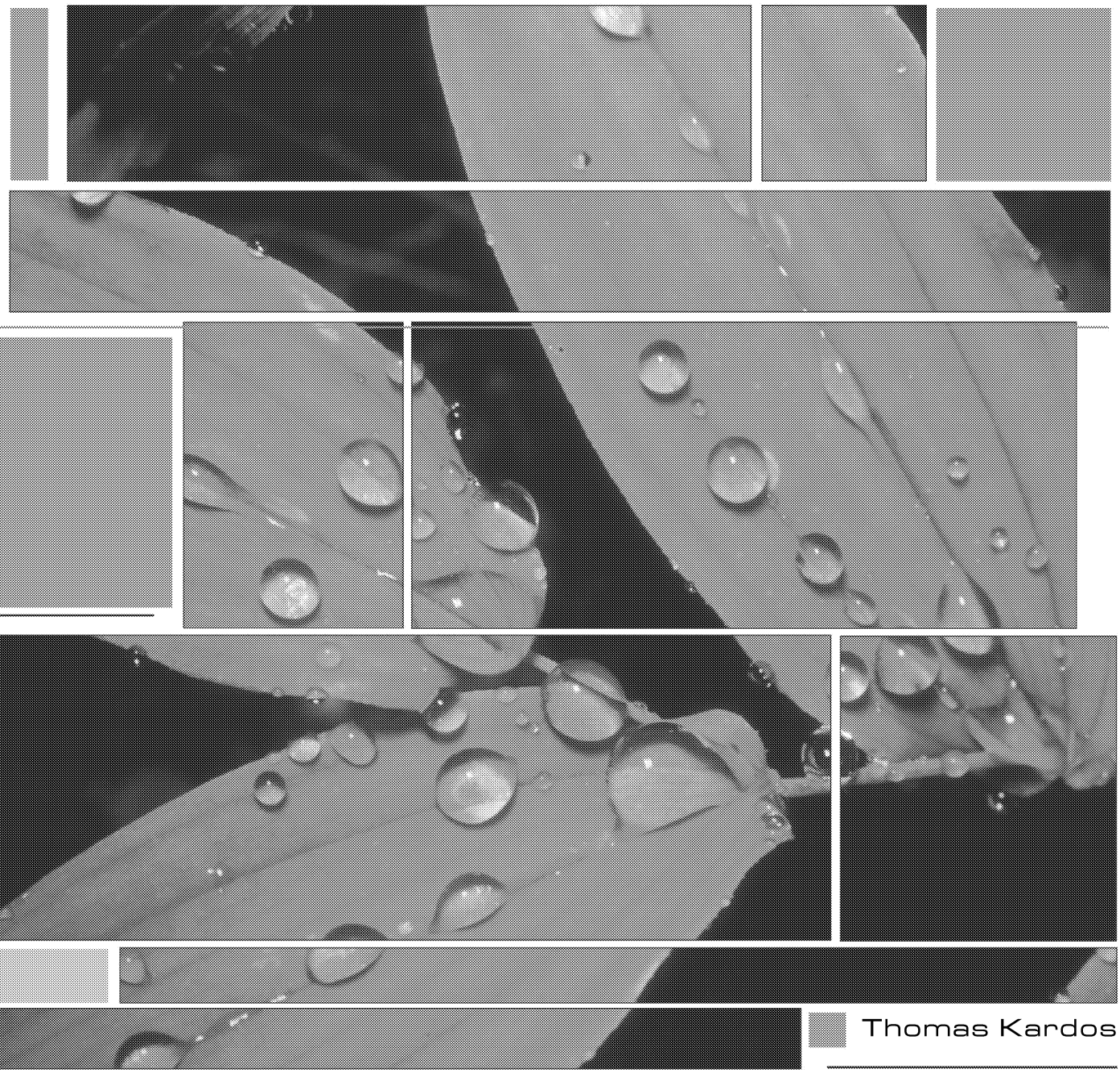
J. WESTON
WALCH
PUBLISHER
Portland, Maine

EASY
Science Demos & Labs

Life Science



Thomas Kardos

Contents

Demos and Labs

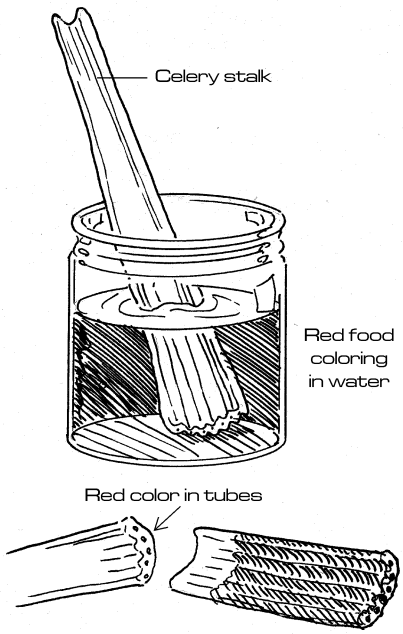
Appendix

Demo 24
Plants Have Circulation (Capillary Action)

Water and other molecules tend to stick to their own kind. This is called **cohesion.** When molecules stick to other kinds of molecules, the process is called **adhesion.** When water or other substances enter very fine openings, they rise through a combination of cohesion and adhesion. This process is called **capillary action.** It describes how leaves of a very large tree can grow by drawing water from the tree's roots, through the stems, and up through the trunk and the branches, until it finally reaches the foliage. Capillary action is not, in and of itself, responsible for water rising through a plant. In addition to capillary action, transpiration serves to pull the water up, as water is released from the stomata of the plant, leaving a void.

