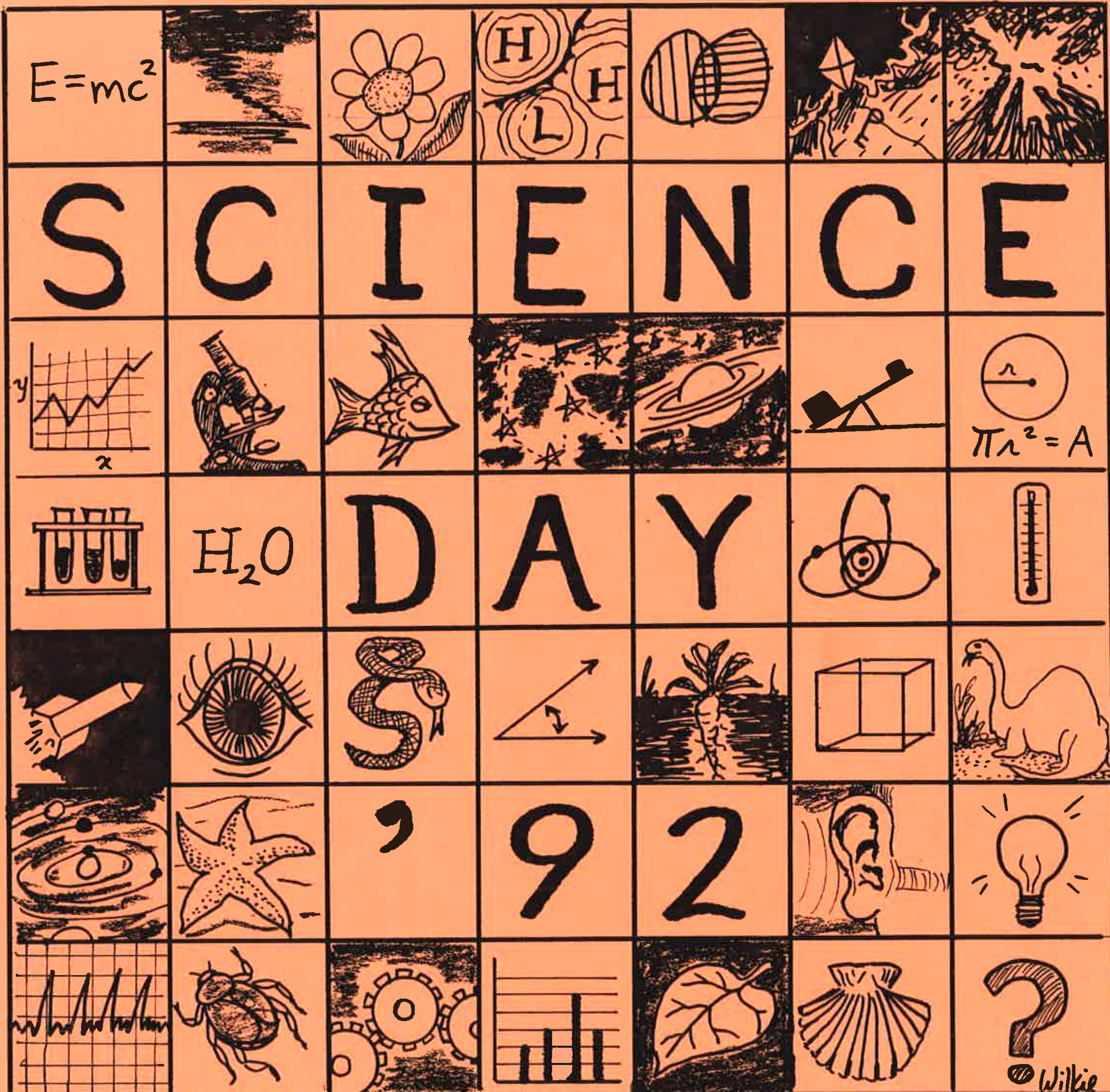


Riverside School

Friday, March 13, 1992

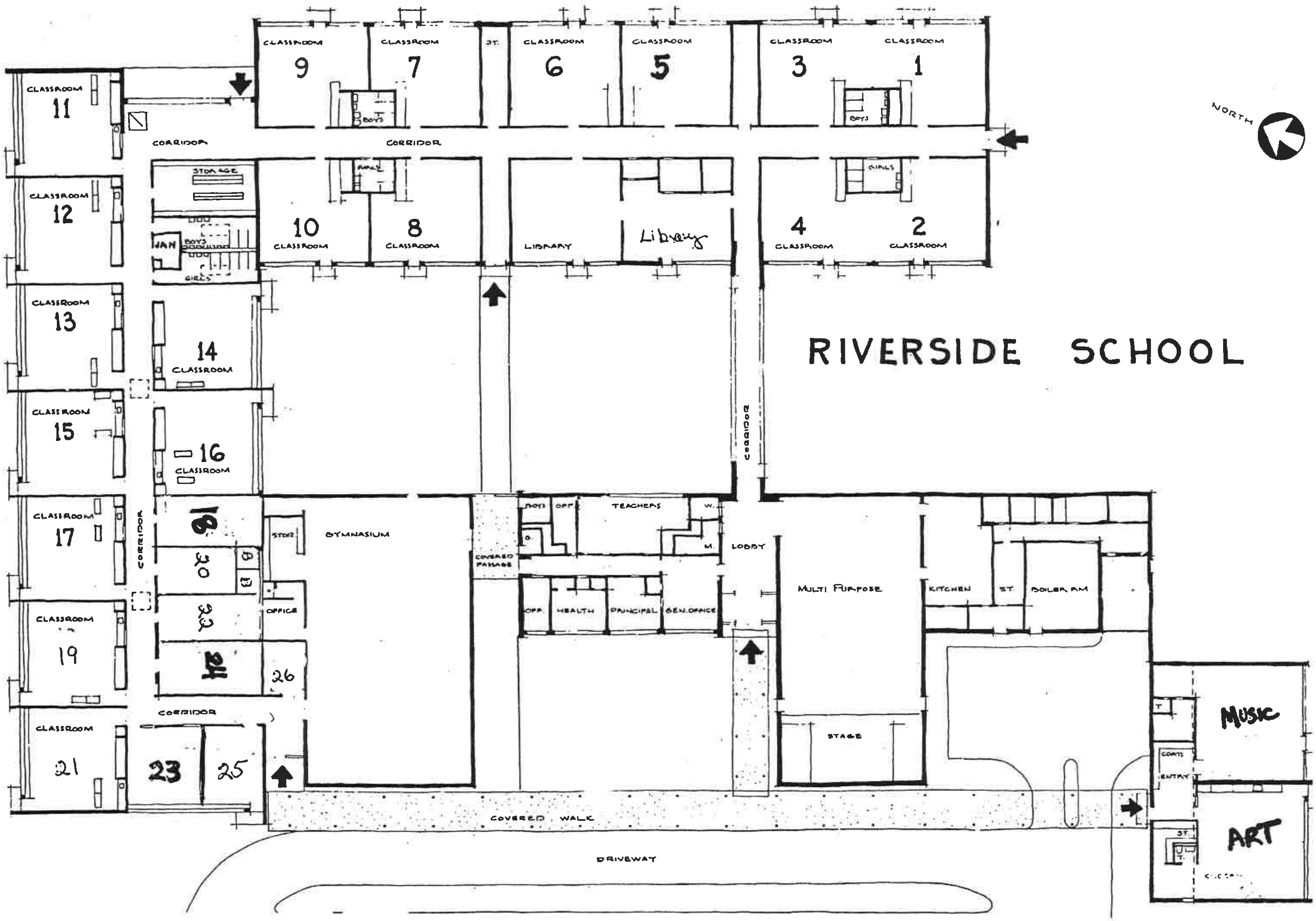
Everyone is welcome!

RIVERSIDE SCHOOL
SCIENCE DAY Schedule
March 13, 1992

Class	R#	Grade	8:50-9:30 40 min	9:40-10:20 40 min	10:30-11:00 30 min	11:00-11:20 20 min	11:30-12:00 30 min	12:00-12:20 20 min	12:30-1:10 40 min	1:15-1:55 40 min	2:00-2:40 40 min
Bruschi	1	K	SL	McAdams	Goodman	--Goodman	X	X	Lunch	Lunch	X
Crusey	3	K	SL	Goodman	X	X	McAdams-----	----McAdams	Lunch	Lunch	X
Lang	2	K	SL	X	McAdams-----	---McAdams	Goodman----	---Goodman	Lunch	Lunch	X
Everitt	6	1	Jackson	SL	Wilkinson	Lunch---	Lunch/McK	McKinley	X	Hagadorn	Discuss
Kanter	11	1	Wilkinson	SL	Jackson	Lunch---	-Lunch/Dah	Dahlen	Hagadorn	X	Discuss
Woods	8	1	Hagadorn	Wilkinson	Wiley	Lunch---	-Lunch/SL-	---------SL	Jackson	X	Discuss
Donlon	16	2	Harvey	Zack	SL---------	--------SL	Lunch	Lunch	Dahlen	McKinley	Discuss
Hagadorn	10	2	Zack	Harvey	SL---------	--------SL	Lunch	Lunch	McKinley	Dahlen	Discuss
Johnson	9	2	Dahlen	McKinley	Zack------	------Zack	Lunch	Lunch	SL	Harvey	Discuss
Bonette	12	3	Vanderbilt	Tilghman	Messersmith	-Messersmith	Harvey	Lunch	SL	Wilkinson	Discuss
Moore	14	3	Tilghman	Vanderbilt	Harvey------	------Harvey	Messersmith	Lunch	Lunch	SL	Discuss
Paris	15	3	McKinley	Messersmith	Vanderbilt---	--Vanderbilt	Jakowlew	Lunch	Tilghman	SL	Discuss
Findley	19	4	Wiley	Feigenson	Just------	------Just	SL--------	---------SL	Lunch	Tilghman	Discuss
Murray	21	4	Feigenson	Just	Tilghman----	-----Tilghman	Wiley--------	---------Wiley	Lunch	Jakowlew	SL
Rosendorf	17	4	Just	Wiley	Feigenson --	--Feigenson	Tilghman	Lunch	Lunch	Feinstein	SL

Hagadorn	Boats	**McAdams**	Sink or Float	**Harvey**	Magnetism	**Vanderbilt**	Simple Machines
Messersmith		**Goodman**	Measurement	**Zack**	Electricity	**Feigenson**	Geology
Jakowlew	Propagation	**Wilkinson**	Bubbles	**Dahlen**	Rocks	**Wiley**	Paper Folding
		Jackson	Graphics	**McKinley**	Electricity	**Just**	Computers
		Tilghman	Adaptation	**Feinstein**	Radiology		

SL= Short Experiment Laboratory in Gym


RIVERSIDE SCHOOL
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PRINCIPAL
GEN. OFFICE
MULTI PURPOSE
STAGE
KITCHEN
BOILER RM
COVERED WALK
DRIVEWAY
MUSIC
ART
T
COATS
ENTRY

Room Assignments of Long Experiments

Presenter	*Room*
Shirley Tilghman	Art
David Wilkinson	Music
Brian Zack	5
Eric Jackson	18
Steve Just	24
Mark Feigenson	23

All other presenters will come to individual classrooms. If room assignments change, you will be notified on Science Day.

