to see against the bright sky? Why would a frog be white underneath?

11. Backbones:
    Study backbone of a fish or chicken.

12. Animal groupings game:
    Make packs of cards e.g. each pack with 2-4 mammals, 2-4 birds, 2-4 amphibians, 2-4 reptiles, 2-4 fish (packs can be smaller to be simpler). Three or four can play. Deal several cards to each and have rest in center. Players in turn ask others for center animals. They try to obtain the complete set. They may ask until they are wrong (name person they are asking and what they are asking for). They must have one of the set to be able to ask for others in that set. Before their turn is over they may draw a card from the pile.
IV. MAN ENJOYS, USES, DEVELOPS, CARES FOR SENSORY CREATURES

1. Pets at home:
   a) Pupils can tell about their pets, show pictures. What does their pet mean to them? Why do they have a pet and why this particular kind? How do they care for their pet?
   b) Pupils can write about their pet.
   c) Have pets brought to school. Let the others see, hear, touch (when possible). If possible, have pet fed at school so others can see him eat.
   d) Poems: My Dog, N. Chute; Chums, A. Guinterman; The Animal Store, R. Field (separate sheet)

2. Pets at school:
   Keep a pet turtle, mouse, fish etc. Let children help plan for the pet: what kind of home the pet needs, what does it eat, equipment in cage etc.; other needs. Have pupils gather the required materials and if possible let at least some of them pick out the pet. If it is to be obtained at pet store, maybe a visit to pet store can be combined with this.

3. Visit a pet shop:
   See the variety of animals that might be kept as pets, the variety of homes sold for these pets, the different foods available. Different groups in class might concentrate on different pets.

4. Other visits:
   e.g. zoo, chicken hatchery, fish hatchery, pond, woods, dog pound, farm. Use whatever resource is available in the area.

5. Visit to farm:
   See the animals; how farmer cares for animals; how and what animals are used etc.

6. Visits of people to classroom:
   e.g. have a farmer visit the classroom. Children ask him about his work with the animals.

7. Interviews:
   Class can prepare questions for an interview than one (or a group) of the class members will have with e.g. a farmer (or other resource persons in the community).

8. Sand-table:
   Build up farm: buildings, animals, equipment, fields, around, etc. Use models, paper cut-outs, labels.

9. Zoo:
   Children might make their own zoo of all kinds of scrap materials... along with plasticene or clay. Have pupils plan so that there is some grouping as in an actual zoo, e.g. birds more or less together... bears next to each other etc.
IV. 10. Comparing wild and tame animals:
e.g. chart

<table>
<thead>
<tr>
<th>Wild</th>
<th>Rabbits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food: any plants he finds</td>
<td>lettuce, carrots, rolled oats</td>
</tr>
<tr>
<td>Home: burrow</td>
<td>clean pen, made by man</td>
</tr>
<tr>
<td>Listens for enemies, needs to run fast</td>
<td>Protected by man, fence</td>
</tr>
</tbody>
</table>

11. Training animals:
a) Child with pet (probably dog) can show class what he has taught the dog and tell how he trained him to do these things.
b) Children have seen circus shows on T.V. What have animals been trained to do?

12. Drama:
Pupils can create their own skits and little plays, e.g. farmer and family on farm
zoo keeper
circus act with animals
veterinary and his work
They should state a specific item or happening. Then with a little group act it out -- dialogue can be created as they go along (if everyone is clear on what happens) or pupils may write out a little play and then have it acted out. The skits could be humorous, e.g.: One morning a zoo keeper arrives and finds one of his fellow workers in the cage and the monkey outside cleaning the walks.

13. Surveys:
e.g. When there are several children living on farms, class could make a survey to compare the animals on each farm.

14. Posters:
Theme: caring for animals, protecting their homes. Students should be clear on characteristics of a good poster (simplicity of form and coloring, large enough to see at a distance, clear and limited amount of lettering etc.)

15. Providing special places for animals:
On map mark with symbols the location of well-known national parks and sanctuaries.

16. Uses of animals:
Buzz session - pupils in groups list as many different uses of animals with as many different examples of animals as they can. Discuss in larger group. Can they find some way of grouping the uses? Each take an animal. Try to think of all its possible uses. See examples. Draw pictures, cut out pictures, label, paste actual material on chart, e.g. wool, poem.
17. Exhibit:
Make an exhibit of all the things man has made or obtained from animals. Let children work on making the display attractive and easy to oversee (e.g., labels, arrangement of products in groups). (Empty cartons etc. might be used for foods that spoil.)

