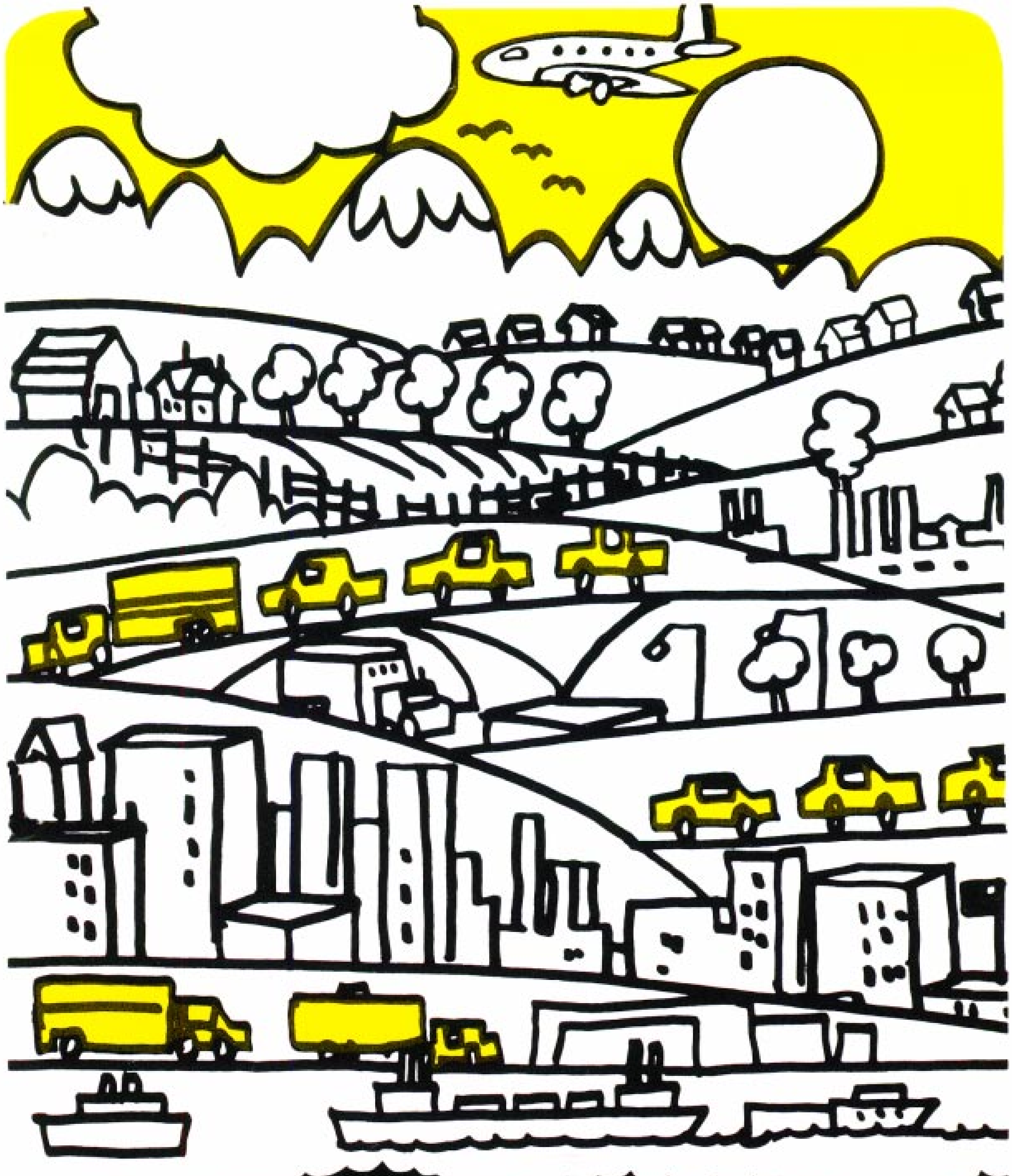


ENVIRONMENTAL EXPERIMENTS

. . . from Edison

THOMAS ALVA EDISON SCIENCE EDUCATION SERIES

Science is a way of knowing about, understanding, interacting with, and appreciating the world around us. Science learning begins by probing, questioning, and discovering the wonders of the world in which we live.

The Thomas Alva Edison Science Education Series uses a “hands-on, minds-on” approach to help students use knowledge and skills obtained through activity-centered experiences to understand the past, present, and the future sources and uses of energy within the natural and social systems of our environment.

This Science Education Series will strengthen any science program by providing students with current information about science exploration and discovery. By developing an understanding of how persons relate to natural systems, the Edison Science Education Series will help students to discover how they can become energy literate and be effective managers of the natural environment in which they live.

LaMoine L. Motz, Ph.D.
Director of Science Education
Oakland County Schools, Michigan

Past President
National Science Teachers Association
National Science Supervisors Association

ENVIRONMENTAL EXPERIMENTS . . . from Edison

Text
ROBERT F. SCHULTZ

Design and illustrations
RUSSELL H. KLIX

Edison Electric Institute gratefully acknowledges the Thomas Alva Edison Foundation as the creator of the first Edison experiments books. We at EEI are pleased to continue the Foundation's fine tradition of offering this service to the young people of America.

TO THE YOUNG PEOPLE OF AMERICA

To some extent we are all responsible for the environmental problems that exist today. Science and technology, both of which are actually providing solutions for today and the future, are often blamed. And, unaware of the positive contributions made through research and development, many people point an accusing finger at industry.

Regardless of where the blame lies, one thing is certain: We will look to you, the future scientists and engineers, to continue the search for the solutions to our national and global environmental problems.

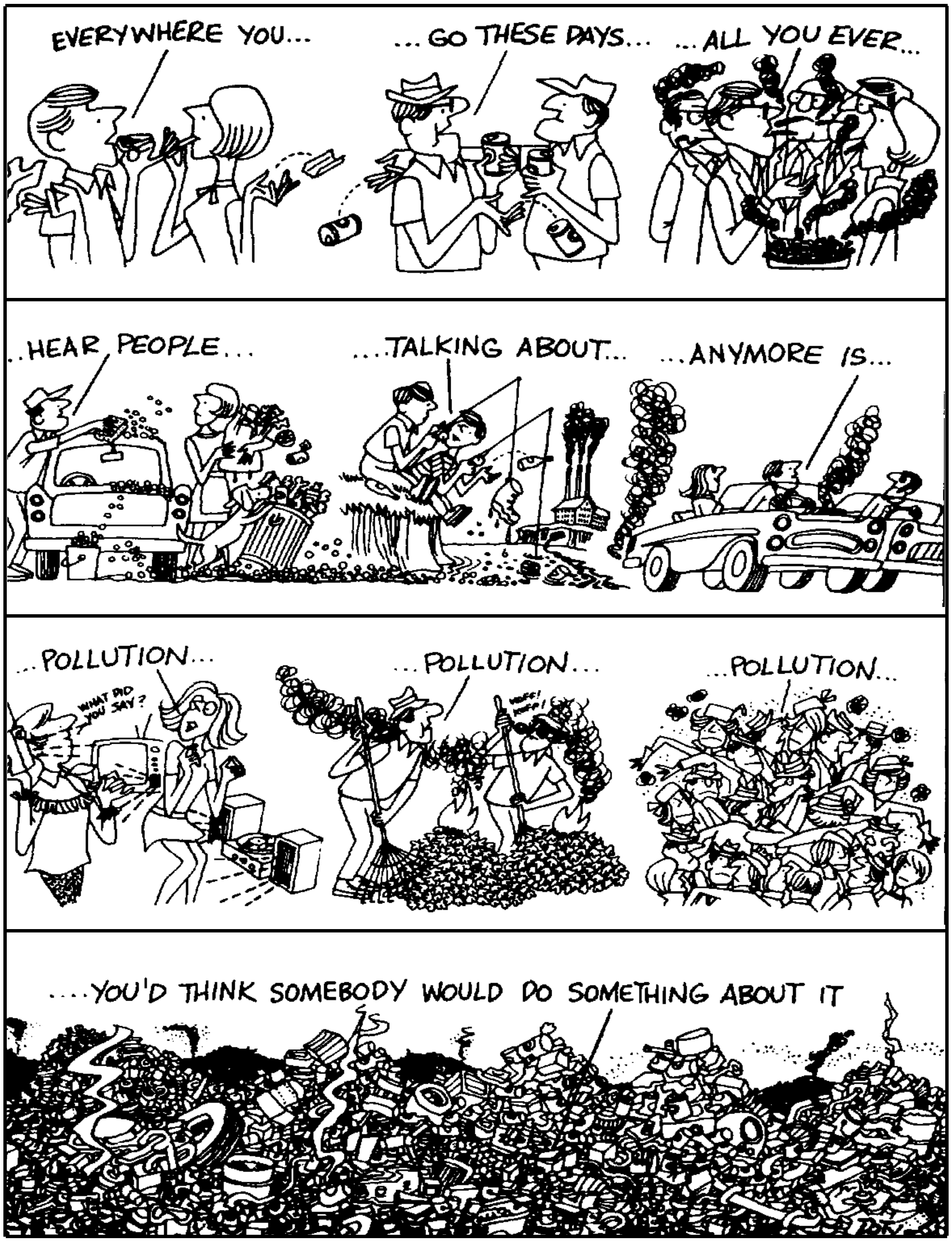
The Edison Electric Institute, in cooperation with the investor-owned electric utilities all over America, is pleased to offer you this book of environmental experiments. Doing the projects described on the following pages may help you to make a positive impact on the environment right now.