Riverside School Science Day '92

Dear Riverside School Students and Parents:

On Science Day, parents and teachers bring you the excitement of scientific exploration. This booklet summarizes the day's schedule and gives you descriptions of the 13 short experiments in the gymnasium and the 17 long experiments in the classrooms. It is a very full and exciting day of activities. Please check the schedule and browse through this booklet before Science Day to familiarize yourself with what will be presented to your class.

We hope you will find Science Day fun and worthwhile!

Karen Fuchs, Co-Chair
Cem Girit, Co-Chair
Mike Littman, Co-Chair

List of Short Experiments

Short Experiment	1:	Why Do Bubbles Float?
Short Experiment	2:	How Does A Hot Air Balloon Fly?
Short Experiment	3:	Can A Magnet Float In The Air?
Short Experiment	4:	What Does Sound Look Like?
Short Experiment	5:	How Does A Human Battery Work?
Short Experiment	6:	How Do You Make A Gold Penny?
Short Experiment	7:	How Does A Thermometer Work?
Short Experiment	8:	Seeing Is Not Always Believing
Short Experiment	9:	Collisions!
Short Experiment	10:	Talking Computers
Short Experiment	11:	See Your Retina - A Window To The Brain
Short Experiment	12:	Laser Fountain
Short Experiment	13:	Geology Display with Fluorescent Rocks

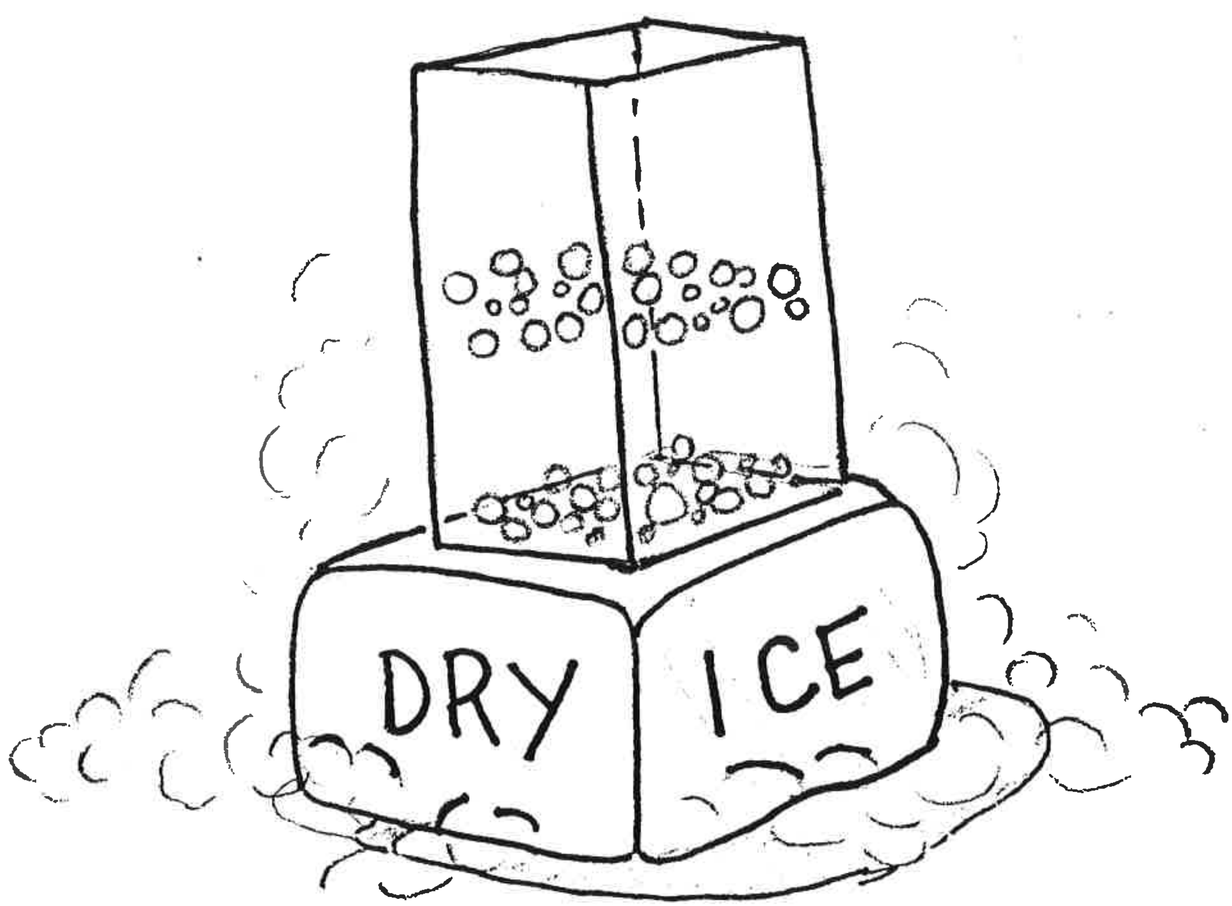
List of Long Experiments

Topic	*Presenter*	*Grade*
1. A Mathematical Balancing Act	Jeremy Goodman/ Maureen Quirk	K
2. Sink or Float	Nancy McAdams	K
3. Computers & Graphics in Science	Eric Jackson	1
4. Bubbles	David Wilkinson	1,3
5. Rocks, Minerals, and Fossils	Tony Dahlen	1,2
6. Electricity	Brian Zack	2
7. Electricity and Magnetism: "Different Sides of the Same Coin"	George Harvey	2,3
8. Invisible Force Fields	Bill McKinley	1,2,3
9. Pulleys, Weights, Springs, and Things	David Vanderbilt	3
10. Fold Your Way to Fun & Fractals	Larry Wiley	1,4
11. Learning Science Using Computers	Steven Just	4
12. Geology Exhibit	Mark Feigenson	4
13. Adaptation in Nature	Shirley Tilghman	3,4
14. Radiology	Richard Feinstein	4
15. "Who Sank the Boat"	Adele Hagadorn	1
16.	Jim Messersmith	3,4
17. Propagation of Swedish Ivy	Paula Jakowlew	3,4

Short Experiment 1: Why Do Bubbles Float?

When you blow bubbles into the glass cubicle in this experiment, you will see that first they will descend, and then hover on the denser layer of carbon dioxide gas. Carbon dioxide is produced when dry ice at the bottom of the cubicle turns from solid to gas. After a few minutes, notice that the bubbles begin to expand and sink! Why do they first float? Carbon dioxide is denser than air, so it forms a layer on the bottom of the glass cubicle. On the other hand, a bubble is full of air. So it floats on the carbon dioxide layer just like a helium balloon floating in the air. But why do they sink afterwards? The soapy wall of the bubble allows carbon dioxide to pass through, but does not allow air molecules to pass through. The added carbon dioxide makes the bubble denser, causing it to gradually sink. When they reach the bottom, the bubbles freeze on the dry ice because dry ice is very cold (-112°F).

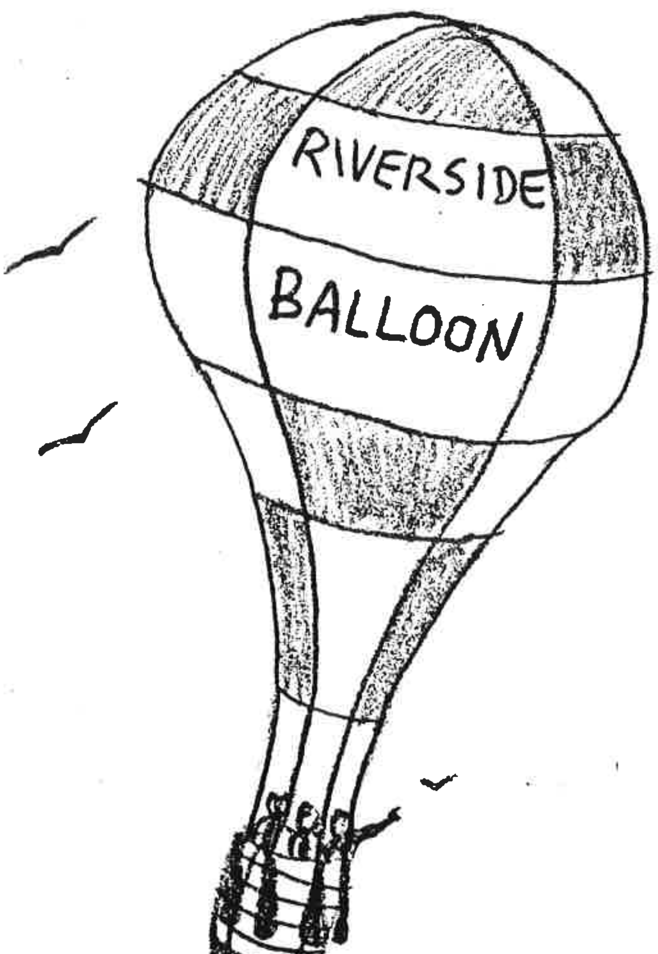
Did you notice the color bands on the bubbles? Try to find out why they have colored bands.