18. Jobs that involve animals:
Buzz session - groups list the jobs. Put together in whole class.
Back to buzz groups, try to group jobs in some way. Put on chart.
Whole class looks at charts of others. Compare ways of grouping.

19. Poem, The Last Free Bird (see separate sheet)

20. Give the children a problem (e.g., extinction or near extinction of animals) and let them work out solutions which might help solve the problem.
e.g., the seal is in danger of becoming rare. Why might that be?
What suggestions do you have to help solve the problem? Have each group work via a different animal (e.g., beaver, koala bear, whooping crane, Bald Eagle, etc). Pupils should be familiar or be made familiar with the animal...have a feeling relationship to the animal. Then ask, what if no one would be able to see this animal again? After the groups have brought their ideas together, they may be ready for further reading or discussion with teacher on the other ways suggested in outline under 'Caring for Animals'.

21. Pictures to illustrate sequence.
e.g. River before and after pollution.

22. Pollution problem - students try to work out answers alone first. A farmer has a corn field sprayed with a poison to kill corn borers that could ruin his crop. What are the possible results? (affects on birds, insects, fish, man)

23. Approach pollution via current events.

Animals:

After studying various characteristics of animals, have the children invent their own animals. Combine various characteristics. Make a new animal by using the imagination and applying this to recalling various characteristics of different creatures. Keep in mind color, line and design. Suggest, for example, that the insect can be made completely in terms of shapes, lines, design.
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2.- C.W. Anderson, Blaze and the Forest Fire (N.Y.: Macmillan Co.)

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   Pet Show, Reptiles.


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   Book 3: Science Far and Near, chap. on Life in the Desert, A Pond Community,
   The Big Ocean.
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   3: chapter on Life in Desert Communities;
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   Life in Pond Communities;
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ANIMAL POEMS

1. Fuzzy Wuzzy, Creepy Crawly - Lillian Schulz

Fuzzy wuzzy, creepy crawly
Caterpillar funny,
You will be a butterfly
When the days are sunny.

Winging, flinging, dancing, springing,
Butterfly so yellow,
You were once a caterpillar,
Wiggly, wiggly fellow.

2. Cat - Mary Britton Miller

The black cat yawns,
Opens her jaws,
Stretches her legs,
And shows her claws.

Then she gets up
And stands on four
Long Stiff legs
And yawns some more.

She shows her sharp teeth,
She stretches her lip,
Her slice of a tongue
Turns up at the tip.

Lifting herself
On her delicate toes,
She arches her back
As high as it goes.

She lets herself down,
With particular care,
And pads away
With her tail in the air.

3. The House of the Mouse - Lucy Sprague Mitchell

The house of the mouse
is a wee little house,
a green little house in the grass,
which big clumsy folk
may hunt and may poke
and still never see as they pass
this swell little, neat little,
wee little, green little,
cuddle-down hide-away
house in the grass.
4. Mice - Rose Fyleman

I think mice
Are rather nice.
Their tails are long,
 Their faces small,
They haven't any
Chins at all.
Their ears are pink,
 Their teeth are white,
They run about
The house at night.
They nibble things
They shouldn't touch
And no one seems
To like them much.

But I think mice
Are nice.

5. Jump of Jiggle - Evelyn Beyer

Frogs jump
Mice creep
Caterpillars hump
Deer leap
Worms wiggle
Puppies bounce
Bugs jiggle
Kittens pounce
Rabbits hop
Lions stalk-
Horses clop
But- I walk!
Snakes slide
Sea gulls glide

6. Frogs - Helen Wing

The papa bullfrog has a voice
That's very loud and deep
The baby frogs have voices that
Can only make a peep,
And every night I hear them talk
Before I go to sleep.

7. Something Told the Wild Geese - Rachel Field

Something told the wild geese
It was time to go.
Though the fields lay golden
Something whispered, "Snow."
Leaves were green and stirring,
Berries, luster-gleamed,
But beneath warm feathers
Something cautioned, "Frost."
All the sagging orchards
Steamed with amber spice,
But each wild breast stiffened
At remembered ice.
Something told the wild geese,  It was time to fly-
Summer sun was on their wings, Winter in their cry.
8. Furry Bear  -  A.A. Milne

(II, 21a)

If I were a bear,
Ard a big bear too,
I shouldn't much care
If it froze or snow;
I shouldn't much mind
If it snowed or friz
I'd be all fur-lined
With a coat like his!