Protection of our planet and its natural resources is of major concern to all of us. Environmental science and engineering offer a wide variety of career possibilities, and I urge you to explore the many exciting and challenging opportunities open to you in this field.

Industry needs . . . indeed America needs . . . a great many more scientists and engineers. Your support is vital.

Thomas R. Kuhn
President
Edison Electric Institute

EXPERIMENTS


EVERYWHERE YOU...
... GO THESE DAYS...
... ALL YOU EVER...
..HEAR PEOPLE...
...TALKING ABOUT...
...ANYMORE IS...
...POLLUTION...
WHAT DID YOU SAY?
...POLLUTION...
...POLLUTION...
....YOU'D THINK SOMEBODY WOULD DO SOMETHING ABOUT IT

POLLUTION AND THE ENVIRONMENT

It's true. We do talk a lot about pollution. That's not surprising, though. After all, environmental pollution exists nearly everywhere. And in one way or another it affects each of us. So really, a person can hardly avoid discussing the topic any more.

But if talk is going to accomplish anything, then we should make some effort to know, at least in part, what we're talking about. Right?

Right.

Let's look at pollution for a moment. It has been defined as being everything in the environment that we don't want. (You can't go wrong with that definition, can you?) Now since the environment includes all the conditions and influences surrounding us, environmental pollution, then, must mean many kinds of pollution. And it does. It means air pollution, water pollution, soil pollution, solid waste pollution, and a few others of lesser importance, like noise pollution.

Well as you can see, pollution is a mighty big problem. Actually, it's the biggest one that man has ever faced. On the other hand, this is only a booklet. So it can't do much more than introduce you to that problem.

Thus, most of the experiments on the following pages are fairly simple and concern just the major types of pollution. However, pollution is only one part of the environmental picture. So a few experiments have been added on other parts to make the picture a little more complete.

Hopefully, by doing these experiments, you will be able to talk more intelligently about pollution. Hopefully, you will get a better. idea of what's happening in, and to, the world around you. And hopefully, you will be inspired to do what you can to protect the sanctity of that world. Needless to say, we all have an obligation here. Too bad the complaining soul under the trash heap (page 4) didn't see it that way instead of waiting for somebody else to "do something about it."

EXPERIMENT 1

SOLIDS IN THE AIR

THINGS YOU NEED: Large coffee can. Shiny white cardboard or paper 10 inches by 20 inches. Petroleum jelly (such as Vaseline). Masking or mending tape. Wood pole 4 feet long. Wood base 1½ feet by 1½ feet.

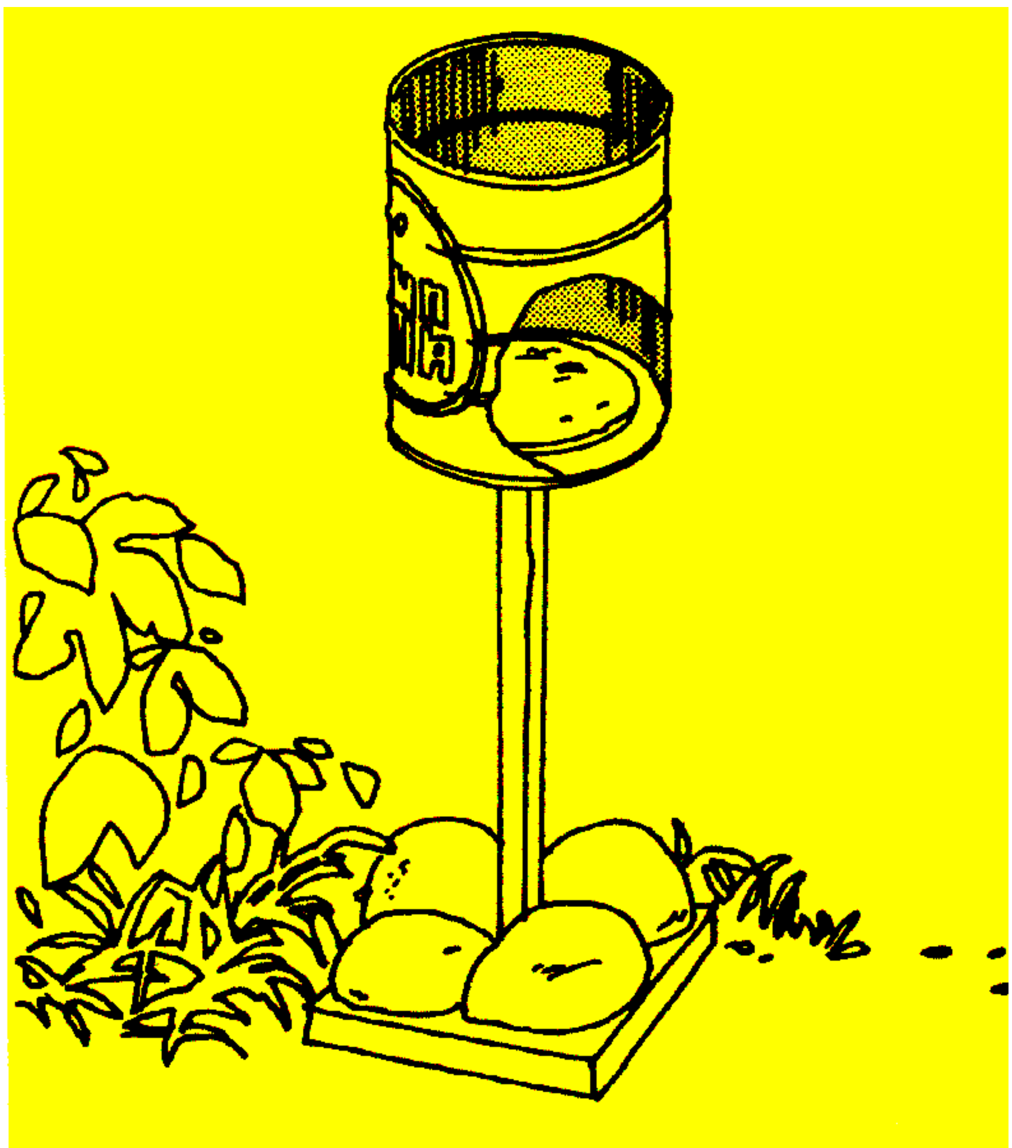
According to the U.S. Environmental Protection Agency, millions and millions of tons of man-made waste products are released into the air each year in this country. The main ingredients in these waste products are carbon monoxide, sulfur and nitrogen gases, hydrocarbons, and very small solid and liquid particles.

