I. **FOREWORD**

All Christian educators bear a joint responsibility for the development of a curriculum that is an expression of their confession. This manual is meant to be a contribution to this communal effort. It was developed in summer workshops on the basis of earlier materials and various communications and suggestions from schools that worked with them. The workshops were sponsored by the OACS and the ICS.

A curriculum is, of course, only one aspect of the teaching-learning situation. The teacher and the various children in the class as well as the relationships with parents and various social institutions all have their impact on this situation. The total educational community must provide for a basic continuity, a religious integrity, in the forming of the child. Also in this broader sense this manual is meant as a contribution to a communal effort.

An attempt is made in this manual to go beyond past efforts of the Christian community at curriculum building. Not the atmosphere only, not the adding of Christian values to "established facts", but a rewriting of the textbooks from the Christian's stance in today's world is the aim. In what measure this aim has been achieved in the brief time available till now is a task of the whole Christian community to evaluate. The manual is truly a "try-out" in that sense. This experimental nature implies that further revision will be necessary in the future. But such revision will only be possible to the degree that we all contribute our experiences, evaluations, suggestions, and comments. These should pertain to the basic aim, the design, the content and to the teaching suggestions. In this way this curriculum can become an expression of our joint efforts and common faith.
II. Introduction

THE AIM and motive of education is to lead the child to a differentiated, sensitive, appreciative, dedicated awareness of God’s works; His works as they have been opened up to us in creation, the original plan spoiled by our sin and His restoration of us and that plan in Christ. This awareness is integrally expressed in the love of God and man and a sense of responsibility for this world. This aim is total in scope. It leaves not human activity out of consideration. Through our example and our teaching the child is to be prepared to account as a trustworthy steward for the way he has fostered and expressed his talents, for the way he has devoted his time. All our time is His time and we must treat it accordingly. This responsibility is a joy. As an aquatic creature exists in water, so we exist before the Lord! This is our "natural environment". This is the wellspring of meaning for our lives.

I mean to sing to Yaweh all my life,
I mean to play for my God as long as I live.
May these reflections of mine give him pleasure,
As much as Yaweh gives me!

Psalm 104:33,34

THE CREATION is marvellous in its variation and order. We can develop in ourselves as educators and in our children a sense of wonder that undergirds the things we learn about ourselves, about animals, about plants, about things. The creation is not, in first instance, an object of inquiry, experiment, prediction and technical manipulation. Primarily it is a hymn to be sung.

Yaweh what variety you have created,
Arranging everything so wisely!

Psalm 104:24

God created the heavens and the earth.

You stretch the heavens cut like a tent,
you build your palace on the waters above;
using the clouds as your chariot,
you advance on the wings of the wind;
you use the winds as messengers
and fiery flames as servants.
You fixed the earth on its foundations;
unshakeable forever and ever;
you wrapped it with the deep as with a robe
the waters overtopping the mountains.

Psalm 104:3-7

God said, "Let there be lights in the vault of heaven to divide
day from night, and let them indicate festivals, days and years."
You made the moon to tell the seasons,
the sun knows when to set:
you bring darkness on, night falls,
All the forest animals come out:
savage lions roaring for their prey,
claiming their food from God.
The sun rises, they retire,
going back to lie down in their lairs
and man goes out to work,
and to labour until dusk.

Psalm 104:19-23

God said "Let the waters under heaven come together into a single
mass, and let dry land appear.: (Genesis 1:9)
At your reproof the waters took to flight,
they fled at the sound of your thunder,
cascading over the mountains, into the valleys,
down to the reservoir you made for them;
you imposed the limits they must never cross again,
or they would once more flood the land.
You set springs gushing in ravines,
routing down between the mountains,
supplying water for wild animals,
attracing the thirsty wild donkeys;
ec near there the birds of the air make their nests
and sing among the branches.

Psalm 104:7-12

God said, "Let the earth produce vegetation". (Genesis 1:11)
You made fresh grass grow for cattle
and those plants made use of by man,
for them to get food from the soil:
wine to make them cheerful,
oil to make them happy
and bread to make them strong.
The trees of Yaweh get rain enough,  
those cedars of Lebanon he planted;  
here the little birds build their nest  
and, on the highest branches, the stork has its house.

Psalm 104:14-17

God said, "Let the earth produce every kind of living creature".  
(Genesis 1:24)

Earth is completely full of the things you have made:  
among them vast expanse of ocean,  
teeming with countless creatures,  
creatures large and small,  
with the ships going to and fro  
and the Leviathan whom you made to amuse you.

All creatures depend on you  
to feed them throughout the year;  
you provide the food they eat,  
with generous hand you satisfy their hunger.

You turn your face away, they suffer,  
you stop their breath, they die  
and revert to dust.  
You give breath, fresh life begins,  
you keep renewing the world.

Psalm 104:21-30

God said, "Let us make man in our image, in the likeness of ourselves, and let them be masters of the fish of the sea, the birds of heaven, the cattle, all the wild beasts and all the reptiles that crawl upon the earth."

God created man in the image of himself,  
in the image of God he created him,  
malie and female created he them.

God blessed them, saying to them, "Be fruitful and multiply, fill the earth and conquer it." (Gen. 1:26-28)

I look up at your heavens, made by your fingers  
at the moon and stars you set in place—  
what is man that you should spare a thought for him,  
the son of man that you should care for him?
Yet you have made him little less than a god,
you have crowned him with glory and splendour,
made him lord over the work of your hands,
set all things under his feet,

sheep and oxen, all these,
yes, wild animals too,
birds in the air, fish in the sea
travelling the paths of the ocean.

Psalm 8:3-9

Yaweh, our Lord,
how great your name throughout the earth!

With this knowledge that we and everything about us exist for God's pleasure we can begin to lead the developing child into a growing and deepening awareness of the riches of creation. The child will learn his responsible place. He learns to enjoy, to understand, to dedicate.

This basic attitude to life must penetrate the way we talk about, use, care for all these things. Not only is the child a creature of God but also the teacher and also the many things we want the child to learn about.

Creation was spoiled by man's Fall. We misuse our position of power and responsibility. We do not meet the very condition of life, listening to God. If the child is going to learn to know reality as he grows up, he must learn to feel, understand and express this.

Have mercy on me, O God, in your goodness,
In your great tenderness wipe away my faults;
Wash me clean of my guilt,
purify me from my sin.

For I am well aware of my faults,
I have my sin constantly in mind,
Having sinned against none other than you,
having done what you regard as wrong.
You are just when you pass sentence on me, blameless when you give judgment. You know I was born guilty, a sinner from the moment of conception.

Psalm 51:1-5

Here again the educational influence is only for a small part achieved by explicit teaching. It is primarily the contrition of the educator that through its contageability affects the child. It is taught through drawing the attention of the child to ways in which man neglects, distorts, destroys, wrongly manipulates God's creation. It is taught by the careful discrimination of the educator between his own personal moods or dislikes, the inabilities of the child, and the willful wrong-doing of the child. It is taught through the manner in which the educator prays with the children. Basically it is taught by the attitude of the educator not to specific sins but to creation, to the child's and his own task and how the child and he ought to meet this task. We are unfaithful stewards.

And yet there is life.

THE RESTORATION in Christ has maintained creation. This great work of God opens our hearts. The creation hymn can be sung in spite of our sin because Christ has paid our debt. In him all things live.

The perspective that we have been given is that we must work for the coming of God's peace, though torn by the already-not yet, redeemed-yet in sin, character of this world: we care, yet we pollute. We understand, yet we ignore. We can truly say Shalom, yet we make war. We educate and yet where is the millstone for our leading astray? And through this we are to develop the child's talents, to guide his decisions so that he is optimately able to express his time and to know in this the works of his Lord.
III. The Curriculum and the Foundation

This aim of education has led to the emphasis on man's task in creation, in this curriculum manual. It is his responsibility to care, to love. The word task has at times been interpreted incorrectly through too much stress on the economic side of it. By task however we mean much more than this. All the uses and misuses of the time we are given in this creation, the way we arrange our lives are intended. Our life is our task.

Man has been given a task with respect to a variety of created realms. There is a physical realm (things), the organic realm (plants), the sensory realm (animals), the human realm. Each of these has its typical characteristics, has typical needs, possibilities for use, development, form-giving, and typical limitations in these respects.

The variety within each realm is astounding. It seems as if there is no end to the interesting things one can learn about plants, their varieties, their growth patterns, their patterns of evolving, their cultivation for food, for drugs, and medicines. Similarly the other realms are wonderfully rich in variations.

Also the intricate interwovenness of the realms is interesting for the child to explore. Water and air are essential to plant, animal and human life. There is a close relation between geographic features of the land, air and water and the kinds of plants and animals that live there. Animals depend in many ways on plants and some plants depend on animals for spreading of pollen or seed dispersion. Water cycles and various food choices show complex interdependencies.

There are many different kinds of tasks. They relate to faith, to truth, to beauty, to justice, work and consumption, recreation, communication, education, technology, caring and nurturing. These open up the possibilities contained in the various uses—as houses,
as statues; in diamond rings, in poetry, in superstition (the Blarney Stone), in faith life (Moses hitting the rock to get water instead of speaking to it).

The task of the school in the primary grades is to guide the child's learning in such a way that crucial abilities to appreciate, understand, and express are developed. This is a different emphasis than the focus on abstract scientific concepts and on training in the method of scientific enquiry so characteristic of many of today's curriculum materials. The latter approach not only cuts out a wealth of information but destroys its very heart; namely, that this is God's plan.