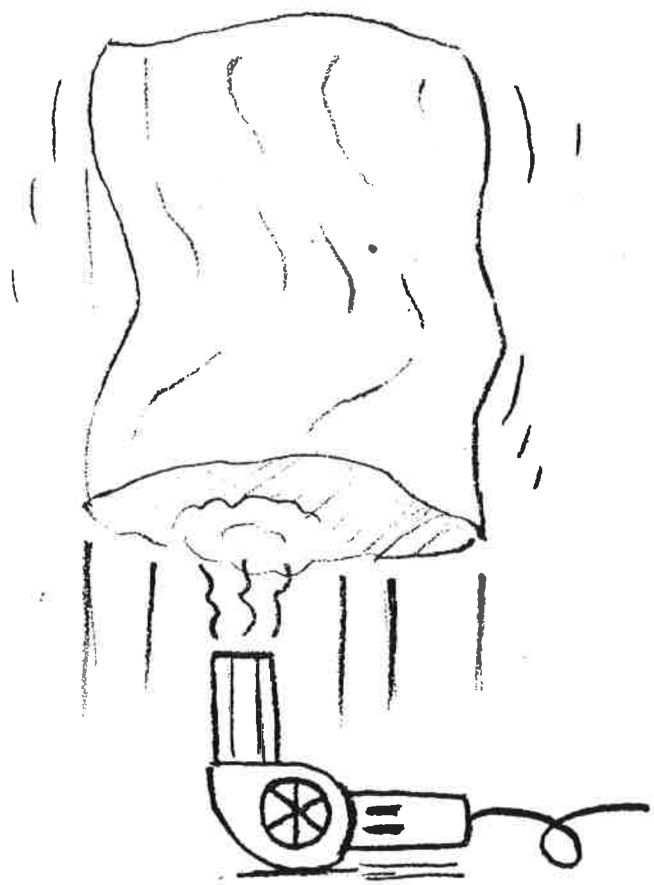


Short Experiment 2: How Does A Hot Air Balloon Fly?

Have you ever seen a big, colorful hot air balloon up in the sky? Do you know how they float in the air? They have no engines and no wings, but they do fly. Here is the explanation. Remember the bubble suspension experiment you have just seen in the previous short experiments? Soap bubbles filled with air were floating on the denser carbon dioxide gas. In this case we have only air, so how does the balloon filled with air float? Periodically the person in the basket under the balloon heats the air inside the balloon by using a flame. This hot air lifts the balloon; thus it floats. Is hot air less dense than cold air at a given air pressure? Let's find out.

You will use a hot air blower to inflate a plastic bag. What happens when you let go of the bag? Just like the hot air balloon, the bag with hot air rises in the relatively cold air around it!



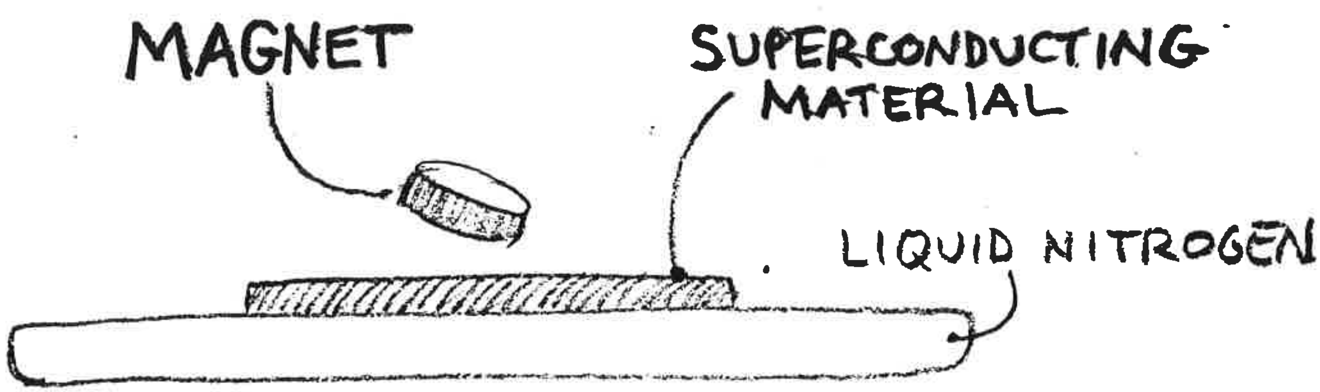


Short Experiment 3: Can A Magnet Float In The Air?

Magnets are amazing things. You can do many fun things with them. In this experiment, you are going to float a tiny magnet on a special material called a *superconductor*. A superconductor is a conductor like a copper wire, except it has no resistance to the flow of electricity. Now imagine that you have a Walkman made out of superconducting electronic components. Since this Walkman will not consume electrical energy, one battery will be enough to use it indefinitely. This is great!

But wait, there are more interesting properties of these superconducting materials. One of them is the following experiment you are going to perform. When a magnet is brought near a superconducting material, it is repelled (as if the material has the like pole of a magnet - and like poles of magnets repel each other). If the magnet is light enough, then it will float over the material.

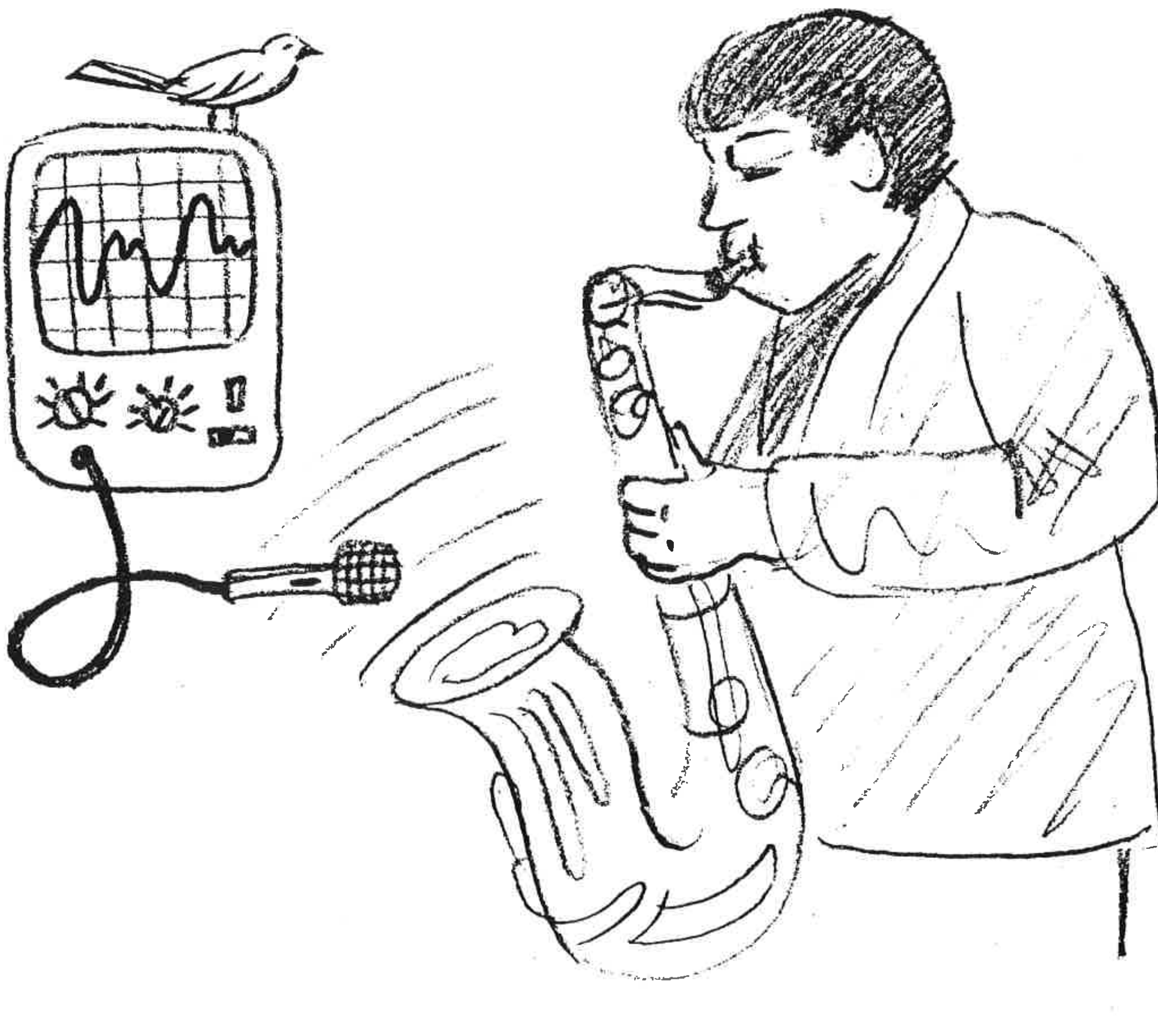
There is one more thing to know before you try the experiment. The superconducting material you are going to use is a special kind. Many materials become superconducting only when they are below -452°F. (Very cold, isn't it?) Recently, scientists found new materials that will be superconducting at relatively higher temperatures, -320°F. (Still cold). In this experiment, you are going to use liquid nitrogen to cool such material, and observe a small, disc-shaped magnet floating on top of it. One word of caution; liquid nitrogen is very cold, so it burns! **Never touch it.** Can you think of an application using these materials to lift things?



Short Experiment 4: What Does Sound Look Like?

It is possible to see the shape of sounds. When you talk, your lungs, the air tract in your chest, and your tongue vibrate to make sounds. Sound is a pressure wave in the air that surrounds us. You hear the sound, but you don't see it.

In this experiment you will see "Hello", "One", "Dog" and your whistle! You will need: a microphone and an oscilloscope. A microphone converts the motion of air into an electrical signal. An oscilloscope displays the variation of an electrical signal in time. By connecting a microphone to an oscilloscope, you can "see" what a sound looks like. The louder the sound, the taller it will appear on the oscilloscope. The higher the pitch of the sound, the faster it will appear to go up and down on the oscilloscope. A pure tone gives a very clear picture on the screen, like in the picture below. Whistling is a good way to generate a pure tone. Try the tuning fork, too.

