DISCOVERY OF CELLS IN CORK

TOPIC:

Microscopy

SCIENTIST:

Robert Hooke 1635–1703

INTRODUCTION:

Robert Hooke was a scientist of many talents. He lived at a time generally recognized as the beginning of the "scientific revolution." One of his many contributions was the development of the compound microscope. Its impact was significant: for the first time, human eyes were able to see the tiny details of living things, such as the eye of a fly or a bee's stinger, as well as other objects previously invisible to the naked eye. In 1665 Hooke published *Micrographia,* the first major work on microscopy. It contained many illustrations of animals, plants, and minerals, and included the results of Hooke's examination of cork. Cork is removed from the outer layer of an evergreen species of oak. By making thin sections of cork and examining it under the microscope, Hooke found it to be full of pores or, as he called them, "cells." Hooke's findings, made possible by the microscope, changed the way organisms were percieved. Today we use his term cell to describe the basic units of life from which all organisms are made.

TIME NEEDED:

1 hour

MATERIALS:

cork from a champagne or wine bottle
X-acto® knife
microscope
microscope lamp
microscope slide
cutting board

Original Materials:

According to *Micrographia* it seems likely that Hooke used "raw" cork from the *Quercus suber* tree. Cork was first used for sealing glass bottles at about the same time that Hooke was doing his experiments. The microscope used the same basic principles as today's light microscopes and gave a magnification of up to 270x, as opposed to the 40x–400x range likely with the microscope you are using.

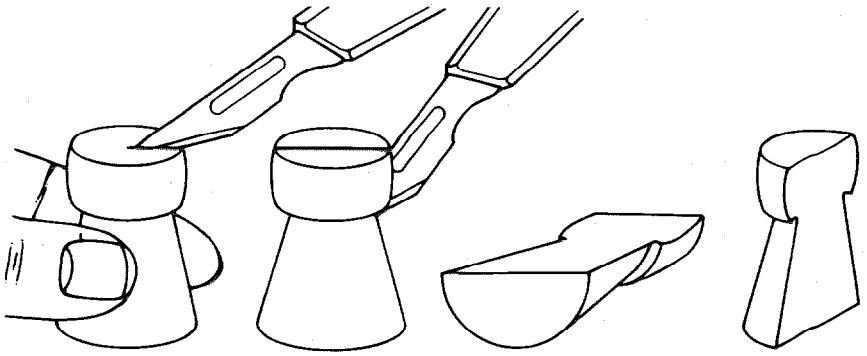
Safety Precautions

Adult supervision recommended. Please read and copy the safety precautions at the beginning of this book. Be careful when cutting the cork with the knife.

PROCEDURE:

1. Take the cork and the knife. Place the cork on its larger end on the cutting board and hold it between finger and thumb.
2. Carefully use the knife to cut a slit lengthwise on one side of the cork from its edge to its center (see figure 1). Turn the cork around and repeat the process on the opposite side so that the cork is cut into two halves. Leave the cut cork for 30 minutes. If the cork is damp leave it in a warm place to dry out.
3. Put one half of the cork on its flat surface on the cutting board. Use the knife to cut 1 cm from one end of the cork (in the case of a champagne cork, from the larger end).
4. Now cut very thin slices from the cut end of the cork. Cut them as thinly as possible so that light can shine through them.

Figure 1



5. Put the thinnest piece of cork onto the microscope slide. Look at the slide using the low power of the microscope. Adjust the light to give the best image, either reflected from the microscope's mirror through the cork or shining onto the cork so that it is seen against a dark background.
6. Make a sketch of your observations.

ANALYSIS:

1. Describe what you saw under the microscope.
2. Do some research. What are the "cells" that Hooke saw?

OUR FINDINGS:

Click on above link to see what we found.

SPECIAL SAFETY NOTE TO EXPERIMENTERS

Each experiment includes any special safety precautions that are relevant to that particular project. These do not include all of the basic safety precautions that are necessary whenever you are working on a scientific experiment. For this reason, it is absolutely necessary that you read, copy, and remain mindful of the General Safety Precautions that follow this note.