Take for instance the example of thunder and lightning that is mentioned in the introduction to the unit on physical things. The scientific approach tends to reduce the sometimes awe-inspiring, sometimes terrifying occurrence to the physical level, an electrical discharge, a vacuum. But in actual fact they are much more. For the Viking thunder represented the God, Thor. On Sinai lightening and thunder represented the presence of God on the mount. Thunder and lightning are objects of poetry and art. They are used in stories and film to set an ominous threatening atmosphere. They can be a danger economically, for instance, to chicken farmers. They stimulate a social huddling together of outside workers. They are symbols of power, etc. To deal with them only at the physical level does injustice to the child's experience of them. It fails to start where the child is.

Similarly organic and sensory things though typically showing an organic or an animal organization are much more than a plant or an animal.
IV. The Organization of the Manual: How to Use the Manual: Evaluation

The manual is divided into a number of units covering the different realms of creation. The earth and physical things, the plant world, animal life and human society. Each unit is developed in terms of man's task with respect to that realm. Understanding the typical characteristics and varieties helps the child to deepen his awareness of his task of caring for, using, developing, etc.

Each unit is divided into two main sections. It begins with an outline for the teacher of basic concepts (suitable to be taught in the primary grades 1 - 3) for the realm. The second section contains teaching suggestions for that realm. Added to the teaching suggestions is a list of literature and teaching materials that could be helpful.

The concepts in the outline for the teacher have, where possible, been arranged in order of difficulty. For example, grade one might deal with foods animals eat, grade two with differences in eating, grade three with food chains. The concepts worked with depend on the ability and interest of the student and the teacher.

Behind this organization of the materials is the conviction that the schools, especially in the primary grades, should be moving in the direction of a more informal teaching-learning situation. The pupils should have the opportunity to explore areas of interest in depth, individually or together, guided by a well-informed teacher. For this reason the material is not organized in a lesson form and not assigned a specific grade level. It is primarily the teacher who must be familiar with the orientation and information in the manual. These can serve as the primary resource in teaching, setting up projects, making assignments, etc. Exactly what teaching suggestions will be suitable and what topics will be covered depend on the teacher, the class, individual children, the school, and locality, etc.
The teaching should foster a sense of awe, appreciation and enjoyment in the child—not a catalogue of facts. They need not learn everything at the same time. All children do not learn in the same way nor at the same age. The teaching of a curriculum should therefore be open ended... not a list of concepts to be 'covered' in grade 1 or a list of activities to be carried out. Specific interests of the child should be encouraged and guided. This may mean the particular area is not in the manual yet. The teacher can then add these concepts to the manual for her own record.

About the Teaching Suggestions: How to Use This Manual

The teaching suggestions are suggestions. If you have better, use them. Pupils may have alternative ways of doing things. Not everyone needs to do the same activity. Different abilities and different interests require that there be various activities. Even when dealing with the same topic various students may learn about it and explore it from different sides with different assignments.

Pupils need to have firsthand concrete experiences as much as possible. Let them do the activities themselves. Let them explore topics on their own (with teacher guidance).

Pupils are often attracted by strong contrasts or incongruities. Differences between realms and variety in them can be approached this way.

The bibliography, art suggestions, poems, materials added to the teaching suggestions are also tentative and need expansion. Add to them.
The Place of This Manual in the Curriculum

The basic layout of the manual is such that it can integrally relate all the subject areas of the school curriculum. Certainly in the primary grades the child experiences reality in concrete wholeness and not as so many subjects. This means the subject areas should be allowed to merge freely. Each realm has varieties and possibilities for exploration in various ways—in science, social studies, language, poetry, art, literature, etc. If a teacher has integrated the basic ideas she should be able to help children integrate their experiences: to find the general principle that relates the activities.

The interrelationships with the various curriculum areas have not been worked out in detail yet. But it is evident that such areas as physical education, math, language, art, and Bible each relate in a special way to the basic aim especially when they are taught within that context of wholeness and not as isolated drill programs. For example the teaching of math, at times, has become such a drill program unrelated in any authentic way to the child's experience, except as a tedious bore. This is doubly true of high school math. However, starting from the task the child is faced with, and integrating the concepts of math into his experience by means of its uses and applications as well as the history of its development makes it an interesting area to explore. Similar things can be said of language, spelling, physical education, etc.

Evaluation and the Child

The main aim of evaluation should be to teach the child how to evaluate what he has done; how to give a responsible account of what he did—what it meant to him, how he would do it if he did it again, what he has learned, and what he should learn next. Assisting the child with this and guiding him toward being able
to do this himself serves the basic aim of education. The testing of knowledge of specific facts only makes a very limited contribution in such a total self-evaluation context.

**Evaluation and the Teacher: the Manual**

This same attitude of constantly accounting and checking one's own teaching activities, trying to find better ways, weeding out the desired elements, improving the whole teaching learning situation is the evaluative task of the teacher. This also includes improving the manual. Thinking about various sections of it, the organization, but especially also the suitability of the concepts, and adding to the teacher's suggestions, the bibliographies, the materials is valuable. Sending these evaluations, suggestions, additions, etc., to the editor will make them available for other teachers. In that way this manual can truly be a communal effort.
THE EARTH AND THE SKY

- The earth is round; the earth pulls

- The sky above: sun, moon, stars

- Night and Day

- The seasons

- Land forms; rocks, sand, soil

- Oceans, lakes, rivers

- Weather

- Maps
Introduction

The children have discovered something of the wonder and unity of the creation, that they are special in the creation and that they have a special place (task) on the earth.

In order for a child to be made more aware of his task to develop the earth and use its resources for the benefit of all people he must be led into a deepened understanding of:

a. the nature of the earth on which he lives. Material will be presented relating to the surface of the earth. Concepts about land, water and the atmosphere will be developed.

b. the solar system and the universe beyond;

c. the inter-relation of the earth and sun which causes day and night and the seasons;

d. the inter-relation of air, water and land, and the sun which results in weather and climate;

e. changes brought about by weather, seasons and by man himself and how these changes result in a change in the physical environment;

f. map skills to show how our environment can be recorded in symbols.

The child should be made aware of how all of creation works in unity to make the earth a good place to live, of how man can help to make the earth more liveable and also how he can spoil the creation.

The concepts are arranged from the very simple to the complex. In selecting concepts for a particular class or group, the developmental stages of the children and the experiences of the class should be taken into consideration.

Concepts should be combined wherever possible. It is assumed that the entire unit will be related as much as possible to a child's everyday experiences with the physical environment in which he lives.
OVERVIEW OF BASIC CONCEPTS

1. The earth is round
2. The earth pulls
3. The sun gives light and warmth to the earth
4. At night we can see the moon and stars in the sky
5. The solar system is a group of nine planets in orbit around the sun
6. Night and day are caused by the earth rotating on its axis
7. The seasons follow one another
8. Everything in creation changes when the seasons change
9. Changes in the seasons result from the tilt of the earth...
10. Land, air, water
11. Land differs in appearance; rocks, sand and soil
12. Rocks differ in several ways
13. Soil grows things the best
14. Wind and water change the land; man can change the land
15. Oceans, lakes, rivers
16. Air is all around us
17. Our weather is constantly changing
18. Changes of the water in the air help make different kinds of weather
19. Changes in the temperature of the air affect the weather
20. A map represents something real by means of symbols
21. A globe is a model of the earth...
1. The earth is round.
   - we live on a round earth
   - we can't see the roundness of the earth from close by
   - we can see the roundness of the earth from a distance

Classroom Procedure

1) Use a large primary globe if one is available. Stress the idea of the globe as a model of the earth. Relate this to other experiences the children have had with models: dolls are models of people, etc. Look out of the window. How does the earth look? How does the globe look? Why doesn't the earth look round from the window?

2) Experiments to show that we can only see the total shape of an object from a distance.
   a) Have the children stand very close to the outside school wall. Now walk away from the school until you can see the total shape. Allow the children to discover that we can see the total shape of large things only from a distance. That is why we can't see the largeness of the earth from where we are.
   b) Put your nose on the globe, it looks huge, you see a little piece of it! Now move back, the piece becomes smaller, you see the whole globe. The further you go, the smaller it becomes. This is the way it goes with the astronauts.

3) Show pictures of the earth taken from space. Why can we see the roundness of the earth?

4) Use of Colour on the globe. Blue shows where the water is. Brown (or other colours) shows where the land is. People live on the land.

5) Films - Big World - E.B.
2. **The earth pulls**

- Inside the earth there is a pull called gravity
- Everything stays down on the earth because of this pull from the center
- Down is toward the earth - Up is away from the earth
- We can't see gravity but we can feel and see what it does
- Some things fall fast, others do not

**Classroom Procedure**

1) Allow the children to experiment with various objects in the classroom: ball, desk, cup of water, pencils etc. What happens when we let go of these objects? What happens when we throw these objects up?

2) Why do you think the rain comes down? the snow? space-men? etc. What keeps people on the earth, animals, plants, water? What keeps the land together on the earth? What keeps the air around the earth? Discuss: The pull from the center keeps everything down and keeps everything on the earth.

3) Bring in a globe. Tell the children we will pretend this is the earth. With plasticine put on tiny cut-outs of car, tree, people, animal, bird, boat, airplane, etc. Find pictures of the same (car, tree, etc.). Ask the children: Are these on the earth? (Holding pictures up) What makes them stay down? Repeat this with several pictures. Compare each to the globe and cut-outs. What holds real things on the earth?

4) Where is up? Where is down?

Throw a ball far up. Where does your throw make the ball go? **Away** from the earth. Establish that up is away from the earth. What pulls the ball down? **Gravity**. Where does the ball go? Down to the earth. Establish that **down** is toward the earth.
5) Use globe with plasticine cut-outs. Put the cut-outs in various places on or near the globe. Have the children show the airplane how to go up (away from the earth). Show the bird how to go down (toward the earth). Show the animals how to jump up and down.

6) Allow the children to experiment with various objects such as: a ball or a feather. Which falls faster? When you throw something up the earth's gravity pulls it down. If we make something go around and around, the earth's gravity pulls on it but we see that it does go up a little. We can make it go around faster and it will go up further. We can make it go so fast that gravity cannot pull it down to earth. If you slow it down again the earth's gravity will begin to pull it toward the earth.

