

77

fairly safe

SCIENCE

ACTIVITIES

for illustrating

BIBLE

LESSONS

Donald B. DeYoung



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List of Lesson Activities and Themes

1. The actual size of the sun is measured with a ruler.
Gen. 1:16—The sun displays God’s majesty.
2. The design of a feather is explored.
Gen. 1:20—Feathers show God’s design.
3. Acids and bases are distinguished.
Gen. 1:28—The universe is orderly.
4. A mixture of salt and ice results in a very low temperature.
Gen. 2:1—God’s laws are dependable.
5. An artificial tree is made from paper.
Gen. 2:9—Creation is to be enjoyed.
6. Sound vibrations are made visible.
Gen. 4:21—Music is a gift from God.
7. A map is cut out to show continental separation.
Gen. 7:11—The Genesis flood was worldwide.
8. Colors are separated from light using a CD or DVD.
Gen. 9:13—Believing God’s promises
9. Sand grains are counted.
Gen. 22:17—God’s family is large and growing.

10. A stairway is built from blocks.
Gen. 28:12—We are always in touch with heaven.
11. An electric circuit is completed to light a bulb.
Exod. 9:16—Using God’s resources
12. Crystals are grown on a rock surface.
Num. 17:8—God makes a garden grow.
13. Paper loops make unusual shapes.
Deut. 29:29—God tells us what we need to know about life.
14. Various liquids and solids are mixed.
2 Kings 6:6—God has power over nature.
15. A magnetic field is made visible.
2 Kings 6:17—Realizing God’s power
16. Copper is plated onto a nail.
2 Kings 6:17—A host of angels defends the believer.
17. Light sticks are compared with fireflies.
Job 12:7–8—Creation teaches practical lessons.
18. Cans are crushed by the pressure of air.
Job 28:24–25—Believing the Bible
19. Water glasses are made to ring.
Job 35:10—Resting in the Lord
20. A magnifying lens is made with a water droplet.
Job 36:24—Creation evidence is always before our eyes.
21. Ink is added to water.
Job 37:13—God controls the weather.
22. Numbers in nature are explored.
Job 38:4—Created patterns show God’s fingerprint.
23. Sticks are balanced on one’s fingers.
Ps. 16:8—God provides stability in a changing world.
24. Light is separated into colors.
Ps. 19:1—God’s colorful artwork fills the skies.
25. The elliptical paths of planets are drawn.
Ps. 19:1—Planets obey God’s laws of motion.

26. A volunteer is tied up with tape.
Ps. 19:12–13—Forming good habits
27. One person wins a tug-of-war against several others.
Ps. 46:1—Using God’s resources
28. A lens is shown to invert objects.
Ps. 94:9—Eyesight is a precious gift from God.
29. Paper is folded several times.
Ps. 104:14—God cares for his creatures.
30. Sound is amplified with a pin and paper.
Ps. 139:14—The gift of hearing
31. The sense of touch is explored.
Prov. 3:5—We cannot always trust our own judgment.
32. Newspapers are torn in easy and difficult directions.
Prov. 3:6—Choosing direction in life
33. The properties of carbon dioxide are shown.
Prov. 14:12—The way to heaven
34. Eggs are safely tossed at a target.
Prov. 15:1—Self-control
35. Air pressure is observed.
Prov. 19:11—It pays to be patient.
36. Vinegar and baking soda make carbon dioxide gas.
Prov. 19:19—Controlling temper
37. Raisins are made to rise and fall in liquid.
Prov. 21:5—Seek the Lord’s direction.
38. A bucket of water is safely swung in a circle.
Prov. 29:25—Trusting in God
39. Groundwater is explored.
Eccles. 1:7—God supplies our daily needs.
40. Construction paper is bleached to a white color.
Isa. 1:18—God’s forgiveness is complete.
41. A blind spot is demonstrated.
Isa. 35:5—New life in Christ

