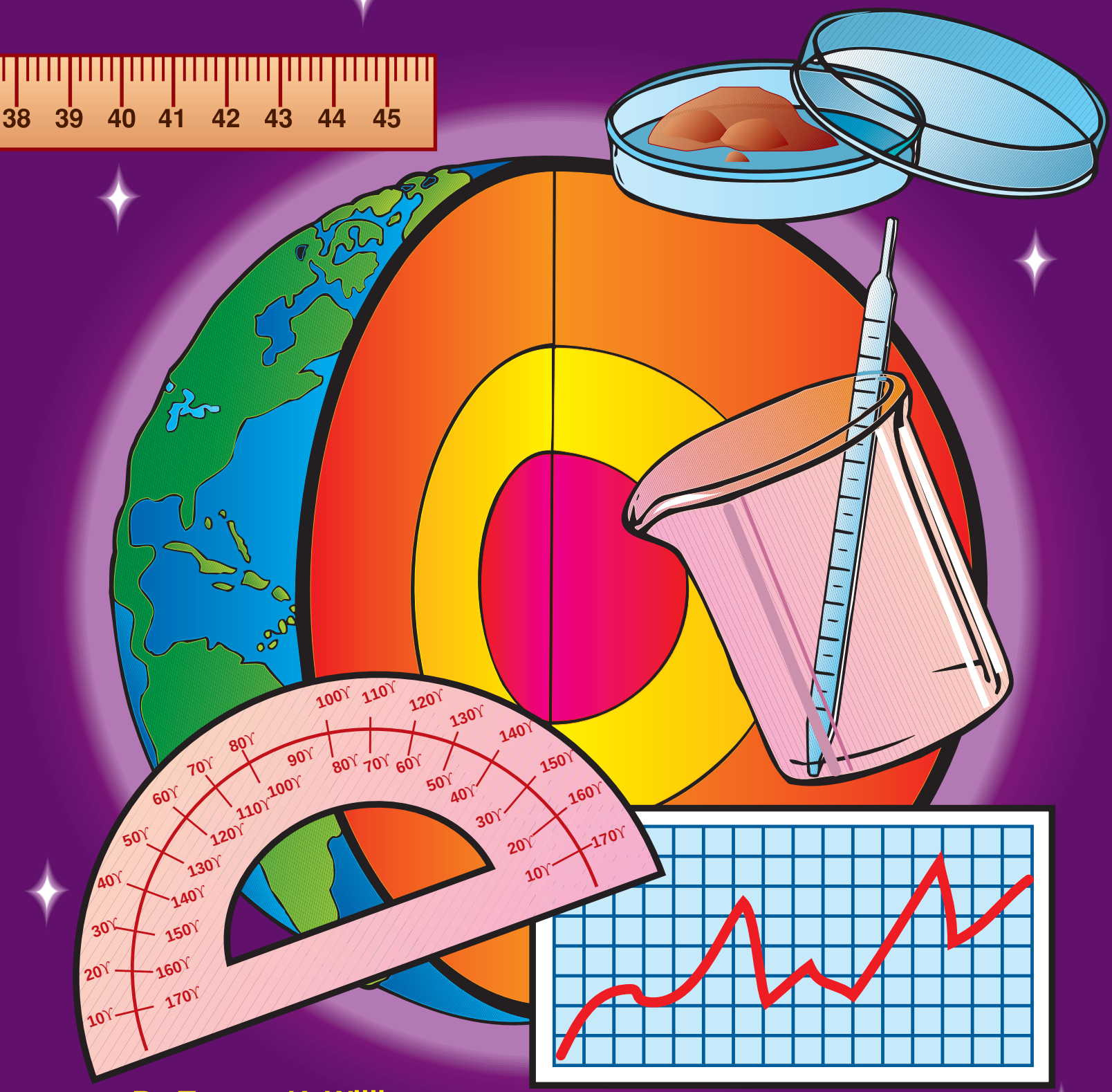
SCIENCE EXPERIMENTS BOOK 2

Science Experiments
Earth Science

GRADES 5–8+

CD–1816



By Tammy K. Williams

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About The Author

Tammy Williams graduated in 1985 from the University of North Carolina at Chapel Hill with a BS in Science Education. In 1987 she completed a Master's Degree in Middle Grades Science Education at the University of North Carolina at Greensboro where she is currently a doctoral student working on an Ed.D. in Curriculum and Teaching Science K–12.