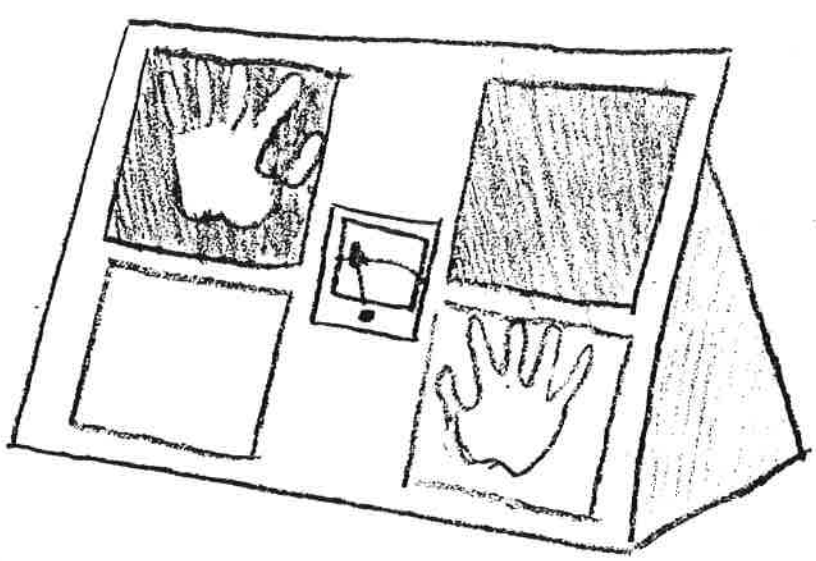


Short Experiment 5: How Does a Human Battery Work?

Do you know how a battery works? A simple dry cell battery has three parts: a metallic rod in the middle, a jelly-like chemical around it, and a different metal casing. Chemical reactions inside the battery produce electrical current that flows between what is called the electrodes; the rod in the middle is the positive electrode and the metallic case is the negative electrode. Basically, you need two different metals and some chemical material to make a battery.

In this experiment, you are going to make a battery using your body and two different metals. On the table you will see a panel with four square metal plates. The two on top are aluminum, the two at the bottom are copper metals. The gauge in the middle of the plates measure tiny electrical currents. Place both hands on copper plates, and watch the gauge. Did the needle in the dial move? Try placing your palms on the two aluminum plates. Anything happen? Now try one hand on the copper plate and the other on the aluminum plate. Bang! The needle in the dial moved all the way to the right. Why? When you touched the two different metal plates, the thin film of sweat on your hands acts like the chemical in the battery, reacting with the copper and aluminum plates. Electrical current produced in this reaction in the copper plate then flows through your body, goes through the aluminum plates, and makes the meter move! Whoever has the smallest body resistance to the flow of electricity will make the needle move the furthest to the right.

You can make a longer human "wire" by holding hands together. As you make the "wire" longer, the needle will move less to the right, producing less current. Why? Did you also notice that the friends with wetter hands move the needle further to the right? This is because wet hands have less resistance, thus more current will flow through the meter.

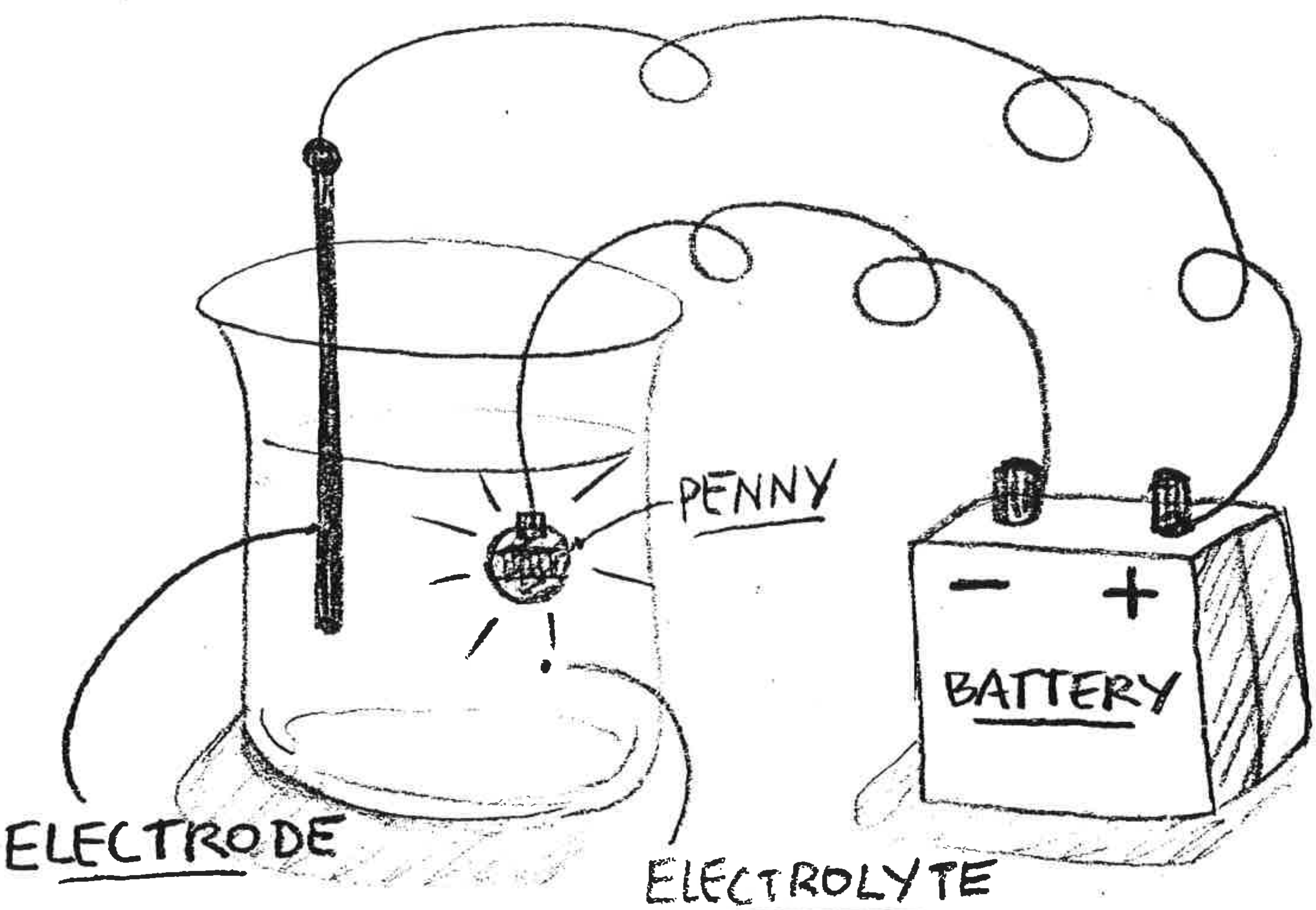


Short Experiment 6: How Do You Make a Gold Penny?

You must have seen gold watches, photo frames, etc. They are not actually made out of gold, but are covered with gold. Covering metals with other metals using electrical energy in chemical solutions is called *electroplating*.

To electroplate a metal object like a picture frame, you connect the object to the negative side of a battery, and another metal (called an *electrode*)to the positive side, and dip them into a chemical solution called an *electrolyte*. If you want to gold plate the object, this chemical should contain gold. When an electrical current passes through this chemical solution between the metallic object and the electrode, gold atoms are deposited on the object, and if you wait long enough, the whole object is covered with a very thin layer of gold.

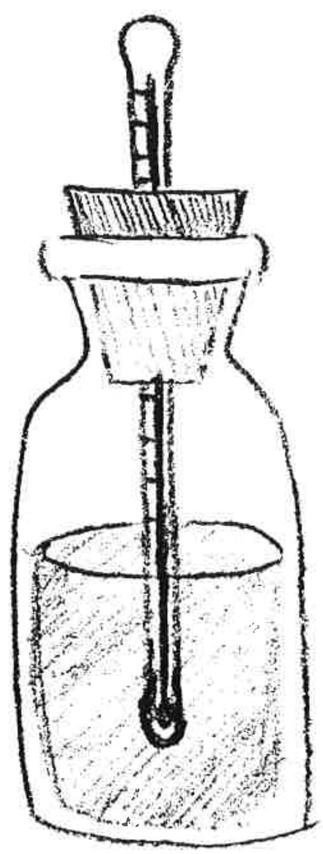
In this experiment, you will electroplate a penny, which is made out of copper, with gold. So bring a nice shiny penny with you to the experiment desk. If you have read this and have done your homework, you will have a gold penny as a reward!



Short Experiment 7: How Does a Thermometer Work?

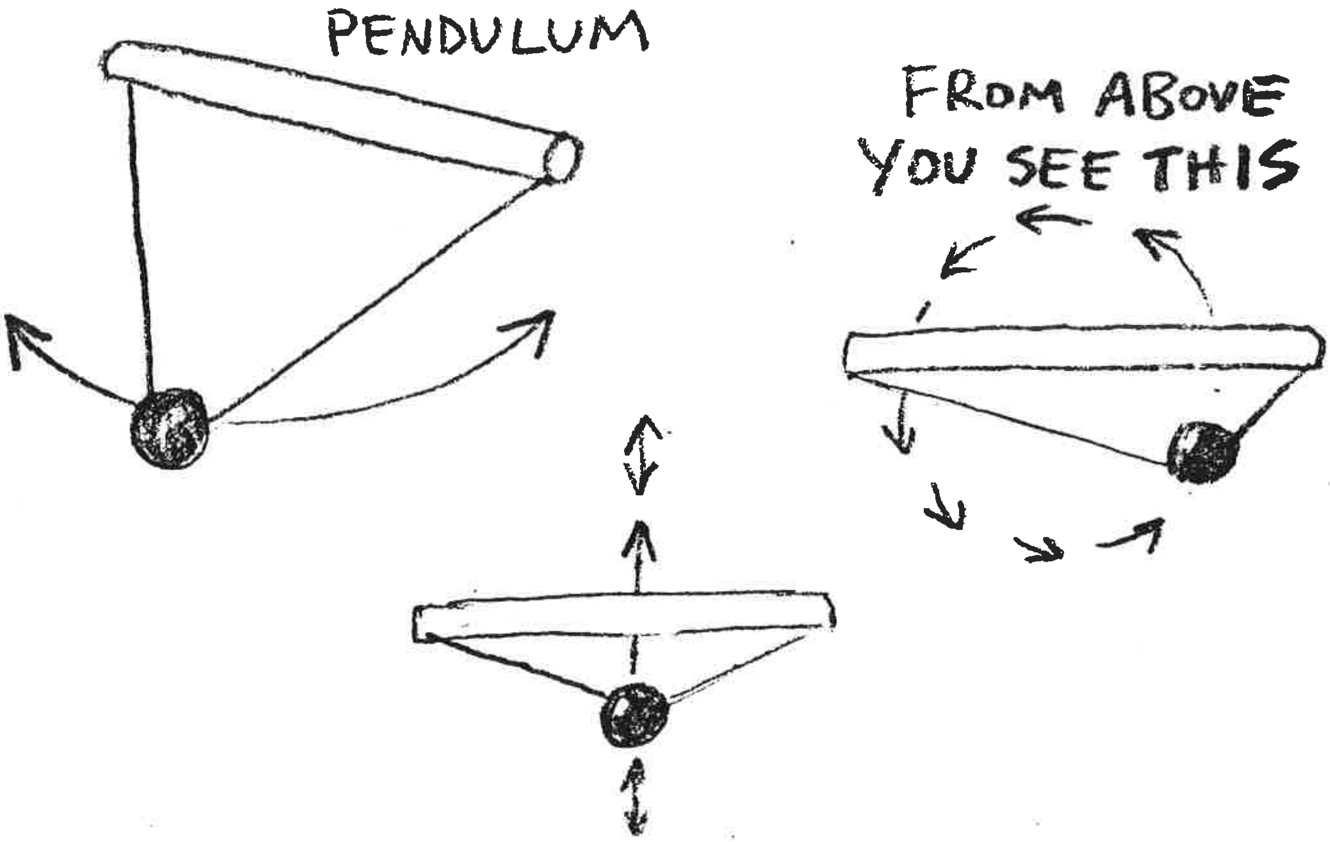
When you get sick and have a fever, your mother or father measures your temperature with a device called a thermometer. A simple medical thermometer is just a glass tube with a chemical called mercury sealed inside. The numbers on the surface of the glass show the temperature. When you place the thermometer into your mouth, its temperature initially is less than your body temperature (it is at room temperature). Liquids expand when they are heated. You know this, for example, if you have seen milk boil in an open pan. After a while, if you are not careful, milk will float over the pan and spill all over the stove. Similarly, mercury (a liquid metal) sealed in a long glass tube will expand due to your increased body temperature, and will occupy more volume than it would at a lower temperature, and rise in the thermometer. In this experiment, instead of mercury, you have water inside a bottle. Red food color has been added in the water, so that you can see it inside the glass tube.

