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TOWARD A COURSE OF STUDY FOR THE PRIMARY GRADES

IN

"THE WONDERS OF THE UNIVERSE"

By

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Thesis submitted in partial fulfillment of the requirements for the Degree of Master of Arts in Hebrew Letters and Ordination.

Hebrew Union College-Jewish Institute of Religion

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Referee, Prof. Sylvan D. Schwartzman

DIGEST OF THE THESIS

The thesis is presented in two major sections. The first of these is a short introduction stating the purpose of the thesis and its design. The second which is the main body of the thesis is a manual for the teacher of a proposed new course for the Reform Jewish religious school. The title of the course is "The Wonders of the Universe." It is designed for the primary grades.

The manual consists of twenty-eight lesson outlimes. The first is an introduction to the course, and the last is a review lesson. The intervening lessons are presented in five units. Each of these deals with a different broad area of nature. Each lesson presents a statement of objectives, both factual and ideological. The facts taught are scientifically discovered features of the universe. The insights drawn from them relate the facts to God in His role as Creator. His relationship to the world and man and His own nature are discussed.

The lesson itself consists of a motivational device, a development of the facts, a development of the insights, a creative activity and an assignment for the following session. In addition, the teacher is provided with the names of several supplementary volumes and a related passage from Jewish sources.

The course is proposed as a major element in the development of a mature and meaningful God-concept by the student in the Reform Jewish religious school.

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INTRODUCTION

In proposing a new course for the Reform Jewish religious school, it is incumbent upon the author to answer two questions. The first of these is -- what is the purpose of this course as opposed to that served by present courses? The second is -- in what way does this course answer the need for which it is proposed? It is to these two questions that this introductory section is addressed.

The name "religious school" suggests a school which deals, in some part, with theological matters. The Reform Jewish religious school is no exception. The statement of goals of almost every Reform Jewish religious school contains a section concerning the development of the children's concepts of God and relationship with Him. The approach to that goal, however, varies greatly from one school to another.

Our interest is in the treatment of theology in the primary grades. Seldom is it isolated as a course in itself in these years. The word "God" is frequently used in the courses of study, but occasions for its use are normally in the prayers studied, the Bible and hero stories read, and the holidays studied and observed. Thus, insofar as the school shapes the children's concepts of God, it does so most indirectly. There are those educators who maintain that this is highly desirable and that theology

cannot be taught meaningfully to younger children in a more direct way. Some hold that we are well advised to withhold conceptual treatments of theology until the children are considerably older and more mature. This view invites several criticisms.

First, the religious school is not the "sole distrutor" of thoughts about God in the world of the child. The child is born into a world which will introduce to him the word "God" and many associated concepts. By and large, these concepts are not in consonance with the beliefs about God which will serve him best in later life. They are usually primitive and superstitious, anthropomorphic and miraculous. Even so, they form the background which the child brings with him into the religious school. To postpone our treatment of the subject of God and His nature is to abdicate our role in the early formulation of the child's beliefs. If we cannot control the child's exposure to theology completely, then we must lose no time in providing exposure to beliefs which will act as firm foundations for a mature theology.

The second problem with the indirect and nonconceptual approach to theology is that it introduces and reinforces ideas about God which may hinder the child's later theological development. The blessings that are taught usually take the form of expressions of gratitude to God for His gifts to us. At the same time, little

effort is made to help the child recognize just how God has given him the gifts he enjoys. The Bible and hero tales used so frequently in primary grade classrooms present a God of "long ago and far away." He is a miracle maker and a superman, but He does not operate in the life or the world of the child. The presentation of holidays and their observance to primary students seldom involves God more than incidentally. In short, when God is treated in the primary grades, the treatment is in some disharmony with the mature, meaningful theological development which we strive for in later years.

At this point, it is important to note a book published within the last few years which provides some relationship between the God whom we thank and the gifts for which we thank Him. The God Around Us by Mira Brichto[1] introduces the younger child to a number of Hebrew blessings and their translations by relating them to natural phenomena and experiences in the child's life. This volume may do much to remedy present defects in the primary grades.

We may also take note of the newest work in The Jewish Heritage Series, God And The Story of Judaism by Dorothy K. Kripke and Meyer Levin.[2] This book, written for the fourth grade, devotes a unit to God's relationship to our world as its Creator. The insights and facts presented are well explained, and the treatment, in general,

is good.

Outside the realm of Jewish religious education, we find a number of works treating theology for the younger child in the curriculum of the Unitarian-Universalist movement. Facing a problem similar in some ways to that of Reform Jewish education, they represent a great deal of creative thought and energy on the subject. Their presentations are quite good, but the overall quality of the works suffer from a reluctance to "go too far" in developing a theological point of view. The books often leave more for the child to "fill in" in terms of God's relationship to the world than is desirable. Even so, they are valuable resources for us and help point the way in our own development of a theological education.

In answer, then, to the question -- what is the purpose of this course as opposed to that served by present courses, the answer is that this course represents a direct treatment of theology for the primary grades. It is an attempt to define a relationship between God and the world of the child's experience. Hopefully, it will enable the child to view the world about him with the thought in mind that it is God's creation and that it reflects its Creator. The author hopes that such a course may form a basis for a gradually developing concept of God which is relevant to the child's life and in consonance with his future experience.

How is this goal to be accomplished through the proposed course of study? This is the second question which must be answered.

We begin by taking cognizance of one very important fact of modern life. Ours is a scientific age. The child in the primary grades is continually exposed to a scientific viewpoint with regard to natural phenomena. He is not long awed by thunder and lightning. He seeks out few "fairy tale" explanations for the world of nature which he observes. He finds increasingly sophisticated answers to the perennial "why" in his vocabulary. In short, he learns early to view the world as capable of scientific explanation, a mass of causes and effects. We are left the choice of ignoring this fact or of acknowledging it and capitalizing on it.

We must acknowledge it, and we need have no fear of it. In an age of scientific growth, liberal religion can keep pace with other disciplines. After all, science is devoted, in large part, to explaining the minutiae of the concept: "In the beginning, God created the heavens and the earth." (Genesis 1.1) It is our task to teach the child to relate his scientific knowledge to this statement. If we can do this, his science will be one ever qualified by a recollection of and relationship to the Creator of the universe. This is the basic plan of the proposed course.

The course treats in detail a number of aspects of the natural universe. The scientific facts are presented to the children through demonstration and illustration, lecture, discussion, and observation. At this point, the presentation of science in the public school and in the general culture ends. The proposed course continues by relating the facts to God and His nature. The child is led to recognize such elements as order, purpose, security, interdependence, creative power, and providence in nature. These point to the nature of the Creator and His relationship with man. In each lesson, the child is exposed to a number of scientific facts and natural phenomena which are explained in scientific terms. Then, he is exposed to the insights which they provide into the nature of God.

Hopefully, this course will provide a basis for continual theological development. As the child grows and as his religious education continues, other aspects of God can be treated. There need be no disjunct between the concept of God presented in the early grades of the Reform Jewish religious school and that presented in the later years. Rather the school should contribute to a gradual and harmonious growth in the student's theological concepts as well as his other understandings in the area of liberal religion.

The author certainly does not claim that the material which follows this introduction is a "finished

product

product" which is ready for immediate use in the religious school. Such a "finished product" would benefit from the consultation of a number of experts in individual areas -- science, arts and crafts, and educational psychology to name a few. Even so, it is hoped that the guide for the teacher which is here presented may prove helpful as a starting point for further work toward the goals which have been stated.

THE WONDERS OF THE UNIVERSE

A Guide For The Teacher

TO THE TEACHER

The following manual provides a detailed guide to the course in "The Wonders Of The Universe." Each lesson plan includes factual objectives and insights to be emphasized, a plan for the flow of the class session, a suggested activity to follow the lesson, a Jewish source related to the lesson, suggested supplementary sources for the teacher, and a suggested assignment for the following session.

The books listed under "Supplementary Sources" are listed in the bibliography. They represent a sample of the many volumes available on each subject. In addition to the books on each individual subject, the teacher can find additional material in any good children's encyclopedia. She is urged to use every available resources to enrich the lessons.

The creative activities suggested may be replaced by other activities as the teacher sees fit. So long as they serve to reinforce the lesson, they are acceptable.

The teacher is urged to use every element and tool of good teaching in presenting the course. Displays, bulletin board decorations, and the like always add to the value of a course when used properly. The teacher may further find it possible to arrange one or more field trips during the year so that the lessons of the classroom may be more vividly implanted in the children's minds.

UNIT I

The Earth And Beyond

INTRODUCTORY LESSON

Lesson 1

Objectives:

A. Facts involved:
   1. In our world, we do not experience anything for which a cause cannot be discovered. We know of nothing that is un-caused or self-caused.
   2. Man has, then, concluded that the universe itself must have a cause. We call that cause "God."
   3. Our best source for knowing about God is the universe that He created.

B. Insights to be developed:
   1. Our course of study is the study of God through observing the universe. We will observe His creation to learn of the Creator.

Motivation:

Did you make anything this summer or last year in school? What sort of things did you make? What did you make them of? Did you ever make something out of nothing? Do you know of anything that was ever made out of nothing? I don't think any of us could think of something made out of nothing. Today we are going to talk about where things come from originally. We are going to try to go back to the first things from which all other things are made.

Lesson development:

1. The teacher holds up a piece of paper. She asks if the children know what is its origin. Briefly, she traces its manufacture back to the tree from which it came.
2. The teacher chooses a simple object in the room and helps the students trace it to its origin. Let it be, for example, a steel coat rack. Together they trace it to the rock which contained iron ore from which steel comes.
3. The teacher asks: "Who made the tree from which we got our paper?" and "Who made the rock from which we got the ore to make the steel?" The children will, in all likelihood, answer that it was God.
4. The teacher asks the concluding question of the lesson: "Can you think of anything that we cannot trace to something which God created?"
5. The teacher sums up the lesson: "We now know that everything we have and see in the world comes from God's creation. This year we are going to learn about the world, and, from it, we will learn about its Creator, God.

6. The application of the lesson as an introduction to the year's study begins. The teacher asks: "What sorts of things can you name that were made directly by God?" The list should include the following:
   a. Sun, moon and stars.
   b. Earth, soil, rocks, oceans and atmosphere.
   c. All living things.
7. Now we know those things which will be studied in the coming year. They are the direct creations of God.

Creative activity:

The students will be divided into three groups in which they will work. One group will be assigned the theme, "Sun, Moon and Stars." Another will work on "Our Earth." The third will be assigned "Living Things." Each will make a fitting decoration to be used on the display table of the room when its topic is the theme of the display.

Jewish sources:

"In the beginning, God created the heavens and the earth." (Genesis 1.1)

UNIT I

Lesson 1

Objectives:

A. Facts involved:
1. The earth is one of nine planets which circle the sun. Together with their satellites, they are called the solar system.
2. Each planet has its own orbit, the path which it follows around the sun. From the sun which is the center of the solar system to the orbits of the planets, the distances represent millions of miles.
3. The orbits of the planets never meet one another, and so, there are no collisions in the solar system.

B. Insights to be developed:
1. When we note the expanse of the solar system from the center to the orbit of Pluto, we are struck by the amazing creative power of God.
2. In the regular orbits of the planets, we see evidence of the order which characterizes the universe. God has established rigid laws which are followed in His creation.

Motivation:

The teacher begins the lesson by passing out to each student a 3x5 index card. The students are to write their names at the top. Beneath their names, they are to write their addresses.

Now the teacher asks one child to read what is written on his card. She copies it on the chalkboard as he reads it. It will read, for example, BOBBY GREENBERG, 4327 OAKDALE LANE.

The following questions lead to a feeling for our place as creatures of one planet of the solar system.

1. If we were looking for Bobby's house in town, this address would be enough. But what if we are sending him a letter from another city? We must add his city. She writes this on the board.
2. This is enough to write a letter from anywhere in the United States. What do we need for a letter to Bobby from, for example, Israel? We need the words "United States of America." She adds this to the address on the board.
3. With this, we can get a letter to him from anywhere in the world, but what if we are writing from out of this world? We must add the word "Earth," the name of his planet. This is written on the board.

4. Now Bobby's address is complete. The children will complete their index cards according to the sample on the board.

Lesson development:

1. The teacher shows the children a chart or model of the solar system. It should show the sun and the nine planets with approximate representations of their relative sizes and distances from one another. She points out earth as the third planet from the sun.
2. If a letter were being sent from Venus, our next door neighbor, to Earth, it would still take our very fastest planes at least three years to deliver it. Venus is 26,000,000 miles from Earth.
3. This is the shortest distance between Venus and Earth. The distances between planets change for they move around the sun at different speeds. Thus, they are constantly at different points in their orbits and are different distances from one another. The students will see this on the model or chart.
4. If it is so far just to Venus, think how far it must be to Pluto, the planet farthest from the sun. The same airplane carrying a letter would take over 400 years.
5. Notice that each planet has its own path around the sun. Each of them stays in its path and does not collide with any other. They follow rules that keep them apart.
6. Notice the sizes of the planets. We have some idea of just how big they are when we see that our Earth is one of the smaller ones. Look at the ones farther from the sun that are much bigger than our planet.

Relating the facts to God:

1. The size of the planets is beyond compare with anything on earth that we know. God is a Creator who can create on a giant scale. What great power He must have!!
2. On earth, we try to set up rules to keep accidents and collisions between cars from occurring. Even so, we fail and accidents do happen. God is such a great "orderer" of things that He keeps accidents from happening to the planets.
3. If we tried to throw nine marbles as far as we could, they would not go very far. Look how far God has spread the giant "marbles" which are planets. Again, we notice what great power God has.

Creative activity:

Using a wire coat hanger, string, and styrofoam or construction paper, the students can make mobiles of the solar system. These can then be hung about the room.

Jewish source:

"Let us adore the everliving God and render praise unto Him who spread out the heavens and established the earth, Whose glory is revealed in the heavens above and Whose greatness is manifest throughout the earth." (Union Prayer Book, Volume I, page 71)

Supplementary sources:

Exploring the Planets.
The Golden Book of Science, pp. 65-66.
The World We Live In, p. 9.

Assignment for next week:

Each child is assigned a planet of the solar system for which he is to find out the following information:

1. size.
2. distance from the sun.
3. time of full orbit in earth years.

UNIT I

Lesson 2

Objectives:

A. Facts involved:
1. The sun is a giant ball of burning gases about one million times the size of the earth.
2. Its outer temperature is about 10,000°F. Its inner temperature may be as high as 20,000,000°C.
3. It is the sole source of light and heat for the planets of the solar system.
4. By virtue of the earth's distance from the sun, human and other life on earth is supplied with sufficient energy. It would be destroyed by an excess of heat if we were closer to the sun. It would be destroyed by a deficiency of heat were we farther from the sun.