Now of this huge amount released, probably around a third of it falls back to the earth. Some of it is visible as dust, ash, and smoke.

Technicians need special equipment to measure and study this fallout. But you can still get a general impression of how much dirt is in the air in your area by doing this simple two-part experiment. The first part concerns the amount of dirt that settles from the air. The second part concerns the direction from which the wind is bringing that dirt.

In part one, the coffee can is positioned on a stand with the open end facing upward. The sides of the can and the height of the stand will help to keep out the ground dust. After assembling the stand, punch a small hole in the bottom of the can. Then nail the can to the pole.

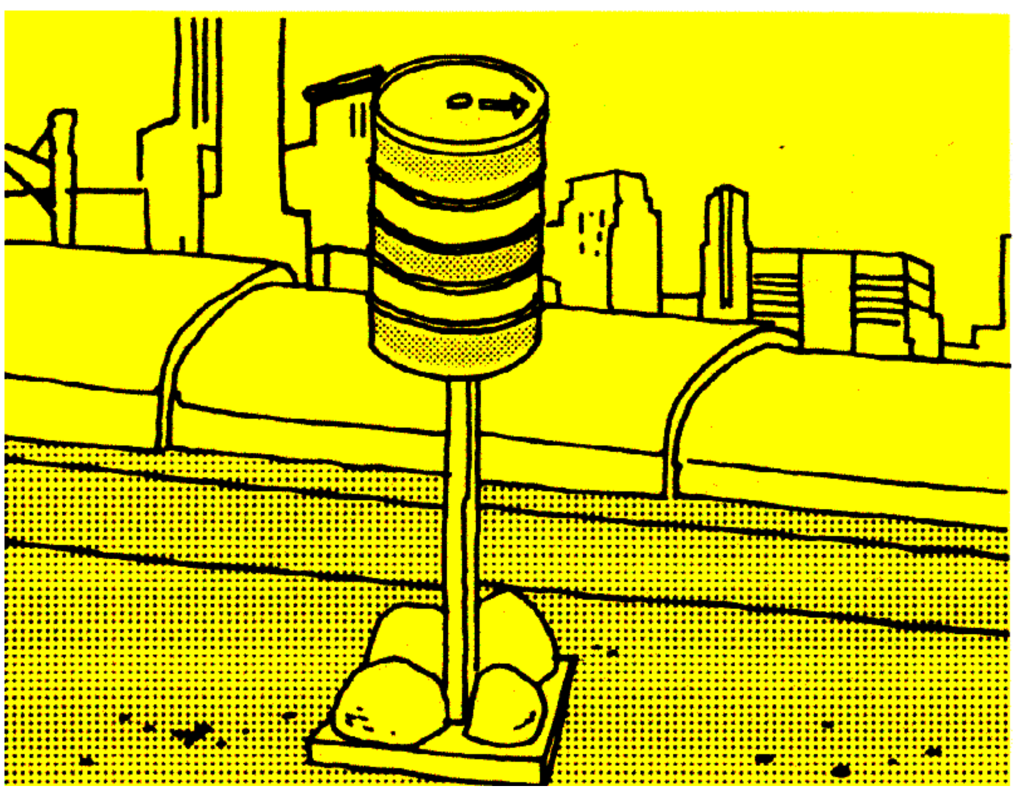
From one end of the cardboard, cut out a disk about 5 inches in diameter, and spread a thick coating of petroleum jelly all over the white surface. Lay the disk on the bottom of the coffee can (jelly side up, of course). Now you can start the test by placing the stand out in an open area as far above the ground as possible. Put a few rocks on the base of the stand to keep it from being blown over. In a couple of weeks or so, you'll be able to tell how clean or dirty the air is around you.



Another method would be to put a large saucer of clean water in the coffee can instead of the cardboard. Actually, you won't need the saucer if the nail hole in the bottom of the can doesn't leak. Keep adding water from time to time to make up for evaporation losses. After a few weeks, let all the water evaporate. Then check for the dirt.

For part two of the experiment, remove the coffee can from the stand. Then wrap several strips of tape tightly around the can, sticky side out. If this is too hard to do, then try to get some double-sided tape. Or, just tie the remaining piece of white cardboard around the can, and apply jelly as before. Nail the can on the pole with the open end facing downward.

Mark an arrow on the lid pointing to the north. Try to locate the stand as high as possible (on the flat roof of a building would be ideal). Check the can every few days to see if there are more particles coming from one direction than another.



EXPERIMENT 2

EFFECT OF AIR POLLUTION ON NYLON

THINGS YOU NEED: Discarded nylon stocking. Stiff cardboard 1 foot by 1 foot. Wood pole 3 feet long (a piece of broomstick would be great). Magnifying glass (desirable, but not necessary). Patience.

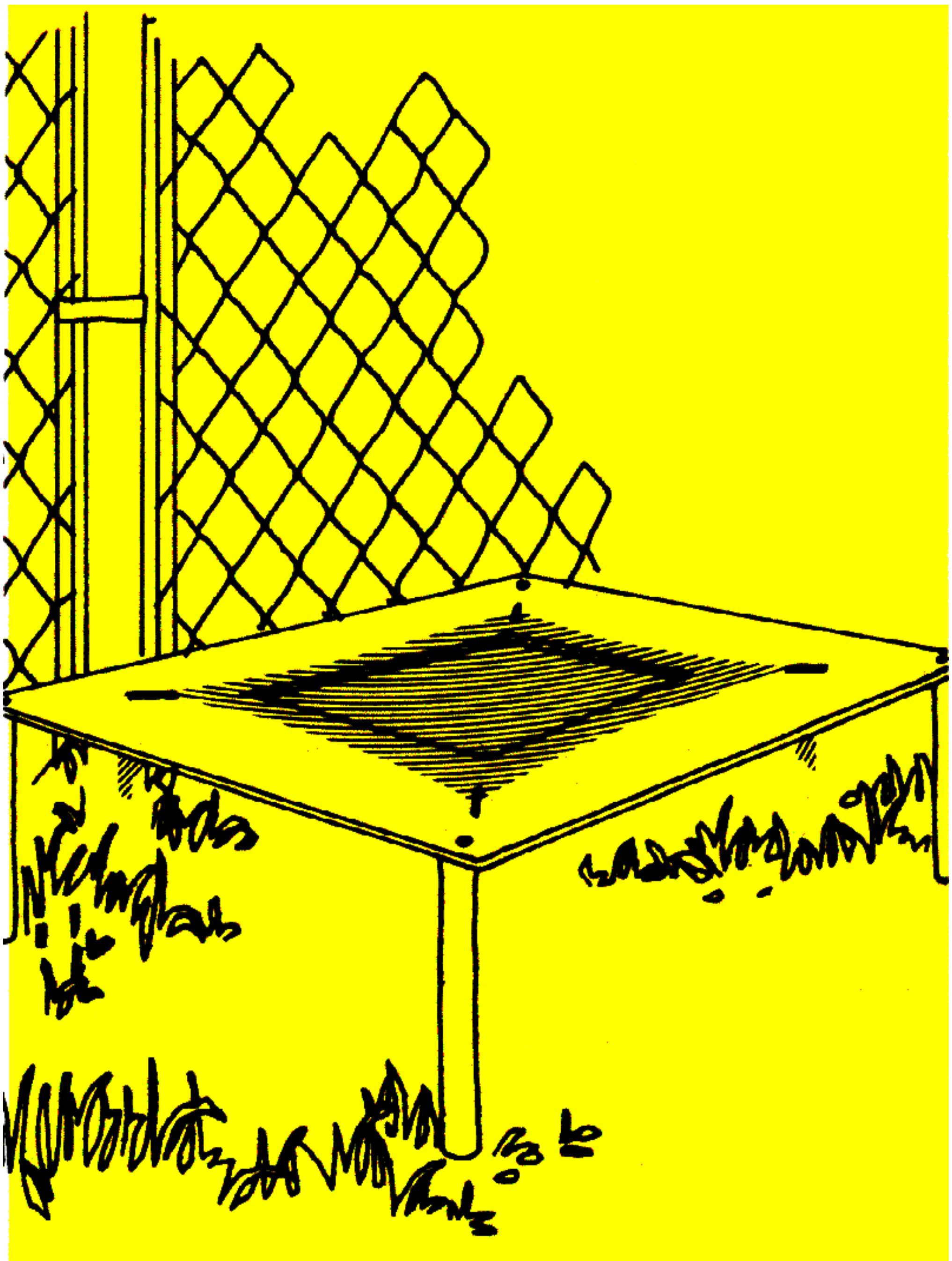
Many cases have been reported in which women's nylon stockings were ruined by something in the air. The damage occurred while the stockings were being worn. In some instances, large holes were produced in the nylon material. Yet the skin was not harmed.