Try the following experiments: hold the bottle thermometer in your hand and see if the level of colored water will rise in the glass tube. Then, hold it above a lit candle. (Be careful not to burn yourself). What happened? Finally, put it on the ice placed on the table.



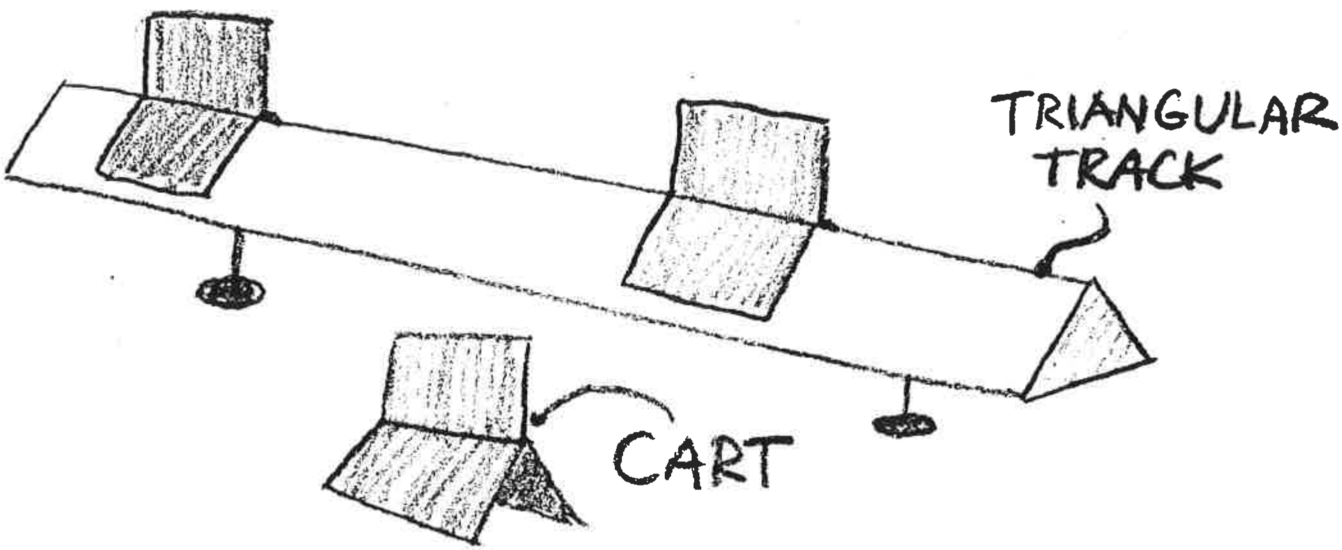
Short Experiment 8: Seeing Is Not Always Believing

A *visual illusion* is a trick played on your mind. In this illusion you look at a swinging object through a special pair of glasses. Your mind thinks that the object is going in circles. When you take off the glasses you realize that the object is actually moving in a line.



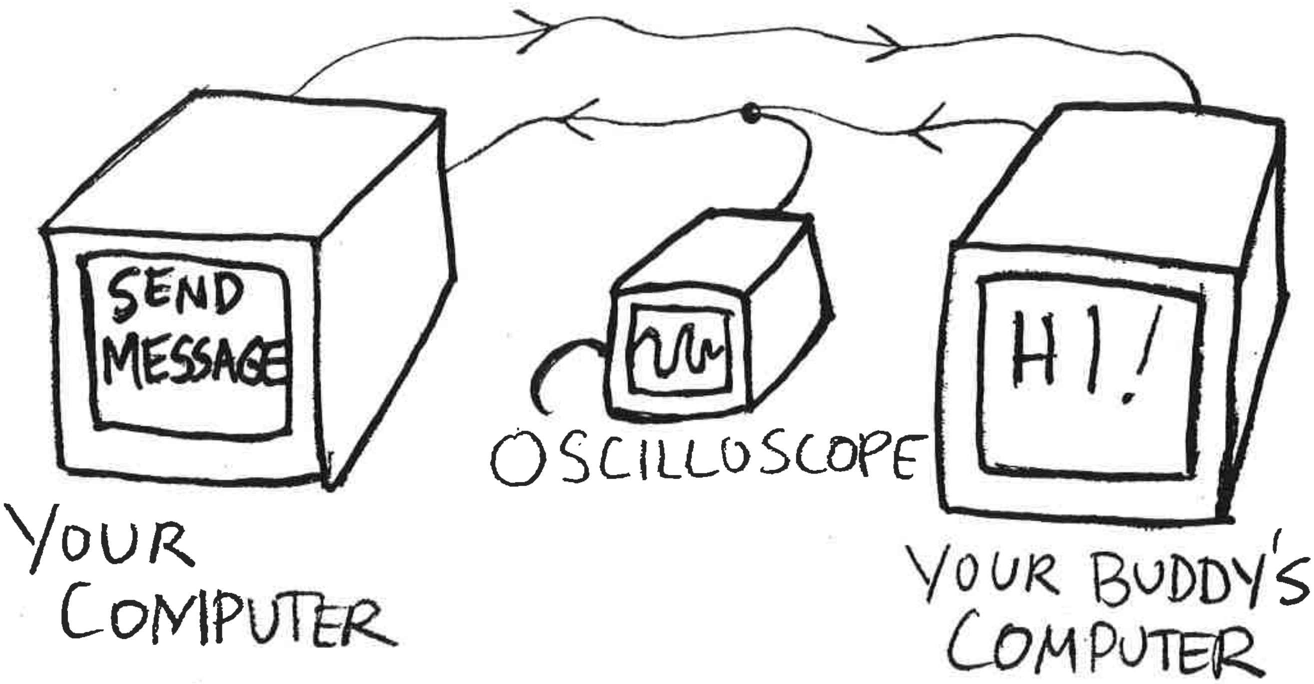
Short Experiment 9: Collisions!

Two carts on a frictionless air track collide. One is at rest, the other is moving before the collision. Predict what will happen if the carts are equal in mass and bounce apart after the collision. What will happen if both carts stick together when they collide?



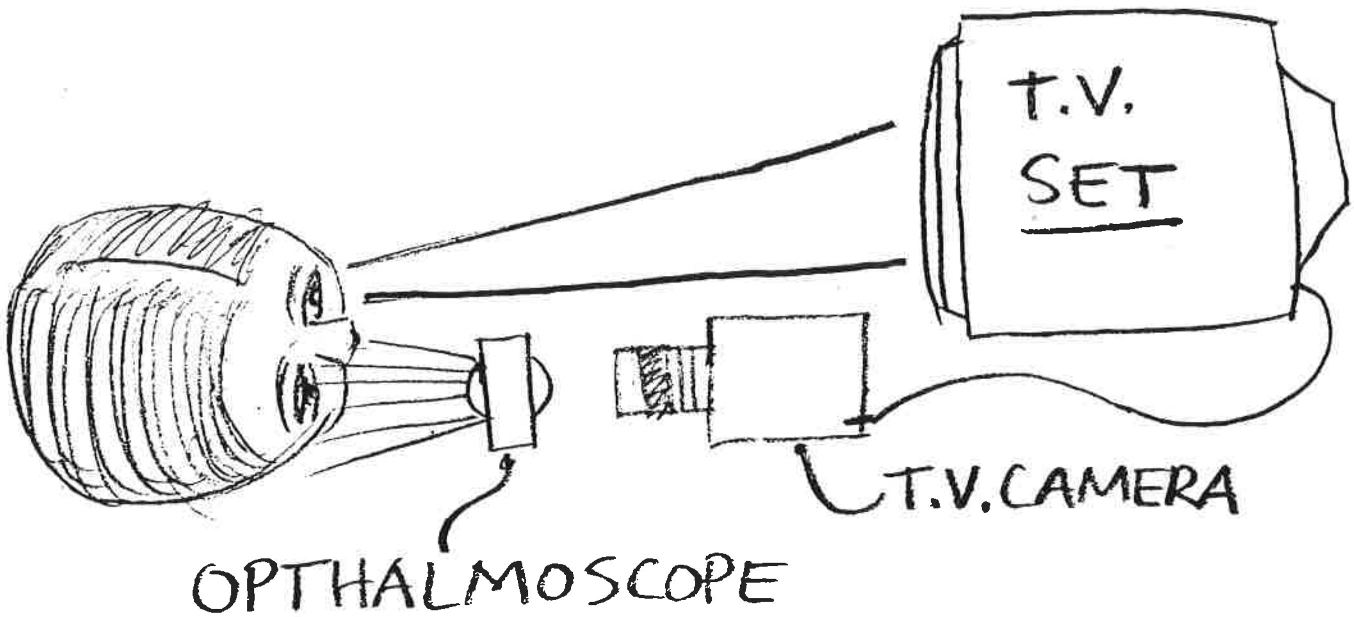
Short Experiment 10: Talking Computers

Computers can "talk" to each other by sending electronic messages along wires. The messages are like the dits and dahs used in Morse code. Type a message on your keyboard and it will appear on your buddy's computer. Your buddy can send a message back to you by typing on his/her keyboard. See the electronic message on an oscilloscope as it is sent.