7) Hold a ball to your nose. Let the ball go. Sit still. What will make the ball go away from your nose? How far will it go? Will it come back? What will make it come back? Will it hit you on the nose? Guess! Then find out. When objects fall, do they keep the same speed? (No) They go faster and faster. Gravity makes it move very fast.

8) Hold a ball like this. See it hang straight down. What makes it hang straight down toward the earth? Now make the ball go in a circle. Note that the ball has moved up a little. Make the ball go faster and faster. See it go higher. So it is with a satellite around the earth, and the moon also.
3. The sun gives light and warmth to the earth
   - God created the sun to give light and warmth to the earth
   - The sun always shines
   - We can see the sun in the daytime
   - The sun is very, very large and very hot
   - The sun looks small because it is very far away
   - The sun warms the soil so plants can grow
   - Heat comes from the sun in rays
   - Light comes from the sun in straight lines
   - Sunlight is made up of many different colors
   - The sun is made up of gasses that glow
   - Sometimes we do not see the sun during the day. Clouds form a shadow on the earth
   - Everything on the earth would die without the sun. The earth would be in total darkness. Everything would freeze.
   - When sunlight is stopped by something we have a shadow

Classroom Procedure
1) Have the children discuss or draw pictures of all the things they see in the sky during the day. Ask which thing they think is most important to them which is the largest, etc.

2) Why is the sun so important? Shine a flashlight on a globe to represent the sun shining on the earth. Even though it is dark where we live, the sun shines on the other side of the earth. The sun always shines.

3) Discuss with the children what color they think sunlight is. White? Yellow? Any color? Discuss the rainbow. When do you see a rainbow? Where does the rainbow get its colors? (When the sun shines through drops of rain, the water scatters the light of the sunbeams. Then we can see the colors in sunlight.)

4) Scatter the sunlight with the use of a prism or lawn-sprinkler. Look for the rainbow. Conclude that light
is made up of many colors.

5) Use a film projector or flashlight and see the rays that are projected. Conclude that light travels in straight lines.

6) Film: How Sunlight Helps Us - Coronet.

7) Observe the shadows of objects outdoors. When do you see shadows? (When it is sunny) Where do you see them? (Next to buildings, trees, etc., something that blocks the sunlight.) They fall in the opposite direction of the sun.

8) Measure the length of a shadow in the morning, at noon, and the late afternoon. When is the shadow the shortest, longest? Observe how shadows change directions.

9) Let the children experiment with making shadows on the screen by blocking the light of the projector.

10) Make shadow men. Take a large piece of bristolboard for each child (a group of children). Take them outside. From the same spot during several parts of the day have them draw their shadows. These could be put up in the hall with this title, The Earth Moves. Notice how their shadows are long in the morning, short at noon, and how the shadows get longer as the day advances.

8 A.M. Shadows

Everyone's shadow is taller than really,  
The shadows of giants are taller than trees,  
The shadows of children are big as their parents,  
And shadows of trotting dogs bend at the knees.  
Everyone's shadow is taller than really,  
Everyone's shadow is thinner than thin,  
8 a.m. shadows are long as the dawning,  
Pulling the night away,  
Coaxing the light to say:  
"Welcome, all shadows,  
Day, please begin!"  
-Patricia Hubbell
4. At night we can see the moon and stars in the sky
   - The moon is solid, doesn't make heat, reflects light from the sun
   - Moonlight is not warm and not bright like the sun
   - The moon looks as big as the sun because it is much closer to us
   - We see many stars at night. Some are bright, some are dim
   - We do not see the stars during the daytime because the sun is so bright
   - The moon appears to change shape from night to night

   **Classroom Procedure**
   1) Write the word "stars" with a black pen on white paper and on black paper. It shows up better on white paper. So it is with the stars at night--they show up better then.

   2) Have a pingpong ball and baseball. Hold the baseball in front of you, at eye level, as far away as you can reach. Hold the pingpong ball directly in front of you in the other hand. What did you find? Closer things look bigger than far-away things.

   3) Through discussion discover similarities and differences between sun and moon, sun and earth, and moon and earth.

   4) Shine a flashlight on a mirror representing the sunshine reflecting the moon or allow the children to reflect sunlight to the ceiling or walls of the classroom with a mirror. Pretend that the mirror is the moon. The light they see at night would be the reflected light on ceiling or wall.

   5) Surface of the moon: Make a large clay ball with many bumps. Shine a flashlight on it in a darkened room. Observe the dark and light spots--similar to that on the moon.
6) How craters can be formed: Fill a box with loose sand. Stand on a chair above the box. Throw a ball as hard as you can. What happens? What happened to the sand that was in the hole? Now make smaller craters inside the larger crater. Throw marbles into the first crater. If you shine a light at the side of a crater, the beams will not light up the crater.

7) Discuss: What problems would people have if they wanted to live on the moon? What would they need to live on the moon? They would need a sealed house with water, heat, food, and air conditioning.

8) Film, "Stars at Night" (S.G.)
5. The solar system is a group of nine planets which revolve in orbit around the sun.
- Planets travel around the sun. The earth is one of the planets. There are nine planets.
- Each planet moves around the sun in its own path (orbit).
- Some planets have moons circling around them.
- The earth also has a moon circling around it. It takes 29 days (month) for the moon to take one trip around the sun. The moon reflects the light of the sun. Only one-half of the moon gets sunlight at one time. The moon does not change shape. As the moon travels around the earth, more of its lighted side turns toward us. We then see more of its surface.
- Stars are huge hot suns which shine day and night.

Classroom Procedure
1) To show the orbit of each planet, have one child stand in the center of the circle representing the sun. Have nine children standing side by side with a couple of feet between them. Children must have their left side to the center person.
   The nine children begin walking around the sun in the direction they are facing. Notice that the planet closest to the sun makes the shortest trip and the trips get longer the further the planets are away from the sun.

2) Make circles on a piece of paper, and have each child watch the moon for two weeks and show the shape of the moon on paper. Darken the part of the moon which cannot be seen.

3) Experiment: electric light, a ball, sheets of black paper and white chalk.
   Have one person stand in a darkened room with a light source to his left. Let him hold a baseball in one hand. The baseball represents the moon, the light source the sun and the person the earth. Turn the ball slowly to
the left and take note at each position how much of the lit side of the moon is visible from the earth.

4) Space project: Divide the pupils into groups, each group responsible for finding out about one aspect of space or space travel. Have the children pool their information and make a big chart of their findings. Make pictures to illustrate chart. Clay models of spaceships, rockets etc. Write stories about space, factual or imaginary, illustrate.

5) Be the astronauts walking toward space capsule: clumsy, heavy awkward movements. Space capsule blasting off. Visiting Mars – being imaginary creatures on Mars.
6. **Night and day are caused by the earth rotating on its axis**

- The earth spins, the sun stands still.
- The earth spins all the way around for each day (and night).
- We call this spinning of the earth the earth's rotation.
- When our side of the earth is toward the sun we have day.
- When our side is away from the sun we have night. At night we are in the shadow of the earth.
- One half of the earth has day, the other half has night.
- The earth is always on a slant--on an axis. This axis is an imaginary line through the earth. On one end of the axis is the North Pole, on the other the South Pole. The earth rotates on its axis once every 24 hours. The axis is always tilted in the same direction. There is an imaginary line around the center of the earth called the equator.
- On some parts of the earth day and night are the same length all year - equator.
- On other parts of the earth day and night are not the same length all year. When the earth tips towards the sun days are longer than nights. When the earth tips away from the sun nights are longer than days.
- When the earth is not tilted toward or away from the sun day and night are of about equal length.
- Day and night change in length but the order remains the same.

**Classroom Suggestions**

1) Observe the sun at various times during the day. Record where the sun is in the morning, at noon, toward the end of the day. Establish that it is the earth that is moving, not the sun. The earth moves from west to east.

2) The children can demonstrate the cause for day and night by using a globe and a flashlight. Point the flashlight directly at the equator. Show that when one side of the globe is lighted (day) the other side is dark (night).
Put an X or white piece of paper marking where the children live. Turn the globe slowly to show how daylight goes around the world. Be sure to spin the globe from west to east. As the globe is turned the children will see that when it is light on their half of the earth, it is dark on the other side of the world and vice-versa. Show that the globe must make one complete turn for each day (and night).

3) Have the globe turned again. Stop! Why is it dark on one side of the globe? (The light rays don't reach, they are blocked by the earth so we are in the earth's shadow at night.)

4) Demonstrate the earth's rotation on its axis by using a ball of clay to represent the earth. Stick a pencil through the clay ball for the axis. At one end of the ball the children should mark the North Pole, at the other end the South Pole. The pencil is tilted slightly. The earth's axis is always tilted in the same way. Use a flashlight for the sun. Show how the earth spins on its axis always on a tilt. Show how when one part of the earth moves toward the sun we have day, when the same part moves away from the sun we have night.

5) With a globe and light show how the tilt of the earth affects the length of night and day. Mark where the children live. Tilt the earth toward the sun. Show how they receive more light for a longer period of time than if the earth is tilted away from the sun. Therefore the days are longer when we are tilted toward the sun (summer) and nights are longer when we are tilted away from the sun (winter). During the spring and fall we are not tilted toward or away from the sun. Days and nights are about equal in length.

6) Have the children discover by means of a globe and light that when the earth tips so that the North Pole faces
the sun the North Pole is always in the daylight and the South Pole has continuous night and vice-versa. These long periods of darkness and light last about six months.