The cause of this particular kind of air pollution damage has been called "acidic soot." The name is a general one that applies to a number of destructive agents such as hot particles in smoke, soot that contains acid, acid droplets, and solvent vapors. If you'd like to know whether or not acidic soot exists in your neighborhood, this experiment will help you find out. But it will require an exposure test of a month or so.

First make a hole in the center of the cardboard 6 inches by 6 inches. Next saw the 3-foot pole into 4 equal parts. Nail the pieces to the corners of the cardboard, forming a little table. Then cut an &inch-square piece of nylon from the stocking (save the rest of the stocking for Experiment 7).

To mount the nylon, make a slit in each corner of the cardboard, and work the ends of the nylon into these slits. They'll stay put. Don't stretch the nylon too tightly . . . just enough to remove the wrinkles.

Before setting the sample outside, examine the nylon carefully (with a magnifying glass if you have one), and make a note of any holes or broken threads it may already have. Put the sample in a place where it isn't likely to be disturbed. Inspect it about once a week for fresh holes, broken threads, and runs. Acidic soot could product any of these conditions.



EXPERIMENT 3

MEASURING LUNG CAPACITY

THINGS YOU NEED: 2-quart plastic juice container (the kind with a screw-on cap). 3 feet of tubing.

It is well known that continued exposure to polluted air over a long period can damage the lungs. One of the results of this damage is that the lungs slowly lose their ability to asborb oxygen from the air and throw off carbon dioxide.

We're all aware of how vital an ample supply of air is to our bodies. On the average, we use about 35 pounds of it every day, which is about 6 times as much as the total amount of food and water we take in.

Here is a simple experiment that will enable you to estimate the capacity of your lungs and keep tabs on their efficiency through the years.

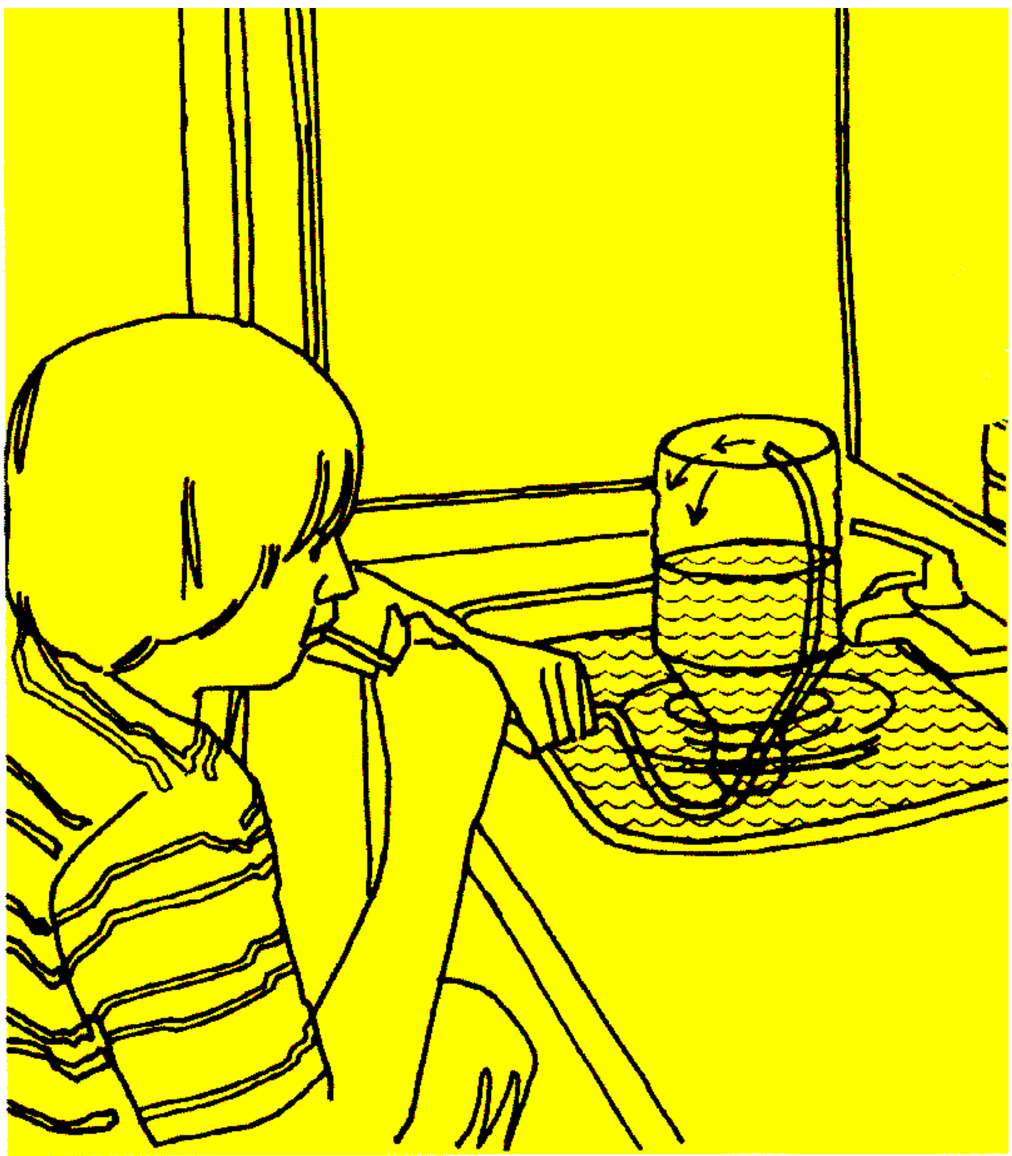
To begin, measure the exact amount of water that fills the plastic juice container to the very brim. Then screw the cap on the container. Using either the kitchen or bathroom sink, run about four inches of water into the sink.

Next, invert the container into the sink. With the neck under water, remove the cap and insert the tubing. If air gets into the container, simply work the tubing into the air cavity and draw the air out by sucking on your end of the tubing. Stop sucking the instant that water starts entering the tubing in the container, and pinch the tubing to stop any further flow.

OK, ready for the test? Take a deep breath . . . deeper . . . and blow into the tubing as long as you can. This will force water out of the container. When you've run out of air (that is, when your eyes start crossing), pull out the tubing. Then screw the cap back on <u>while the container is submerged.</u>

For the final step, measure what's left in the container, and subtract that amount from the starting amount. The difference is your lung capacity. Use this method on others, and compare their capacities with yours.

Incidentally, if you decide to keep this container for future measurements — fine. But if not, don't throw it away. You can use it for Experiments 7 and 8.