Ms. Williams has taught eighth grade science for nine years for the Guilford County School System. During that time, she was recognized as Rookie of the Year in science education her second year and has been nominated for Science Teacher of the Year and Teacher of the Year. She was also nominated for the President's Award for Excellence in Math and Science Teaching.

Ms. Williams worked on the NSF-funded Project Earth Science, has taught earth science workshops statewide, and was a contributor on the publication of the NSTA-funded activity books that resulted from those workshops.

Tammy is the author of *Science Experiments: Chemistry and Physics* and *Science Experiments: Biology and Ecology,* also published by Mark Twain Media, Inc.

SCIENCE EXPERIMENTS

EARTH SCIENCE

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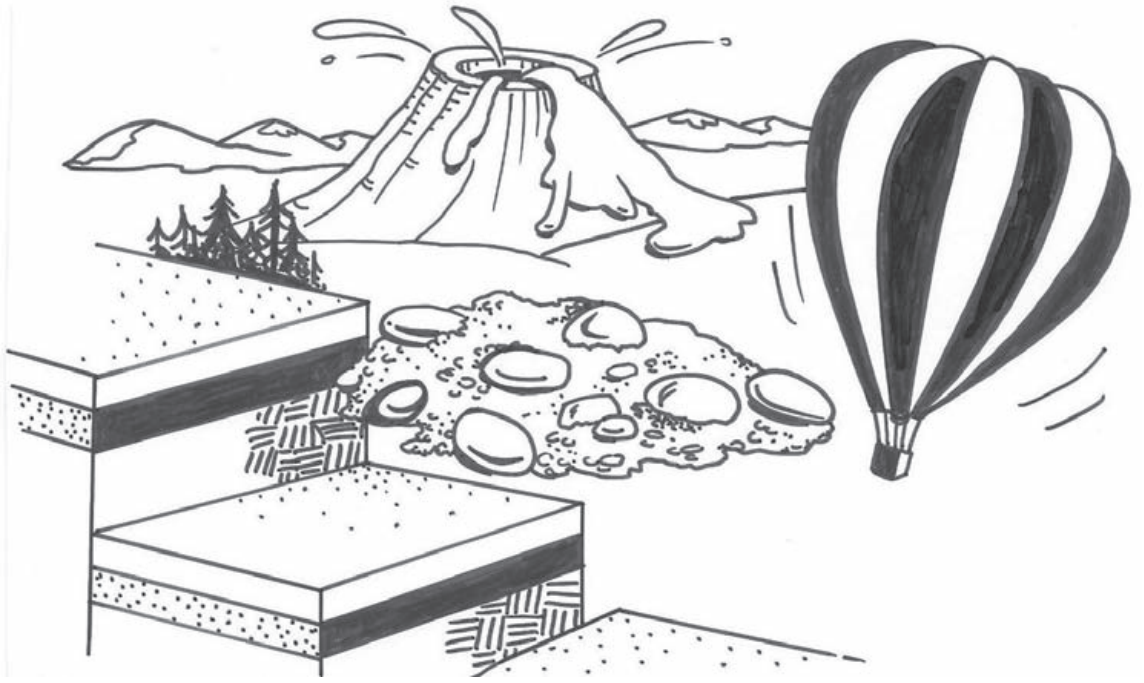


INTRODUCTION

The processes that have shaped the earth become visible as mountain ranges, volcanoes, rocks, and trenches on the ocean floor. Those same features are affected by the water that flows over them. That water falls onto the surface of the earth, flows down the mountains and across the land, shaping the contours of the land until it pools in lakes and oceans and evaporates back into the atmosphere. Conditions in the atmosphere are in turn affected by forces present in the space surrounding Earth.