B. Insights to be developed:
1. The immensity of the sun and the intensity of its energies are monumental examples of God's creative power, a continual source of awe and wonder to man.
2. We may be grateful to the Creator for placing our planet in such a relationship to the sun that we are preserved and not destroyed by it.
3. The fact that God has placed on this planet types of life which must be at this distance from the sun is additional evidence for order in creation.

Motivation:

The teacher demonstrates the purpose of the sun for our lives through two simple demonstrations. The first requires the children to imagine that it is night and that the room is totally without light. The teacher lights a small pencil flashlight. Could we conduct a class by this light? What would we need? We need a larger light to light a large room. The area to be lighted determines the size of the bulb needed. The sun lights the whole solar system including earth. Even on the darkest night, we can still see by moonlight, and moonlight comes from the sun.

The second demonstration concerns heat. If this were a bitter cold day and there were no furnace in the building, would a safety match warm the room? It is hot if we touch it, but we need a larger source of heat for a large area. The sun warms the whole earth. Without it our earth would be very cold.

The sun acts as a giant light and a giant furnace for our earth.

Lesson development:

1. The teacher uses a model of the relationship of the earth to the sun if it is available. She may substitute a light bulb and a world globe for this. In addition, she will want to have the chart or model used in the previous lesson for this one.
2. Did you ever look at the inside of a light bulb? There is a piece of wire inside that gets very hot and glows when the light is on. You have probably felt the heat around a light bulb at one time or another. When something gets very hot, it usually gives off both light and heat. This is what the sun does.
3. The sun is a ball of fire, hotter than any fire on the earth. It is also much, much bigger than the earth. If the earth were a marble and the sun were a round bag, we could fit one million "earth-marbles" into that bag. It is from this giant ball of fire that we get our light and heat.
4. Because the sun is so hot, we could not live very near to it. If we lived on one of the planets which are between us and the sun, we could not stand the heat. The planets farther from the sun than us are too cold for us. Our planet is just the right distance from the sun for us to get the heat we need.
5. Have you ever wondered why we sometimes have no sunlight? The reason that we have night is because our earth is always spinning around. When we are on the part away from the sun, we have night. The teacher shows this through the model of earth and sun. Even so, the moon gives us light, and the moon has no light of its own. It only reflects the light of the sun like a mirror.

Relating the facts to God:

1. We know that people have made very large lights such as those that light football stadiums at night, but no light made by man is comparable to the sun made by God. God is so powerful a Creator that He has made a giant light like the sun.
2. We have made furnaces hot enough to melt rocks and steel, but no fire made by man is comparable to the fire of the sun made by God. How wondrous is the power with which God creates.
3. Isn't God wonderful to us? He has placed us on a planet just close enough to and far enough from the sun. We are grateful to our Creator for this. He has made us part of an orderly creation. We are in the place we need to be because of His order.

Creative activity:

The children may work in small groups, each of which creates a frieze showing some of the benefits which we derive from the sun such as children playing in light clothes for summer, trees growing and flowers blossoming in sunlight, and people swimming in the ocean on a sunny day.

Jewish source:

"The sun shall not smite you by day, nor the moon by night." (Psalm 121.6)

Supplementary sources:

Exploring The Planets.
The Golden Book of Science, pp. 64-65.
How Miracles Abound, pp. 29-39.
Your Wonderful World of Science, pp. 78-81.

Assignment for next week:

Each student is to record the high and low temperatures for three days of the week. Further, he is to note whether it was sunny or overcast on the same three days.

UNIT I

Lesson 3

Objectives:

A. Facts involved:
1. Time is a measure of motion. In the case of the earth, time is the measure of the earth's rotation on its axis once every twenty-four hours.
2. Because of this fact, each unit of time may be represented as a distance on the earth's circumference. Each degree of the circle which forms the circumference is equal to one-fifteenth of an hour.
3. Because of the relationship between the earth's rotation and time, the position of the sun in the sky is an indication of the time of day.
4. Our devices for measuring time are based on some form of motion or another, e.g., running sand, electrical cycles.

B. Insights to be developed:
1. The order of the earth's motion is evidenced by our ability to measure regular time. This indicates the principle of order which God built into the creation.
2. The eternal regularity of the earth's motion is evidence of God's eternal laws of nature operating in creation.

Motivation:

The teacher will have arranged on a table the following items: an egg timer, a wrist watch, a clock, a candle calibrated for measuring time (which need not be accurate), and any other time-measuring devices she may find. Her question to the class is to ask what these items have in common. She will get or draw out the response that they are used to tell time.

She now asks the class what time is. This will lead to some discussion. She must lead the class to the idea that time is related to motion. For this, she can draw on the objects before her. If time is motion, she continues, how do we have a standard measure of time? The answer which she must provide is that we live on a "giant clock" which is the standard by which all other timepieces are set. Our earth is a "giant clock."

Lesson development:

1. The teacher will have a pencil flashlight and a world globe to show the relationship between the earth and sun which determines time. She can use pins or other markers to indicate points on the globe for demonstration purposes.
2. While one student holds the light stationary, the teacher holds the globe which is slowly turned from left to right. The globe should be held at a distance from the light to make for the illumination of the greatest possible area on the globe. As she turns the globe, she explains that the illuminated area is that which would be experiencing daylight. The rest is under darkness of night.
3. She can demonstrate the concepts of sunrise, high noon, and sunset in this manner. She can also point out the relationship between two points such as Chicago and New York in terms of the position of the sun at any given time.
4. The teacher now puts two pins in the map on the globe at a distance of fifteen degrees from one another. The light is held so that one pin is at the "sunrise" point while the other is still in darkness. She turns the globe until the second pin is at the "sunrise" point. This, she explains, represents one hour. Using as much discussion as is necessary, she implants the idea that the measure of time is a measure of the earth's rotation.

Relating the facts to God:

1. All of us have clocks in our homes, but none of them can run perfectly and none of them can run forever. God is such a great and powerful creator that He has made a clock that is perfect and perpetual.
2. Imagine what the world would be like if we had no orderly time!! If some days were sixteen hours and others were twenty-nine hours, we could make no plans that related to sunlight or daytime. Imagine two people planning to meet to play tennis when they had no way of knowing whether the time they set would be light or darkness. God has made an orderly time system for us so that we can operate in the world. We are grateful to Him for this.

Creative activity:

The children may play any games that require timing with a watch or an egg timer such as quiz games. Thus, they see something of the need for accurate measurement of time.

Jewish source:

"So teach us to number our days, that we may get us a heart of wisdom." (Psalm 90.12)

Supplementary sources:

The First Book of Time.
Understanding Time.

Assignment for next week:

Make a diary for two days this week telling what different things you were doing at 8:00 a.m., 10:00 a.m., 4:00 p.m., and 8:00 p.m. One day should be a school day and the other a day of the weekend.

UNIT I

Lesson 4

Objectives:

A. Facts involved:
1. The earth revolves around the sun once every $365\frac{1}{4}$ days. This is the length of a solar year, but, for convenience, we omit the fraction and make it up through leap year.
2. The axis of the earth is not vertical. It tilts at a $23\frac{1}{2}°$ angle to the plane of its orbit. Thus, at one extreme of the orbit, the North Pole points to the sun; at the other extreme, it points away.
3. This tilting of the axis changes the angle at which the sun's rays strike the earth at any one point. This accounts for seasonal variations in the hours of daylight and in weather.
4. The seasonal variation is, then, perfectly regular since the journey of the earth around the sun is regular.

B. Insights to be developed:
1. The regularity of the earth's revolution about the sun is another instance of the order which God has built into the universe.
2. As that order affects us, we can predict seasonal changes and prepare ourselves accordingly. The orderly arrangement of the universe helps us to be more secure in living in the world.

Motivation:

The children have, over the years, learned to take seasonal variations in weather for granted. The teacher now makes a statement contrary to fact, namely, "Our vacation this year will not be June, July, and August. Instead, our summer vacation will be January, February, and March." This will, no doubt, raise a murmur of objections. Vacation is in summer, not in winter.

Now the teacher pursues the reason for vacation being in summer. What kind of things can we do in summer? What is our weather like then? The class is now ready to discuss the four seasons.

Lesson development:

1. Again, the teacher will use the globe. If it is one that is fixed on a base, it will be set at an angle is is the actual planet. Any other object may be used as the sun. The children know something of the earth's revolution about the sun from our

first lesson of this unit.
2. One child can hold the globe; another child can represent the sun. The first can slowly carry the earth around the sun as the teacher explains this process in terms of the length of the year.
3. Now the teacher points out the tilting of the earth. She takes note of the poles as they point to or away from the sun. She mentions the difference in the distance the sun's rays travel and their angle of incidence with the earth's surface. This extra distance makes for winter; the lesser distance makes for summer.
4. Using the two children with the globe, she demonstrates summer, fall, winter, and spring for the Northern Hemisphere. The children are asked to name the months that belong to each season, and they can discuss the weather common to each season.
5. The teacher encourages the children to discuss the meaning of each season to them in terms of its weather and the things that they can and cannot do during that season.

Relating the facts to God:

1. What if we could not predict, each year, when summer would be or when winter would be? We might end school in June and have three months of snow and rain as vacation. People might plan to go somewhere to ski in February and find swimming weather. But God has given us an orderly world. We know for all time what seasons will come when and why it is that way.
2. As a result, we can make plans based on what the weather will probably be at any time of the year. God has given us help in planning our lives far in advance. We are grateful to Him for this.

Creative activity:

The children may work together in small groups to make a "movie" of the seasons. Four groups is best. Each is assigned one season. Several pictures are made to characterize that season in terms of its weather and the activities connected with it. The pictures are, then, joined together to make a movie of the seasons.

Jewish source:

"In wisdom Thou hast established the changes of times and seasons and ordered the ways of the stars in their heavenly courses." (Union Prayer Book, vol. I, p. 12.)

Supplementary sources:

Exploring The Planets, pp. 43-46.
The First Book Of Time, pp. 36-39.

Assignment for next week:

List as many activities as you can that are associated with each of the seasons.

UNIT I

Lesson 5

Objectives:

A. Facts involved:
1. All bodies attract other bodies. The force of that attraction depends on the relative masses of the two bodies and their distance from one another.
2. This force, called gravity, is the force which holds us and all things on the earth while it is spinning through space. Without gravity, we would be thrown off.
3. The concept of weight is related to gravity. The pull of gravity on an object is determined by the mass of the object. The mass of the object is its weight. Thus, we measure weight by determining the pull of gravity on an object.

B. Insights to be developed:
1. God's concern for our needs is apparent in the law of gravity. Had He not established gravity, there could be nothing on earth.
2. This concern for us leads us to a more secure feeling. We see that our needs are answered through God's creation, and we are not put in an impossible situation.
3. Often, we find gravity inconvenient as, for example, when we try to lift a heavy object. Now we know that God has created it with a purpose that is for our benefit. We live in a purposeful creation.

Motivation:

The teacher reminds the students of the lessons of the last two weeks, namely, that the earth is rotating on its axis at a high speed and revolving around the sun at a high speed. She demonstrates the normal effect that the rotation of an object has on bodies that rest on that object. For this, she uses a record turntable with a 78 r.p.m. speed. She places a small object on the turntable and starts the motor. The object is thrown from the turntable. Our question for the day is, then, what keeps us from flying off the earth just as the object flew off the turntable?

She may add to the "puzzlement" by noting on the world globe that the people of the Southern Hemisphere are walking around upside-down. How can this be? Our lesson today on the force of gravity will answer these questions for us.

Lesson development:

1. The teacher has now demonstrated the need for a force to counteract the effect of the earth's rotation. She can ask the class if they know what it is that keeps us from falling off. It is possible that they may know the term "gravity."
2. The teacher will now demonstrate gravity to the class in various ways.
3. First, she takes a rubber ball or other small object. If I throw it up in the air, she asks, how many of you think it will come down? Why are you so sure that it will? She throws it up and their prediction is, of course, fulfilled. Why did it happen? Gravity pulled on the ball.
4. The teacher has brought a small scale with her. She weighs several object in the class room. What she, asks, have we found out when we weigh objects? We find out how hard gravity is pulling on them. The heavier an object is according to our scale, the greater is the pull of gravity on it.
5. Gravity operates because the earth is so much larger than any object on it. Every object has some power to pull other objects toward it, but this power is unnoticed unless the objects are of tremendously different masses. Because the earth is so big, we can observe the effect of its "pulling power."
6. The children are now reminded of the differing sizes of the various planets. Each planet, because its size is different than the others, has a different "pulling power." Mercury is much smaller than the earth. As a result, something that weighs 100 pounds on earth would weigh only 27 pounds on Mercury. If you were on Mercury, its gravity would pull less than that of earth. You could jump four times as high there as you can here, for the force pulling you down is much less.
7. On Jupiter, the largest planet in the solar system, the "pulling power" is much greater than that of earth. Something that weighs 100 pounds on earth would weigh 264 pounds on Jupiter. You could hardly stand up very easily if you were on Jupiter. The pull of gravity would be too great for us to live as we do here.

Relating the facts to God:

1. If God had only made the earth with the rotating quality that gives us time, we could not live due to the force that would throw us off. God wants us to live comfortably on earth so He gave us the force of gravity to hold us on the earth.

2. Sometimes gravity seems to us like a terrible inconvenience. If we try to lift a very heavy object and cannot do it, we might wish that gravity were not so strong a force. Now, however, we know that God has made it for a purpose. It keeps us and all other things we need firmly implanted on the earth.

Creative activity:

The children can play games in the classroom which involve gravity. Examples of such games are ring-toss in which the ring must come down after it has been thrown into the air; dropping clothes pins in a milk bottle; and jacks in which the ball is bounced into the air and must come down.

Jewish source:

Rather than a quotation from Jewish sources, we take an example of a Jewish game which involves gravity. This lesson should fall some short time before Chanukah. The game of dreydl is based on the fact that the dreydl will fall because gravity pulls it down.

Supplementary sources:

Exploring The Planets, p. 123.
The Golden Book of Science, p. 82.

Assignment for next week:

We have learned that weight tells us how much there is of something. This is what determines the pull of gravity on it. Make a list of all the things you know of that are sold by weight, that is, that are sold by the amount of material there is in them.

UNIT I

Lesson 6

Objectives:

A. Facts involved:
1. Between the Northern Hemisphere and the Southern Hemisphere which see different stars in the heavens, about three thousand stars are visible to earth with the naked eye. Actually, the number of stars that exist is incredible.
2. Stars are suns, that is, they are burning spheres of gas. Of the stars known to us, they range from one-tenth the size of our sun to fifty times its size.
3. The distances related to stars are too great to be measured conveniently in miles. They are measured in light-years, the distance which light travels in a year. One light-year is equal to about six trillion miles.

B. Insights to be developed:
1. The immensity of the solar system is dwarfed by the immensity of the universe and the number of giant bodies that make up the universe. Here is the greatest indication of God's creative power.
2. The beauty of the twinkling stars in a clear sky is an example of the beauty that we find so often in God's creation.

Motivation:

What is the highest number in the world? Even if you try to guess it, you will not be able to because there will always be one more.