EXPERIMENT 4

AN ELECTRICAL SMOKE TRAP

THINGS YOU NEED: Wood base 6 inches by 6 inches. Wood support 14 inches long. Cardboard tube 1½ inches in diameter and 1 foot long (such as from a roll of paper towels). Aluminum foil 6 inches by 6 inches. 2 toothpicks. Fresh &volt lantern battery. 9 feet of bell or hook-up wire. Knife switch. Type F-7996 induction coil or Ford Model "T" spark coil.*

One way that some industrial firms have been fighting air pollution is through the use of electrostatic precipitators. These devices capture smoke, dust, and liquid particles before they have a chance to go up the chimney into the atmosphere.

In general, electrostatic precipitators work as follows: On the way to the chimney, smoke and other wastes are channeled past wires and plates that are oppositely charged at high voltage. The particles receive a negative charge from the wires. As a result, they are attracted to the positively charged plates. This action not only keeps pollution down, but it recovers useful by-products too.

Electric utility companies have been using such devices for decades. In fact, the first full-scale application of an electrostatic precipitator in the U.S. was made by The Detroit Edison Company in 1923. That was only a few years after its development, in 1910, by an American chemist named Frederick Gardner Cottrell.

***For the F-7996 coil: Pontiac Coil, Inc., 5385 Perry Dr., Waterford, MI 48329 (phone 1-313-674-0456). For the Ford coil: Class-Tech Corp., 1400 Arboretum Blvd., Victoria, MN 55386 (phone l-800-874-9981). Each coil costs $30 postpaid. Mention that you are a student.**

The electrical smoke trap in this experiment is a model electrostatic precipitator. Mainly because of the cost of the coil, you may want to build the model as a joint venture with a few of your friends. In that way, everyone can pitch in to pay the bill. Better yet, why not suggest it as a class project at school.

Start by nailing the wood support to the base. That's that for the stand. Next, wrap the aluminum foil around the cardboard tube about an inch from the end of the tube. Tape the foil in place.

Remove 6 inches of insulation from a 3-foot piece of wire. Wrap the bared portion around the foil halfway up its length, and twist is tightly. Now you can mount the tube on the stand, using tape, rubber bands, or string. Leave about 3 inches of clearance between the bottom of the tube and the base.

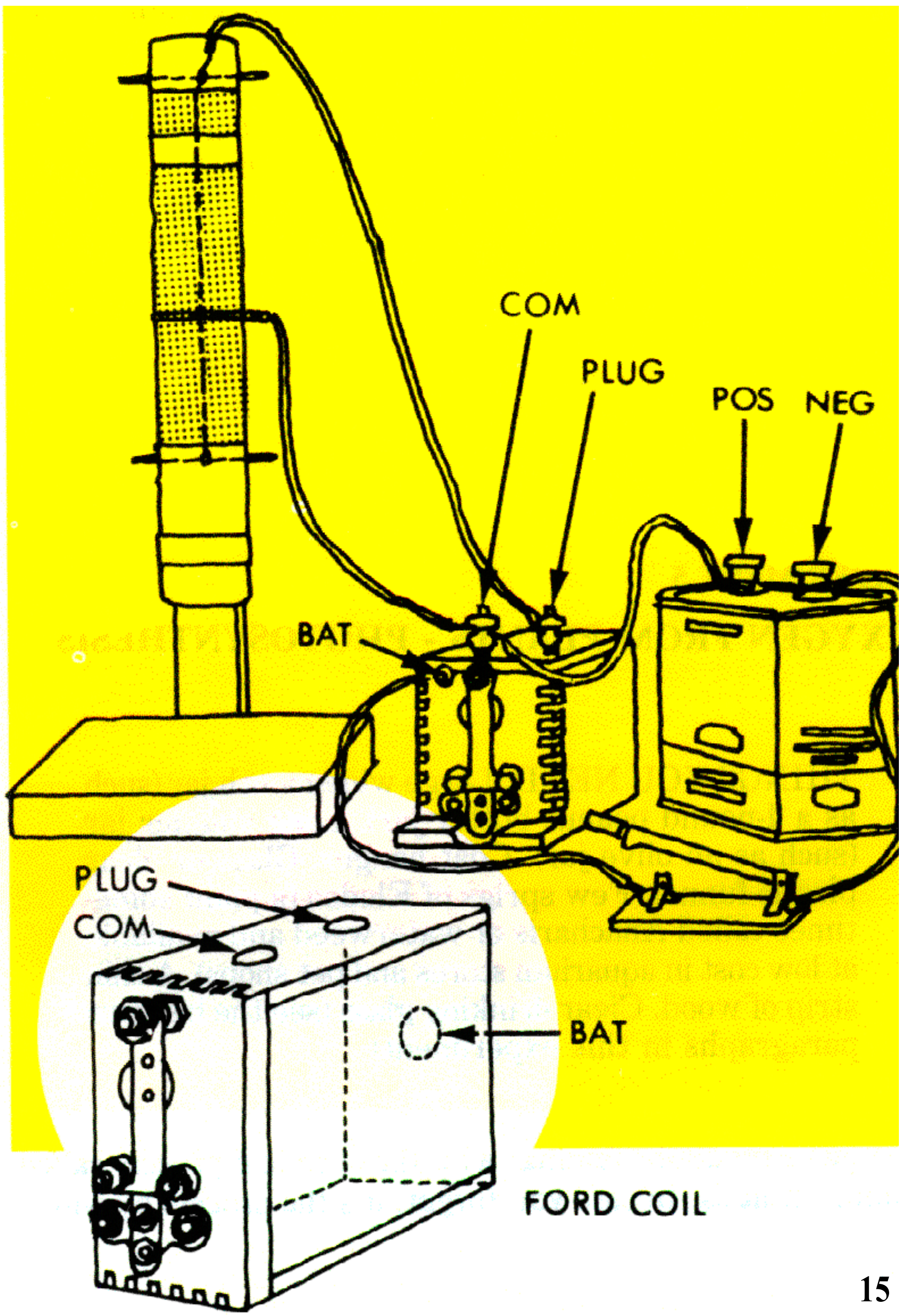
Take the other end of the wire from the foil and connect it (with the tip bared, of course) to the "COM" terminal of the coil, as shown in the drawing. If you're using a Ford coil, try to solder the wire on. Otherwise, you'll have to rely on tape to hold the wire down.

From a second 3-foot piece of wire, remove 7 inches of insulation. This bared portion will have to be supported in the center of the tube. Use toothpicks as support bars. Push one toothpick through the tube just above the foil and the other just below it.

To install the wire, form a hook on the end so that you can fish it onto the lower toothpick. After hooking the toothpick, pull the wire snugly, and loop it around the upper toothpick. Keep the wire centered within the tube as best you can. Then connect the free end to the "PLUG" terminal on the coil.

With the remaining wire, complete the connections as shown.

Leave the knife switch open. (CAUTION: When the knife switch is closed, the smoke trap will be "ON." When it is, do not touch the terminals on the coil, the wires from these terminals, or the aluminum foil. They can give you a hair-raising shock. It's the same kind of shock you'd get if you touched an automobile or lawn mower spark plug with the engine running. Scary, but not dangerous.)



OK, let's see what our smoke trap can do. Hold a source of smoke under the bottom of the "chimney." A burning incense cone or twisted damp paper towel should work nicely. When you see smoke coming from the top of the chimney, close the knife switch. Hey, it works! Now open the switch to see if the chimney starts smoking again. Yup, there it goes. Naturally, your model won't be as efficient as industrial electrostatic precipitators. But its principle will certainly be the same.