42. A balloon is suspended in the air with a hair dryer.
Isa. 40:31—Using the Lord’s strength
43. The cooling effect of water is measured.
Ezek. 34:26—The creative design of water
44. Boiled and fresh eggs are compared.
Amos 3:3—Friendship with Christ
45. A stone and other objects are dissolved.
Hab. 3:6—God outlasts the mountains.
46. A burning candle is sealed inside a glass.
Matt. 5:15—The gospel must be shared.
47. A coin is dropped into a glass.
Matt. 24:40–41—Trusting in the Lord
48. Soda cans are compared by weight.
Matt. 25:32—God knows our hearts.
49. Water is made to swirl from one bottle to another.
Mark 4:39—Turning to God
50. Creative designs are constructed.
Mark 10:6—A special part of creation
51. Two plungers cannot be separated.
Mark 10:27—God is able to save us.
52. A boiled egg is pushed into an empty bottle.
Luke 11:24—Filling the heart with God
53. Eggshells support the weight of many books.
Luke 12:6—God’s tender care
54. Round and square shapes are compared.
Luke 19:4—God designed trees with strength.
55. Two pendulums affect each other in a curious way.
John 13:35—Giving help and encouragement
56. A single sheet of paper is cut to make a large doorway.
John 20:19—Realizing God’s presence
57. A downhill race is held between objects.
1 Cor. 9:24—Be faithful to God.

58. The colors within ink are observed.
1 Cor. 12:27—The church family
59. A mirror gives strange reflections.
1 Cor. 13:12—Understanding God’s plan
60. Rulers are dropped to measure short reaction times.
1 Cor. 15:51–52—Accepting the Lord
61. The force of expanding seeds breaks a jar.
2 Cor. 5:17—Sharing the gospel
62. Cotton is added to water.
Eph. 3:20—God blesses us beyond our imaginations.
63. A ball is swung in a circle and released.
Col. 1:17—A dependable universe
64. The apparent and actual depths of water are compared.
Col. 3:20—Obey your parents.
65. Pepper spreads out on water.
1 Tim. 6:11—Run from sin.
66. Surface tension of water is observed.
Heb. 1:3—God holds the universe together.
67. One balloon is popped inside another.
Heb. 4:12—Knowing ourselves
68. A comparison is made between hard water and soft water.
Heb. 4:13—Looking on the inside
69. A banana is sliced without being peeled.
Heb. 11:1—Understanding faith
70. A person swivels on a chair.
Heb. 12:1—Dropping things that hinder
71. A form of Silly Putty is made from cornstarch.
James 1:6, 8—An unstable person
72. An object floats or sinks in water.
James 3:4–5—The power of the tongue must be used wisely.
73. A large object is moved with a small push.
James 5:16—Prayer brings results.

74. Stalactites are grown.
2 Pet. 3:8—Creation was recent.
75. Objects are balanced in unusual ways.
2 Pet. 3:17—Keeping steady in the Lord
76. Water is separated into gases.
Rev. 14:7—Water displays God’s creative handiwork.
77. A sandwich bag is heated without melting.
Rev. 22:17—Accepting the gift of salvation

Introduction

Science object lessons are of interest to everyone from age five to ninety-five. Such lessons help our understanding of God's creation and his Word. This book began with three smaller volumes published by Baker Publishing Group under the title *Science and the Bible*. Each volume contained thirty simple object lessons with a Bible application. These earlier lessons are gathered here with many new ideas and activities for successful teaching.

This book contains seventy-seven Bible- and science-related activities. They have been used successfully with small and large groups, both young and old. With help, children can also perform most of the activities at home. Most people have an interest in science, even if they are somewhat intimidated by it. The creation in all its wonder calls out to our hearts and minds for attention. In these activities science ideas are used to illustrate biblical truth. The Lord Jesus freely used everyday objects to communicate his message, including rocks, water, sheep, and flowers.