The teacher may illustrate this briefly by making a string of marks across the board. She points out that, no matter how long the string is, one more mark can always be added.

The number of stars in the sky is like this. We can see a great many stars, but there are many many more that we cannot see. There are so many, in fact, that we do not know how high the number of them would go. Today we are going to talk about the stars that we see so often in the skies.

Lesson development:

1. Have you ever looked up at the sky and tried to count the stars? You probably gave up because there were so many. Did you know that people south of the equa-

tor see a different set of stars in the sky? Let's see why that is.

2. The teacher holds up the world globe and explains that the stars are not above us but all around us. We see the sky above us, but people in other places see the sky that is over them. It is all part of the same universe, but, by seeing a different patch of sky, we see different stars.
3. How big do you think a star is? What do you think it is made of? The teacher allows the children to hazard some guesses at the answers.
4. Actually, stars are all suns. Do you remember how very big our sun is -- a million times larger than the earth? It is actually a medium size star. It is much smaller than many other stars. Why, then, do the stars look so small?
5. Stars look so tiny because they are so far away. We think of China or Australia being far from us, but they are several thousand miles away. Stars are so far from us, that we do not measure the distances in miles. How do we measure them?
6. You may not know it but light travels. It travels faster than anything else in the universe. Over short distances we do not notice it. If I turn on the light in a room, you do not notice a time that elapses between the light starting to glow and your seeing it. The stars are so far away, however, that the light we see from them takes years to get to us.
7. We call the distance light travels in a year a "light-year," and that is what we use to measure the distances to stars. Stars that are close to us are several light-years away. The light we get from them is years old.
8. Our universe is so very big that these distances are common even though they amount to bigger numbers of miles than any numbers we ever write.

Relating the facts to God:

1. Just imagine having the power to make a universe as big as ours -- a universe so big we can barely imagine it!! This shows us how powerful God is as a Creator. We might make little things. People build buildings that are tall or roads that are long, but our creations are nothing compared to God's.
2. Now we know what stars are. They are suns like our own, burning balls of gas. Even so, when we look at the stars above on a clear night, we are seeing one of the most beautiful sights in creation. God has made a universe that is not only big but also beautiful. The stars are part of the beauty of God's creation.

Creative activity:

The teacher briefly explains to the class that people have see certain patterns in the stars and given those patterns names determined by the shapes they made. These are called constellations.

The teacher assigns to each row a different constellation. Some suggestions are the rabbit (Lepus), the dog (Canis major), the lion (Leo major), the fish (Pisces), and the crown (Corona). A full list may be found in Exploring The Planets.

The children are to make representations of the constellation assigned to them as they imagine it. For this, they will make the stars needed with white crayon and then paint over the whole paper with black water color. This will leave the star white against the black background.

Jewish source:

> "Ever-living God! Thy majesty is proclaimed by the marvels of earth and sky. Sun, moon and stars testify of Thy power and wisdom." (Union Prayer Book, Vol. I, Newly Revised, p. 29)

Supplementary sources:

Exploring The Universe, pp. 23-49.
The Golden Book of Science, pp. 69-70.
How Miracles Abound, pp. 26-46.
The World We Live In, pp. 201-211.

Assignment for next week:

On a clear night, look at the stars and see if you can see any shapes made by them. Write down the things that you see in the stars.

UNIT II

Land, Sea, And Air

UNIT II

Lesson 1

Objectives:

A. Facts involved:
1. The earth lies at the bottom of an ocean of air.
2. The air is made up of a number of gases. The primary ones are oxygen (about 20%) and nitrogen (about 78%). Of the others, two are important. They are carbon dioxide and water vapor.
3. People and animals breathe air in order to get oxygen which is needed for life.
4. The blanket of air over us acts as protection from the sun's harmful rays and from objects from space such as meteors.
5. The moon has no atmosphere, and, comparing the moon with the earth, we can see its benefits. The moon is covered with craters from being hit with meteors. Further, its sunny side is incredibly hot and is hit with all the sun's destructive rays.

B. Insights to be developed:
1. The presence of an atmosphere and the proportions of its gases permit us to live. God is concerned for us and has provided for our needs on earth.
2. To know that, without oxygen, we cannot live for more than a few minutes could be frightening, but we are secure because God has placed us in an ocean of air where we have oxygen all about us.

Motivation:

The teacher must begin by making the children aware of the fact that they live in a sea of air and that it is vital to them. She asks them to hold their breaths for a time. What makes it so hard to hold your breath? What does it mean to hold your breath? It means that you stop breathing. What is breathing? What do you do when you breathe? You draw in air and then let it out. Has anything happened to that air inside you? It may seem the same, but, actually, you have taken out part of it to use. That part of the air is necessary for us to live. That is why we cannot stop breathing for long.

Lesson development:

1. What do we call that part of the air that we use? It is called oxygen. About 1/5 of the air is oxygen. Our bodies use it so that the food we use can be made into energy for life. It is vital to us.

2. We speak of our bodies burning up our food. That is true in a way although there is no fire inside us. Oxygen is needed for burning. The oxygen is also changed when the food is "burned up." When we breathe out, the air that comes out has less oxygen than before. It has more of another gas into which the oxygen has been changed. This is a gas called carbon dioxide.
3. We are very fortunate that our air has the right amount of oxygen for us. If there were too much, things would burn too easily on earth because oxygen is the gas needed for burning fires, too. If there were not enough, we could not breathe in the necessary oxygen to convert our food to energy. About one part oxygen in five parts of air is just right.
4. Oxygen is not the only reason that the air is good. We feel the air around us. Actually it is like a deep ocean on the bottom of which we live. There are many miles of air above us, and that air acts as a blanket over us. It protects us from certain rays of the sun that would harm us if we got them directly. It keeps pieces of "space dust" or rocks in space called meteors from hitting us. When a meteor hits the air, it burns up. Without the air, it would crash down on the earth. The moon has no air. Many meteors hit it every day, and, with a telescope, we can see the dents in its surface that they have made. Likewise, the moon gets the full force of the sun's harmful rays because it has no blanket of air above its surface.

Relating the facts to God:

1. Even if God had given us everything else in creation, if He had given us no oxygen, we could not live. God has provided for all our needs for life.
2. God could have placed us on other planets which have no atmospheres. There we could not live, but He has put us on a world which fits our natures.
3. God's concern for us is shown by the fact that, as dependent as we are for many things, those things are provided for us.

Creative activity:

The children may see for themselves that air exists. The teacher provides a number of balloons and allows the children to inflate them. What are they putting into the balloons? They are blowing air into them. To further reinforce the lesson, the balloons used may be in a ratio of four of one color to one of another. They may then be "deployed" around the room and labelled

to show the fraction of the air which is oxygen.

Jewish source:

> "While the breath of life is within me, I will worship Thee, Sovereign of the world and Lord of all souls. Praised be Thou, O God, in whose hands are the souls of all the living and the spirits of all flesh." (Union Prayer Book, Vol. 1, Newly Revised, p. 101.)

Supplementary sources:

Exploring The Planets, pp. 46-47.
The Golden Book of Science, p. 44.

Assignment for next week:

None.

UNIT II

Lesson 2

Objectives:

A. Facts involved:
1. Weather is the name we give to conditions of the atmosphere. Those conditions are the temperature of the air, the amount and form of moisture in the air, and the movement of the air.
2. Weather conditions conform to certain laws of nature so that, to some extent, weather conditions can be predicted. This enables us to prepare ourselves and adjust our activities accordingly.

B. Insights to be developed:
1. The orderly behavior of weather conditions is a sign of the order with which God has endowed the world.
2. The ability to predict weather conditions successfully makes our lives more comfortable and secure. This is an element of God's concern for us which is readily apparent in our daily lives.
3. Many weather forms add to the beauty of the world. God's world offers us many sights and phenomena whose beauty we appreciate, e.g., a sunset, a rainbow.

Motivation:

While the children are aware of the forms that weather takes, they are not likely to think of it as a phenomenon which can be scientifically measured and predicted. The teacher first must bring them from their general awareness of weather conditions to a scientific approach to weather.

The teacher asks the children to describe the weather outside. They will respond with such answers as "It's cold," or "It's raining." The teacher asks what they mean by such words as "cold" or "hot." Is cold like the inside of a deep freeze? Is hot like the flame of a kitchen range? Are some cold things colder than others? How do we determine which of two things is colder or hotter than the other?

The teacher shows the children a weather thermometer. They are probably familiar with it. What is it for? The children will probably know that it tells how hot or cold "it" is. What is "it"? The teacher explains that "it" is the air around us. She may wish to recall the preceding lesson about air. When we say "It's cold," we mean the air around us is cold. The thermometer will show us how cold it is. With a thermometer, we can compare one cold thing with another.

Lesson development:

1. What do we mean when we say "weather"? We mean the things that are happening to the air or the way the air around us is. For example, we may say "It's windy today." What is wind? Wind is air moving. When we feel a breeze, we really feel air moving past us. Each child may take a piece of paper or cardboard and use it as a fan. What is he doing? He is moving air.
2. What kinds of weather can you name? The children will think of rain, snow, etc. Do you know where rain comes from and what causes it? In the air, there are a number of gases. One of those gases is water in the form of a gas. We have seen evidence of it without knowing it. When a window faces out on the cold air on a cold day and the room is heated, we see water forming on the inside surface of the window. That water is water from the air. When the water that is gas in the air is cooled, it changes to liquid water. This is what causes rain. When the air up high gets cool, some of the water gas in it changes to liquid and falls as rain. If it gets even cooler, it becomes snow.
3. Weather is the word we use to mean the "hotness" or "coldness" of the air about us, the type of water that air may be giving out or holding, and the movement of the air as wind. Scientists know the rules which weather follows. They can predict the weather for the immediate future by knowing the conditions of the air now. That is what television and newspaper weather forecasts are. They are scientific predictions of the weather. They help us know how to prepare for the future so we are ready for the type of weather that will come.

Relating the facts to God:

1. We have learned that the air is necessary for us to live. Now we know that the air is what causes our weather. God has made the weather follow rules of science and order so that we can predict and prepare for weather.
2. God has controlled the weather so that we can live in it. We can survive rain, snow, wind, and hail although, at times, people do die because of lack of adequate protection and preparation. God has given us the tools to learn of weather and how to deal with it.
3. Some of the loveliest sights in the world are related to the weather. A rainbow is related to rain. A sunny day means we have few clouds of moisture. God has made weather a source of beauty.

Creative activity:

The students may play a game in which the object is to list as many objects as possible which are related to the weather. Some are overshoes, air conditioners, umbrellas, and the like.

Jewish source:

"...On that day, all the fountains of the great deep burst apart, and the flood-gates of the sky broke open. The rain fell on the earth forty days and forty nights." (Genesis 7.11f.)

Supplementary sources:

The First Book of Weather.
The Golden Book of Science, pp. 71-75.
The World We Live In, pp. 55-71.
Your Wonderful World of Science, pp. 42-59.

Assignment for next week:

Clip out the weather forecast for three days this week in the newspaper. Paste each forecast on a sheet of paper and write on the paper the actual weather for the day predicted including high and low temperature, sunny or cloudy sky, and rain, snow, or dry.

UNIT II

Lesson 3

Objectives:

A. Facts involved:
1. One of the most abundant types of material in our world is rock. Soil is made of small fragments of rock. The earth's crust is made up of rock.
2. Rocks were and are formed in three major ways. The first of these ways is fire. "Fire-made rocks" are formed from the boiling hot material under the crust of the earth. When it bubbles up to the surface, it cools into rock. The second way rocks are made is a process by which small pieces of material settle out of water and are pressed together in layers of rock. The third method by which rocks are made is one that begins with another kind of rock. When that rock is caught under the pressure of the earth's crust and exposed to great heat, it is changed into another form of rock.
3. An example of fire-made rocks is granite. An example of water-made rocks is shale. An example of rocks that have been changed is marble.

B. Insights to be developed:
1. When we recognize the tremendous amount of rock that there is on earth and the forces that go to make it, we see an example of the great creative power of God who created the earth.

Motivation:

The teacher arranges a number of different types of spheres on a table before class. They should include a basketball or other ball inflated with air, a solid rubber ball, a ball of string, etc. The principle demonstrated is that each ball has some type of support inside the circumference to maintain the spherical shape.

The teacher asks the students to watch as she blows up a balloon. She points out the nature of the balloon in its uninflated state. It is shapeless and limp. After she blows it up, she asks the students what gives it its round shape. It is air. She points to the different balls on the table. What gives each of them their shape. The question is answered for each. Then, she points to the world globe. Our world is shaped like a ball. What keeps it in this shape. The answer is that our world is made up largely of rock. Under the thin layer of soil is a thick layer of rock which encircles the globe. Today we are going to discuss the nature of rock and how it comes into being.

Lesson development:

1. The foundation of our earth is rock. Under the soil is a base of rock made up of many layers of different kinds of rock. Beneath that is a hot core of melted rock.
2. Even our soil is made of rock. Did you ever look at a grain of sand? It is a tiny piece of rock. Wind, rain, snow, ice, and running water are continually breaking little pieces of rock off. These pieces make up much of our earth. One of the reasons plants can grow in the soil is because the rocks have good things in them that give strength to the plants.
3. How are rocks themselves made? There are three ways.
4. One kind of rock is "fire-made rock." Recall that there is a mass of liquid rock in the hot core of the earth. Sometimes that rock comes up through the ground in volcanoes or other holes in the earth's rocky crust. When it comes to the air, it cools and hardens into rock. The teacher may have a sample of igneous rock to show the class.
5. A second kind of rock is "water-made rock." If we sprinkle some small bits of material in a glass of water and shake it, the material spreads through the water. Eventually, it settles to the bottom and is a mass of solid material. You may have used a salad dressing at dinner which had to be shaken before use. If you looked at it before you shook it, you saw a lot of material at the bottom. This is one of the ways rock is formed. Water carries little fragments of rock and other material in it. Sometimes those fragments settle out of the water and form a solid material. That material is rock. The teacher may have a sample of sedimentary rock to show the class.
6. The third kind of rock is made from other rocks that are changed. A water-made rock may be at the top of the earth's crust. Sometimes that crust shifts and the water-made rock at the top is forced down under other rock. It is pressed down and heated there. This may change it into another form of rock. The teacher may bring a sample of marble as a sedimentary rock changed to a metamorphic rock.

Relating the facts to God:

1. Just imagine the tremendous amount of rock that it takes to make up the crust of our earth and the soil on top. All of this was made by God. God also is responsible for all the tremendous forces that act to make rock -- the heat under the earth, the weather that breaks down rocks, and the water that carries materials from which rocks are made. What a powerful creative force God has.

Creative activity:

The children may make decorative items using small stones fixed to paper plates or cardboard cutouts. Such stones or simulated stones are available in large kits. The children might combine the use of "rocks" for this lesson with decorations for Jewish holidays, e.g., seder plates or Chanukah decorations.