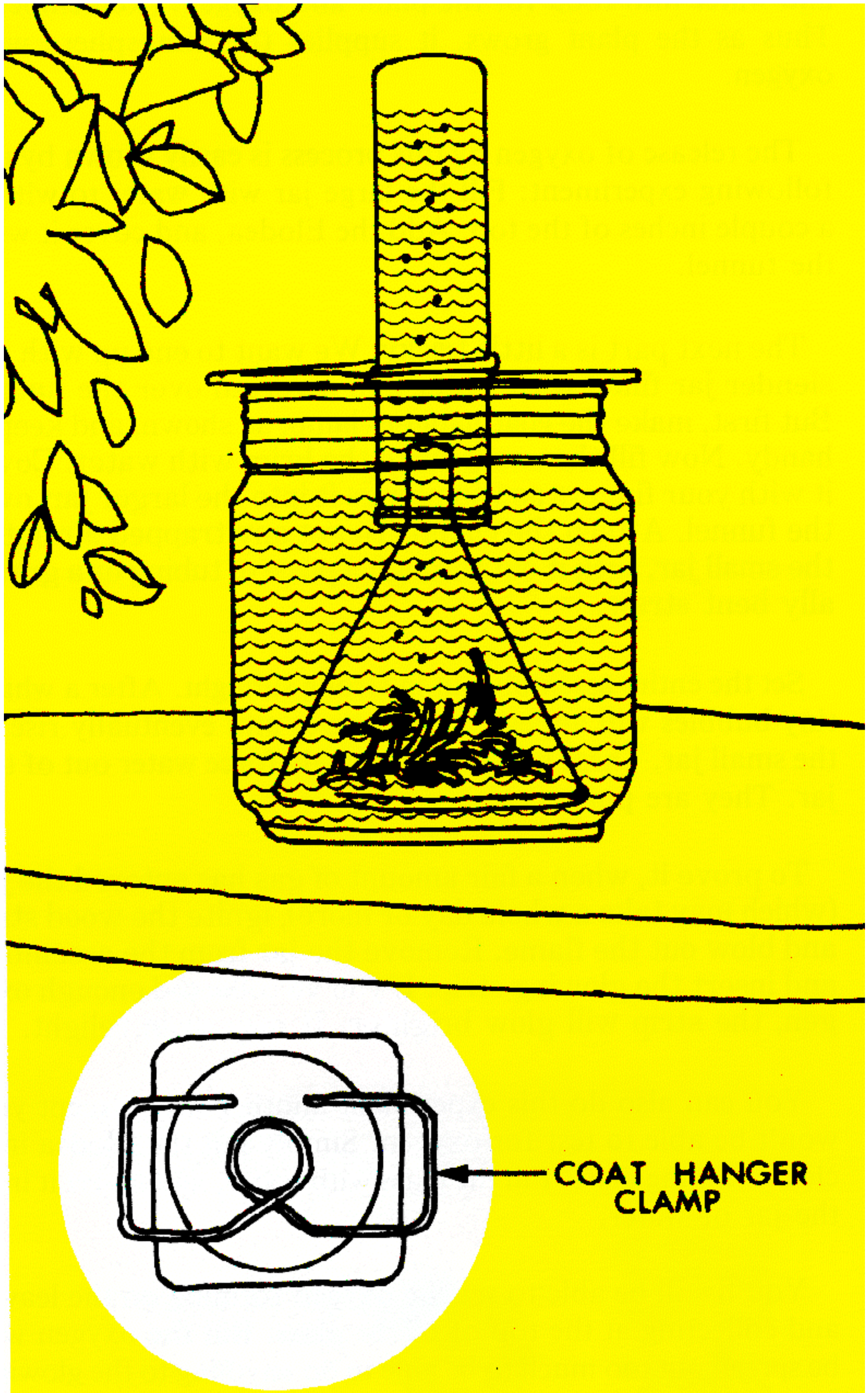
A word about the coils: No matter whether you use the F-7996 coil or the Ford coil, it will have a vibrator on it. The vibrator should buzz smoothly when the knife switch is closed. If it doesn't, open the switch and adjust the nut on the vibrator arm.

EXPERIMENT 5

OXYGEN FROM PLANTS - PHOTOSYNTHESIS

THINGS YOU NEED: Large wide-mouth jar (such as a 4-pound peanut butter jar). Long slender jar (such as an olive jar). Coat hanger. Glass or clear plastic funnel. Few sprigs of Elodea (a plant sometimes called Anacharis or waterweed and available at low cost in aquarium stores and pet shops). A thin strip of wood. Clear drinking glass (see the last two paragraphs in this experiment).

You're no doubt familiar with the chemical process called photosynthesis. In case you forgot, it's the process by which


COAT HANGER CLAMP

green plants use the energy in sunlight to convert carbon dioxide and water into food for the plant and oxygen. (Remember?) Thus as the plant grows, it supplies the atmosphere with oxygen.

The release of oxygen by this process is easily shown by the following experiment: Fill the large jar with water to within a couple inches of the top. Add the Elodea, and cover it with the funnel.

The next part is a little tricky. We want to end up with the slender jar filled with water and inverted over the funnel. But first, make the coat-hanger clamp, as shown, and keep it handy. Now fill the small jar to the brim with water. Cover it with your fingers as you plunge it into the larger jar, over the funnel. Attach the clamp. To get any trapped air out of the small jar, suck it out through a piece of tubing or a gradually bent straw.

Set the entire assembly out in strong sunlight. After a while, tiny bubbles will appear on the leaves and eventually rise in the small jar. These bubbles will slowly force water out of the jar. They are pure oxygen.

To prove it, when a fair amount of gas has entered the jar (which may take a whole day or more), ignite the wood strip and blow out the flame. Remove the jar from the assembly, and insert the glowing strip. If you've collected enough oxygen, the strip will glow brighter. It may even relight.

You can also do this experiment another way, except you won't be able to test for oxygen. Simply put the Elodea in a clear drinking glass. Fill the glass with water, and invert it into the jar of water.

You'll still be able to see the oxygen forming on the leaves and collecting at the top of of the glass. But the oxygen will be spread out too much to be able to do anything to the glowing wood strip.

EXPERIMENT 6

WATER FROM PLANTS - TRANSPIRATION

THINGS YOU NEED: A potted plant. Sheet of clear plastic (such as from a dry cleaner's bag.)

In a way, transpiration is to plants what perspiration is to us. It's the process by which a plant draws water from the ground through its roots and allows it to evaporate into the air through its leaves.

Quite a bit of water enters the atmosphere by transpiration. For example, a birch tree can give off as much as 70 gallons of water a day and a single corn plant up to 50 gallons in one season.

To see transpiration in action, take the plastic sheet and form a puffy bag around the most leafy potted plant available. Seal the bag by gathering the plastic at the base of the plant just above the soil and tying it with string. Put the plant in sunlight for a few hours. If the plastic is pressing down on the leaves, rig up some kind of support for the plastic (like maybe a stick pounded into the ground at an angle).

What do you think you will eventually see inside the bag? Well . . . you'll see.