Short Experiment 11: See Your Retina - A Window To The Brain

The retina is the lining on the back surface of your eye. It is actually a portion of your brain that converts pictures into messages that your brain understands. Using a television camera and the device that a doctor uses to look into your eyes (ophthalmoscope), your left eye can see the retina of your right eye on a TV set.



Short Experiment 12: Laser Fountain

In the laser fountain, a stream of flowing water traps a laser beam forcing the light to curve away from the straight line path that it would normally follow. Modern "fiber-optic" telephone communications use the same principal to transmit information over tiny glass fibers almost as thin as human hair.

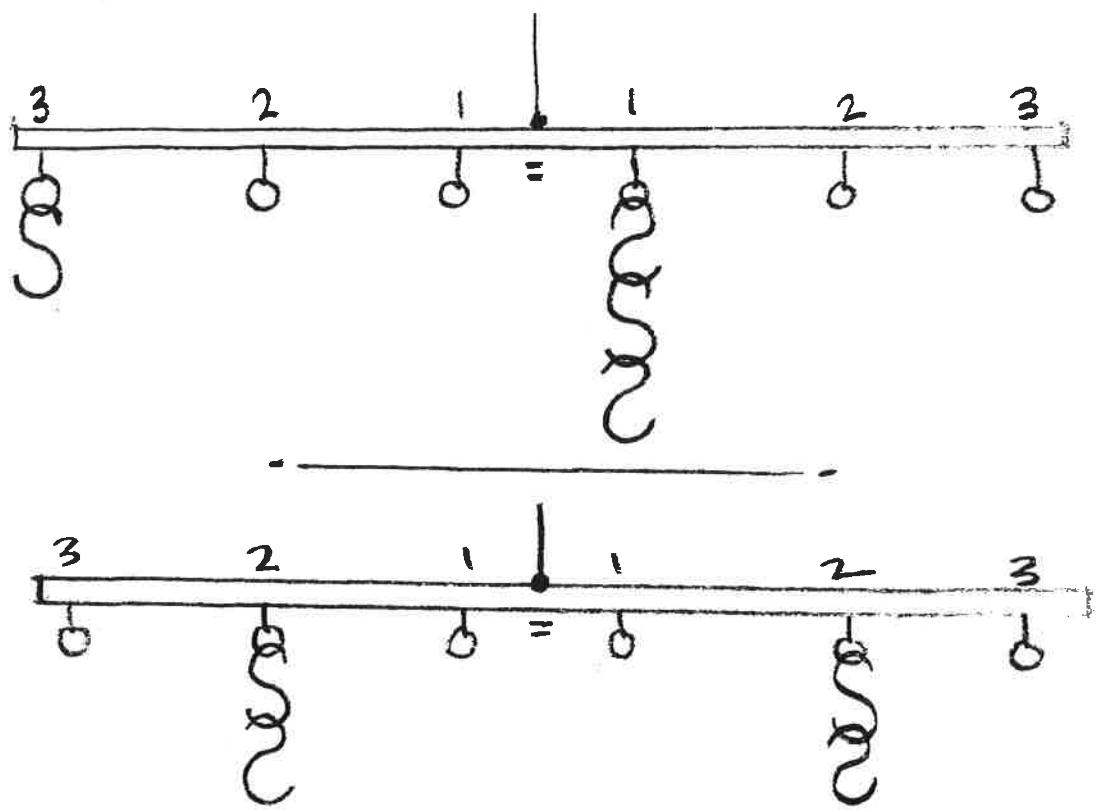
Short Experiment 13: Geology Display With Fluorescent Rocks

This short experiment is a geology exhibit of different rocks and minerals, including igneous, sedimentary and metamorphic rocks and a variety of different minerals. Certain rocks, known as fluorescent rocks, will also be on display. These rocks emit a red or green color only under ultraviolet light. In addition, fossils of leaves, fish and petrified wood will be on exhibit.

Long Experiment 1: A Mathematical Balancing Act

Presenter: Maureen Quirk
Jeremy Goodman
Grade: Kindergarten

The purpose of this experiment is to explore the notions of addition, multiplication, and arithmetical equality through a simple physical model. The apparatus is an 18" long wooden dowel and six 1-ounce "S" hooks. The dowel is suspended from its center (via an eyelet screwed into the wood and a small loop of cord). "S" hooks can be suspended from the dowel at positions 3", 6", or 9" to the left or right of the center, downward-pointing eyelets having been affixed at these positions. Children discover that equal numbers of "S" hooks placed at equal distances to the left and right of center will balance; that three hooks 3" left of center will balance a single hook 9" on the right, or one at 3" right plus one at 6" right; etc. Children who can count by ones, twos and threes may be able to determine in advance whether a given configuration of hooks will balance.



Long Experiment 2: "Sink or Float"

Presenter: Nancy McAdams
Grade: Kindergarten

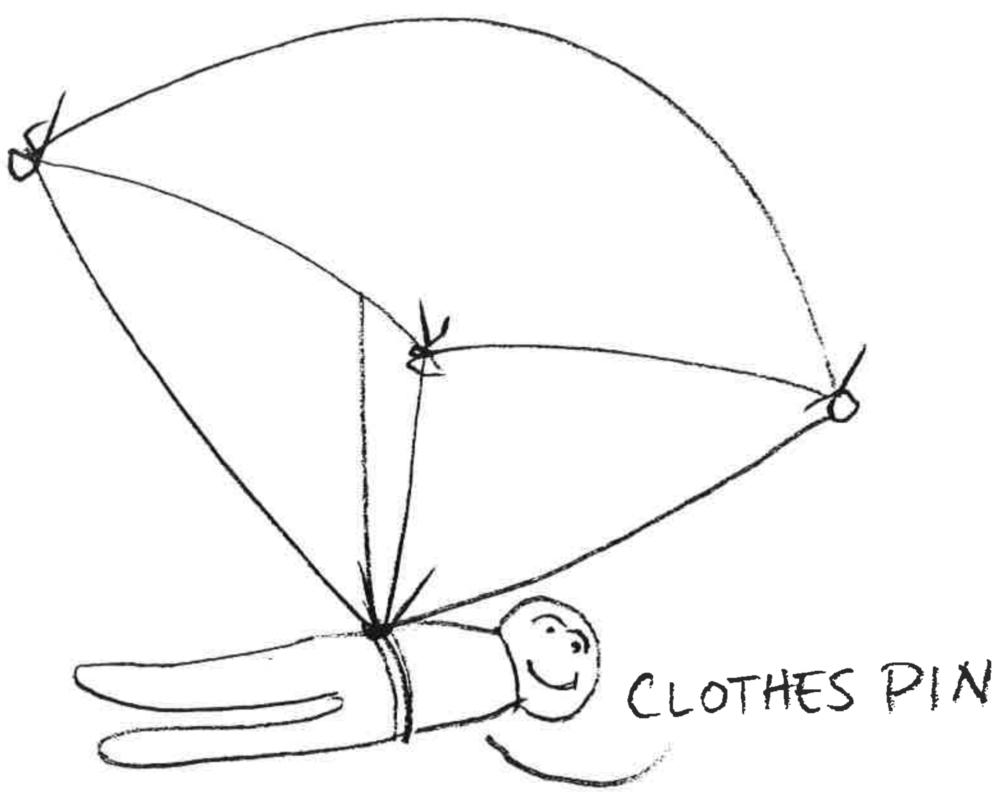
1. In the first part of this presentation, the children will learn about the concepts of "sink" and "float". They will practice their classification and observation skills as they predict which items in a set of objects will sink or float in water. After dropping the items into a bucket of water and observing the results, we will record the observations on a chart.

After the objects are sorted, we will discuss reasons for the results using the chart.

2. Next, the children will make parachutes to study the concept of floating in air. We will use clothespins, string, and pieces of fabric to make the parachutes.

The children will drop the clothespins without the parachutes and observe what happens. Then they will assemble the parachutes on the clothespins, throw them into the air and watch them fall.

We will discuss why the parachutes float in the air. The discussion will be extended to include other objects the children know about that float in the air.



Long Experiment 3: Computers & Graphics in Science

Presenter: Eric Jackson
Grade: 1

The purpose of this presentation is to convey the idea that computers can be used to conduct scientific experiments that may be difficult or impossible to do in real life. The demo will use two basic concepts - gravity and the food chain. Each experiment will begin with a group discussion about what the concept is and what the students know about it, followed by an interactive session on a Silicon Graphics workstation in which the concept is illustrated. For gravity, the children will use the mouse to select planets of different masses and to watch how the trajectory of, say, a cannonball, changes on different planets. For the food chain, I'll have a graphical game-of-life-type simulation, with different colors representing different animals, plants, insects, etc. The children will be able to select starting populations of the different kinds of life and see how the ecosystem evolves, observing that if any populations are missing, the whole ecosystem dies out.

Long Experiment 4: Bubbles

Presenter: David Wilkinson
Grade: 1,3

Bubbles are extraordinary. No scientist could have predicted that they would exist- they're too complicated. Yet we make them easily, and they look so beautiful and so simple. Even today scientists disagree about the details of how bubbles work. It seems that the bubble is like a very thin sandwich with soap on both sides of a film of water. In the experiment, we'll divide up into small groups to do several things with soap bubbles and films. Here's a list of projects:

* Look at how soap spreads out on water.

* Measure how long soap bubbles last.

* Look at and draw the shapes of soap films inside wire frames. (You would never have guessed the answer.)

* We'll put on our coats and go outside to make some BIG BUBBLES, just for fun.

Long Experiment 5: Rocks, Minerals, and Fossils

Presenter: Tony Dahlen
Grade: 1,2

A variety of geological materials will be displayed for the students to examine and discuss: igneous, sedimentary and metamorphic rocks; minerals; fossils; and rocks from the Princeton area used for building and other purposes.