7) Experiencing night and day.
Have a group of six children stand in a circle facing out. Have them link arms. Put this group of children in one end of the classroom. At the other end shine the light of the film projector towards the group of children. Tell the children that they are going to be the earth and that the light will be the sun. Turn on the projector. "The sun is shining." Tell the children to turn in a circle. "The earth is turning." (It might be wise to repeat this several times.) Stop the earth turning. Ask: Who sees the most light? (sunshine) Who sees the least light? (sunshine) Who sees the day? Who sees the night? Who is probably sleeping? Who is eating lunch? Who is probably getting up? Who is probably going to bed? etc. Have the earth turn again. Stop. Repeat the same series of questions. At the end of the lesson ask: Does the sun ever stop shining? Does the earth ever stop turning? Why? (There is always day and night. God made it that way.)

8) Relating experiences: Discuss the differences between night and day. Which do you like better? Why? Let the children express their feelings about night and darkness. If some children are still afraid of the dark let them feel that it is quite common to be afraid at night.

9) Creative writing and art: Write or paint pictures of "Why I like night the best" or "Why I like day the best."

11) Poetry:

"Evening" - Harry Behn
"Bed in Summer" - Robert Louis Stevenson
Discuss: Why do you think it seems like night when you get up in winter? Why does it seem still day when you go to bed in summer?
"Night" - Lois Weakly McKay
Ask, "Why do you think the kitten likes the night?"
"Morning" - Emily Dickinson
(All poems from Childcraft, Vol. I)

12) Books:

Night's Nice, Barbara and Ed Emberley. Doubleday.
Night Noises, LaVerne Johnson. Parents.
Creatures of the Night, Dorothy Sterling. Doubleday.

13) Projects: Some children might like to discover what animals are nighttime animals, and what each one's habits are. Make booklets or have each child tell what he has discovered.
7. **The seasons follow one another and God promised that their order will not be changed**

- The seasons come in a specific order
- There are four seasons: spring, summer, fall, winter

**Classroom Suggestions**

1) **Show a film or filmstrip on the seasons.** Establish that there are Four Seasons, spring, summer, fall and winter, and that they come in specific order.

2) **Have a variety of pictures on the seasons available.**
   Hold up each picture and ask the children to tell what the season is. Arrange all the pictures in groups according to seasons. Mix up the pictures and have the children rearrange them in their proper order. Pin them up on the bulletin board.

3) **Discuss:** The seasons were put in this order by God. Can the order ever be switched? Do you think there could be summer all year? Do you think there could be winter all year? Ask them why.

4) **Paint pictures.** Arrange the class in groups. Have each group paint one season on a large sheet. Put a label on each sheet - winter, spring, summer, fall. Put the pictures up for display. The display could be entitled "God Put Them In Order."
8. **Everything in creation changes when the seasons change**

- Things change when the seasons change. Plants change when the seasons change. Animals change when the seasons change. People do different things when the seasons change.

- We can see, hear, taste, smell and feel when the seasons change.

**Classroom Suggestions**

1) Discuss:

   a) What season is it now? Can you see what season it is? Can you feel it? (air) Taste it? Hear it? (crackle of leaves, rain, crunch of snow) Is the air warm or cold? What kind of clothes are we wearing for this season? What do the water, the trees and plants look like? What are the birds and animals doing? What would a farmer be doing?

   b) What will the next season be like? What will happen to the air, the water, the trees? Will they change? What will the birds and animals be doing? What will we be doing? (wearing different clothes, playing more indoors or out, etc.)

   c) What happens to the air in winter, the water in the lakes, the trees, birds, etc. etc.? Establish that everything changes when the season changes - In winter the air becomes colder, the water becomes ice, the soil becomes hard so we cannot plant or grow food or flowers. The plants die because they have lost their leaves. Animals need to find warm homes. Their fur becomes very thick. People need to find warmer clothes, heat their homes, etc.
2) Write these four headings on the board:

<table>
<thead>
<tr>
<th>Things change</th>
<th>Plants change</th>
<th>Animals change</th>
<th>People do different things</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(air)</td>
<td>(water)</td>
<td>(soil)</td>
</tr>
</tbody>
</table>

Have the children draw a picture appropriate to one of these titles and put it up on the board. Some may want to do the series of pictures on changes in all of the seasons.

3) The teacher could prepare a worksheet of four pictures illustrating the above. Have each child put his up in the appropriate column.

4) Construct a chart. Show objects you can taste, smell, feel, hear, see in a particular season.

5) Make collections. For example in fall make a leaf or seed collection. Establish that leaves have different shapes, colors, sizes, etc. Also that each leaf comes from a particular tree.
9. Changes in the seasons result from the tilt of the earth as it revolves around the sun
   - The way the rays from the sun strike the earth will determine the temperature. When the rays strike the earth directly, the earth gets much heat. When the rays strike the earth on a slant the same amount of heat is spread over larger areas.
   - The earth moves in two ways. It rotates and it revolves around the sun once every year. During the year our part of the earth is tilted toward the sun for three months. At this time we get more sunlight than at other times of the year. The days are longer than the nights. This season is called summer. The earth continues to revolve around the sun. The next three months our part of the earth is not tilted toward the sun or away from the sun. The weather is not very hot or cold. The days and nights are about equal in length. This season is called fall. On and on the earth revolves around the sun. For three months our part of the earth is tilted away from the sun. Our part of the earth does not get as much sunlight now. Nights are longer than days. The weather is cold. This is the winter season. The earth moves on around the sun. During the next three months the earth is neither tilted toward nor away from the sun. This is spring.
   - There are different lengths of seasons in different parts of the world but the order of the seasons remains the same.
   - The seasons affect plants, animals' habits and the way people live.

Classroom Suggestions
1) See how the sun's light hits the earth in summer by shining a flashlight straight down on a sheet of paper. Mark or outline the area where the light strikes the paper. Then hold the flashlight on a slant and mark the area where the light strikes the paper. "When does the
2) Have a source of light in the middle of the desk and revolve a globe on its axis around this light. Ask at certain point: "Where is it summer now, where is it winter?" etc. etc. "Why?"

3) Ask the children how old they are. If they are 6 years old they have travelled around the sun 6 times.

10. To make the earth a place for man to live, God separated the seas from the dry land
   - The water is gathered together in seas, lakes, rivers, streams, ponds, etc.
   - The land is gathered together in plains, hills, valleys, deserts, mountains, and islands, etc.
   - The land and water is surrounded by a band of air.

Classroom Suggestions
1) Integrate with creation story. Discuss the events of the first days of creation. Show how each day serves as a foundation for the next. Emphasize that on the third day the seas and land were separated in order for the plants to grow.

2) Have available: a bucket of earth, a bucket of water, an empty jar with a lid on it. Ask: What are these? Label each with either "land", "water," "air". Ask: Where do you find the air altogether (in one place)? Where do you find the land altogether (in one place)? Where do you find water altogether (in one place)? Discuss: Talk with the children about the air being all above the earth and water. The water in oceans, lakes, rivers and ponds. The land all gathered together in plains, hills, mountains all around us, etc.

3) Picture study: Use pictures of filmstrips to locate the position of air, land and water. Have the children point
to air, land (hills, plains, etc.) and water (rivers, lakes, ponds, etc.). Discover that air is gathered above the land and water, etc.

4) Prepare a worksheet on which is drawn a land, air and water scene (see illustration). Have the children color the land brown or green, the water blue, and the air remains colorless.

5) Cut and paste:
Have cut-out labels prepared, marked land, water and air. Allow the children to glue the labels in the proper places on the prepared worksheet (after it has been colored). The same could be done with magazine pictures.

6) Allow the children to draw their own land, water and air pictures.

7) Field trips: Point out land, air and water as the children see them.

8) Tell what you think the earth is like.
- Gravel, sand, rocks and soil differ in appearance.
- Gravel, sand, rocks and soil form different types of land.
- Rocks can be broken down into pebbles, stones, gravel and sand.
- Wind and water break down rocks.
- Man uses gravel, sand, rocks and soil.

Classroom Suggestions
1) Bring into the classroom: a tray of gravel; a tray of loose sand; a tray of soil; a large solid rock. Ask: What would you call all four of these? (land) Do you think all these kinds of land are the same? Pointing to each sample ask: How does the gravel differ from the large rock? Is it bigger or smaller, does it look different, etc. Continue in the same manner with sand and soil. Ask: Which type of land would grow things the best? Establish that rocks, gravel, sand and soil are different types of land.

2) Picture and sample study. Show the children a picture of a desert, mountain, beach, rocky field, gravel pit and a productive field (wheat, grapes, flowers, etc.). Match the pictures to the rock samples.

3) Discuss how rocks can be broken down into smaller parts and become gravel and sand. Have samples of broken-down rock available or have the children hammer some rocks down. Have the children discover that gravel and sand were once part of solid rock. Discuss how water and wind break down rock.

4) Ask the children: Which do you think man uses the most? Gravel, sand, rocks or soil? Have the children find pictures of people using rocks, sand, gravel, soil. Glue them on a sheet.
12. **Rocks differ in several ways**

- Rocks are different in appearance (size, shape, weight, color).
- Rocks are different in feel (hard or soft, rough or smooth).
- We can group together rocks that are alike.

**Classroom Suggestions**

1) Have the children bring rock samples to school or plan a field trip to look at rocks and collect specimens. Discover how rocks vary in size, shape, color, and feel. Establish that some rocks are large, some small, some crumbly, some rough, some very smooth. Discover that within one stone or pebble there may be many colors.

2) Rock study. Take a smooth and a rough rock. Have a child close his eyes and feel them. What does he feel? The child should discover that rocks may be smooth (worn by water) or rough.

3) Try to get a sample of soft, crumbly shale to compare with a piece of hard rock. Scratch each with a fingernail. Establish that it is much easier to scratch shale because it is softer.

4) Make a chart.

**Rocks**

Rocks are different colors

Rocks may be smooth, or rough

Chalk

Rocks may be soft, or hard
5) Have the children make a rock display. Label various rocks as to size, texture, color, etc.