For I'd have fur boots and a brown fur wrap,
And brown fur knickers and a big fur cap,
I'd have a fur muffle-ruff to cover my jaws,
And brown fur mittens on my big brown paws,
With a big brown furry-down up to my head,
I'd sleep all the winter in a big fur bed.

9. The Animal Store  -  Rachel Field

(IV, 1d)

If I had a hundred dollars to spend?
Or maybe a little more,
I'd hurry as fast as my logs would go
Straight to the animal store.

I wouldn't say, "How much for this or that?"
"What kind of dog is he?"
I'd buy as many as rolled an eye,
Or wagged a tail at me!

I'd take the hound with the drooping ears
That sits by himself alone;
Cockers and Cairns and wobbly pups
For to be my very own.

I might buy a parrot all red and green,
And the monkey I saw before,
If I had a hundred dollars to spend,
Or maybe a little more.

10. My Dog  -  Marchette Chute

(IV, 1d)

His nose is short and scrubby;
His ears hang rather low;
And he always brings the stick back,
No matter how far you throw.

He gets spanked rather often
For things he shouldn't do,
Like lying-on-beds, and barking,
And eating up shoes when they're new.

He always wants to be going
Where he isn't supposed to go,
He tracks up the house when it's snowing—
Oh, puppy, I love you so.
11. Chums — Arthur Guiterman

He sits and begs, he gives a paw,
He is, as you can see,
The finest dog you ever saw,
And he belongs to me.

He follows everywhere I go
And even when I swim.
I laugh because he thinks, you know,
That I belong to him.

But still no matter what we do
We never have a fuzz;
And so I guess it must be true
That we belong to us.

12. The Last Free Bird — A. Harris Stone

Once we were many —
living in quiet valleys
and green fields,
by bubbling brooks...
by the sea's edge...
in the dense forest...
or in the marshlands.
And there we bred and nested and fed
and flow in the crisp, clean air.
We were suited to our world.
But that was long ago...
before people came,
and came;
Before the people changed the land
and built and paved and dumped
and spilled and spewed and changed the world.
We could not compete.
We looked for a place to feed,
for a place to drink,
for a place to rest and breed.
But none could be found...
and I am the last free bird.

Buffalo Dusk — Carl Sandburg

The buffaloes are gone.
And those who saw the buffaloes are gone.
Those who saw the buffaloes by thousands and how they
pawed the prairie sod into dust with their hoofs,
their great heads down pawing on in a great pageant of dusk,
Those who saw the buffaloes are gone.
And the buffaloes are gone.
Color — Rowena Bennett

Who knows where the tiger passes
through the stripes of jungle grasses.
In his coat so subtly made Half of sun and half of shade —
Who knows where the tiger passes?

Who can find a leopard sleeping
On the bough beneath the creeping Vine, his softly spotted Fur amid the dotted Shadow
Who believes Its more than sun and leaves
When he sees a leopard sleeping?

Who can see a bear that goes
Riding on the Arctic floes?
When the long day glistens bright
Who can see white frames in white Seal and salmon, O take care Last upon you unaware
Come the snowstorm of a bear.

What in the world? — Eve Merriam

What in the world
— Rowena Bennett

Who knows where the tiger passes
through the stripes of jungle grasses.
In his coat so subtly made Half of sun and half of shade —
Who knows where the tiger passes?

What in the world
— Eve Merriam

goes whiskery friskery
mewing and prowling
nappling and lapping
at silky milk?

Psst,
What is it?

What in the world
— Eve Merriam

goes leaping and beeping
onto a lily pad onto a log
onto a tree stump or down to the bog?
Splash, blurbp,
Kerchurp!

Who knows?

What in the world
— Eve Merriam

goes gnawing and pawing
scratching and latching
sniffing and squiffing
ribbling for tidbits of left-over cheese?

Please?

What in the world
— Eve Merriam

jumps with a hop and a bump
and a tail that can thump
has pink pointy ears and a twitchy nose
looking for anything crunchy that grows?

A carroty lettucey cabbagey luncheon
To munch on?

What in the world
— Eve Merriam

climbs chattering pattering swinging from the trees
like a flying trapeze
with a tail that can curl
like the rope cowboys twirl?

Wahoo!
Here's a banana for you!