Long Experiment 6: Electricity

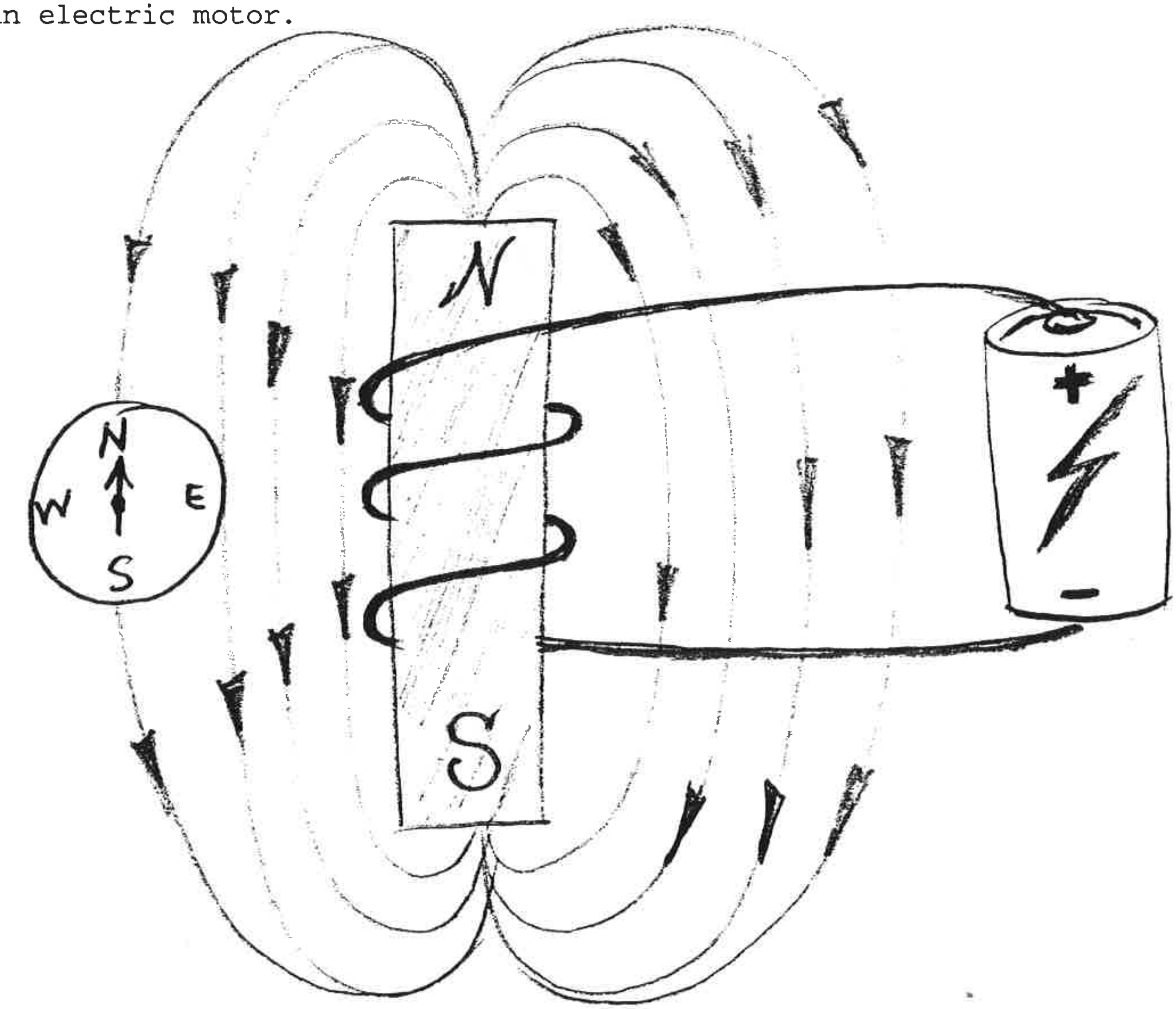
Presenter: Brian Zack
Grade: 2

Demonstrations and hands-on 'experiments' will be provided, which will illustrate various aspects of current electricity and static electricity. This will involve a series of short and simple activities, chosen both for their ability to illustrate basic physical principles, as well as for unusual or counter-intuitive outcomes - i.e., for interest and enjoyment. All activities will be entirely safe, even assuming a worst-case scenario! It is hoped that the children will come away with some very basic information about electricity - but the primary aim will be to stimulate their curiosity and leave them with the feeling that science is fun.

Long Experiment 7: Electricity and Magnetism: "Different Sides of The Same Coin"

Presenter: George Harvey
Grade: 2,3

Electricity and magnetism are two aspects of the same force. Students will explore the connection between them in a series of experiments with compasses, magnets and electrical currents. They will learn how to create electricity with magnets, and how to create magnets with electricity and to use these principles with an electric motor.



Long Experiment 8: Invisible Force Fields

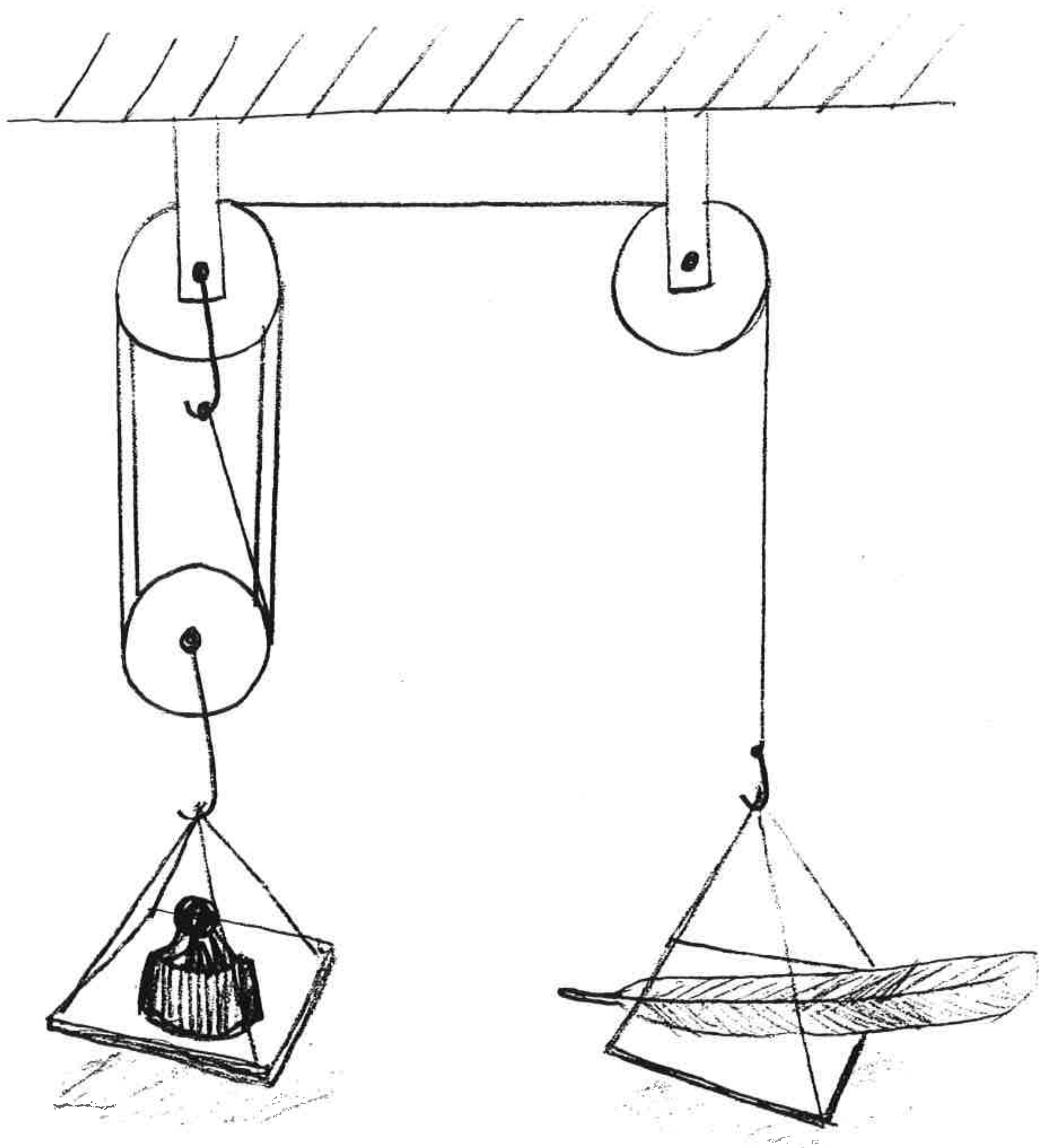
Presenter: William McKinley
Grade: 1,2,3

Our world is filled with invisible force fields. We know they exist, and define them by what they do. The force of the Sun's gravitational pull bends the earth's motion into the circle we call "orbit". The moon's gravitational field pulls on our ocean waters, and forces them across the earth's surface creating the tides. Strong electric fields, produced during storms, break through the air as lightening while gentle electric forces tickle the antenna of our TVs and radios to transmit sound and pictures. Magnetic forces drive the motors that run our machines. What are these force fields and why do they exist? This discussion will guide the students through the explanation of these phenomena so they can begin to develop their own understanding.

Long Experiment 9: Pulleys, Weights, Springs, and Things

Presenter: David Vanderbilt
Grade: 3

We can do some surprising things with a little simple equipment: a few pulleys and some string. For example, we can make it easier (or harder) to lift a weight - feel it for yourself! We will use spring scales to measure weights and forces, and check whether this effect is real. And we will use rulers to measure the movements of weights and string - and maybe understand something about how this neat trick is accomplished.



Long Experiment 10: Fold Your Way to Fun and Fractals

Presenter: Larry Wiley
Grade: 1,4

This activity will engage students in paperfolding and pattern discovery, move on to concrete/symbolic representations of the patterns and shapes which develop as the students fold the paper. We will conclude with an abstract representation using computer graphics of what the result would be if one could fold the paper in half 'many' times - a fractal called a dragon curve!