6) Go for a walk. Find places where we use rocks—buildings, fireplaces, sidewalks, etc.

13. **Soil grows things the best** (Rocks, sand and soil all compose land)
   - There are different kinds of soil.
   - Top soil grows things the best.
   - There are three types of rocks: igneous, sedimentary, metamorphic.
   - Man spoils the land.

**Classroom Suggestions**

1) Observe soil in your neighborhood. Take samples of soil into the classroom. Look at them. Feel them. Smell them. How are they different? Put water in each jar of soil sample. "Which soil soaks up the water faster?"

2) Layers of soil cover the land. Mix together equal parts of soil, gravel, and sand. Shake this up with water and pour into a tall glass. Repeat this a few times each day for several days. Pour off extra water. Observe how it separates into layers. Establish that land is made of layers of soil.

3) With a magnifying glass let the children examine samples of soil.
   a. Rocks—some pieces in the soil are so tiny they do not look like rocks. Activity: Rub two rocks over a big piece of white paper. Ask, "What falls from the rocks?" Establish that rocks rubbing against each other cause pieces of broken rock which may become part of the soil. Wind and water may cause the rocks to rub against each other.
      Activity: Rocks can be separated from the soil. Have a child pour a soil sample into a strainer. Hold it
over a large pail. Pour some water into the strainer. Ask, "Why does some remain in the strainer?" "Will small rocks remain?" "What else might remain?"

Activity: Pour a cupful of sandy, light colored soil through a strainer. "What falls through? What is left?" Use a magnifying glass. Then pour a cupful of topsoil through a strainer. "What falls through the strainer?" "What is left?" Use a magnifying glass. In which soil are there more bits of plant material? In which soil are there more bits of sand and rock?

b. The children may see some small bugs crawling around the inside of the soil, e.g. ants, earthworms, beetles, grubs. Ask, "What will happen to the bodies of the bugs when they die?" Leaves and twigs fall to the earth. Rain and sun change the leaves and twigs. The leaves and twigs die and fall apart. They become part of the soil.

c. Air is part of the soil.
Activity: Add water to some jars half filled with soil. The water level should be above the soil level. Observe the water. The children should notice air bubbles rising to the surface. Establish there is air in soil.

d. Water is part of the soil.
The children may think there is no water in the soil unless it feels wet. Put some soil that seems dry into a jar. Close the jar and place it on top of a radiator. Observe how moisture collects on the sides of the jar. Establish there must be water in the soil. Discuss importance of earthworms in the soil. They chew the soil. Their food is bits of plants in the soil. Earthworms make tunnels. These tunnels allow water and air to get into the soil.
Activity: Get a flat dish and put damp topsoil on one half and damp sandy soil on the other half of the dish. Put some earthworms on top of both soils. Count the number of earthworms you put on. Keep the soils damp and observe them for a day or two. "Do you see any tunnels?" Turn the dish upside down over some newspaper. Count the number of earthworms in each soil. "Which soil has the most earthworms?" "Why?"

e. Integration: earthworms, plants, water, air. Plants need water, air and soil to grow.

Activity: Put topsoil and earthworms in a jar. Cover the jar with black paper. The next day open the paper and look in. "Can you see the tunnels?"

4) Plan a hike. Find a place where the topsoil has been dug away. Observe carefully and keep a record of your observations. Some things to look for:
   a. How deep is the topsoil?
   b. Does the color of the topsoil change as it goes down?
   c. Does the color change gradually or all at once?
   d. How deep do the roots grow?
   e. Do you see any gravel? How deep is it?
   f. Can you see any dead leaves and twigs in the soil? How deep are they?
   g. Feel the topsoil. Rub it between your fingers. Does it feel wet? Smell it. Do the same for the soil below. Which feels more sandy? Which is softer?
   h. Take a sample of each soil back to school. This can be used to grow some plants.

5) Which soil is better for grass plants? Put some of the good topsoil in one box. Put some of the sandy soil in another box. Plant grass seeds in each box. Observe them for a few weeks. Keep the boxes damp. In about 5-7 days the grass seed should begin to grow. Give them light and keep them damp. "Which soil is better for
grass plants?" After a week pull a plant up from each box. Observe the roots, stems and leaves on each plant. Every day do this for a week. Use a ruler, magnifying glass, paper and pencil. "Do the plants keep growing the same in both soils?"

6) Keep a record for two weeks. Talk about what you see. Draw pictures of what you see including roots, stems, and leaves. Make a line to show the top of the soil. Establish that grass seeds grow better in topsoil than in sandy soil. Some children may want to experiment and add fertilizers to poor soil.

Rocks:
1) Igneous rocks.
Activity: Melt some chocolate candy. When it cools and hardens it is similar to melted rock. Ask, "What part of the chocolate cools first?" As in liquid lava, a hardened crust forms at the surface. Ask, "Can you see the small holes in the candy where the hot gasses escaped?" Similarly hot lava sometimes contains gasses. These escape as bubbles leaving small holes behind. Examine some igneous rocks to see if there are small holes on the surface. Establish that some rocks are formed as hot melted rock cools. Sometimes escaping gasses leave small holes behind.

2) Sedimentary rocks.
Activity: Fill a glass jar with water and pour in a mixture of sand and soil. Alternate the handfuls of sand and soil. "Is there a difference between the particles that settle to the bottom first and those that settle later?" (The layers of soil in the jar may be made to harden by adding a little cement.) With a magnifying glass the children should examine rocks in the classroom collection. Look for layers which show that rocks were formed under water. Establish that
rocks can be grouped this way. Establish rocks are formed under water by layers of sediments (similar to layers of a cake). As more layers are deposited, pressure builds up and the layers of sand and soil are pressed together. Under great pressure the layers are formed into rocks.

a. Sandstone. Find building in your neighborhood which is made from sandstone.

b. Clay. Add water to powdered clay. The children can see how it can be compacted into clay beds. Make some adobe bricks. Mix clay with cut-up straw and water. Pour this into a cut-down milk carton. Leave the carton in the sun for a day or two. Then take out your adobe brick and finish drying it. When the clay is dried it becomes hard but what will happen when the clay becomes wet again?

Activity: Put your adobe brick or a lump of dry clay into a bowl of water. Leave it there but stir it. What happens to the clay? What happens to the water? (The water becomes cloudy and the clay becomes soft.) Why wouldn't adobe bricks be good on a rainy day? Water can wash away the adobe bricks. Houses made of adobe bricks are only suitable for areas with dry climates. Could we change the adobe bricks so it wouldn't wash away? Do you know anything made of clay that does not wash away? (Dishes hold water) Baking clay in a kiln will make it waterproof. If possible fire an adobe brick and repeat the experiment of putting it in a bowl of water. Does the water become cloudy now? Does the clay become soft?

Establish heat changes clay. It becomes stronger and harder.

c. Limestone. A test for limestone. Take samples of different types of rocks. Make scratches on them. Put a few drops of vinegar or lemon juice on the scratches. (If you heat the vinegar or lemon juice the bubbling...
3. Test rocks for hardness:
   a. If rock can be scratched with a fingernail—very soft
   b. " " " " " edge of penny—soft
   c. " " " " " knife-blade—fairly soft
   d. " " cannot be " " knife—hard
   e. Rock will scratch glass—very hard

Establish: to test for hardness, try to scratch one material with another. The harder material will always scratch the softer. You can classify rocks by "hardness".

4. Look and observe the minerals (colors) in the rocks of the classroom collection.

5. We use rocks—limestone in cement for buildings, dams, etc. Builders use collections ores, iron etc.
14. Wind and water change land. Man can also change the appearance of land.

- Moving air and water can displace soil (erosion).
- Plants hold the soil in place so that wind and water will not carry it away. When soil is displaced, plants can no longer live.
- Trees and plants can be used advantageously so that soil will not be displaced.
- Rocks can be changed by wind, water, pushes in the earth, plants, animals and people.
- Man, animals and plants can change rock (dynamite, wearing out and cracking rock).
- Fossils are imprints or traces of plants and animals that lived in the past.
- We must care for the land which God gave us.
- Man misuses the land.

Classroom Suggestions

1) Wind erosion.

Ask, "Did you ever get something in your eye?" "How did it get there?" (wind) Desert people wear clothing with which they can cover the face. "Why?" "Why isn't there much plant life in the desert?" Discuss what strong winds can do to soil. Usually the wind only carries soil a short distance but sometimes farmland can be changed into desert e.g. dust bowl of Oklahoma. Establish that the wind can displace soil.

2) Water erosion.

After a heavy rainstorm examine the schoolyard for water erosion. Observe the building wall where it is next to grass and where it is next to a bare spot and where it is next to pavement. Ask, "Are there differences in the cleanliness of the wall?" "Why?" After a rainstorm, see if there are any channels or miniature valleys on the playground. Ask, "Where is the material that was
formerly in that place?" It has been carried away by water and dropped somewhere else. Look at the end of the channel. Usually the material collects there.

--After a heavy rain collect jars of muddy water. Let the water settle and see how much soil has been carried away. "Where did the soil come from?" "Where will the soil go?"

Activity for wind and water erosion. Place very small pieces of colored paper on an incline leading to a basin. By blowing the water as it runs over the pieces of paper establish what can happen to soil by moving air and water.

3) a. How can we keep soil from washing away?

Get two long pans. At the end of one put a clump of soil with grass on it. At the end of the other pan put only a clump of soil. Tilt the two pans as if they were on a hill. Sprinkle water on the soil in each pan. Look at the bottom of each "hill". "In which pan does the water stay with the soil?" Establish that plants help prevent running water from carrying away the soil. The plants break the force of the rain and the roots "grab" the soil. Trees also scatter rain so it doesn't hit with force and wash the soil away.