The connections between the earth, the water on its surface, the atmosphere, and the effects of extraterrestrial forces have provided the topics covered in this activity book, which contains units on geology, oceanography, meteorology, and astronomy. A unit to review and strengthen laboratory skills is also included.

In the laboratory skills section, objects are classified by different appearances, household items are given nonsense names after their characteristics are observed, experiments are conducted to measure water droplet splatter size and ball bounce height, balloon rockets are constructed, and finally, an edible test of measurement skills is conducted.

In the geology unit, layers of the "earth" are deposited, folded, then eaten; the mantle of the earth is "mixed up," poured through fingers, and rolled into a ball; and riches are mined from the "earth" and then eaten. The crystallization of rocks is modeled, the circulation of material underground is observed, and earthquake epicenters are plotted.

In the oceanography section, "water molecules" are built, cups full of water are filled with pennies until they spill, an "ocean" has its bottom mapped, and mystery solutions are "stacked" in straws according to densities and the amount of salt that each contains.

In the meteorology section, the percent of oxygen in the air is calculated, aluminum cans are crushed by the air pressure in the room, hail is created in test tubes, and hot air balloons are built and flown.

Finally, in the astronomy section, a unit of time called a "student minute" is invented to model light years, the effects of a "mini-atmosphere" are investigated, and objects nearby have their distances away, altitudes, and angles of separation estimated in the same way that ancient astronomers used to gather information about celestial bodies.

Though each section explores very different, often unrelated topics, there are some concepts that thread their way throughout the entire book. The convection current that circulates molten magma underground causes warm water to rise and cold water to sink and is responsible for those cooling breezes that blow off the water at the beach in the summer, helping to cool the earth that is affected by heat radiated from the Sun. Enjoy the activities, and don't be afraid to get your hands dirty.

"You learn to do what you do and not something else."

Gerald Unks, Ed 41, UNC-CH, 1984

LABORATORY SKILLS INDEX AND MATERIALS LIST

Date: _____ Names: _____

CLASSIFICATION

INTRODUCTION: How do scientists decide that crocodiles belong in one family of organisms while alligators belong in another family?

OBJECTIVE: In science, organisms are grouped according to their different or similar characteristics. This process, called classification, allows for the study of the similarities and differences between organisms. In this activity, we will practice classifying a set of colored and marked cards in order to examine the flexibility that exists when classifying things.

PROCEDURE:

1. A set of marked colored cards are in the envelope provided.
2. Your goal is to design as many classifications systems for those cards as possible.
3. As you decide on a classification system:
   a. Arrange the cards into the system.
   b. In the chart below, identify CATEGORIES and MEMBERS in the spaces provided. Members may be drawn in or described.
   c. Draw vertical lines in the charts to separate categories.
   d. List all the members of a category in the column below the category name.

Example: SYSTEM 1: Classify by shape SYSTEM 2: _____

CATEGORIES	square	circle	rectangle
MEMBERS	 A2  B1	 B2  A1	 B1

Date: _____ Names: _____

SYSTEM 3: _____ SYSTEM 4: _____

CATEGORIES		
M		
E		
M		
B		
E		
R		
S		

SYSTEM 5: _____ SYSTEM 6: _____

CATEGORIES		
M		
E		
M		
B		
E		
R		
S		

Date: _____ Names: _____

SYSTEM 7: _____ SYSTEM 8: _____

CATEGORIES		
M		
E		
M		
B		
E		
R		
S		

QUESTIONS:

1. What characteristics about the cards did you use in order to classify them?

_____

_____

2. Does each classification system contain the same categories? Why/why not?

_____

_____

3. Do all categories contain the same members? Why/why not? _____

_____

_____

4. Do you think that each group in the class thought of the same classification systems that you did? _____

5. Do you think that each group in the class would agree on the same system as THE BEST SYSTEM? Why/why not? _____

_____

_____

6. Why then is it important for scientists to agree on a single classification system for each particular group of items/organisms? _____

_____

_____

Date: _____ Name: _____

DICHOTOMOUS KEY

INTRODUCTION: Once plants, animals, rocks, and minerals have been assigned by scientists to certain families or groups, how do you figure out their species or names? This is done by using a device called an identification key.

OBJECTIVE: In science, organisms, rocks, minerals, and elements are identified and classified according to characteristics that they possess. These characteristics may be either similar to or different from those of other organisms. When differences are observed so that the presence or absence of a characteristic determines which category the organism or object falls into, the identification tool is called a DICHOTOMOUS KEY. In this activity, we will use a dichotomous key to give household items nonsense names.

PROCEDURE:

1. For each item below, read the description and follow the directions at the end of the line.
2. When the description is followed by a nonsense name, write in the actual name of the household item on the blank line

1a. Object is partly or completely made of metal ..... go to 2

1b. Object has no metal on it ..... go to 16

2a. Object has nonmetal parts ..... go to 3

2b. Object is completely made of metal ..... go to 5

3a. Object is less than 10 cm in length ..... whippersnapper _____

3b. Object is 10 cm or greater in length ..... go to 4

4a. Object is pointed at one end ..... tapered doodad _____

4b. Object is not pointed at one end ..... common doodad _____

5a. Object is greater than 10 cm ..... go to 6

5b. Object is 10 cm or less ..... go to 9

6a. Object has a twisted area ..... thingamajig _____

6b. Object has no twisted area ..... go to 7

7a. Object has 3 or more prongs ..... left-handed monkey wrench _____

7b. Object has no prongs ..... go to 8

Date: _____ Names: _____

8a. Object has a cutting edge ..... geegaw _____

8b. Object has no cutting edge ..... scooperdoo _____

9a. Object has spiral grooves ..... go to 10

9b. Object has no spiral grooves ..... go to 11

10a. Object has a hole ..... cashew _____

10b. Object has no hole ..... whatsit _____

11a. Outside edge is a circle ..... go to 12

11b. Outside edge is not a circle ..... go to 13

12a. Object is silver-colored ..... quinto _____

12b. Object is not silver-colored ..... uno _____

13a. Object is silver-colored ..... go to 14

13b. Object is not silver-colored ..... go to 15

14a. Object is less than 4 cm in length ..... micro whatnot _____

14b. Object is 4 cm or more in length ..... macro whatnot _____

15a. Object is brass-colored ..... skyhook _____

15b. Object is not brass-colored ..... dingus _____

16a. Object is white ..... go to 17

16b. Object is not white ..... go to 24

17a. Object has holes ..... wadget _____

17b. Object has no holes ..... go to 18

18a. Object is a circle in at least one dimension ..... go to 19

18b. Object is not a circle in any dimension ..... go to 20

Date: _____ Names: _____

19a. The circumference of the circular dimension is 6 cm or less... bric-a-brac _____

19b. The circumference of the circular dimension is greater than 6 cm ..... roundabout _____

20a. Object is made of plastic ..... go to 21

20b. Object is not made of plastic ..... go to 23

21a. Object has 3 or more prongs ..... doohickey _____

21b. Object has no prongs ..... go to 22

22a. Object has a cutting edge ..... gismo _____

22b. Object does not have a cutting edge ..... flim flam _____

23a. Object appears to have a string running through its center ..... wickey _____

23b. Object does not appear to have a string running through its center ..... scrubadub _____