Jewish source:

> "Jacob left Beer-sheba, and set out for Haran. He came upon a certain place and stopped there for the night, for the sun had set. Taking one of the stones of that place, he put it under his head and lay down in that place." (Genesis 28.10f.)

Supplementary sources:

All About Our Changing Rocks.
Exploring Under The Earth, pp. 26-27.
The Golden Book of Science, pp. 50-52.
Rocks And How They Were Formed.

Assignment for next week:

Look for different sorts of rocks in the places where you walk and play. Bring a few samples of the rocks you find to class.

UNIT II

Lesson 4

Objectives:

A. Facts involved:
1. Rocks are the source of a great many of the items we use for our needs, e.g., metals, clay, building materials.
2. The rock crust of the earth has been studied by man so that he can use many of the things in it by processing them in various ways.

B. Insights to be developed:
1. God has provided our needs in numerous ways. In the case of rocks, however, we see that He has provided them in such a way that man must learn to use them. We see, then, two ideas about God. One is that He provides for our wants. The second is that He leaves something for us to do in order to use them properly.
2. We see God's creative power again demonstrated. He has included a multitude of elements and compounds in nature, each of which has a use and purpose.
3. We are again made aware of our gratitude for the gifts of God which we find in the world about us.

Motivation:

Last week, we discussed how rocks were formed and what types of rocks there are. Have you ever wondered why there is so much rock? What use is there to rock? Can you think of any reason at all that we might need rocks for the things we want? Let's talk about some of the things we see and use everyday that we would not have if there were no rocks. I think we will find that there are quite a number of them.

Lesson development:

1. Let's begin with the things in our classroom that are products of rock. How about our windows? What are they made of? Did you know that glass is made out of sand? We learned last week that grains of sand are tiny pieces of rock that have broken off. We would have no glass for drinking glasses, windows, and many other things if their were no rocks to crumble into sand.
2. How many things in this room can you name that are made of metal? There are the legs of our desks, the chalk tray along the chalkboard, and others. Do you know where we get all of our metals? They come from

rocks. Sometimes the rocks have to be melted so that the metal will come out as a liquid. Giant furnaces are used to take the metal out of the rocks. The metal is made into sheets or bars and sent to factories where it is made into all sorts of items. How many things can you name that are made of metal?

3. What is your house made of? Does anyone have a house made of stones? Stones are rocks. Do you have a brick house instead? How are bricks made? They are made of clay, and clay is a type of earth. We remember that earth is made of broken parts of rocks, and so, bricks come from rocks, too. The clay is shaped into bricks and baked until it is hard.
4. What else is made of clay? Did you know that many of your dishes at home are made from clay that has been baked until it is hard? Many vases and bottles for flowers or perfume are made of clay as well.
5. What is the sidewalk in front of your home made of? What does it look like? Do you ever notice what look like little tiny stones in the cement? That is exactly what they are. Cement is made of crushed rocks.
6. I think we can see from this that there are many things which we are familiar with that we would not have without rocks.
7. The teacher should attempt to bring as many examples of household items made of rocks as possible. This will lead the children to associate them with the lesson, and the children may be moved to recall more examples on their own.

Relating the facts to God:

1. Imagine!! There was a time when people had no metal or glass to use for building things or making useful items for their homes. Now we know that they had all of the elements needed to have metals or glass, but for some time, men did not know how to use them. We see here that God has given us a great many things that are useful in the world, but some of them have to be discovered by people. We are fortunate, though, because God has also given us the ability to discover these things and the ways they are to be used. That is how God helps man continually. He gives him what he needs and the ability to use it, but man must find out on his own that he has the ability. Then he will apply it to God's gifts.
2. If God had wanted to do it, He could have created "window trees" and "car bushes" and all of the things that we use. Instead He created a world full of useful elements which we can put together. What a wondrous job of creating He did. The same thing that makes soil makes glass. The same thing that makes houses makes cars. He made one kind of thing with many different uses.

3. When we look about us and see all of the items which we enjoy that are derived from rocks of all sorts, we are grateful to God for creating a universe filled with such wonderful and useful gifts.

Creative activity:

If possible, a small kiln is brought to the school for use by the teacher. If not, the teacher arranges to have the use of one during the coming week. The children are encouraged to make clay models of anything they choose. The models are then baked to hardness in the kiln. If it can be done at the school, the children may paint and shellac the figures. If not, they may be given the figures to take home or display in the room on the following weekend.

Jewish source:

"The word which came to Jeremiah from the Lord, saying: 'Arise, and go down to the potter's house, and there I will cause thee to hear My words.' Then I went down to the potter's house, and, behold, he was at his work on the wheels. And whensoever the vessel that he made of the clay was marred in the hand of the potter, he made again another vessel, as seemed good to the potter to make it." (Jeremiah 18.1-4)

Supplementary sources:

All About Our Changing Rocks, pp. 1-4.
Rocks And How They Were Formed, pp. 46-52.

Assignment for next week:

Make a list of all the products of rocks that you can find in your home in the coming week. Ask your parents' help in determining whether something is or is not a product of rock.

UNIT II

Lesson 5

Objectives:

A. Facts involved:
1. The earth's surface is 70% water. The oceans are all connected so that every continent is, in reality, a giant island.
2. The oceans of the earth are deeper than the height of the highest mountains. Their average depth is two miles.
3. Water is one of the most valuable things on earth. Without it we could not survive. Areas where it is scarce or absent are seldom inhabited.
4. The earth is one of the few planets which has water as a liquid. Mars appears to and Venus may, but all others are either too hot or too cold.
5. There is a water cycle which operates on the earth. The sun heats the surface of the oceans and evaporates some of the water. This forms clouds which are carried by the wind over the land. These produce rain which gives a fresh supply of water to the land. Some of the water seeps into the land and forms springs. Other water flows down the land into streams. Small streams flow into larger ones until the largest ones flow back into the ocean.

B. Insights to be developed:
1. God has provided for all of our needs. Our planet has been endowed with water, a necessity for life as we know it. God's concern for us is shown here.
2. The orderly and regular water cycle operation is an indication of the degree to which the universe is established on constant laws which lead to a secure life for us.

Motivation:

The teacher poses the hypothetical case of a fish living in the South Pacific wishing to visit a friend in the North Atlantic. Using the globe, she shows that he is able to do so, travelling through water at all times. In the case of a dog in the U.S.A. who wants to visit a friend in Europe, he cannot travel the entire distance on land. He must cross water to complete his trip.

The teacher points out on the globe the massive expanse of water on the earth's surface. She shows the children that all land masses are surrounded by water, but that the oceans are joined together. There is more than twice as much water surface as land on the earth.

Lesson development:

1. If we were to take a trip far out into space and look back at the earth, we would see a great deal more water than land. We actually live on islands in a great ocean of water.
2. It is good that we have so much water, for we need water to live. We and all animals and plants use it for life.
3. We have a great deal of water, for the oceans are quite deep. The tallest mountains on earth are not as high as the ocean is deep. When we look at the ocean, we may be seeing the top of a pile of water two or more miles deep.
4. You know that we do not drink ocean water. It is very salty and does not taste good. Also, many places are far from the ocean and could not get its water easily even if it were good for drinking. What good does ocean water do us?
5. The truth is that we do drink a good deal of ocean water, but it has travelled a complicated path to get to us. When the sun shines on the surface of the ocean, some of the water rises as water vapor such as you see at the mouth of a tea kettle. It leaves behind the salt and becomes part of a cloud. The cloud is eventually blown by the wind until it is over land. There, when it cools, the water vapor turns to liquid water and falls as rain. The rain may seep into the ground and form a spring from which drinking water is taken. Or it may flow into a stream which, in turn, flows into a larger stream. Eventually, it will flow into a stream that empties back into the ocean. At any point in its flow to the sea, it may be taken from the stream for drinking water.
6. We are very fortunate to have so much water. Of the nine planets in our solar system, we are one of only three that may have water, and without it, we could not live.

Relating the facts to God:

1. If God had put us on a planet that had no water, we would not be here or anywhere. The human race would have died. But God is concerned with His creatures. Since we need water, He has provided it for us.
2. We need not worry about using up all the water on earth, for God has made the "water cycle law" which maintains an orderly movement of water to and from the sea.
3. We see in the water cycle another example of the way God has made constant laws in the universe so that we can live more securely.

Creative activity:

With the aid of the teacher, each child can draw a diagram showing the path of a drop of water from ocean to cloud to rain to inland stream and back to the ocean. The teacher might supply outline maps to the children for this. They are usually available at school supply or book stores near colleges or through the Board of Education in the community.

Jewish source:

> "God said, 'Let the water below the sky be gathered into one area, that the dry land may appear.' And it was so. God called the dry land Earth, and the gathering of the waters He called Seas." (Genesis 1.9f.)

Supplementary sources:

The Wonderful World Of The Sea, pp. 6-17.
The World We Live In, pp. 20-37.
Your Wonderful World of Science, pp. 31-32.

Assignment for next week:

Find out how we get the water we use in our homes; that is, from what larger source of water do we get it?

UNIT II

Lesson 6

Objectives:

A. Facts involved:
1. Mountains were formed in three ways. One is by volcanic action. A second is through pressure on the line where two sections of rock meet (called a fault). The third is through pressure forcing down one area of the surface and forcing up the adjacent area. Most large ranges of the world were formed in the third way.
2. Canyons and river beds are formed by the effect of water wearing away soil and rock.
3. Waterfalls show the effect of running water on rock. They wear away the rock at the edge of the falls. Niagara Falls wears away three and a half feet of rock a year. It has moved seven miles up the river from its original location.

B. Insights to be developed:
1. The various features of the earth's surface show us a great deal of natural beauty in God's creation.
2. Natural wonders make us wonder at the great forces involved in their creation. They are evidence of the tremendous power of the Creator who set them in motion.

Motivation:

Look at our world globe. Does it really show us what the earth looks like? Is the earth smooth as is our globe? We have all seen hills and valleys. We know that rivers are lower than the land on either side of them. We have all had the experience of going uphill or downhill to get from one place to another. The earth, then, is not a smooth surface. Today we are going to talk about some of the things that illustrate this feature of our world.

Lesson development:

1. The Appalachian Mountains of the eastern part of the United States are a good example of mountains that were made when the ocean floor became so heavy that it was pushed down. The mountains were part of the land next to the ocean. They were pushed up into tall peaks above the rest of the land. This takes millions of years to develop, and it is happening all the time somewhere on earth. [The teacher may demonstrate the process by using a lump of clay. As she pushes down on one part, another part rises.]

2. Looking at our globe, we notice that the Appalachian mountains are some distance from the ocean. It was not always that way. Millions of years ago, the water covered all the land east of them. It was this weight that forced them up.
3. The Grand Canyon of Arizona is another example of the way that water makes "rough spots" on the earth. At one time, the Colorado River was probably a swiftly flowing river whose bed was just a little below the top of the canyon. As the waters flowed, they wore away the rock little by little. Now the river is far below the level of the rock on either side. As we have learned, the upper layer of rock is "water-made," and it is not very hard rock. It was easy to cut through. The river has now gotten to the layer of far harder "fire-made rock," and it cuts even more slowly into it. If you have seen water pouring out of an open drain pipe after a heavy rain, you may have noticed how it wore away the earth at the spout. This is the same process that is involved in making a canyon.
4. Another wonder of the world made by water is Niagara Falls. Millions of gallons of water go over the edge continually. As they do, they wear away the rock at the edge and the edge moves slowly back. The falls have moved back seven miles over the years.

Relating the facts to God:

1. We have often talked about usefulness and purpose in the world, but let's not forget the beauty of creation. God has not created a world that is without wonders and interesting sights. Instead, He has made many natural sights that people travel for miles to see. We are grateful for such a beautiful world.
2. When we think of water wearing away rock or pushing up mountains, we realize how powerful the forces of nature are. If they are so powerful, God who created them must be even more powerful.

Creative activity:

The students will make a salt map showing some phenomena of the earth's surface such as mountains, valleys, rivers, and canyons. The paste is made of two parts flour to one part salt and enough water to give a consistency proper for molding. Several children can work on one map. When the map is dry enough, the details can be painted with water colors. The maps need not represent any actual area on the earth's surface. The purpose is to represent topographical features commonly found on the earth.

Jewish sources:

"And God said: 'Let the waters under the heavens be gathered together in one place and let the dry land appear.'" (Genesis 1.9)
Story of Rabbi Akiba watching water wear away a stone. (Ketubot 63a quoted in The Talmudic Anthology)

Supplementary sources:

All About Our Changing Rocks, p. 32.
All About The Planet Earth, pp. 34-59.
The Golden Book of Science, pp. 55-61.
The World We Live In, pp. 13-15, 39-49.

Assignment for next week:

Write a poem or a story about some natural wonder that you have seen or read about.

UNIT III

The Plant Kingdom

UNIT III

Lesson 1

Objectives:

A. Facts involved:
1. Seeds are "packets" containing tiny plants which can grow into large plants like their "parents."
2. Seeds are manufactured by their "parents" and are contained in the fruit of the plant. "Fruit" means that part of the plant that contains the seeds.
3. Seeds are transported from the "parent" through various means. Some are carried by wind; others are carried by animals; still others by water; and still others by man.
4. Seeds range in size from some which are as fine as dust to large ones like the double coconut which may weigh forty pounds.

B. Insights to be developed:
1. Just as we see elsewhere, the precision of creation is shown in the form of a seed. Though it may be a very tiny object, it is designed to grow into a large plant. It carries with it much of the needs of a "baby" plant. This gives us great cause for wonder.
2. The element of purpose in creation is to be seen here. We think nothing of finding acorns on the ground or of throwing away watermelon seeds as we eat, yet one of those common seeds may someday grow into a large plant, for that is its purpose.
3. In past lessons, we have seen God's activities on a large scale with planets and atmosphere and the like. Now we see that His creative power and wisdom has been applied on the smallest as well as the largest scale.

Motivation:

Did you have any seeds on your breakfast table today? Perhaps you had canteloupe or grapefruit or oranges. Have you eaten any seeds lately? How about peanuts or beans or berries? Did you ever realize how many seeds we eat or see around us? Whatever are they for? They are to make new plants like the ones they came from. Today we are going to see what a wondrous part of God's creation they are.

Lesson development:

1. Most plants make new plants like themselves with seeds. As often as we see and even eat seeds, we may not know much about them. Today we are going to use a seed as an example in class and learn about seeds with it. It is the lima bean which all of you have seen before.