Materials: small jar, water, red food coloring, celery stalk

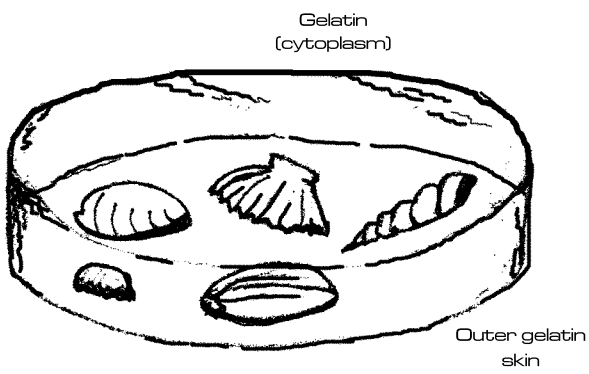
- Half-fill the jar with a deep-red solution of food coloring and water. Place a celery stalk in the jar. Let the setup stand for 15–20 minutes. Cut the celery stem above the waterline and observe the red color in its vessels.



Demo 25
Animal Cell Model Using Gelatin

Most animal cells are composed of a nucleus, cytoplasm, and organelles that have discrete functions. Unlike plant cells, animal cells have no hard cell wall; rather, they possess a permeable membrane through which nutrients and waste products pass. Animal cells have different shapes based on their function; there is a world of difference between a **white corpuscle,** a nucleus-free **red blood cell,** and a star-shaped nerve cell. For simplicity's sake, we will construct a prototypical animal cell with a "nucleus," "organelles," and "cytoplasm" as a demonstration model, but students should be informed that cells have different appearances based on their function in the animal's body.

Materials: small plastic bowl, water, package of gelatin, bean, tiny seashells, plate



- Prepare the gelatin according to the instructions on the package. Pour the hot gelatin into the plastic bowl and let it cool. When the gelatin is nearly hardened, place the bean in the center of the gelatin and the little seashells in other locations in the gelatin. Let the gelatin harden. Flip the bowl over and lay the gelatin on a plate or other flat surface. Now you have a model of an animal cell with the nucleus (bean), organelles (seashells), the cytoplasm (gelatin), and the cell membrane (outer skin of gelatin).

Student Lab 6
Plant Cells

Robert Hooke discovered and named cells when he first looked at cork under his early microscope. Cork is a dead, protective layer of plant cells that is found on the trunk of some species of trees, especially the cork oak.

In this experiment, we will be looking at cork cells under the microscope and comparing them to the animal-cell model we constructed in the last demonstration.

Materials: cork, microscope, microscope slide and coverslip, stain, sectioning tool or razor blade

Procedure:

1. Shave a paper-thin slice of cork from the stopper with the razor blade or sectioning tool.
2. Place the cork on a drop of water or glycerin; on a microscopic slide, stain it to see the details better and cover with a coverslip.
3. Observe the cells at the edge of the cork at both low and high power under the microscope. Make a drawing of the cells at each power.

Conclusion: What shape are cork cells? What is inside the cork cells? What function does the cork provide for the tree? How are plant cells different from animal cells?

Strong Safety Warning: Use caution while handling the razor blade or sectioning tool. Sharp objects can cause injury.

2. Density of Liquids

	approx. gm/cm^3 at 20°C
Acetone	0.79
Alcohol (ethyl)	0.79
Alcohol (methyl)	0.81
Benzene	0.90
Carbon disulfide	1.29
Carbon tetrachloride	1.56
Chloroform	1.50
Ether	0.74
Gasoline	0.68
Glycerin	1.26
Kerosene	0.82
Linseed oil (boiled)	0.94
Mercury	13.6
Milk	1.03
Naphtha (petroleum)	0.67
Olive oil	0.92
Sulfuric acid	1.82
Turpentine	0.87
Water 0°C	0.99
Water 4°C	1.00
Water–sea	1.03

3. Altitude, Barometer, and Boiling Point

altitude (approx. ft)	barometer reading (cm of mercury)	boiling point (°C)
15,430	43.1	84.9
10,320	52.0	89.8
6,190	60.5	93.8
5,510	62.0	94.4
5,060	63.1	94.9
4,500	64.4	95.4
3,950	65.7	96.0
3,500	66.8	96.4
3,060	67.9	96.9
2,400	69.6	97.6
2,060	70.4	97.9
1,520	71.8	98.5
970	73.3	99.0
530	74.5	99.5
0	76.0	100.0
–550	77.5	100.5

4. Specific Gravity

gram/cm^3 at 20°C

Agate	2.5–2.6	Granite*	2.7	Polystyrene	1.06
Aluminum	2.7	Graphite	2.2	Quartz	2.6
Brass*	8.5	Human body–normal	1.07	Rock salt	2.1–2.2
Butter	0.86	Human body–lungs full	1.00	Rubber (gum)	0.92
Cellural cellulose acetate	0.75	Ice	0.92	Silver	10.5
Celluloid	1.4	Iron (cast)*	7.9	Steel	7.8
Cement*	2.8	Lead	11.3	Sulfur (roll)	2.0
Coal (anthracite)*	1.5	Limestone	2.7	Tin	7.3
Coal (bituminous)*	1.3	Magnesium	1.74	Tungsten	18.8
Copper	8.9	Marble*	2.7	Wood: Rock Elm	0.76
Cork	0.22–0.26	Nickel	8.8	Balsa	0.16
Diamond	3.1–3.5	Opal	2.1–2.3	Red Oak	0.67
German silver	8.4	Osmium	22.5	Southern Pine	0.56
Glass (common)	2.5	Paraffin	0.9	White Pine	0.4
Gold	19.3	Platinum	21.4	Zinc	7.1

*Non-homogeneous material. Specific gravity may vary. Table gives average value.