Carefully cut a piece of grassy soil out of the ground. Notice the network of roots. Shake it. "Does much soil fall out?" A farmer can plant rows--windbreak of trees--to hold the soil. Plants with spreading roots can hold the soil. If soil is displaced, plants often die e.g. dust bowl of Oklahoma. Farmlands can be changed into deserts.

b. "Where are rock gardens usually planted?" "How does this help to hold the soil?" Observe other slopes in your neighborhood and see how soil is kept from being washed away. Establish many methods can be used to keep soil from washing away.
4) How rocks change.

a. Rub some sandpaper over some rocks e.g. sandstone and limestone. The softer parts can be worn away first. Establish the wind acts as a "sand-blasting" effect on rocks. Illustrate with pictures of some of the rock formations in the West.

b. Fill a pan with soil and smooth it down. Set it under a dripping faucet. If possible have two pans and vary the strength of the water coming out of the faucet. After a day observe the soil. Ask, "What do you see?" "What caused these holes?" "Why are some holes deeper than others?" Establish that water over a long period of time can change rocks e.g. Grand Canyon. Rivers cut deep channels through the rock.

c. Put a pile of colored construction papers on top of each other. Push from under. "What happens?" (bending) Push from under again. "What happens?" (bending) Push from one point. It is like a crack (shifting). Volcano hot lava comes out. Sideward pressure on rocks can be very great and may cause the rocks to crack. This crack is called a "fault". The rocks along the fault can be pushed up or down. Such pushing inside the earth can set up earthquakes. Establish rocks can be changed by pushes inside the earth.

Review: Changes in rocks can be caused by rocks rubbing against each other. Wind and water (waterfalls) may cause the rocks to rub against each other. Tree roots or ice may break rocks. Sidewalks get lifted and cracked by tree roots. Water freezes to ice in the cracks of the rocks. Ice takes up more space than water. Ice pushes hard and breaks the rocks into small pieces.
5) Fossils. If possible have the children bring in samples of fossils. Fossils are imprints or traces of plants and animals that lived long ago. Dead plants and animals are covered by sand and soil. As the sand and soil get hard, the plants and animals either harden or dissolve and just the imprint remains. Have the children make imprints of a leaf, shell or other object using clay or plaster of Paris.

15. Oceans, lakes, rivers
- The appearance of any body of water is affected by the shape of the land around it and the vegetation of that land. Water can be grouped into lakes, rivers, oceans. Smaller bodies of water can be called ponds, streams, lagoons, brooks etc.
- The largest bodies of water are called oceans. All ocean and sea water is interconnected. The big ocean has no end. A lake is a body of water with land all around it. Rivers are formed when water flows from a higher to a lower place. Rivers flow down a slope. A river begins where land is high and flows to a body of water (ocean or lake) that is lower.
- Three fourth of the earth's surface is water.
- The water table is a place under ground where water is held. This can be far under ground, near the surface, or at the earth's surface. Then lakes form.
- The ocean is salty. Rivers carry salt and other minerals to the ocean. Oceans are saltier than the rivers that flow into it.
- There are many valuable minerals especially salt in the ocean.
- Oceanographers, scientists who study the ocean, are trying to find more food and minerals in the ocean for the world.
Classroom Suggestions

1) Sail a paper boat on the oceans of the globe. Look for a place where you cannot sail around the land to another spot of the ocean. Establish that all oceans of the world are really one.

2) Formation of rivers. After a heavy rain rills are formed. These form large streams which make channels or beds. These streams are separated by ridges. The tops of the ridges form watersheds. Small or big rivers are formed this way. If possible observe rills, streams, and watersheds nearby.

3) "Why is the ocean salty?" There is a little salt in the rocks and soil. Salt is a mineral. When rain falls on the rocks and soil, tiny bits of some minerals are dissolved and carried away. The water may flow underground or above ground. It carries the dissolved minerals to the rivers. The rivers carry it to the oceans. The salt on the water makes the ocean taste salty. Activity: Wash some regular aquarium sand by rinsing it with clean water, stirring it, letting it stand and pouring out the excess water. Do this several times. Cut off the tops of two milk cartons and punch some holes in the bottom. Put a cupful of clean washed sand in each. In one of the cartons mix in a teaspoonful of salt. Have the two cartons arranged so that the water can trickle through into a cup underneath. Pour a half cup of water in each carton. After it trickles through taste the water in each cup. Does it taste the same? Can you see the salt in the water?

4) If river waters have some salt dissolved in it, why doesn't river water taste salty? The rivers flow into the ocean and the ocean water tastes salty. When the sun shines on the ocean the water evaporates but the salt does not. It stays in the ocean. Rivers only have a
small amount of salt—not enough to taste. In the ocean the water keeps evaporating but not the salt. Any body of water without an outlet will have an accumulation of minerals including salt. This is why landlocked seas e.g. Great Salt Lake in Utah are salty. This is why oceans are saltier than rivers.

Activity: Use two bowls of the same size. Pour a cupful of water into each bowl. Dissolve one-half teaspoonful of salt in each bowl. Taste the water in each bowl. Does it taste the same? Cover one bowl. Put both bowls in a warm sunny place. Mark the water level on each bowl. After two days taste a spoonful of water from each bowl. Which water tastes saltier? Which bowl has less water? (uncovered bowl) Why? (evaporated) Did any of the water in the uncovered bowl evaporate? Establish the water in the uncovered bowl tastes saltier due to the evaporation of some of the water.

5) Getting minerals from the ocean.

Activity: Pour some salt water in an open bowl and let it stand in the sun. (If you want to hurry the process up boil the water first.) Let the water evaporate. What is left behind?

In some places people let the ocean water flow over flat beaches. They build walls of sand or soil so the water will not flow back into the ocean. After the water evaporated salt and other minerals remain. There are many salt mines. They were probably once shallow seas. The water evaporated and the salt remained. There are many other minerals in the ocean. Machines that look like huge vacuum cleaners scoop them off the ocean floor. Oceanographers are studying how the resources of the ocean can be used.
16. **Air is all around us**
- Air is all around us. It takes up space.
- Although we cannot see or touch air, we know it is there by what it does.
- We can make air move.

**Classroom Suggestions**
1) Allow the children to discover that air is all around them. For example, have the children hold their nose and close their mouth. Ask, "Why can't you keep this up very long?" (Because you need air to live.) How do you get air? Do you have to go to a box, to an airtap, to the store to get it? Where do you get it? (It is all around you.) Is it on the playground? Is it in your home? Is there still air when you sleep? Establish that air is someplace—it takes up space.

2) Activity: Push a dry piece of paper to the bottom of a glass. Put the glass into water. Take the glass out of the water. Take the paper out of the glass. Ask, "How does the paper feel?" The paper is dry. Why? The air in the glass keeps the water out. Establish air takes up space. It is there but we cannot see it.

3) Activities to establish that we cannot see or touch air but we can see what it does. Air is real.
   -- Blow up a balloon. Let the air out slowly. Let it blow small bits of paper around.
   -- Run with a piece of cardboard. You can feel the cardboard pushing against something. It is pushing against air.
   -- Streamers in front of a fan.
   -- Bicycle tires need air.
   -- Air helps to make music. Blow air in and out it comes with music.
   -- Put a jar over a burning candle. The flame goes out. A fire needs air to burn.
17. **Our weather is constantly changing**

- Changes in the movement and temperature of the air, and changes of water in the air help make different kinds of weather.
- Wind, water and land and the sun's heat interrelate in causing the weather.
- Air changes—moving air is wind. When the air moves very fast we say it is a windy day.
- Air can differ in temperature.
  Air can make us feel warm or cold.
- The temperature is the degree of hotness or coldness of the air.
- The thermometer goes down when it is cold. The thermometer goes up when it is warm. When the air is warm we say it is a warm day.
- Air has water in it. Water comes from many places—from rivers, lakes, ponds, oceans. When water goes into the air we say it evaporates. When water evaporates, it forms water vapor. This cannot be seen, but when many drops come together they form clouds which can be seen. If there are many clouds we say it is a cloudy day.
- We can tell the air has water in it because rain comes out of the air. When water droplets in the air become cooled, they come together and form large drops. They are heavy and fall as rain.
- When the air becomes very cold the water vapor changes to snow.
- Snowflakes are many shapes but always have six sides or points.
- When weather changes, plants change, animals' habits change and we do different things.

**Classroom Suggestions**

1) Watch the weather about you. Make a record. Tell about the wind, how the air feels. Tell about the clouds.
2) Place a thermometer outside the classroom window and a thermometer above the radiator. Note the difference in the temperature of the air. Measure the temperature of a bowl of ice cubes. Measure the temperature of water being heated on a stove. Establish the thermometer goes up when it is warm and goes down when it is cold.

3) Evaporation: Ask, "What happens to the water on the sidewalks and grass after it rains?" Establish water eventually evaporates in the air.
Activity: Put some water in a low dish. Over a period of a few days observe how the water evaporates in the air.

4) Clouds: Formation of clouds. Activity: Heat some water. Let it boil. Watch the tiny drops go out into the air. They become water vapor. We cannot see it. When it is cool, a little cloud forms.
Observe the clouds for a week. Note how they are related to the different types of weather, e.g. fluffy clouds, storm clouds, etc.

5) Rain--make some rain in the classroom.
Make a cloud with boiling water. Hold a pan of ice cubes over the cloud. This makes the cloud cold. They come together and make big drops. The big drops are heavy and fall down. Raindrops come falling down. If possible, have the children put a pan outside and have them measure the rainfall.

6) Snow. If a cloud becomes very cold, the water vapor does not make drops of water but snowflakes. If possible have the class fill a jar with snow and bring it inside. Mark the height of the snow immediately with a crayon or tape. Let it melt. Put another mark to show the water line. Establish snow when melted is water. If possible have the children examine some snowflakes under a magnifying glass. The snowflakes should be placed on black cloth or paper. Snowflakes have six sides.
7) Make a weather chart. Read an outside thermometer each day for a week. It should be at the same time each day. On the weather chart record the temperature and indicate with sketches the type of weather. E.g. sun—sunny day, clouds—cloudy day, windy, rainy, etc.