2. The teacher will have prepared for the demonstration before class. She will already have soaked a half dozen or more lima beans overnight to soften the outer seed coat. Now she displays them on a table.
3. She points out the seed coat and slips one off easily. Inside she points out the baby plant after splitting the bean in two. The baby plant is above the curve. All the rest, she explains, is food for the baby plant. This keeps it alive until it has grown into a plant.
4. This is one kind of seed. There are many others. A fresh pineapple is a giant cluster of seeds. Each little section of the pineapple is one fruit which grew from one blossom of the plant. Each little section of a blackberry or raspberry is one seed container. The black specks in the center of a banana are the beginnings of seeds. Banana plants are no longer grown from seeds. Instead cuttings of the plant are used.
5. One problem with seeds is getting them from the parent plant to a place where they can grow into a new plant. This is done in many ways. Did you ever notice the "propeller" that comes off of many trees in certain seasons? The wings of the propeller are joined at the center where the seeds are. Some trees have two wings to the propeller; others have only one. The seeds are, then, flown to a new place. Did you ever see a dog that had burrs tangled in its fur? Those burrs are seeds. Animals that get tangled in them carry them to new places. Have you ever heard the cowboy song about the tumbleweed? It is a plant in the desert that makes a ball of seeds which rolls along the sand and scatters its seeds as it goes.
6. No matter what they look like or how they get to a new place, seeds are able to grow into new plants if they get their needs. The new plant takes root, grows bigger, and eventually looks like its "parent." It can then make new seeds for new plants itself.

Relating the facts to God:

1. What an amazing thing it is to find so many different kinds of seeds doing the same job!! Imagine a little speck of dust that is actually a miniature plant!! A little acorn may grow into a giant oak tree. How often we see seeds and do not realize what a wonder of God's creation they are. They serve a great purpose for such very small objects.
2. It is especially interesting to see that God made each plant so that its seeds are able to find their way to a place where they can grow. What attention God paid to the smallest details of creation!! The giant planet and the tiny seed are both perfectly designed by the Creator of the universe.

Creative activity:

Working individually, the children may construct small seed gardens using paper plates, sheets of flannel, and lima beans. This sort of garden allows them to view the progress of the seeds as they begin to germinate.

The teacher will have brought with her a number of lima beans so that each child will have at least five. These have not been soaked. Each child will be given two paper plates and a sheet of flannel sufficent to cover the surface of one plate. The flannel should previously have been sterilized through boiling and left damp but not soaked. After cutting it to the size of the bottom of the plate, it is laid on the plate and the seeds are put on it. The other plate is used to cover it.

The children will take their gardens home at the end of the day. The teacher will have told them that the gardens should not require further dampening, but, if the flannel does dry out, they may have to add moisture.

The stages of growth should be pointed out to the children so that they will know what to expect. The next day the children should notice a swelling of the seeds. After that, the seeds will split open their coats. The baby plant will force its way out above the scar of the bean. As time passes, the plant will send a root down toward the moisture in the flannel and grow a pair of leaves upward. It may be that the sprout will even lift the upper plate a bit. This is a demonstration of the force of growth in a seed. (This experiment is taken from How Miracles Abound by Bertha Stevens.)

Jewish source:

"Then God said, 'Let the earth sprout vegetation: seed-bearing plants, fruit trees of every kind on earth that bear fruit with the seed in it.' And so it was.... And God saw how good this was." (Genesis 1.11f.)

Supplementary sources:

All About The Flowering World, pp. 9-26.
The Golden Book of Science, pp. 38-39, 41.
How Miracles Abound, pp. 94-99.
Play With Plants, pp. 23-42.

Assignment for next week:

Each child is to keep a record of the progress of his plate garden and note his observations at twenty-four hour intervals through the week.

UNIT III

Lesson 2

Objectives:

A. Facts involved:
1. Flowers are the parts of plants that produce the seeds.
2. The fine dust called pollen which the flower produces must come into contact with another flower to cause seeds to be formed.
3. Many insects and birds help to transport the pollen from one flower to another to keep the species alive.
4. The colors and shapes of the flowers serve the purpose of attracting these carriers of pollen. The insects and birds come to get the sweet nectar and are drawn by the aroma and appearance of the blossom. In getting what they want, they pick up pollen from the flower.

B. Insights to be developed:
1. Here is a display of purpose in creation. We have long recognized the beauty of flowers, but their purpose is more than merely providing beauty for man. God has designed them to serve a vital function for the species.
2. We see that God has created a world in which one thing must depend on another. The flowers depend on insects and birds for pollination; these creatures depend on the flowers for nectar.

Motivation:

Have you ever looked at a rose bush or a field of flowers in the summer and seen a great many bees and other insects around the flowers? Did you wonder why they were there? Today we are going to talk about some very special reasons why these insects are drawn to the flowers and why flowers are the way they are. What seems to be a casual friendship between insects and flowers is a very serious partnership instead.

Lesson development:

1. The teacher should have several flowers large enough for the students to observe closely. If they are not available, a model of a flower should be used.
2. Did you ever wonder why flowers are not green like the rest of the plant? Isn't it strange that they come in so many different colors? Have you noticed the aromas of the flowers? Do you wonder why these parts of plants should be so different from the rest?

These colors and aromas of the flower are there for a very important purpose. They attract the insects that you see around the flower. It is necessary for this to happen if the family of the flower is to survive.

3. You recall that most plants make new plants by making seeds. The flower is the seed maker of the plant. The seeds are made when the fine powder that we find on the inside of one flower is carto the inside of another flower. The insects we see around the flowers do just that. They carry the powder which is called pollen from one flower to another.
4. The teacher, if she is using real flowers, can show the children what the pollen looks like and where it is found.
5. Certain insects need the sweet liquid called nectar which is inside the flower for food. In order for them to get the nectar, the flower is designed so that they must brush against the pollen. Some of it rubs off on them and they carry it to another blossom. The colors of the blossoms and their sweet fragrances attract the insects and tell them that they can get nectar from the flower.
6. Almost all the plants that we are familiar with make new plants this way. Even tiny blades of grass have flowers so small we cannot see them. Grass seed is made by these flowers.

Relating the facts to God:

1. As often as we have seen flowers, we may never have known that God made them for a vital purpose. Their colors, shapes and aromas all serve the purpose of keeping the plant family alive.
2. God has made many partnerships in the universe, and we see one here. The flowers and insects are partners. The insects get food from the flowers. In return, they transfer the pollen from one flower to another so new plants can grow.

Creative activity:

The children may make artificial bouquets of flowers in one of two ways. They may make them by folding two-ply paper tissues of various colors to make carnation-like paper flowers, or they may make candy flowers out of colored gum drops and tooth picks. In the latter case, bouquets are made using a doily through which the toothpicks are stuck. Using ribbon and other decorative materials, a very pretty bouquet may be made.

Jewish sources:

"There is not a blade or an herb that does not manifest God's wisdom." (Zohar, Exodus 80b)
"Lo, the winter is past, the rain is over and gone; the flowers appear in the earth; the time of singing is come, and the voice of the turtle is heard in our land." (Canticles 2.11f.)

Supplementary sources:

All About The Flowering World, pp. 9-26.
The Golden Book of Science, pp. 26-27.
The Rainbow Book of Nature, pp. 133-139.

Assignment for next week:

None.

UNIT III

Lesson 3

Objectives:

A. Facts involved:
1. Green plant cells are able to manufacture food from carbon dioxide, water, and sunlight. This is done by virtue of the chlorophyll which gives them their green coloring.
2. This process is the only known process in nature through which actual food is made from the raw materials of nature. The green plant is the world's food factory. Animals eat plants and are themselves eaten by other animals. The basis is the food that the plants produce.
3. The food produced by the plants is sugar, but it may be converted to fats, oils, or proteins for various uses.
4. The process by which food is manufactured by green plant cells is called photosynthesis.

B. Insights to be developed:
1. We recognize the interdependence which God has built into our world. Man and the other animals depend upon the green plant for food.
2. God has provided the necessities of our lives. At times, we find them provided directly in nature, e.g., oxygen in the air. In other cases, they are provided indirectly. Here we find the latter case. God has endowed plants with the ability to sustain man and other life on earth.

Motivation:

There are some machines that run on electricity, for example, a television set or a washing machine. Some run on gasoline such as cars and trucks. Do you know what very important machine runs on sunshine? It is the green plant. Green plants are the most important factories in the world. They make food. All the food that we eat is derived directly or indirectly from that factory -- the "green plant food factory."

Lesson development:

1. What is the recipe for making food in green plants? They use three things which are a gas called carbon dioxide which is in the air, water from the soil, and sunlight as a fuel.
2. What kind of food do they make from these ingredients? They produce sugar, the basis of our food.

3. How do plants get the ingredients for making sugar? Carbon dioxide is a gas in the air. It is constantly replenished in the air since it is the gas animals exhale in place of the oxygen they use. To "repay the kindness," plants give off oxygen to the air. There is water in the soil, and the roots of plants bring it out for the plants to use. The water is distributed through the plant through veins in the stem and leaves. This may be demonstrated with a stalk of celery. The stalk should be soaked in water for an hour to freshen it. Then, it should be put in water dyed red. In about an hour, the leaves will redden. A lateral cut across the stalk will display the full veins as red dots.
4. After water and carbon dioxide have been distributed through the plant, the action of sunlight on the cell causes it to transform them into sugar. To get as much light as possible, the leaves grow toward the light.
5. When sugar has been made, it is distributed through the plant as "sugar water" or sap. This passes through the veins of the plant. The food may be stored as starch for later use. This is what a potato or a carrot is -- stored starch.

Relating the facts to God:

1. With the many different types of factories and products that man has made, there are still things for which he must rely on others. God has created in the green plant a factory for food which man cannot match.
2. God provides for our basic needs in nature. We need food, air, and water to live. These are all available naturally.
3. We see that we live in a world where one thing is dependent on another. Man may raise and care for plants so that they can grow, but he depends on them for his food.

Creative activity:

The children can be divided into small groups. Each group is assigned a common food item which we find on our tables, e.g., meat, eggs, milk, butter. They are, with the teacher's help, to illustrate through pictures the relationship of that food with the original green plant food factory. This may be done in a series of frames or in a picture chart.

Jewish source:

Baruch ata adonai elohenu melech ha'olam hamotzi lechem min ha'aretz -- Praised be Thou, O Lord, our God, King of the universe, Who causes the earth to produce food.

Supplementary sources:

All About The Flowering World, pp. 52-54.
The Golden Book of Science, p. 32.
How Miracles Abound, pp. 137-138.
Play With Plants, pp. 49-51.

Assignment for next week:

None.

UNIT III

Lesson 4

Objectives:

A. Facts involved:
1. As we have learned, plants are the original producers of our food. While often we eat animals or animal products through which we get plant-made food indirectly, we also eat plants themselves.
2. We eat various parts of plants. Among these are stems, leaves, roots, sap, fruit and seeds, and bark.

B. Insights to be developed:
1. The element of purpose in God's creation is shown here. While each part of the plant serves a purpose for the plant itself, it often serves an additional purpose as food for man or other animals.
2. Here is a good example of interdependence. God has provided food for us, but we must know how to get it. Often, that involves cultivating plants.
3. The tremendous variety of edible plants shows the variety of God's creation.

Motivation:

Let's think of something that is very unlikely. Let's suppose that your mother asked you to go to get her some food for supper. She gives you a list that includes asparagus, potatoes, peanuts, cinnamon, maple syrup, and spinach. You walk out of the house and find out that all grocery stores have disappeared. You look across the street and there, on a vacant lot, is a sign. It says, "When you step into this lot, you will find all the food you need growing here." You walk to the lot, and, sure enough, a thousand different kinds of plants are growing there. Would you know which ones were the ones you wanted and what parts of the plants you wanted?

We have learned that plants are our food factories. Today, we are going to find out what parts of the different plants we use to feed ourselves. We are going to find out about nature's giant grocery store.

Lesson development:

1. The teacher should have the following items on display for the class: a common fruit, fresh leaf spinach, fresh asparagus, maple syrup, stick cinnamon, potatoes, and some nuts.
2. First, we will write the marketing list we talked about on the board. Then we will find out how to

get what we need directly from the plants. The teacher copies the list on the board.

3. We begin with asparagus, and the teacher holds up a few stalks. What part of the plant that it comes from is this? It is the stem of the plant. Can anyone name some other stems that we eat? [Celery, rhubarb]
4. The teacher continues the same process with the other items on the list. The following will be of aid.

   ASPARAGUS - stem - transmits fluids - [celery]
   POTATOES - root - draws out soil water - [carrot]
   PEANUTS - seeds - reproduces plant - [peas]
   CINNAMON - bark - protects plant
   MAPLE SYRUP - sap - fluid containing food - [sugar]
   SPINACH - leaves - food manufacture - [lettuce]

5. We see that many things we eat have special purposes for the plant. We also see that we eat different parts of different plants.

Relating the facts to God:

1. Each part of the plant that we eat has at least two purposes, food and its function as part of the plant. God has created a world in which each thing has a purpose.
2. We need food, and God has provided it in many forms.
3. When we help plants to grow and plant new ones, we are often helping ourselves.

Creative activity:

The children can make crayon-watercolor resistances. They can make representations of common foods as they grow naturally. Using crayon, they can color stalks of asparagus, spinach leaves, tomatoes on a vine, and the like. Below the ground level, they can show potatoes, onions, and carrots. Then, the area of sky can be painted blue and the ground brown. The crayon will resist the watercolor giving an unusual effect.

Jewish source:

"See, I give you every seed-bearing plant that is upon all the earth, and every tree that has seed-bearing fruit; they shall be yours for food." (Genesis 1.29)

Supplementary sources:

All About The Flowering World, pp. 63-67.
The Golden Book of Science, pp. 38-39.
Plants That Feed Us.

Assignment for next week:

Choose one day this week and make a list of the plants you eat during that day. When possible, identify the part of the plant you eat.

UNIT III

Lesson 5

Objectives:

A. Facts involved:
1. We use many plants for purposes other than food.
2. Some plants are useful in curing diseases.
3. Plants furnish material for our fabrics.
4. We use wood which comes from plants for building material, paper production, furniture, and other purposes.
5. We recognize the beauty of many plants and use them to make our homes and the out-of-doors more lovely to the eye.

B. Insights to be developed:
1. The plant world gives us innumerable instances of the purposive nature of creation. Though we may see plants every day of our lives, we often are unaware of the many functions they serve in our lives. God has provided us with many gifts through the plant world.
2. Plants add much to the beauty of creation. Our world could have been all rock or sand or soil, but God has endowed it with beautiful sights for us to enjoy.

Motivation:

The teacher arranges a display on a table before the session begins. On the table are a number of objects, some of which are plant products and others which are not. They might include a sheet of paper, a cotton shirt, a bottle of pills, and some small wooden pieces of doll furniture as examples of plant products. The teacher asks the children to identify those items which come from plants. After they have made their choices, she places small labels of some sort in front of the items that are derived from plants so that they can be referred to during the lesson.

Lesson development:

1. Have you ever seen a movie or a television program in which there is a witch doctor among Indians or African natives? Do you recall scenes which showed the witch doctor trying to cure a sick person? What did he use? Often, we see him using plants or parts of plants which he cooks or processes in some way? Sometimes they cure the sick person in the show. Did you know that he may be using a medicine that

our doctors use when we are sick. Many modern medicines come from plants. The Indians and the African natives often accidentally discovered that these plants had a healing effect. Now, doctors have discovered many more plants which cure various diseases.