One major danger with science activities is that they may be remembered while the Scripture lesson is lost. The goal of the presenter should be to reverse this common problem. The activity should be like a compass that points back to the Scripture challenge. When a similar object is seen by the listener weeks or even years later, it can again bring to mind the application of the related Bible lesson. For this reason, all the objects used in these activities are familiar and readily available. Each lesson is divided into three parts: a short Bible lesson,

an activity, and a science explanation. The latter is provided for those who want further background information and can be integrated in the actual presentation. Deletions and additions are also encouraged. The lessons are purposely not written for word-by-word repetition. Any effective lesson must be adapted to the presenter's own style.

No effort is made in the lessons to cover every possible aspect of the Christian life. Instead, these particular lessons are chosen to be of practical help for all ages. Every lesson can be made evangelistic with a proper introduction and ending challenge. The lessons include the Old and New Testaments. The New King James Version of Scripture is quoted for the most part.

If you have questions or comments about these activities, feel free to contact the author in care of Baker Publishing Group. It is my hope that this book will encourage the study and enjoyment of the Bible for all ages and that it will stimulate an awareness of the everyday details in God's creation that illustrate biblical truth.

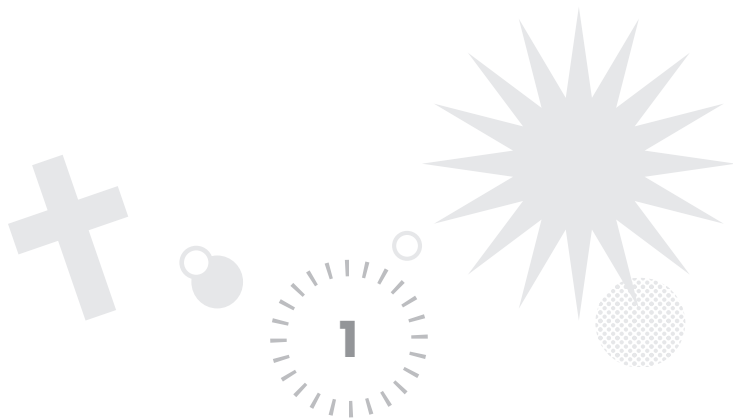
Ten Hints for Successful Science Object Lessons

1. Don't let activities "steal the show." Start with a presentation of the Scripture. Memorize it if possible. Emphasize the main point of the lesson at the conclusion so the audience will clearly remember it.
2. Practice the science activity ahead of time. Repetition helps bring a smooth delivery, and practice avoids surprises when you are in front of the group. Remember the five P's for object lessons: prior practice prevents poor presentations!
3. Double-check that all needed materials are present and arranged in convenient order. Small details add up to a confident and effective presentation.
4. Adapt activities and Bible lessons to your own situation and interests. Improvise with available materials; insert new ideas of local or current interest. Creativity will hold the attention of your listeners.
5. When unexpected results occur in an activity, laugh and build them into your presentation. The audience will understand and be on your side.

6. Read the background of the Scripture passages. If you are comfortable and familiar with the Bible story, your confidence will be apparent.
7. Good activities use everyday materials. When seen again months later, these items can trigger memory of the Bible lesson. Use of common items may also encourage the audience to try the activities for themselves, extending the learning process.
8. Many of the best activities involve a dramatic point: an unexpected result such as a popping balloon, or something that causes the audience to “ooh and aah.” Science activities should be alive and exciting.
9. Have the audience participate as much as possible. Instead of the lecture approach, help the listener be a part of the Scripture lesson and activity.
10. Safety for you and the audience is the highest priority in any science activity. Plan ahead for possible problems; don’t take chances. Know where a first aid kit is located. If the activity involves a flame, have a fire extinguisher nearby.

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How Large Is the Sun?

Theme: The sun displays God’s majesty.

Bible Verse: Then God made two great lights: the greater light to rule the day, and the lesser light to rule the night. He made the stars also. (Genesis 1:16)

Materials Needed:

- Ruler with millimeter markings
- Calculator
- Paper clip or straight pin
- Several index cards

Bible Lesson

The creation week was filled with miracle upon miracle as God formed the physical universe. On the fourth day the sun, moon, and stars were set in place. At this time the heavens were filled with a great variety of light sources. The last part of Genesis 1:16 is especially majestic, “He made the stars also.” These stars now are known to number in the billions of trillions. In fact, they comprise more than 99.9 percent of the physical creation. The average nighttime star is as large and bright as the sun. In other words, the sun itself is a star. It dominates

our sky and our lives simply because it is much closer to us than the many remote evening stars.