EXPERIMENT 7

A MODEL WATER FILTER

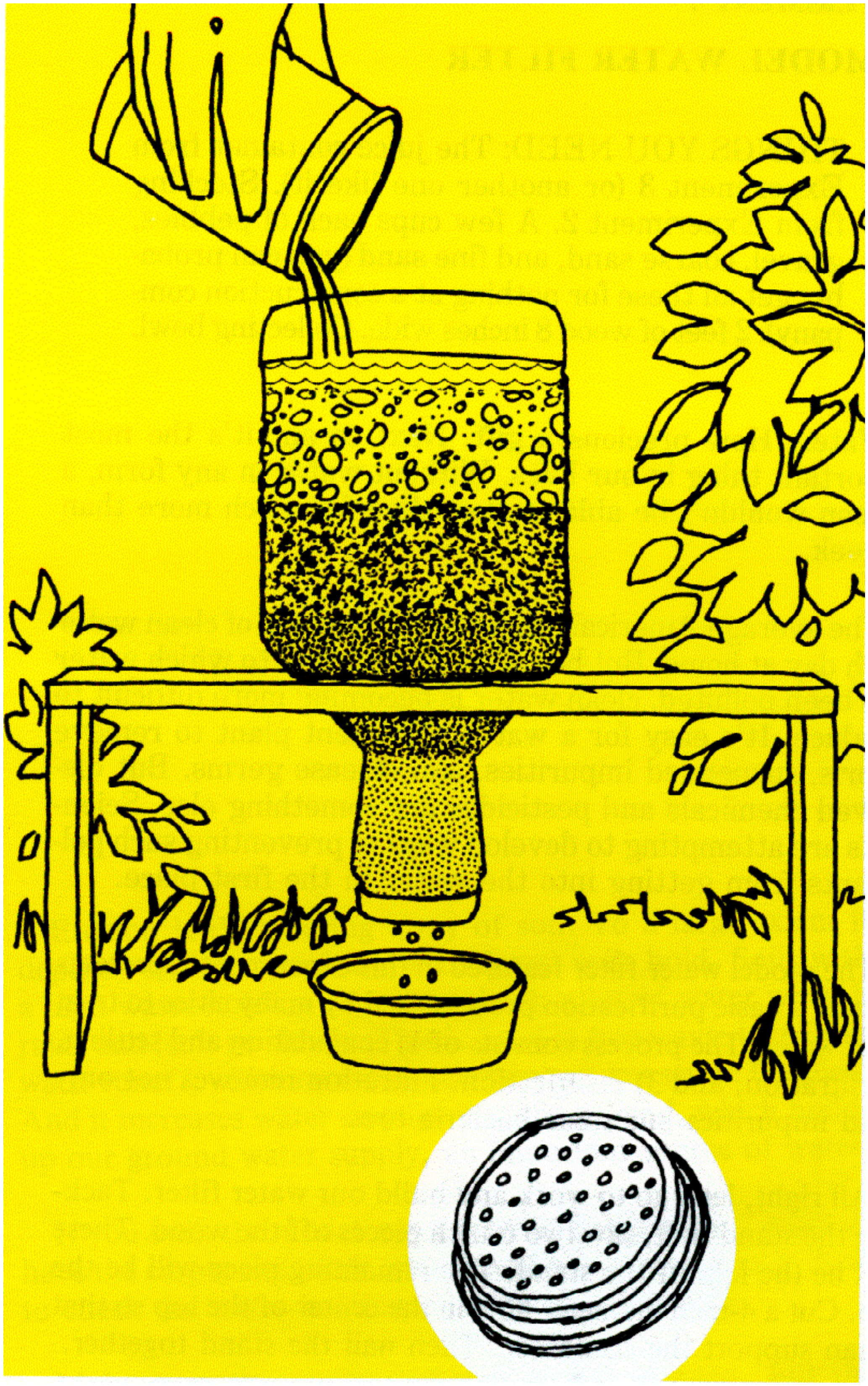
THINGS YOU NEED: The juice container from Experiment 3 (or another one like it). Stocking from Experiment 2. A few cups each of pebbles, gravel, coarse sand, and fine sand (you can probably get all these for nothing at a construction company). 2 feet of wood 8 inches wide. Collecting bowl.

Water. How precious a gift. Next to air, it's the most important thing in our lives. Without water in any form, a person wouldn't be able to stay alive for much more than a week.

The average American uses about 70 gallons of clean water each day at home. But because of the extent to which water has been polluted, clean water is becoming more difficult to produce. It's easy for a water treatment plant to remove debris, suspended impurities, and disease germs. But dissolved chemicals and pesticides are something else. Scientists are attempting to develop ways of preventing such pollutants from getting into the water in the first place.

The model water filter featured in this experiment represents part of a basic purification process used by many cities to treat their water. The process consists of 1) coagulation and settling, 2) filtration, and 3) disinfection. Filtration removes not only solid impurities but some bacteria too.

All right, let's go to work and build our water filter. Tackling the stand first, saw two 6-inch pieces off the wood. These will be the legs of the stand. The remaining piece will be the top. Cut a 4-inch diameter hole in the center of the top so that it can support the container. Then nail the stand together.



Using a sharp instrument (easy there), slice the very bottom off the plastic container. Next, we want to convert the cap, minus the liner, into a screen. So with either a 1/16-inch drill or a pointed tool, make as many holes as practical in the cap, then cover all the holes with a piece of stocking. Screw the cap back on the container, and seat the container upside down in the stand.

Now start preparing the filter bed. First goes the fine sand, up to the narrowest part of the neck. Follow with coarse sand, up to the top of the funnel section. Then two or more inches of gravel and the same amount of pebbles.

With the bowl under the filter, pour some dirty water on the pebbles. Try muddy water, dishwater, your bathwater (the last one could prove to be the toughest test of all). What empties into the bowl should be noticeably cleaner.

But it certainly won't be clean enough to drink. After all, we're just trying to demonstrate a principle, not really purify water.

EXPERIMENT 8

WATER-HOLDING CAPACITY OF SOILS

THINGS YOU NEED: Equipment from Experiment 7 (except for pebbles, gravel, and sand). Some soil samples.

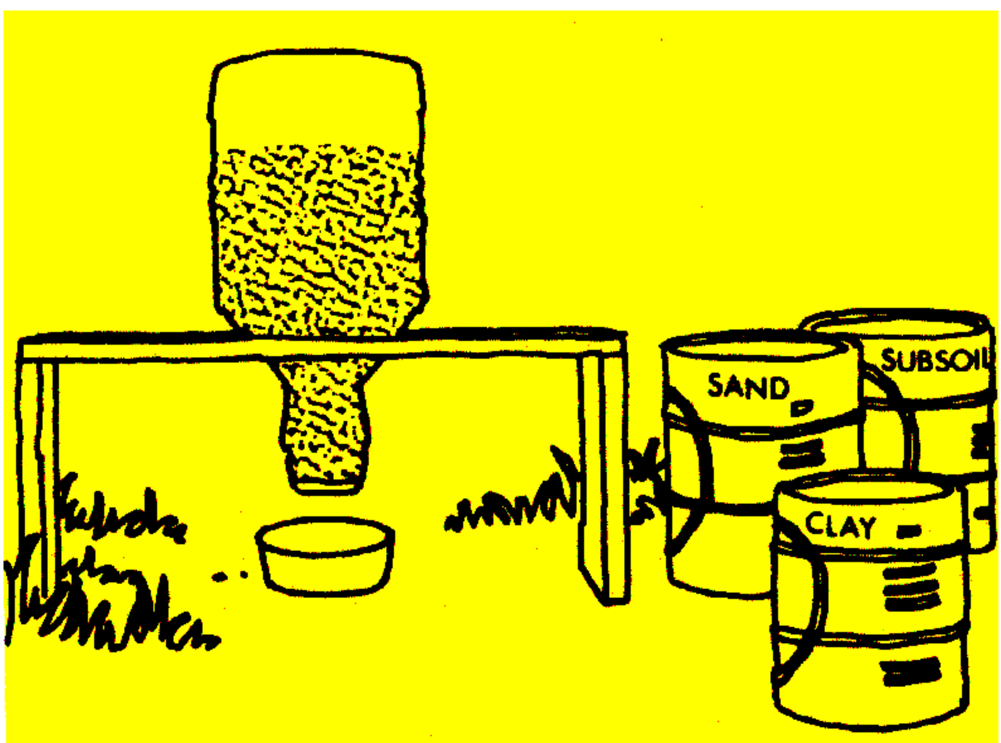
Nature took thousands of years to form the thick layer of soil on which we grow food. But pollution and erosion could destroy that soil in only a few years. And where would that leave us?

In his book Cry the Beloved Country, novelist Alan Paton said of soil, "Keep it, guard it, care for it, for it keeps man, guards man, cares for man. Destroy it and man is destroyed."

Erosion is the wearing away of soil. To a large extent it depends on how much water different soils hold. Soils with a high water-holding capacity take in a lot of water when it rains and let it go slowly. This is good in two ways: It reduces water runoff, which means less erosion and less severe flooding. And it increases water seepage into the ground, which builds up our ground water supply, an important source of water.