Experimental science can be dangerous, and good laboratory procedure always includes carefully following basic safety rules. Things can happen very quickly while you are performing an experiment. Things can spill, break, even catch fire. There will be no time after the fact to protect yourself. Always prepare for unexpected dangers by following basic safety guidelines the *entire* time you are performing the experiment, whether or not something seems dangerous to you at a given moment.

We have been quite sparing in prescribing safety precautions for the individual experiments. We made this choice for one reason: We want you to take very seriously every safety precaution that is printed in this book. If you see it written here, you can be sure that it is here because it is absolutely critical to your safety.

One further note: The book assumes that you will read the safety precautions that follow, as well as those in the box within each experiment you are preparing to perform, and that you will *remember* them. Except in rare instances, these precautions will not be repeated in the procedure itself. It is up to you to use your good judgment and pay attention when performing potentially dangerous parts of the procedure. Just because the book does not say BE CAREFUL WITH HOT LIQUIDS or DON'T CUT YOURSELF WITH THE KNIFE does not mean that you should be careless when simmering water or stripping an electrical wire. It does mean that when you see a special note to be careful, it is extremely important that you pay attention to it.

If you ever have a question about whether a procedure or material is dangerous, wait to perform it until you find out for sure that it is safe.

GENERAL SAFETY PRECAUTIONS

Accidents caused by carelessness, haste, insufficient knowledge, or taking unnecessary risks can be avoided by practicing safety procedures and being alert while conducting experiments. Be sure to check the experiments in this book for additional safety regulations and adult supervision requirements. If you will be working in a lab, do not work alone.

PREPARING:
—Clear all surfaces before beginning experiments
—Read the instructions before you start
—Know the hazards of the experiments and anticipate dangers

PROTECTING YOURSELF:
—Follow the directions step-by-step; do only one experiment at a time
—Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eye wash, and first-aid kit
—Make sure there is adequate ventilation
—Do not horseplay
—Wear an apron and goggles
—Do not wear contact lenses, open shoes, loose clothing, or loose hair
—Keep floor and work space neat, clean, and dry
—Clean up spills immediately
—Never eat, drink, or smoke in laboratory or work space
—Do not eat or drink any substances tested unless expressly permitted to do so by a knowledgeable adult

USING EQUIPMENT WITH CARE:
—Set up apparatus far from the edge of the desk
—Use knives and other sharp or pointed instruments with caution
—Pull plugs, not cords, when removing electrical plugs
—Don't use your mouth to pipette; use a suction bulb
—Clean glassware before and after use
—Check glassware for scratches, cracks, and sharp edges
—Clean up broken glassware immediately
—Do not use reflected sunlight to illuminate your microscope
—Do not touch metal conductors
—Use only low voltage and current materials such as lantern batteries
—Be careful when using stepstools, chairs, and ladders

USING CHEMICALS:
—Never taste or inhale chemicals
—Label all bottles and apparatus containing chemicals
—Read labels carefully
—Avoid chemical contact with skin and eyes (wear goggles, apron, and gloves)
—Do not touch chemical solutions
—Wash hands before and after using solutions
—Wipe up spills thoroughly

HEATING SUBSTANCES:
—Use goggles, apron, and gloves when boiling water
—Keep your face away from test tubes and beakers
—Never leave apparatus unattended
—Use safety tongs and heat-resistant mittens
—Turn off hot plates, bunsen burners, and gas when you are done
—Keep flammable substances away from heat
—Have fire extinguisher on hand

FINISHING UP:
—Thoroughly clean your work area and glassware
—Be careful not to return chemicals or contaminated reagents to the wrong containers
—Don't dispose of materials in the sink unless instructed to do so
—Wash your hands
—Clean up all residue and put in proper containers for disposal
—Dispose of all chemicals according to all local, state, and federal laws

BE SAFETY CONSCIOUS AT ALL TIMES