2. How many of you have had poison ivy? Do you know what it is and what it comes from? That is a plant that makes us sick and uncomfortable. You may have had a cough at one time and taken some cough medicine that made you better. It may have been the cough medicine that comes from the pine tree. This is just one of the medicines that come from plants.
3. Have you ever thought of where the wood we use for houses and furniture comes from? Of course, it is from trees which are plants. We can probably look around the classroom and see wood from trees. It is a useful material in our lives.
4. Look at the shirt on the table. It is made of a part of a plant, the cotton plant. Cotton plants are grown in large fields in our southern states. The cotton grows in a sort of cup on the plant. It is picked from the ground, the seeds removed, and its fibers are spun into thread. We wear cotton shirts and slacks, sweaters and skirts, and many other kinds of cotton clothing.
5. Even the paper we use comes partly from plants. The wood of trees is used to make it. The wood is made into something called pulp which is the basis of our paper.
6. Sometimes plants do not have to be taken from the ground or treated to have a use. When we walk through a wooded area or a flower garden or when we just see pretty plants, we are finding another use of plants. They help make the world prettier. Sometimes we keep plants in our homes for that reason. We put flowers or vines or other leafy plants in our windows or in our living rooms or on our dinner tables for decoration. They make any room they are in prettier to see.

Relating the facts to God:

1. How very many things that we have and use and see each day come from plants. They have so many uses for our lives. God has given us many gifts in the plant world. Some we have discovered, but there are probably a good many more.
2. What a plain and drab world we would have without plants! They provide much of the beauty and the color that we see. There is green grass; there are green leaves on trees; there are brightly colored flowers. God has given us a beautiful world made more beautiful by the plants in it.

Creative activity:

Each child may choose one of the uses of plants which has been discussed in this lesson and illustrate it. One way of doing this is to make a model of a plant product discussed out of clay or construction paper. Then, a model of the plant from which it comes may be made. These may be connected by a string or thread and put on the class display table.

Jewish source:

"...Make yourself an ark of gopher wood; make it an ark with compartments, and cover it inside and out with pitch." (Genesis 6.14)

Supplementary sources:

Plants That Heal.

Assignment for next week:

Look around your room at home and list all the things that you know come from plants. You may want to ask your mother or father to help you.

UNIT IV

The Animal Kingdom

UNIT IV

Lesson 1

Objectives:

A. Facts involved:
1. Man has developed clothing, armor, weapons and the like which he uses for various purposes. Animals have no ability to do this. Thus, their outer coverings serve these various purposes and more.
2. The hair of animals serves to maintain body temperature through insullation.
3. The hair of the porcupine is an example of specialized hair used as a defensive weapon.
4. The feathers of a bird are important for his flying.
5. Many animals have shells as protection against danger.

B. Insights to be developed:
1. There is a source of wonder in the many different functions for which animal coverings have been designed. This is evidence of God's creative power and the wisdom that it shows.
2. Once again, we see the purposeful nature of creation. The covering of each animal serves that animals special needs.
3. God could have created all animals with one type of covering, but His concern for His creatures is shown in His giving each animal the covering it needs.

Motivation:

How many things can you think of that we wear for different kinds of protection? There are heavy, warm clothes for cold weather, light clothes for hot weather, special water-proof coats for rain and snow and many other things. And you have seen, in movies and on television, that the soldiers of long ago wore armor made of metal to protect themselves from spears and swords and arrows.

Animals don't wear clothes, do they? What do you suppose they use for all of these things? Today, we are going to learn of several different types of animal "clothing" which are used for very special purposes.

Lesson development:

1. Have you ever wondered how a polar bear or a wolf or other forest and arctic animals can live in very cold weather? After all, they do not have special clothes as we do. They do, however, have built-in protection.

2. The fur and hair coats of many animals serve to keep them from getting too cold or too hot. The coat acts by either letting heat out or keeping heat in. This is the way our heavy clothes in winter and light ones in summer function. We speak of warm coats for winter wear, but are they really warm? No, they insulate us to keep our own body heat in. This is true of the coat of the polar bear or the rabbit in cold weather. The coat of the leopard who lives in hot countries, on the other hand, allows heat to escape from his body so he can keep cool. Fur or hair works this way by having more or less air space between fibers. There is more or less room for heat to escape the body.
3. The porcupine has very specialized hair. The quills which are sharp and stick in those who touch the porcupine are his hair. When he is attacked, his quills stick out and his tail lashes. Any animal which gets in the way of his tail or touches him will be stuck by the quills. The porcupine has a good way of protecting his privacy.
4. A bird is not covered by hair or fur. He has feathers. The feathers help maintain his body temperature, but they have an extra job. They are important in flying. The flight feathers are on the wings. Each wing has the same number of feathers of the same size and shape in the same places. The bird's wing is the most perfect instrument for flight known, and this is because of the arrangement and nature of the feathers. The feathers have another function. They are oily so that the bird can go through rain and snow without getting water-logged. The water cannot get through the oil and runs off "like water off a duck's back."
5. Sometimes we think of shells on turtles and other sea or shore animals as their homes, but they are also their clothing. The shells act as armor against enemies. The shells of sea animals are varied and often quite beautiful besides being protection for the animals. Other types of animal armor are the scales of fish and reptiles.

Relating the facts to God:

1. Just imagine how many different kinds of clothing God has made for animals! There are water animals, flying animals, cold weather animals, warm weather animals, and so many others. Isn't it wonderful that God has created so many different details in the world?
2. Just think of the mix-up that would occur if turtles suddenly had feathers and birds had shells or if a polar bear woke up with scales and a fish grew a fur coat! They would be unable to live. God has given each creature the kind of clothing that it needs for the kind of life it lives.

Creative activity:

This lesson lends itself to an activity involving clay modelling. The children may choose one of the animals that has "unusual clothing" and make it out of clay. Then, each child may construct a small backdrop for his model. The backdrop will show the natural habitat for which the animal's covering is adapted.

Jewish sources:

The story of the fox and the fish. It may be found on page 133 of Rabbinic Stories for Christian Ministers and Teachers by William B. Silverman. The story illustrates the fact that God has adapted each creature for his home.

Supplementary materials:

Animal Clothing, pp. 13-51, 61-77.
The Golden Book of Science, pp. 14-17, 20-23.

Assignment for next week:

The children are to bring in examples of animal clothing for display in the room. Seashells, fur, and the like are easy to find around the house or neighborhood.

UNIT IV

Lesson 2

Objectives:

A. Facts involved:
   1. Many animals are equipped by God with tools for performing functions for which man needs extra tools.
   2. These tools include drills, saws, propellers, and "carrying cases."

B. Insights to be developed:
   1. Each of God's creatures was created with a purpose, and each part of the creature serves a purpose.
   2. God's concern for His creatures caused Him to provide their needs in one way or another. Some have the ability to make and use tools. Others are born with tools and the instincts to use them.

Motivation:

Let's think this morning of the types of tools we or other people use for jobs. I'll name the job. You tell me what tool or machine or object we use to perform it.

1. When we go on a trip, in what do we pack our clothes?
2. If we want to put a hole in a block of wood, what do we use?
3. When the doctor gives us a shot, what does he use?
4. When a lumberjack cuts down a tree, what does he use?
5. What kinds of things do we use to make a boat move?

Lesson development:

1. The teacher draws upon the answers she has gotten to the above questions. Each of the animals used in the lesson will be related to one of the questions.
2. Our first example is the kangaroo and his (or, rather, her) pouch. We have no built-in suitcase to carry our baggage, but the kangaroo has a pouch. The mother kangaroo carries her young in it when they are not yet ready to walk by themselves. Another example of an animal with a built-in suitcase is the squirrel. He can carry many more nuts in his cheeks than we would expect. Of course, he cannot carry a shopping bag for his food.
3. Our next example is the woodpecker. None of us could or would use our noses to bore a hole in a tree, but the woodpecker is able to because of his special tool.

The woodpecker finds his food, insects, in the trunks of trees. To get to them, he must drill a hole in the tree. His beak has a chisel-shaped point for this purpose. The beak and head of the bird are so constructed that they can take the shock of his constant pecking.

4. When the doctor uses a hypodermic needle to give us a shot, he puts the needle under our skin to put in something. But when you find a mosquito bite on your skin, you will know that a needle has been put in to take something out. The mosquito's food is blood. He only needs a little, but he must get to it. For this, nature has given him a little set of tools. He really does not bite for he has no teeth. Here is what he does. He uses two little needles to make a tiny hole in the skin. Into the hole goes a small tube like a straw through which a very little bit of blood is drawn.
5. When we look at a big thick tree trunk, we feel sure that it would take a strong tool to cut through it. None of us would try to do it with our teeth. Beavers, however, have teeth that were made for this. The beaver uses his teeth to cut down trees so that he can build dams. His teeth are very strong and sharp so that they can do the job.
6. We can think of several ways to make a boat move. There are paddles and oars, sails, and propellers. The fish is equipped with paddles which are his fins. His tail can move from side to side and steer him. In addition, the tail acts as a propeller to add to his swimming power and speed.

Relating the facts to God:

1. We can see that there are many things which animals can do by themselves that we can only do with tools. God has equipped man to make and use tools. We are able to learn how to use nature. Animals must have everything provided for them and this God has done. This is because He is concerned for the welfare of His creatures.
2. Once again, we see the wonderful purpose in things. Perhaps, in the past, we wondered why the woodpecker hit his beak against trees or why mosquitos like us so much that they left so many marks. Now we know that these things all have purposes for the life of the animals.
3. Now that we realize how fortunate we are to be able to make and use tools, we are thankful to God for the abilities which He gave to us.

Creative activity:

The students work independently. Each makes a picture-chart based on the examples used in the lesson. In each case, the child illustrates the animal discussed and a human being performing a similar task with human artifacts. The pictures will be as follows:

1. Kangaroo with young - person carrying suitcase or wheeling baby buggy.
2. Woodpecker perched on tree - man drilling through board.
3. Fish swimming - rowboat or canoe being used.
4. Beaver felling tree - lumberjack felling tree with saw or axe.

Jewish source:

"The Lord spoke to Moses, saying: 'See, I have singled out by name Bezalel, son of Uri son of Hur, of the tribe of Judah. I have endowed him with a divine spirit of skill, ability, and knowledge in every kind of craft: to make designs for work in gold, silver, and copper; to cut stones for setting and to carve wood -- to work in every kind of craft.'" (Exodus 31.1-5)

Supplementary materials:

Animal Tools, pp. 28f., 44-48, 56-58, 86.
The Golden Book of Science, pp. 16-18.

Assignment for next week:

See if you can discover the answers to these questions:

1. What animal is equipped with its own fly swatter?
2. What animal has its own flashlight?
3. What animal can make thread?

Can you think of any other examples of animals that have special tools?

UNIT IV

Lesson 3

Objectives:

A. Facts involved
1. Some animals' appearances make them blend into the natural surroundings in which they live so that they are hard to see.
2. Some use this gift for protection from their enemies. Others use it so as to catch their prey more easily.
3. Some animals practice mimicry. This means that they look and/or act like other animals. Thus, an animal which is a natural food for another creature may mimic another animal which is distasteful to that creature.
4. Some animals can even change their colors when they change their surroundings.

B. Insights to be developed:
1. Even though we take the various appearances of animals for granted, they offer great value to the animals. They exhibit another aspect of purposeful creation.
2. We see God's concern for the small, slow or otherwise vulnerable creatures in that even they have some means of protection from their enemies.

Motivation:

Do you recall our discussion of the colors and the shapes of flowers? We learned that they are made as they are to attract the attention of insects. Their purpose is to make the flower noticeable. Some things in nature use color for just the opposite purpose. They hide from their enemies by being almost invisible in their surroundings. Today we are going to learn about some of these animals and their protective coloring.

Lesson development:

1. One very good example of coloring for protection is the coloring of a deer. Its coat is a reddish-brown which blends into the leaves and the ground of the woods. The baby deer is protected by his mother in many ways, but the most common is for her to make him lie still on a pile of leaves. He has white spots on his coat so that he looks like a pile of leaves on which the sun is shining through the trees.
2. A very unusual example of this is the weasel. The weasel is a furry woods animal whose coat changes its color with the seasons. In the warm days of spring,

summer and early fall, its fur is dark to blend with the dark ground on which it lives. When winter and its white snows come, the weasel's coat changes to a soft white fur. Now it again blends with its surroundings. When its coat changes, so does its name. we call the weasel an ermine when its coat is white.

3. Some animals are protected by their appearance even though they are not made invisible by it. Instead, these animals look or act like other creatures which their enemies will not harm. An example of this is the viceroy moth. It would be very desirable food for birds, but they never eat it. It is protected because it looks just like the monarch butterfly, an insect the birds know tastes bitter. There are other insects which look and act like bees or wasps so that other animals, afraid of being stung, will leave them alone. This is called mimicry.
4. You may have seen the lizards that we often call chameleons. A chameleon is protected by his coloring, but he has an added ability. He can change his color. His skin has the capacity to change from brown to green depending on the surface he is on. Thus, on the trunk of a tree or on a twig, he is brown. When he moves to a leaf, in a few minutes he will turn green to blend with it. This hides him from enemies and makes it easier for him to catch insects to eat. They come near him because they do not realize he is there.
5. Looking at the tiger in a zoo, you would not think his coloring was an aid to him. His bright orange and dark black stripes are easy to see. But when he is in grassy lands where he lives, his stripes look like swaying stalks in the wind. He can trail his prey for miles through the jungle without ever being noticed. This is how he gets his food.

Relating the facts to God:

1. We see the different colors of animals and think little of them, but God has given them these colors for definite and valuable purposes. This shows another example of purpose in God's creation of the world.
2. If God were not concerned for His creatures, he could have given them all the same coloring. Then, the strong would kill the weak, the swift would kill the slow, and the large would kill the small. Very soon, only a few kinds of animals would survive. But God has protected each creature in some way so that it has a chance to survive and reproduce its kind. Thus, it does not become extinct.
3. We might remember how fortunate we are. We have no protective coloring, but God has given us the ability to protect ourselves in many other ways.

Creative activity:

This lesson lends itself to finger-painting. The use of a single color paint to represent an animal and the background into which it blends will reinforce the lesson. The children may make green trees with lizards on them. They may make a forest scene with a baby deer in it. Any number of examples may be used.

Jewish sources:

Our concern is with the protection which God gives His creatures out of concern for them. Thus, the following example, while not related to protective coloring, is evidence of the idea of God's protective concern.

> "And of all that lives, of all flesh, you shall take two of each into the ark to keep alive with you.... From birds of every kind, cattle of every kind, every creeping thing on earth, two of each shall come to you to stay alive." (Genesis 6.19f.)