8) Have the children make a water cycle.

9) To find the temperature at which water begins to form from water vapor: Put warm water into a container. Add ice to cool. Check the temperature of the water with a thermometer. Notice the temperature the moment droplets begin to form. This is the dew point temperature. 

   Explanation: The glass is colder than the air around it. Water vapor cooled and formed drops on outside of glass.

10) To find which would contain more water— an inch of snow or an inch of rain. Melt snow to find out how much water one inch of snow equals.

11) To find out what helps water evaporate faster: with a wet cloth or a sponge make two large spots on the chalkboard. Now fan one of the spots. You may use a heavy piece of cardboard as a fan. "Which spot dries faster?" "Why?" "What has happened to the water on the board?" (The water evaporated. Fanning speeds up the process of evaporation.)

12) Air expands when heated. Put a balloon on the top of a bottle and heat the bottle. What happens to the balloon? (Expands) The air inside the bottle rises into the balloon. When air is heated it takes up more space or expands.

   Heated air rises. When the bottle and balloon are cooled after this by putting the bottle in a bucket of ice cubes. The balloon deflates. When the air in the atmosphere cools it contracts and falls to a lower level.
13) Is all the air in your room the same temperature? Use a room thermometer to find the temperature near the floor and the ceiling. Where is the air warmer? Why?

14) a. Which heats up faster, soil or water? Place a bowl of soil and a bowl of water outdoors in the sunshine. Check the temperature of each before exposing them to the sun. Then check the temperatures again in about an hour. Which one has warmed up more? (Land should have heated faster.)

   b. Which cools faster? Place both in the refrigerator, using same procedure.

15) Fronts--At many fronts there are high thick clouds followed by a storm. Watch weather reports to know when fronts are approaching. Outdoors on a clear day you can usually tell when they are coming by the line of clouds moving in.

16) Make a wind vane. Cut two arrows from thick cardboard. Make the tails of the arrow wider than the points. Lay a piece of strong plastic straw between the arrows. Place the straw close to the points of the arrows. Now staple the arrows together. Put a thin nail through the straw. Then fasten the nail to a stick of wood. You may use clay to make a stand for your wind vane. Now take your wind vane outdoors. The wind will push the heavy tail away and the arrow will point into the wind. The arrow will point to the direction from which the wind is coming. Use a compass to find in what direction the arrow is pointing.
18. Changes of the water in the air help make different kinds of weather.

- Water leaves the earth through evaporation and returns in some form of precipitation: rain, snow, etc. This is the water cycle.

- There is water --in the earth
- --on the earth
- --above the earth

- When water goes into the air, we say it evaporates. It becomes water vapor.

- The water vapor spreads out into the air. If it becomes cool, it may form fog along the ground. Both fog and clouds are made of tiny drops of water.

- Different types of clouds bring different weather:
  *Cumulus*, big fluffy clouds mean good weather (usually white). Cumulus clouds may become very tall and look dark at the bottom. Then they are called thunderheads and are often accompanied by thunderstorms. The dark storm clouds from which rain, snow, sleet, hail fall are called *nimbus* clouds. They do not have much shape and are often close to the ground.

*Cirrus* clouds look like wisps or curls of smoke. They are formed high above the ground and they too are an indication of fair weather. When tiny drops of water are cooled still more, they stick to dust in the air. More and more tiny drops stick together. They form larger drops. These drops will fall to the earth as rain, snow, hail or ice, when the air is cooled. Dew is formed during the night when the grass is cooler than the air around it. The grass cools the air around it and if the air is moist some water vapor may condense (form drops of water) on the grass. Frost is found in very cold weather when moist air touches very cold surfaces. It forms only on things below freezing temperature.
- Rain. When it is warmer the water vapor condenses and when it becomes heavy enough it falls as rain.

- Snow. When some particles in a cloud become very cold they freeze and snowflakes are formed. When they become heavy enough they fall.

- Sleet. When raindrops freeze as a result of falling through very cold air and become "frozen rain" they are known as sleet.

- Hail. Sometimes the pieces of ice are carried up into the clouds again by a strong wind. Water forms on each piece. When the pieces fall from the clouds through this cold air again the water changes to ice. This may happen several times and each time a new layer of ice is formed. At last the pieces of ice get so heavy they fall to the ground.

19. Changes in the air affect the weather.

- The sun heats the land and water of the earth. Sunlight shining through transparent air adds little heat to the air. The sun heats the land and water and they in turn heat the air.

- Land is heated faster than water.

- When air is heated it expands; when cooled it contracts. When air is heated it becomes lighter and rises and cool air moves in to take its place. This flow of air is known as wind.

- Big differences in temperature cause strong winds; small temperature differences cause gentle winds.

- Wind evens out the temperature of the land. Without wind hot places would get hotter and cold places would get colder.

- Wind vanes are used to show the direction from which the wind is blowing.

- There are many different kinds of winds:
  Gale--windspeed between 32-54 miles per hour. Whole trees bend.
Hurricane--It always starts over warm parts of the ocean. A hurricane blows hardest over water where there is nothing to slow the wind. If it blows over land, it is slowed by hills and mountains. Hurricane winds move in a great circle. The center of a hurricane is called the eye and is very calm but the winds whirl around this eye.

Tornado--A strong wind which moves in a spout-like form. It looks dark because it picks up dust as it moves across the land. It turns like a top in a counter-clockwise direction. It follows a very narrow path. A tornado that reaches the ground can do great harm.

- An air mass is a body of air in which all the air has the same characteristics i.e. cold, warm, dry or moist.
- When two air masses meet we usually have bad weather.

The place where they meet is called a front.

Classroom Suggestions

Poetry: "Weather is Full of the Nicest Sounds"--Aileen Fisher

Weather is full
of the nicest sounds:
it sings
and rustles
and pings
and pounds
and hums
and tinkles
and strums
and twangs
and whishes
and sprinkles
and bangs
and mumbles
and grumbles
and rumbles
and flashes
and CRASHES.
I wonder
if thunder
frightens a bee,
a mouse in her house,
a bird in a tree,
a bear
or a hare
or a fish in the sea?
Not ME!

(From Ginn "Light and Life", Blackout)
Take the children outside on a windy day. Have the children listen to the sounds the wind makes. Notice the different things that are blowing around and making these sounds. Have them discover that they can feel the wind, hear the sounds it makes, watch what the wind does. Read the poem to the children. Ask what words help to make sounds—blows, whisper, clang, creak etc. How else can the wind sound? Does the weather ever frighten you?
"Spring Wind", Nancy Byrd Turner.

Art: Discuss and make murals of how the wind can be harmful (or helpful). Discuss what the wind can do to you. (push, pull, pull you up (tornado), knocks you down, swirls, twirls, etc.)

Creative writing: Allow children to write stories or poems entitled "It was a windy day" "When the power went off".

Films: "One Rainy Day" (Coronet). Describes how a storm begins with wind, clouds, thunder and lightning and what rain does for soil, plants, cities, people. After the film allow the children to make a landscape scene. Put the pictures in sequence and wrap them around a round object such as a waste basket. As the round object is turned the stages of the storm are seen—bright shining sun, dark clouds appearing, dark clouds, dark sky and high winds, the storm itself, the storm clouds departing, the dripping rain, soaked trees, flowers, houses etc., the sun coming out and back to a bright sunny day.
"How Weather Helps Us" (Coronet)
"Blow, Wind, Blow" (Coronet)
Music: "The Thunderstorm" in *This Is Music* by W. Sur (Macmillan Co. of Canada).

"A New Created World", "God Who Made the Earth" - *Children's Hymnbook*; "O See the Sky" and others from *Let Youth Praise Him*.

Records: Rossini's Overture to *William Tell* (describes beautifully the coming and going of a storm in music).

Projects: What makes thunder, lightning, hurricanes, etc.

20. A map represents something real by means of symbols.
   - We can represent things in the classroom by means of symbols.
   - We can represent a neighborhood by means of a map.
   - A map is a special kind of drawing which represents something real.

**Classroom Suggestions**

1) Make a map of school, school yard, community using a map key, e.g.:

- house
- tree
- railroad
- bridge

2) On map of community have child trace route from child's house to school etc.

3) To find the four cardinal directions:
   Have the children stand with outstretched arms. All right hands facing North; all left hands South. Lower your left arm and you are pointing North; raise your left and lower your right arms and all are pointing South. Have all pupils make a quarter turn to the right so that they are facing North with their backs to the South. Now raise your right arm to point East and then your left arm to point West. (P.S. North is a direction, not one spot...
4) Discuss life in the polar, tropic and four-season zones.

5) Use pictures and photographs to show pupils what these land forms and water forms look like.

6) Locate certain places on the globe, e.g. Toronto, using the meridians of longitude and parallels of latitude.

7) Take a photograph of part of the classroom. Make a two-dimensional drawing looking right down into the room. Put this on the opaque projector. Have the children identify the different objects in the room. Discuss: A map is a drawing. It is a special kind of drawing. It is not the same as a picture. Maps are drawn as if you were looking down from up high. A map can be very large or a map can be very small. We will make a map of our room. Help the children by teaching them the symbols for a desk, chair, table, window, blackboard, door. Cut-outs for these objects could be made and the children could lay the cut-outs on their paper and trace around them.