Consider the energy available in our sun. Solar energy is thought to be produced by nuclear fusion reactions. The result is continuous nuclear energy production on a scale vastly greater than all of the power plants on earth combined. In fact, every second the sun gives off much more energy than mankind has produced since the beginning of time. And the sun never stops shining; it is always sunrise somewhere on the earth. We benefit from this solar energy in the form of our pleasant morning light. The sun itself is not running out of energy in any perceptible way; its fuel gauge is still on “full.” The significance of Genesis 1:16 is clear: God has infinite amounts of energy available to himself, and he also placed unimaginable amounts in the sun and the stars. God is worthy of all our praise.

Science Activity

Participants will measure the actual size of the sun in a simple way. This activity must be done during the day and at a time when clouds do not hide the sun. First, a pinhole is punched in the center of an index card. This small hole can be made with a paper clip, pin, or pencil point. On a second index card, draw a small circle with a diameter of 2 millimeters, using a ruler and a pen or thin pencil. The circle should be near the center of the card and can be drawn freehand.

Now the punched card is held above the second card as shown in the illustration. Orient the cards in the direction of the sunlight, either while standing outdoors or inside near a window in the path of the sun’s rays. A small round image of the sun should appear on the lower card. The pinhole in the upper card acts somewhat like a lens to focus the sunlight. Now adjust the distance between the two cards until the sun’s image is roughly the same size as the 2-mm circle drawn on the lower card. While one person holds the cards steady, a second person then measures the cards’ separation, also in millimeters. Precision is not needed; let’s give this card separation distance the symbol x .

The actual diameter D of the sun can now be found by substituting the measured value of x into this formula,

$$D = \frac{186,000,000 \text{ miles}}{x}$$

If the x distance is in millimeters, the final answer for the sun's diameter D will be in miles. As a check on the answer, the accurate values are

$$\begin{aligned}x &= 215 \text{ mm (about 8.5 in.)} \\D &= 864,000 \text{ miles (or 1.4 million km)}\end{aligned}$$

Participants will usually get a sun diameter within 10 to 20 percent of the correct value. Differences are mainly due to the difficulty in accurately producing the 2-mm image of the sun on the lower card.

Emphasize the participants' accomplishment: they have measured the vast size of the sun using only a simple ruler! It may be worthwhile to show participants the origin of the formula used. It comes from the similar triangles shown in the figure. The large solar diameter, 864,000 miles, also is typical for many of the nighttime stars. This is a greater distance than many people travel in their entire lifetime. The creation is beyond our understanding, and truly it declares God's great glory and also his great love for us.

Science Explanation

The formula used to calculate the sun's diameter comes from a proportion based on similar triangles. From the figure,

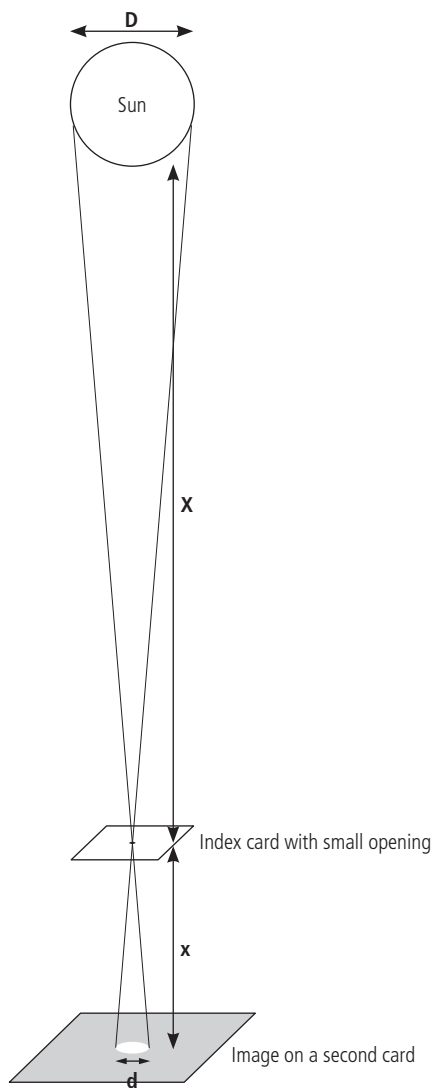
$$\frac{\text{Sun diameter } D}{\text{Image diameter } d} = \frac{\text{Sun-earth distance } X}{\text{Card separation } x}$$