24a. Object is made of plastic ..... go to 25

24b. Object is not made of plastic ..... go to 28

25a. Outer edge of the object is round ..... go to 26

25b. Outer edge of the object is not round ..... whatchamacallit _____

26a. Object has holes ..... go to 27

26b. Object has no holes ..... spinaroo _____

27a. Object has 2 holes ..... bihole _____

27b. Object has 4 holes ..... tetrahole _____

28a. Object is made of glass ..... seethru _____

28b. Object is not made of glass ..... go to 29

29a. Object is yellow in color ..... screecher _____

29b. Object is not yellow in color ..... soaky _____

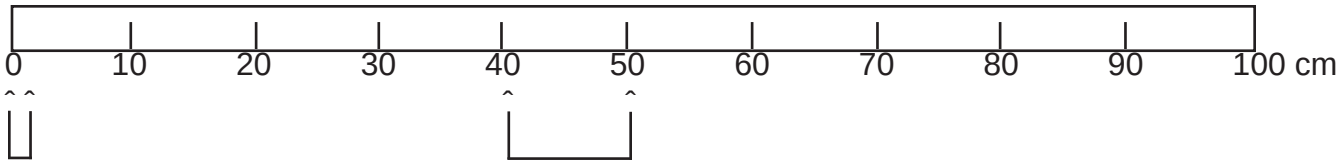
Date: _____ Names: _____

METRIC MEASUREMENT (LENGTH)

INTRODUCTION: If your hand is 3 inches wide, how many centimeters wide is it? Which metric unit is closest to the length of 1 yard?

OBJECTIVE: In this activity, we will review metric units for measuring distance or length—the meter, decimeter, centimeter, and millimeter. We will also use these units to estimate and then measure the sizes of various objects around the room.

Meterstick: 1 meter (m) = 10 decimeters (dm) OR 100 centimeters (cm) OR 1,000 millimeters (mm)
Here is a visual representation of a meterstick.



0–1 is 1 centimeter

1 decimeter

** 1 millimeter is the distance between each tiny black mark on a meterstick.

PROCEDURE:

1. Use a meterstick to measure the objects listed in the chart below. Make sure you use the metric side of the meterstick (with numbers to 100 cm, not 36 inches).
2. Measure the objects in the units listed. Write the unit abbreviation after the measurement you get (example: instead of 47.5, write 47.5 cm).

OBJECT	MEASUREMENT	UNITS
Length of your table		Meters (m)
Width of your table		Decimeters (dm)
Length of a piece of paper		Centimeters (cm)
Width/thickness of a pencil		Millimeters (mm)

3. Which unit above is closest to the following size:
   a. the thickness of a fingernail? _____
   b. the width of a finger? _____
   c. the width of a hand? _____
   d. longer than your leg? _____

Date: _____ Names: _____

4. Keep the sizes of each of the metric units in mind. For each object listed in the chart below:
   a. Choose the most appropriate unit of measurement (m, dm, cm, mm) and record that unit in the chart in the "Unit Chosen" column.
   b. Estimate the size of that object using the units you chose and the "body parts" in step 3a–d above. You may actually lay fingers side-by-side along an object to see how many centimeters long it is. Record your estimates in the chart below under the "Estimate" column.
   c. Get up and measure the objects listed using the units that you chose. Record your measurements in the chart below under the "Measurement" column. You do not have to measure the items in the order listed.

OBJECT	UNIT CHOSEN	ESTIMATE (WITH UNITS)	MEASUREMENT (WITH UNITS)
Height of table			
Length of tabletop			
Height of classroom door			
Thickness of tabletop			
Width of cabinets			
Thickness of a pencil lead			
Width of your table leg			

QUESTIONS:

1. Which unit might be best used to measure:
   a. shoe length? _____
   b. thickness of hair strands? _____
   c. a bus length? _____
   d. width of a door? _____
   e. length of a hallway? _____
   f. height of the letter "E"? _____
   g. length of a pencil? _____

2. How is the metric system more simple to use than English units (like inches, feet, and yards)?

_____