8) Each child could work on his own or they could work in small groups and make a map together. Give each child (group) a large piece of bristolboard and have them make a map of their class. Have the opaque with the picture and drawing ready for their reference. When they are finished you could choose one map and place their name cards on the desks or other parts of the room in a mixed-up order. Tell the children to find their new place.
1. **Seat Switching Game**

Take an imaginary trip in the classroom. Use such questions with the class as, "Where would Suzanne be sitting if she moves three seats back and one row to the right?" After the children have found Suzanne's new position, have Suzanne make the proper moves and stand beside or sit in her new spot. This will serve as a check for the children. Small construction paper squares may be used as markers by the children and a larger marker used on the wall seating map.

2. **Treasure Hunt**

The maps made of a child's classroom may be used in treasure hunt games. Unknown to the pupils, hide a tiny "treasure chest" or other object somewhere in the room. During the "Treasure Hunt", children search for the object. When a child finds the object, he does not tell anyone but quietly returns to his seat and marks the approximate position of the "treasure chest" on his own classroom map.

3. **Introducing the Directions**

Now hold your arms outstretched in the North-South directions. Have the children hold their outstretched arms in the same directions as yours. All right hands should point North; all left hands South. Lower your left arms and you are pointing North, raise your left and lower your right arms and all are pointing South. Have all pupils make a quarter turn to the right so that they are facing North and the backs of their heads are toward the South. Now raise right arms to point East and left arms to point West.

Arrange all pupil desks in a rectangle so that each pupil desk is facing North. Duplicate simple rosettes for each child. Place one on each desk so that the North arrow points North. Have each child sight along the North arrow toward the wall of the room. Have several children show the rest of the class what points
on the wall are directly North from their seats. Repeat this procedure for the other three directions. Children will notice that, for different positions in the room, North points to different places on the wall.

4. Land and water forms and symbols can be seen on a map.

Pirate Island

Build an island of modeling clay on a blue paper base on the floor. The island need not be too large; three pounds of clay should suffice. Do not build all the geographic land and water forms into one map but introduce them in small doses. A river may be made with a pencil point. After the land has been formed. The river bed should be realistic in that water would flow downhill to the coastline. Trees may be easily made by placing small absorbent cotton balls on toothpicks. Palm trees may be fashioned of paper. Other features may be made of oaktag or cardboard.

Let children stand right above the island to see how it looks from above and attempt to sketch a simple map of the island. Then develop a class map of the island, introduce symbols, and make a key. Place a compass on the model to determine North and put a rosette on the map. Finally, duplicate a map for each child. Make up a story of a treasure hunt and give the pupils a series of directions to follow to find the "treasure". Unknown to the class bury a tiny 'treasure' in the clay at the proper spot. After the children have decided on the location of the "treasure" - a marble or a penny - on their maps, have them dig up the treasure from the clay model.

(see map on next page)

In a similar manner, other make-believe models and maps can be developed.

Suggestions: 1. An Indian Village  
2. An Amusement Park  
3. A Farm  
4. A Zoo  
5. A Small Town
DIRECTIONS (oral)

1. Start at the fisherman's house in the Southern part of the island.
2. Go North to three trees.
3. Go East and climb to the top of the mountain.
4. Go to the nearest tree.
5. Go South to the river and cross over the bridge.
6. Go West to a tree by the coastline.
7. The treasure is just North of this tree.
8. Put an X where you think the treasure is.
5. Position Game

Arrange the pupils' desks in a SQUARE that is oriented directly North. Each desk should be facing North and each row should line up in a North-South direction.

Review the use of a letter-numeral code to locate each seating position.

Ask all pupils to leave their seats and stand at the back of the room. Define each seat by using the code and the eight directions. For example, "Three seats Northeast of B-5" would designate seat E-2. The child whose seat is in position D-2 would then sit down. Game ends when all pupils are seated.

Further practice using the eight directions may be achieved by playing the game of MAPPO.

Each pupil is given a square "map" of 36 small squares. A rosette in the corner of the paper gives the eight directions. Each child writes the letters M, A, P, P, and O on his own map, placing one letter in each of any five squares. The teacher then gives directions which designate a certain square such as "Three squares South-east of E-2". At this command each pupil would place a cross in square B-5. One by one, squares are crossed out until one pupil has crosses in all of the five squares containing the letters M, A, P, P, O. This child then calls out "MAPPO!". If he hasn't made a blunder, he wins the game.
6. Different time on different parts of the world

Have twenty-four children stand in a circle on the playground. They should have their backs toward the center of the circle and their hands joined. Place another pupil outside the circle to represent the sun. Call the position directly in front of the sun the 12 o'clock noon position. Place a sign on the ground in front of this spot to indicate the time. Going west-to-east around the circle, place signs in front of each child to indicate the time. Have the circle of pupils slowly rotate. Children will notice their position in relation to the sun for each hour of the day. Call out certain times such as 4 o'clock in the afternoon. The child in that position should raise his hand. This can be used as a game by employing such questions as "Who is at 5 hours before midnight?"

7. Battleship

The game of "Battleship" may be adapted to give practice in using longitude and latitude. The game is played between two pupils. Each player rules his paper into two squares, each square containing 64 smaller squares - eight on a side. Each square map is divided into four quadrants. Meridians of longitude and parallels of latitude are marked in 10° intervals. Each player is allowed one battleship (4 squares in a row), one cruiser (2 squares in a row), and two nuclear submarines (1 square each). Each player positions his "Navy" anywhere on the map by placing X's in the squares. Players cannot see each other's maps.

Players alternately "bomb" each other's fleet by calling out the position of a "raid". Each player's turn consists of one 'bomb'. The position is indicated by using longitude and latitude. Each player records the "enemy's" bombs on the map that has his own fleet. The other map is used to record the player's own bombs. Player must call out "a hit", when an enemy bomb touches a sub. A ship is sunk when four corners of the ship are hit. Player must tell when a ship is sunk. The first player to sink the entire enemy fleet wins the game.
"BATTLESHIP"

**NY FLEET - ENEMY "BOMBS"**

- **SUB**
- **Cruiser (Sunk)**
- **A Hit**
- **HITS**

**ENEMY FLEET - MY "BOMBS"**

- **BATTLESHIP**
- **HITS (A SUB)**
- **A HIT (BATTLESHIP)**

20° E. Long., 30° N. Lat.
8. **Elevation Model and Maps**

Build a model of the earth's surface out of modeling clay in a rectangular glass baking dish. Any transparent container with straight sides such as a small aquarium will do. Cover the bottom with clay, then build a simple landscape, perhaps a high hill with gently sloping sides. On the outside of the container place a vertical strip of tape. Mark the tape at regular intervals dividing the tape into five equal sections.

Fill the container up to the first mark with clear water. This will represent the level of the ocean or **SEA LEVEL**. Let pupils see that there is land under the water. Color the water blue with either ink or vegetable coloring.

Give each pupil a piece of paper. Ask each child to come up and stand directly over the dish which has been placed on the floor. Have each pupil try to draw the land that is above sea level. Back at his desk, the pupil will color the land below sea level a light blue.

Label the first mark on the tape as Sea Level. Let the second mark represent 1000 feet above sea level, the third mark 2000 feet above sea level, etc.

Now empty out the water. To find out what parts of the land are more than 1000 feet above sea level fill the dish to the second mark with green colored water. Each child will stand above the model again and try to draw the land that he sees above the 1000 foot mark.

Repeat this procedure with yellow, then brown water. Any land above that mark will be left white. The height above or below the level of the sea is called **ELEVATION**. Maps that show elevation are sometimes called **RELIEF MAPS**.
9. **Making Relief Maps**

Using a flat or a plastic relief map as a reference, build a three-dimensional relief map of Ontario, Africa, or other area under study.

1. Draw an outline of the area on a 3' x 3' piece of plywood. Build up the land with modeling clay. Cover the exposed plywood with a thin layer of vaseline. Cover the entire map - clay and wood - with a piece of cheese cloth that has been dipped in liquid starch, smoothing and stretching the cloth to fit the contours of the land. Be sure to force the cloth into the valleys and river beds and against the coastlines. Cover the cheese cloth with several layers of torn newspaper strips that have been dipped into wallpaper paste, allowing each layer to dry before applying the next. Paint over the papier-mâché map with a mixture of liquid glue and water, then carefully remove the "map" from the clay and plywood which may be stored and re-used.

Finally, paint the map with show card or tempora paint, then apply several coats of white shellac. This type of map may be used year after year.

2. Smaller, less durable maps may be made of papier-mâché or of salt and flour. For the latter, dry mix five parts flour, five parts paste, and four parts salt. Add water until the mixture is workable, then apply in layers to a heavy cardboard or plywood base. High features may be built up with crushed aluminum foil that has been taped down to the base, then covered with the mixture.
DIRECTIONS

1. Carefully cut out map.

2. Fold back along all straight lines.

3. Glue or tape flap #1 as indicated by the arrow.

4. Repeat step by step, folding each side to its adjacent sides, gluing or taping the flaps on the underside.
21. A globe is a model of the earth which shows size and shapes of water and land forms.

- The earth has three zones: tropic zone - always hot; polar zone - always cold; four-season zones - sometimes hot, sometimes cold.

- The places where the earth opens are poles. The one on the top is the North Pole and the one on the bottom is the South Pole.

- Four directions: North is toward the North Pole; South is toward the South Pole; East is where the sun comes up; West is where the sun sets.

- We can show the way land looks on a map:
  - plain - a place where the land is flat
  - hill - a place where the land goes up and makes a bump
  - mountain - a very high hill
  - valley - a place between hills or mountains
  - coastline - a place where land and water meet
  - beach - a flat place on the coastline
  - river - a place where water runs down all the time
  - island - a place of land that has water all around it
  - lake - a body of water that has land all around it
  - oceans - large parts of the earth's water surface
  - continents - six large islands.

- The globe has lines on it going from pole to pole. These lines are called meridians of longitude (long)

- The globe has lines on it going from east to west. These are parallels of latitude.

  We use these lines to locate positions on a map.

- A map is a drawing that shows what something looks like from above. We use symbols to stand for large objects.

Classroom Suggestions