Supplementary sources:

Animal Masquerade (Useful for its illustrations.)
The Golden Book of Science, p. 29.
Wonders of Animal Disguises, pp. 25f., 49-57.
The World We Live In, pp. 125f., 156-159, 170, 175.

Assignment for next week:

What sort of special advantages do the following animals have by their coloring?

1. Polar bear.
2. Frog.
3. Rabbit.

Write a short paragraph about one of them and how his coloring helps him live.

UNIT IV

Lesson 4

Objectives:

A. Facts involved:
1. The flying fish lives near the surface of tropical oceans. Its specially adapted pectoral fins enable it to "fly" or glide several hundred feet through the air.
2. The archer fish lives in swamps and canals in Asia. It catches insects for food by "shooting" them off leaves above the water. It shoots drops of water at them with great accuracy.
3. The angler fish lives in the deepest part of the ocean where it is completely dark. It catches other fish for food by attracting them with its "illuminated fishing rod."
4. All fish share one adaptation that other animals neither need nor have. They can extract oxygen from water so that they can survive without need to come out into the atmosphere.

B. Insights to be developed:
1. How silly it would be if a fox had gills for underwater living but no other equipment for it! In nature, we find that animals have those special features that they need for their environments. God has given each creature what it needs for its life.

Motivation:

What animal is the best marksman? Is it a fish, a bird, or an insect? Or did you know that there is an animal that shoots? What animal goes fishing with a fishing rod? Do only birds fly? These are some of the questions we are going to answer today as we look at the wonderful world of fish.

Lesson development:

1. In tropical seas, a traveller may see fish flying through the air. They are called "flying fish." They are able to act very much like the toy gliders you have seen. The teacher may bring a toy glider to class to show how its wings catch the air and cause it to glide. The fins of the flying fish are large and can be spread out. When the fish wants to escape an enemy, it swims rapidly along the surface, gives a flip of its tail to get into the air, spreads its "wings," and glides for as much as a hundred yards.

2. Have you ever been to a carnival or amusement park and seen a game in which you knock down a target by shooting a water gun at it? There is a fish that makes its living that way. It is called the archer fish, and it lives in swamps and canals in Asia. The food it likes is insects, but insects do not live in the water. It must get them there. It does this by shooting drops of water at insects on leaves above the water. When the archer fish sees an insect on a leaf, it takes a drop of water in its snout and fires. It is very accurate, and the insect is usually knocked into the water where the fish eats it. An archer fish has been known to put out a lit cigarette with one shot. It must have thought it was a firefly.
3. In the deepest part of the ocean, there is no light at all. As a result, many of the fish that live there are equipped with their own lights on different parts of their bodies. One of the most unusual is the angler fish. An angler is a fisherman and so is this fish. It has a rod attached to its head. On the end of the rod is a light. It uses the light to attract the attention of a fish that it will eat. As the fish follows the light, the angler fish bends the rod down toward its own mouth. When the fish gets close enough, the angler fish eats it.
4. So far we have talked about very special kinds of fish, but all fish have one thing that we do not have. You recall that we need oxygen from the air to live. So do fish, but they do not live in the air. How do they get oxygen? There is oxygen in water. We cannot breathe in oxygen from water, but fish can. They have openings on either side of their heads through which water passes. As it goes through, they are able to take out the oxygen that they need. These openings are called gills. The teacher may want to have a goldfish on display so that the students can see how the gills look and operate.

Relating the facts to God:

1. Land animals such as people or dogs or birds cannot breathe under water, but they do not have to for they live in air. Fish cannot breathe in air, but they do not have to for they live in water. God has given each animal the powers and abilities it needs to live in its own home. Those that need special abilities such as the archer fish or angler fish have been given what they require. God has created a world in which each creature is able to live in its environment.

Creative activity:

Because of the uniqueness of the fish that were discussed in the lesson and because it is unlikely that the children have ever seen them, the children can be urged to draw pictures which represent their conceptions of an archer fishing shooting insects, a flying fish in the air, and an angler fish catching its food. When they have done so, the teacher can show them actual pictures of these creatures which may be found in the books listed under "Supplementary sources." The archer fish is on page 39 of All About Fish; the angler fish is on a page near the end of See Through The Sea which has no page numbers; and the flying fish is on a middle page of the same book.

Jewish source:

The story of the fox and the fish from the Talmud. (Rabbinic Stories for Christian Ministers and Teachers, pp. 132-133.)

Supplementary sources:

All About Fish, pp. 8, 29-46.
The Golden Book of Science, p. 24.
See Through The Sea.

Assignment for next week:

Find out what you can about another unusual creature of the water called the electric eel. Look in an encyclopedia at school or another book on fish.

UNIT IV

Lesson 5

Objectives:

A. Facts involved:
1. We depend upon animals for a great many of our necessities and luxuries.
2. We keep warm by wearing clothing made from the wool of sheep and other animals.
3. We eat the eggs of chickens, drink the milk of cows, and the meat of many animals.
4. We wear comfortable and beautiful clothing made of fibers created by the silkworm.
5. There are still places we cannot travel by car or other means so that we must use animal transportation.

B. Insights to be developed:
1. If man had been created as the only living creature on the earth, he probably would not have survived. Many of his needs are fulfilled by the other animals of the earth. God has made us dependent on other forms of life for our own survival, but He has provided those forms of life for us, and we have learned to take advantage of them.

Motivation:

Did any of you see a cow this week? Did you drink any cow's milk? Did you see a lamb or a sheep this week? Did you wear a woolen sweater or coat or woolen socks?

We may use things each day that came from animals even though we have not seen those animals. The truth is that, without animals, our lives would be very greatly different from what they are. Today we are going to talk about the animals on which we depend.

Lesson development:

1. The teacher shows the class of ball of woolen yarn and a woolen sweater. This sweater was made from yarn just like this. From what was the yarn made? It was made from wool. Wool is the hair on a sheep and some other animals. When it grows out to a sufficient length, it is clipped off in much the same way that a barber cuts boys' hair when they need it. Instead of sweeping the hair out as they do in barber shops, the wool is gathered and sent to a mill where it is spun into strong yarn like this or into

thinner threads. These can be knitted or woven into woolen clothes to keep us warm and comfortable. The sheep, in the meanwhile, goes back to his pasture to eat grass and romp for a while until his wool grows out again and is ready for shearing.

2. Let's take a look at a few things on the day's menu in an imaginary kitchen. For breakfast, there will be eggs and milk. Lunch will include tuna fish salad. Dinner will include roast beef as a main course. Now, where are we going to get all these things? At a grocery, we find them on the shelves or in the cases ready for us, but where do they come from originally? Eggs are from chickens. Many animals lay eggs out of which will come little animals. Farmers who raise chickens will gather some of the eggs so that we will have eggs for food. They will leave many others, however, so that new little chickens will be born. The milk that we drink comes from cows. Cows, like many other animals, make milk inside them so that their babies will be nourished when they are young. The teacher may show a picture of a calf or colt being suckled by its mother. The farmer will take some of the milk for people to drink or make into butter and cheese. Never will he take milk from the cow that is needed for her calves. That tuna fish salad for lunch has tuna fish as its main ingredient. Tuna fish swim in the oceans off our coast. Fishermen go out each day to catch some of them for food for us. They make certain that there are always many more left swimming in the ocean. Finally, dinner brings us roast beef. Just as all animals eat either plants or other animals or both, so do we. Roast beef is part of another animal, the cow. The cow eats grass, a green plant that makes food. The cow, then, is nourished by plant food. When we eat roast beef, we are being nourished by plant food "once removed."
3. When the weather is not so cold that we need to wear woolen clothes, we may wear clothes made of silk. Do you know where silk comes from? It is made in tiny threads by little worms from China. They are called silkworms. These worms wind themselves into the very thin silk threads that they make from their body. One little worm may make a mile or two of thread wound so tightly around his body that the whole little package is the size of a peanut. Workers, then, unwind the silk from the worm and spin it into stronger thread. The thread may be woven into fabric for dresses, shirts, and many other kinds of clothes. Thus, our silk clothes come from the "clothing" of a little worm that it makes for itself.

4. There is another important way that animals serve some people. In parts of the world, cars cannot travel because of the kind of land there is such as mountains or deserts or swamps. In many places, people have no cars. They often use animals to take them from place to place. In the desert, the camel is used to carry burdens from one place to another and to carry people on its back. It can walk easily along the sand for long periods of time without getting hungry or thirsty. In high mountains, there are animals who can walk carefully along steep grades and narrow ledges while carrying burdens or people. We all know of people who ride horses to get them from one place to another. Many times, this is done for fun, but sometimes it is necessary. Finally, we have heard of the strong dogs in the snows of the north which pull sleds carrying people and supplies from one place to another. In all these cases, people rely on animals to help them do things that they cannot do by themselves.

Relating the facts to God:

1. In many ways, man is the most gifted of all the creatures on earth, but even he needs other creatures to help him survive and live comfortably. God could have put us on earth alone so that we would have to do everything for ourselves. We would have had no eggs, no cow's milk, no meat, no woolen clothes, and no other products of the animals. God has been good to us by creating the animals along with us. We have learned to take advantage of what they give us, and, at the same, time, we have learned to care for and protect them so that they survive to continue providing for our wants.

Creative activity:

The children can be divided into groups for the purpose of preparing exhibits for the room. The exhibits would come under the general heading, "Animals That We Need." One exhibit might deal with food and include a menu for a day with stand-up or colored figures showing the origins of the food. Another might portray people in different types of clothing coming from animals with accompanying representations of the animals as they live naturally. Still another might deal with animal transportation. The full range of arts and crafts may be employed in the making of these exhibits depending only on the ability of the children and the materials available.

Jewish source:

The story of Noah and the ark in which the raven and the dove are used for "recconaissance agents" to find dry land. (Genesis 8.6-12)

Supplementary sources:

Animals That Clothe Us, pp. 5-17.
The Golden Book of Science, p. 16.

Assignment for next week:

Ask your parents to help you make a list of those things you eat, wear, or use this week which are originally from animals.

UNIT V

The Wonder of Us

UNIT V

Lesson 1

Objectives:

A. Facts involved:
1. Many creatures are physically superior to the human being in one way or another, yet man has been able to surpass most of them even in their own "specialties."
2. Certain physical and mental endowments have enabled man to do this.
3. Among the most important of these are his erect posture which frees his arms for other work than transportation and his grasping hand with its opposing thumb. The latter enables man to be a tool-maker and a tool-user.

B. Insights to be developed:
1. God has endowed us very specially so that we are the most versatile of creatures and are able to improve on our natural gifts.
2. We are grateful to God for blessing us so that we can live as we do.

Motivation:

What animal can cut down a tree? What animal can fly through the air? What animal can drill a hole in a tree trunk? What animal can move fast over land? Your answers to these questions might have been this list which I am putting on the board:

BEAVER
BIRD, BAT, INSECT
WOODPECKER
HORSE

Those animals all answer the questions that I asked. But the same questions could be answered with just one word. That word is "PEOPLE." I will put it on the board next to our list. People do not have the teeth of the beaver, the wings of birds, bats, and insects, the beak of a woodpecker, or the running speed of a horse, yet they can match all of them. How is this possible? It is possible because we can make tools and use them to do what other animals can do naturally. Today we are going to talk about our special ability to do all kinds of things because we can make and use tools.

Lesson development:

1. Think of a bird that can soar through the air!! How many legs does it have? Only two legs to a bird so that when it stands on a limb or on the ground, it must use them to keep it upright. What might be considered its arms are its wings. They cannot be used as we use our arms and hands. If you gave a bird a hammer or a saw or a pencil, it could do nothing with it because it has no hands and arms to work with.
2. Think of a dog or a cat!! It has four legs, and it may be able to stand up for a short time on only its back legs. But what are its paws like? Can it pick up a pencil in one paw? Could it use a knife and fork in its paws? No. It has no hands for such purposes.
3. Most animals must use both their legs and "arms" for standing and walking. Even if they can free their "arms," they have no hands to use as we do. Thus, they must depend on what they have naturally. The beaver cannot use a saw on trees; it can only use his teeth. The bird cannot make an airplane and fly it; it can only fly with its wings. The woodpecker cannot use a drill to bore holes in tree; it must use its beak. Most animals cannot rise above their own natural endowments. They cannot make and use tools to do things that they cannot do alone.
4. People are much different. For one thing, after the first year or so of life, we can stand and walk on two legs. We do not have to use our arms and hands to support ourselves. If we did, our whole lives would be completely different from what they are.
5. Because our arms and hands are free, we can use them. How can we use them to do things for which we are not physically equipped such as cutting down trees or boring holes in wood or flying? We use them by making tools and machines to do these things. For this, we have a very special built-in tool, our hands.
6. Most animals do not have hands at all like ours. The most special thing about our hands is our thumbs. Do you know how important your thumbs are? Let's try a few experiments. Pick up your pencil and write your name on a sheet of paper without using your thumb at all. Hard, isn't it? Imagine how hard it would be to hold a little nail in place while you were hammering it into a board if you had no thumbs. If you are wearing a shirt or sweater with buttons, try to button or unbutton one button without using your thumb. Can you do it? Is it easy? Our thumbs are very, very important to us.
7. The very first people on earth many years ago probably used only their own bodies to do work. As a result, they found that they could not do some things that

they wanted to do. For example, they might have seen tasty looking fruit in the top branches of a tree, but they could not climb up to get it. Or they might have been surrounded by many animals which could serve as food, but they could not catch the animals when they ran after them. They had many disadvantages, and they had not learned of the advantages they had.

8. Then, one man may have discovered that he could pick up a stone and throw it at an animal. If he hit the animal, he could catch it for food. Later, someone may have learned to sharpen the stone and attach it to a stick to make a spear. Then it would sail farther when it was thrown. Perhaps, someone learned how to tie several sticks together to reach up high into the trees to knock down the fruit. Slowly, the first people learned to make and use tools.
9. Today, we have an amazing number of tools and machines to help us do things we could not do ourselves. We have airplanes and cars, vacuum cleaners and television sets, refrigerators and ranges. None of them could have been built and used if it were not for our ability to stand on two legs and to use our hands as we do.
10. It is helpful in illustrating the lesson if the teacher can display pictures or models of primitive tools.

Relating the facts to God:

1. When we realize how many of the helpful things we have and use and how many of the things we do depend on our two abilities to stand erect and to grasp with our hands, we are very grateful to God for giving us these blessings. Even though another animal may be naturally able to do something we cannot do, we are able, because of our special gifts from God, to do the same thing with tools and machines.

Creative activity:

The children may enjoy being "primitive man" for a while and attempting to solve his problems as he had to. The teacher will have collected a number of variously shaped stones and some sticks of different lengths. She will also bring string which, she explains, was available to the caveman in the form of vines. She poses the various problems of tool-making to the children. For example, a tool to hammer or pound, a tool to hunt animals, a tool to dig holes, etc. are needed. How shall she go about making them from the materials she has brought with her? She can encourage the children to be as inventive as they can in solving the problems and directing her.