Solving for D ,

$$D = \frac{d X}{x}$$

The sun-earth separation X averages 93,000,000 miles. If the image size d is adjusted to 2 millimeters, then

$$D = \frac{2 \text{ mm (93,000,000 miles)}}{x}$$



Sunlight passes through a small opening in the upper card, focusing as a small round image on the lower card. Note the narrow triangles with lengths X and x above and below the top card. The drawing is not to scale; the X distance actually is billions of times greater than x .

$$D = \frac{186,000,000 \text{ miles}}{x}$$

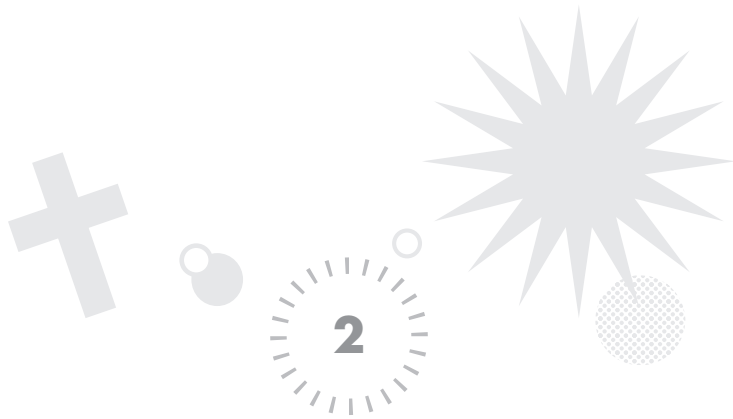
where x is measured in millimeters. Notice that the solar image size does not depend on the size of the pinhole but only on the distance between the cards.

One complicating factor is that the sun is about 2 percent closer to the earth during December and January, and 2 percent farther away during June and July. This variation in distance is due to the earth's elliptical orbit. A slightly smaller sun diameter might therefore be measured in summer when the sun is more distant from earth, and a slightly larger diameter in winter when the sun is closer. This earth-sun distance variation has little effect on our weather. It is the earth's tilt that causes our seasons, not the small change in earth-sun distance.

The pinhole measurement technique also can be used in the evening to measure the diameter of a bright full moon. The equation for moon diameter D with a 2-mm image is

$$D = \frac{477,000 \text{ miles}}{x}$$

The moon's actual diameter is 2,160 miles (3,456 kilometers). For this correct answer, the card separation x is 221 millimeters, or about 8.7 inches. Our moon is about 4 times smaller than the earth and 400 times smaller than the sun.



Inside a Feather

Theme: Feathers show God’s design.

Bible Verse: Then God said, “Let the waters abound with an abundance of living creatures, and let birds fly above the earth across the face of the firmament of the heavens.” (Genesis 1:20)

Materials Needed:

- Several feathers (often sold in craft stores)
- Water
- Dish soap

Bible Lesson

This world is filled with the Creator’s handiwork, especially seen in living creatures. Our Bible verse describes the first animal life that appeared on earth, including the sea creatures and the birds. They were supernaturally made in great abundance on the fifth day of the creation. These first animals were not primitive ancestors of today’s life. Instead, they were made in all of their intricate complexity. In particular, birds show God’s careful attention to detail. Flight in nature is a marvel of engineering. The smallest flying insect displays a

greater ability to take off, maneuver, and land than even our most advanced military aircraft.