Long Experiment 11: Learning Science Using Computers

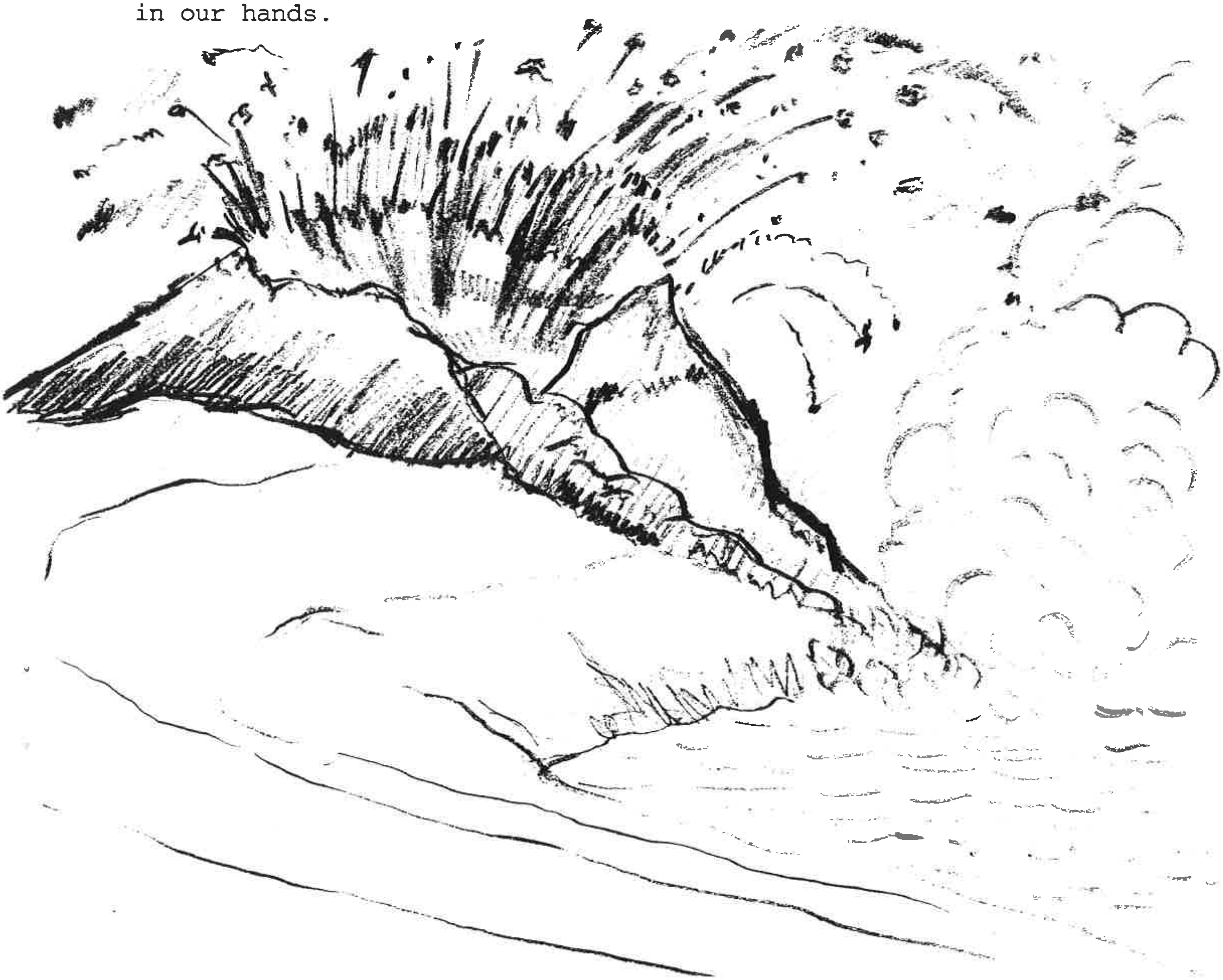
Presenter: Steven Just
Grade: 4

In this presentation, the students will play with an instructional computer game that quizzes them on science knowledge. Subjects covered in the game will emphasize third and fourth grade-level science topics. The goals of the game is to move from elementary school on through five higher levels of education. At each level, it becomes a little more difficult to "graduate" and move on to the next level. The class will need to collaborate in order to answer all of the questions in the time allotted.

Long Experiment 12: Geology Exhibit

Presenter: Mark Feigenson
Grade: 4

In this presentation, we will view a videotape of recent volcanic eruptions, and discuss why volcanoes around the world have different shapes, and what makes some volcanoes more dangerous than others. We will also look at hand specimens of some lavas and see fragments from the deeper parts of the Earth that are brought to the surface in a few eruptions. Although the minerals that make up the lavas are too small to be seen with the unaided eye, we will investigate a few samples with a petrographic microscope to magnify the lavas. We may be able to compare the minerals we see in the microscope with some larger varieties of crystals than we can hold in our hands.

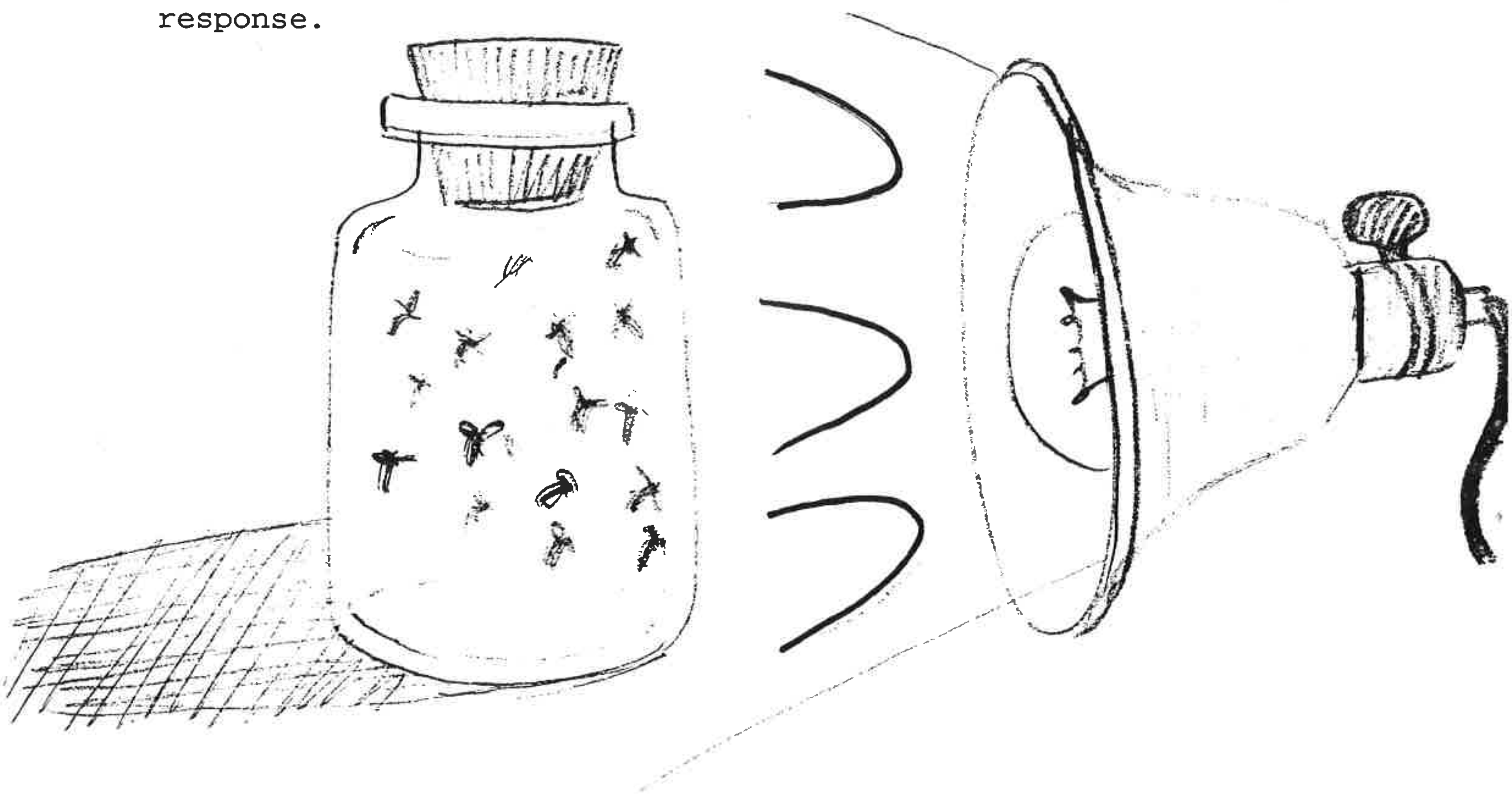


Long Experiment 13: Adaptation in Nature

Presenter: Shirley Tilghman
Grade: 3,4

In order to survive in nature, animals need to be able to quickly adapt to a change in their surroundings. For example, animals must be able to sense a change in the amount of food in their environment by using their sense of smell. They must be able to adapt to changes in temperature, in order to protect themselves against both heat and cold. Most animals can respond to differences in light and dark. By using their sense of hearing, they can be warned about danger nearby, and respond by running away.

The speed with which an animal responds to these signals from their environment will often determine whether the animal will live or die. In our experiment we are going to study how rapidly the common fruit fly, *Drosophila melanogaster,* can respond to changes in temperature and light. We will change their environment, and then ask how quickly the flies can adapt to the change. We will try to understand what determines how fast the fly responds by designing and carrying out experiments that vary the change in temperature and the intensity of the light. We will use microscopes to watch the flies, and stopwatches to time their response.



Long Experiment 14: Radiology

Presenter: Richard Feinstein
Grade: 4

In this presentation, we will view a viedotape about radiation, and demonstrate how we can see various organs inside the body using X-ray film.

Long Experiment 15: "Who Sank the Boat"

Presenter: Adele Hagadorn
Grade: 1

In this workshop, the children will be actively involved in creating clay or foil forms (boats) that float. They will then add "cargo" (paper clips, coins, etc.) and try to sink their boats. The concepts of buoyancy, balance and characteristics of matter - size and weight - will be investigated and discussed as children rework their forms to once again float.

Long Experiment 17: Propagation of Swedish Ivy

Presenter: Paula Jakowlew
Grade: 3,4

This workshop will require the use of counting skills, measuring with a ruler, observation skills, as well as the ability to follow directions. It will be a hands-on experience, as well as a "make and take" experience. Students will grow Swedish Ivy and place the potted cuttings in the school's grow lab for several weeks before taking them home.

*Special thanks to **Karl Kovacs** for all the drawings and to **Ken Wilkie** for the booklet cover.*