Jewish source:

"Establish Thou also upon us the work of our hands;
Yea, the work of our hands establish Thou it."
(Psalms 90.17)

Supplementary sources:

The First Book of Stone Age Man, pp. 5-9.
First Men: The Story of Human Beginnings, pp. 43-51.
The Golden Book of Science, pp. 76-78.
How Miracles Abound, pp. 183-195.

Assignment for next week:

Make a list of some of the things you do or the tools you use this week that require the type of hand that people have.

UNIT V

Lesson 2

Objectives:

A. Facts involved:
1. The brain of the human being has certain capacities that enable man to achieve goals far beyond his mere physical capacities.
2. Man is able to remember facts and apply them to different situations. He can approach a problem which has never confronted him before and set about solving it by applying what he has learned in other cases.

B. Insights to be developed:
1. God has given man the ability to change the world around him and to deal with that world that reason. Because of this, man can live more comfortably and is more adaptable to new situations. We are grateful to God because He has blessed us with the ability to think and learn and do things in new and better ways. He has given us the power to invent.

Motivation:

Just imagine yourself in this spot!! You do not know how to swim. You are travelling on foot from one town to another. You come to a stream of water too deep to wade across. There is a log lying next to the bank of the stream. The log is just a little longer than the stream is wide. How will you get across? Do you see how? You put one end of the log on your side of the stream and the other end on the other side. Then you can just walk across on the log.

Let's try another problem. You are at home, and the phone rings. You answer and are told that someone wants your mother to call a certain number as soon as she comes home. The person tells you the number, and you want to write it down so you do not forget. There is no pencil or pen handy. You do have a piece of clay and a short stick. How will you solve your problem of writing down the number? That's right. You flatten the piece of clay, and then you use the stick to "write" the number on it.

In both problems, the stream of water and the phone number, you have had to invent a solution to your problem. One of the greatest things about being human is that our brains are able to invent new things. Today we are going to talk about that wonderful feature of people, the ability to invent.

Lesson development:

1. We know that animals can learn some things. For

example, you may have taught your dog to sit up and beg for food. By giving him a dog biscuit every time he does it, you teach him that he is rewarded for doing it. A monkey may be taught to ride a bicycle or roller skate. But other animals only learn things exactly as they are taught. A monkey who wanted to go to another city would not think of putting on roller skates to get there faster. A dog who can sit up and beg for food would not think of begging for money to buy food or begging for a new collar or leash. When animals learn, they usually learn exactly what is taught and cannot apply it to any other situation.

2. People are different. The problems we talked about with the log and the clay are examples. People learn things by experience, but they can use that experience later to solve other problems. In the case of the clay, for example, you knew that you needed to make some marks on something to show the phone number for your mother to call. You knew that the usual way to make those marks was with a pencil or pen on paper, but you did not have these. You knew, also, that you could make marks in clay by using a stick to dent the surface. You applied this fact to your problem and wrote the number in the clay. You invented a new way to do something because the old way was not possible.
3. You probably thought that inventions were only machines like the telephone or television or the light bulb, but an invention is any new or different way of doing something. Can you name some inventions that you have made? Perhaps you broke a shoe lace while you were at school. Did you invent a way of replacing it until you got a new one? Have you ever invented a new game with your friends when you got tired of all the old ones?
4. Let's think of some of the big inventions that we know of. How about the car? Why do you suppose anyone went to the trouble of inventing an auto when they already had horses and buggies? Why do you think airplanes were invented? Where did the inventors get the idea that they applied to their problem? What about the electric light bulb? Perhaps Mr. Edison had seen a wire get hot and glow when it carried an electric current. Maybe he thought to himself that this could be applied to the problem of getting better lighting for streets and houses. Do you see how people invent the things they need? They see a problem to be solved. They find that the old ways are not good enough or that there are no old ways. They remember something they have done or seen that might apply to the problem. They use that knowledge to invent a solution.
5. If it were not for man's ability to think about things he has learned and apply them to problems, our life would be completely different and much less comfortable.

Relating the facts to God:

1. God has given each animal certain knowledge or instincts so that it can do the necessary things to survive. To us, he has given the ability to learn and apply new knowledge and ideas. When we find a new problem, we are able to invent a new solution. We thank God for this ability. It makes our life so very enjoyable and comfortable.

Creative activity:

The teacher shows the class three small rubber balls and four boxes of varying sizes. She divides the class into groups of three or four students each. She explains to the class the problem to be solved. We want to invent a new game to play. We have these boxes and balls to use for our invention. Each group is to discuss the possibilities for inventing a game, and, after about five minutes of discussion, each group will demonstrate to the class the game they have invented complete with scoring, rules, etc.

A variation on this is to present the same problem and to give each group a different set of materials to work with. One may get the boxes and balls. Another may be given yardsticks and balloons. Another may be given a sheet of large paper, crayons, and checkers. The possibilities are unending, but the teacher should have in mind, in each case, a possible solution for the problem.

Jewish source:

"The Blemish On The Diamond" -- the story of a jeweler faced with the task of removing a scratch from a large gem. His solution is that, since the scratch cannot be removed, he will use it. Using the scratch as the stem, he engraves a beautiful rose on the face of the stone. (101 Jewish Stories for Schools, Clubs and Camps, pp. 26-27)

Supplementary sources:

The First Book of Stone Age Man, p. 7.

Assignment for next week:

Solve this problem with a new invention of your own. You are playing a card game with a friend. You find that one of the cards in the game is missing. What will you do?

UNIT V

Lesson 3

Objectives:

A. Facts involved:
1. A number of animals have means for communicating with one another, but their communication is limited to a very few things, e.g., warning, signalling the discovery of food, mating.
2. A few animals, notably the parrot, can be taught to speak, but the words have no real meaning for them.
3. A great deal of man's way of life is based on three special abilities he has. He can think in ideas; he can create sounds to represent those ideas; and he has an ability to make a great many different sounds to communicate his ideas.
4. Because man can speak and write ideas, one person can share his learning with other people so all will benefit. With written language, he can even share his ideas with people whom he will never see or meet.

B. Insights to be developed:
1. Even when an animal learns something, it has no way to teach it to other animals. Without communication, man would have the same problem. Each man would have to discover everything for himself instead of learning about the discoveries of others. God has given us the ability to tell other people what we know and to learn from them the things that they know. He has enabled us to develop continually more knowledge and continually higher ways of life.

Motivation:

Have you ever heard a parrot or a parakeet talk? What did it say? How do you suppose it knew what to say? What if you asked it a question such as "How much is two plus two?" Could it add them up to get a sum of four? If a parrot were only taught the words "Polly wants a cracker," what would it answer if asked "How do you feel?" Do the words really have any meaning to the parrot or is it just imitating what it has heard over and over again?

There are some ways in which animals signal each other. There are animals like the parrot that can be taught to sound words. But none of them can communicate like you and I do. Today we will talk about people and the wonder of communication. Of all the animals, only we are able to make up new words to stand for new ideas and tell them to other people.

Lesson development:

1. How does a little baby let his parents know that he is hungry or thirsty or too cold or too warm? He cries. His crying is very much the same in each case. He cannot speak to them in words to tell them exactly what he wants. As he gets older, he learns to talk and to say words that tell what he wants or needs. Eventually, he makes sentences that can tell many different things. People can talk their ideas. They can tell other people what they are thinking.
2. Some animals can give signals to other animals. For example, a beaver may slap its tail against the water when it sees danger. Other beavers hear the splash and know that it is a warning. But the beaver cannot tell the others anything else. That is the only thing it can "say." Many birds sing to tell other birds where they are and to attract them to that place. But their song is the same each time, and it means the same thing each time to the other birds.
3. People make words out of sounds to stand for different ideas. I may say to you, "What is it like outside?" You know that I am asking about the weather, and you answer, "It is snowing out." I understand that you mean that white flakes of almost frozen water are falling. I have communicated an idea to you, and you have communicated an idea to me. We understand each other's words. We talk in a language of sounds that stand for ideas.
4. How are we able to do this? Our brains are such that we think in ideas, and we can attach sounds to them. When we agree to the meaning of a certain sound, that is, when we both decide that the sound "rain" means water falling from clouds, we can talk to each other. Because we are able to make many different sounds, we can have a lot of words to stand for a lot of ideas.
5. If our language were only sounds, then we could only share ideas with people around us. We could not share ideas with people in another town or another country. We could not share ideas with people in the future. We could not learn the ideas of the people of the past. For these purposes, we have a written language. We have agreed that certain marks stand for certain sounds which stand for certain ideas. I will make some marks on the board. Tell me what they mean. The teacher writes "CAT." What do the marks mean? What is the idea that they stand for? This is how we share ideas with people far away or in the past or in the future. We may read a book printed many years ago or a letter written miles away and learn the ideas of the person who wrote each.
6. Much of our way of life depends on our ability to share ideas through writing and speaking.

Relating the facts to God:

1. God has given us still another extra blessing that the other animals do not have. We are able to benefit from the thoughts of other people through speech and language. A man in Baltimore may invent a new game which we would enjoy playing. He writes out the rules and describes the game and sends his writing to us. Now we can play the game.
2. God has given us the power of speech, the brain to think ideas, and the ability to make language. We do not have to do everything for ourselves and learn everything from our own experience. If someone finds a better way of doing something in one place, he can tell us about it and help us. If we want something, we can say exactly what we want. Even though a person with many good ideas may die, he can leave us his ideas in books and letters.
3. We are happy that God has been so good to us and given us the ability to share ideas with each other.

Creative activity:

A language is nothing more than signs that are agreed upon to stand for sounds that are agreed upon to stand for ideas. A good example of this is in the use of codes. The teacher explains that a code is a language that stands for another language. She writes the following code table on the board.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Z Y X W V U T S R Q P O N M L K J I H G F E D C B A

The letter on the bottom will stand for the letter on top. Thus, the word "CAT" will be written as "XZG." Each child is to write his name in the code. The papers are passed to the teacher who writes each one on the board. The children must decipher the name from the code.

Jewish source:

The story of the Tower of Babel. (Genesis 11.1-9)

Supplementary sources:

The First Book of Stone Age Man, pp. 7-9.
The Language of Animals, pp. 41-44.

Assignment for next week:

None.

UNIT V

Lesson 4

Objectives:

A. Facts involved:
1. Man is the only creature who can consciously and purposefully create beauty.
2. Man is the only creature who is aware of and capable of a vast range of emotions.
3. Man is the creature who makes much more out of life than what is offered by his appreciation and awareness of beauty, love, wonder, right, and joy.

B. Insights to be developed:
1. All animals are blessed by God with the ability to live their lives. They can obtain what they need to live -- oxygen, water, and food. With these gifts they can survive.
2. But God has made man more than a "survivor." We have not only minds but feelings and imaginations, ideas of good and bad, right and wrong, and many gifts that make our lives more than just existences. God has made us the highest creatures on earth, able to enjoy life and make it more enjoyable for ourselves and others. And we are aware of all this. God has made us very much like Him, for we, too, can be creators of wonderful things.

Motivation:

Have you ever been to a zoo or seen a movie in which you saw the beautiful feathers of the peacock? Did you ever listen to a bird singing and think of the beauty of its song? There are many beautiful things in nature. Did you ever ask yourself, however, does the peacock realize that its feathers are beautiful? Does the bird know that its song is very pretty? Did you ever think that, perhaps, we human beings are the only ones who know or who think of beauty in nature? It is very likely that we are. This is what we want to talk about today. Some things about people that just do not exist among the animals.

Lesson development:

1. What do you suppose would happen if you gave your dog or cat a box of crayons or a set of water colors? Do you think they would make pretty pictures? No. At best, they would probably eat them. What if you gave them pretty pictures to look at? Would they think they were pretty or just ignore them? Do they have the ability to see beauty? It is not likely.

2. Suppose that you took a robin into your house and tried to teach it a new song? Could it learn one? Would it care? Even if the new song were prettier than the robin's call, it would not understand the idea of songs being pretty. It sings what it sings because that is part of its nature.
3. Do animals know right from wrong? We may teach a dog not to get on the furniture, but does he stay off the furniture because he knows it is wrong or because he is afraid of punishment? What if we did not teach him? He would see nothing wrong with it. A tiger does not think of right and wrong when it attacks a smaller animal. Animals do not make judgments about right and wrong. Only human beings do that.
4. Have you ever seen an animal laugh? We may think that an animal is smiling or laughing at times, but it is not. Animals feel one of two ways. They are either satisfied or else they need and want something. People may feel sad or happy; they may laugh or cry about many things. People have many more feelings than animals.

Relating the facts to God:

1. It is certainly not true that God has not been good to animals. He has given them all that they need to live. We have learned of their tools for eating and other things. Animals are blessed by God.
2. People are especially blessed by God. Not only do we have the ability to get what we need to live, but we understand and feel certain things that make life even better. We can appreciate beautiful sights and sounds. We can feel very happy. We can feel a great deal of love for other people like our sisters and brothers or fathers and mothers. We also have ideas about right and wrong. Without anyone telling us in a specific situation, we have a sense of whether or not to do something.
3. All of these special gifts of God make man the highest and most blessed of all the creatures on earth. We thank God for our extra blessings.

Creative activity:

Each student is to demonstrate the human capacities discussed above. He is to make a list of the following things according to his judgment. They are as follows:

1. Someone whom he loves or likes very much.
2. Something that it is right to do.
3. Something that is beautiful.
4. Something that makes him happy.

5. Something that it is wrong to do.

When the children are finished, some of the items may be read to the class. They are asked if they agree on them. Most will agree to the statements of their classmates. This demonstrates something of the human ability to see various abstract qualities.

Jewish source:

"And God said: 'I will make man in My image after My likeness.'" (Genesis 1.26)

Supplementary sources:

None.

Assignment for next week:

Recall the things that we have learned this year about God and nature. Next week we will review them. I will ask you what we can know about God from the world that He created.

REVIEW LESSON

The teacher may have to give extra explanations to the children as they take the test. The object is as much for them to learn from it as for the teacher to see what they have learned.

1. When we thank God for our food, which of the following are we giving thanks for?

   (a) plants (b) rocks (c) stars

2. There are three things that all animals need to live and that God has supplied. One of them is:

   (a) language (b) wool (c) air

3. One difference between animals and people is that people can:

   (a) cut down trees (b) make tools (c) make food

4. God has made the earth spin around so that we have:

   (a) sunshine (b) day and night (c) air

5. One thing that God created and gave directly to us is:

   (a) houses (b) water (c) tools

6. Choose one of the following and tell how it is related to God and what it tells us about God.

   (a) Seeds.
   (b) Sunlight and heat.
   (c) Talking and writing.
   (d) Animal coloring.
   (e) Weather forecasts.

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FOOTNOTES

[1]Brichto, Myra. The God Around Us. New York: Union of American Hebrew Congregation, 1958.

[2]Kripke, Dorothy and Levin, Meyer. God and the Story of Judaism. New York: Behrman House, Inc., 1962.