One day in 1948, the Swiss engineer Georges de Mestral was walking his dog in the woods. Arriving back home, he noticed cockleburs caught in the dog's fur coat. These are round seedpods with a prickly surface that readily cling to clothing or animal fur upon contact. Closer inspection showed tiny hooks on the ends of the burrs. From this finding, de Mestral invented the Velcro fastener made of tiny nylon hooks and loops. Velcro has been called one of the great inventions of the past century, but this fastener actually has been around since the creation of cockleburs. Bird feathers show a similar fastener design in the connections of their side vanes. These are explored in our science activity.

What additional useful ideas remain in nature, awaiting discovery? Surely there are many. God planned all the parts of our world, complete with endless applications and benefits for us to discover and utilize.

Science Activity

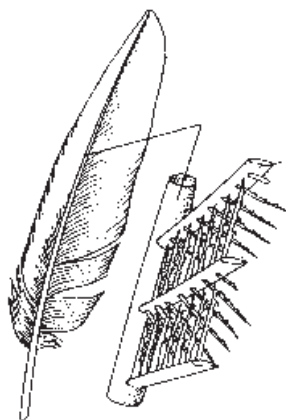
This activity works best if a feather can be given to each person or to selected participants. Packages of colored feathers are often sold in the craft departments of stores. Feathers found in the outdoors probably should not be used since they may not be clean. Note that feathers have a solid, waterproof surface. They provide excellent lightweight insulation. Hold a feather up before the audience and show how the side vanes can be pulled completely apart in several places. Listen closely and you may hear the individual parts, called barbules, snap loose with a click. The feather no longer looks smooth but is instead disorganized.

Now comes the interesting part. With your fingers, stroke softly upward on the sides of the feather several times. The barbs should reattach to one another and once again become a smooth surface. The fasteners within the feather consist of many tiny hooks that grasp each other, equivalent to the Velcro fasteners found on shoes and jackets. The unzipping and quick repair of a feather can be repeated almost endlessly. Birds sometimes separate their feathers in a similar way when cleaning or *preening* them. Clearly, the Creator's Velcro is very durable.

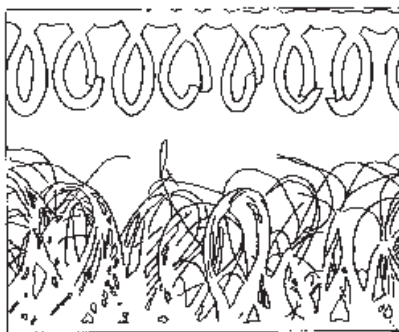
Additional activities with feathers are also of interest. A drop of water placed on the feather will form a round bead, showing the

feather is entirely waterproof. If a small trace of soap is added to the water drop, however, the surface tension is broken and the water quickly soaks through the feather. It is important for birds to keep their feathers oiled and waterproof.

As an additional activity, hold a feather horizontally and blow gently across the top surface. The feather should tend to pull upward. This *lift* is how birds and airplanes are able to fly. The air movement decreases the air pressure across the top of the feather or aircraft wing, causing the upward thrust.



Feather detail



Velcro detail

Magnified views of a feather and also Velcro. The enlarged feather detail shows the side barbs that connect together. The Velcro has loops that catch and hold nylon strands when the two surfaces are pressed together.

Science Explanation

A feather's material is made of beta-keratin, a fibrous protein. The figure shows a feather and also a piece of Velcro, each magnified about twenty-five times. The feather's central shaft has side barbs, which in turn have hair-like *barbules*. These are hooked strands that readily grasp each other. Birds also have fluffy *down* feathers that lack the hooks. These small feathers trap air and provide insulation for birds. The cockleburs noticed by Georges de Mestral grow on burdock, a weed that can grow to six feet tall. It successfully scatters its seeds by attaching itself to passing animals.

Some scientists believe that feathers somehow evolved from animal scales over a great span of time. In this view, lizard-like animals such as dinosaurs gradually were transformed into birds. However, the fossil evidence is not convincing. Scales and bird feathers are not at all similar. Each functions uniquely as God intended from the beginning of time.