If you built the model water filter in Experiment 7 and still have the empty container, stand, and bowl, you can use them to check the water-holding capacity of a few soils.

Make sure the perforated cap is not clogged. Fill the container about 2/3 full with dry topsoil, and pour in 1 pint of water. As soon as you do, note the time. See how long it takes before the water starts dripping in the bowl, how long the water continues to drip, and how much water comes through. Do the same for sandy soil, clay soil, and subsoil.



EXPERIMENT 9

WHICH SOLIDS DECOMPOSE IN SOIL

THINGS YOU NEED: Large deep tray (we'll talk more about this later). Some soil. Test samples. The patience you used in Experiment 2.

Of all the kinds of environmental pollution we have, the most glaring kind is solid waste pollution. We see it everywhere. Not all communities have air that looks dirty or rivers that look gray. But they all have unsightly litter, garbage, and abandoned junk. (We could certainly do something about that, couldn't we?)

The solid waste explosion in this country has reached a fantastic level of 6 billion tons a year! Of this annual total, 180 million tons (or 4 pounds per person per day) are collected by trash trucks and hauled away for disposal. Where does this solid waste go?

One place is in sanitary landfills. Here, the waste is crushed and covered with dirt. Bacteria and moisture in the soil then set about to decompose the trash.

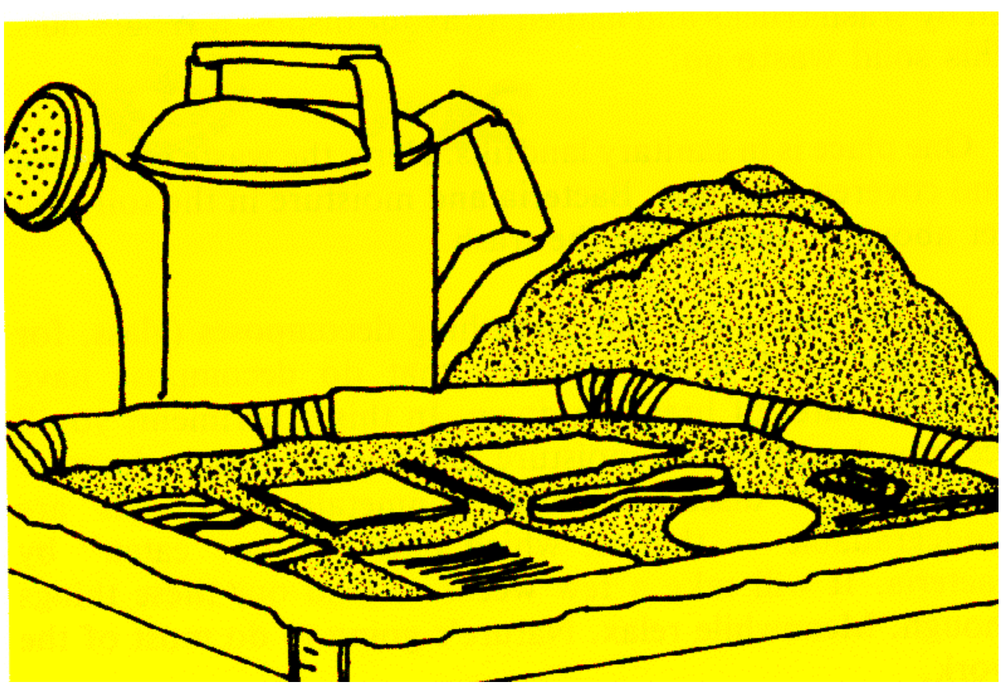
But, as you know, not everything decomposes (glass, for instance). And those materials that do decompose have different rates of breaking down. In this experiment, you'll see how bacteria and moisture affect solid waste. Another thing, you'll discover which nonmetallic materials are biodegradable — that is, which ones can be "eaten" by bacteria. It will take a few weeks to find out these things though. Meanwhile relax. Nature's going to do most of the work.

Now about that large deep tray we called for . . . it doesn't have to be anything fancy. Look around for some kind of container about 1½ feet long, 1 foot wide, and a few inches deep. You could even use a cardboard suit box and line it with a polyethylene trash bag or dry cleaner's bag (which can be one of your test samples).

Gather as many different kinds of test samples as you can. But limit yourself to small, thin items. For example: aluminum foil, tin-can lid, newspaper, rubber band, leather, paper towel, wood, cotton, nylon, toothpick, broomstraw.

Put an inch of soil in the tray. Spread your samples on the soil, keeping a record of where you put what. Then cover up the samples with another inch of soil, and water the soil enough to make it moist (but don't get carried away and flood the container). Add a little water every day.

After a month or so, pull out one or two samples to see if enough decomposition has taken place for you to draw some conclusions. If so, carefully remove the soil covering the rest of the samples. And start concluding.



EXPERIMENT 10

BUILDING A CAN CRUSHER

THINGS YOU NEED: 2 feet of "two by six" lumber. 2 feet of "two by four" lumber. Heavy duty door hinge. 6 flat-head hinge screws 1½ inches long. 1 lag bolt ¼ inch by 1½ inches long.

In addition to its frightening proportions, solid waste pollution has another serious side: Most of the ways we dispose of waste today have faults of their own. Putting trash in open dumps results in an ugly haven for rats and disease. Incineration is costly. And sanitary landfilling uses up land rapidly.

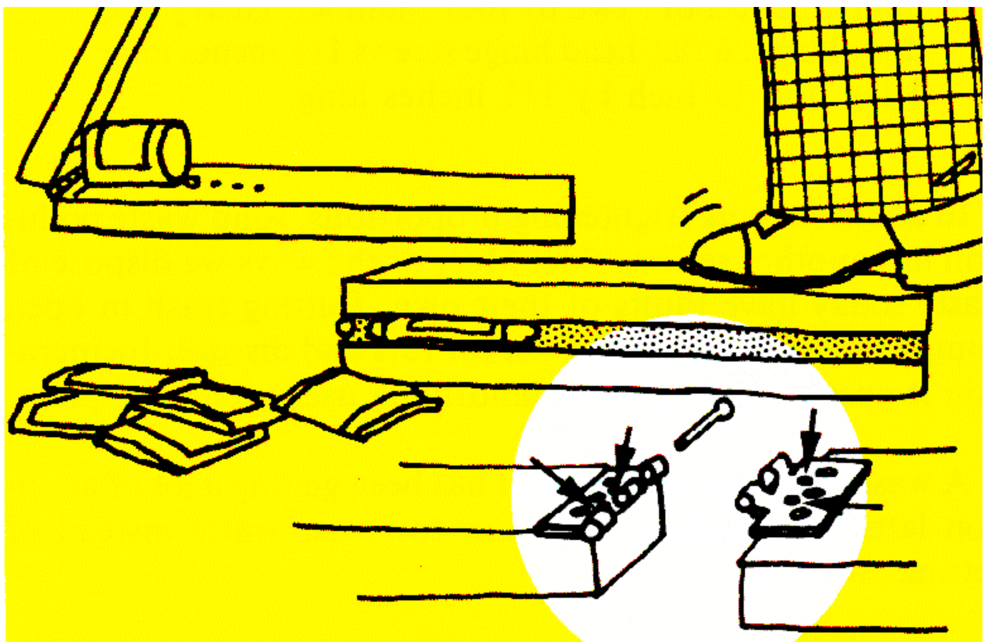
A waste-disposal concept that has been getting a lot of attention lately is recycling. It means to re-use waste instead of getting rid of it.

Recycling is not new. Water is recycled. So are cloth, glass, metal, rubber, and paper (we're going to recycle paper in the next experiment, in fact). But it's going to take time for engineers to develop recycling processes for widespread use.

Meanwhile, many communities have places where you can sell certain kinds of unmixed waste for recycling. Interest in aluminum waste, for example, is becoming quite high these days. Call your local officials or newspaper people to find out if there are any agencies in your area that buy aluminum waste. If there are, then the can crusher in the following experiment could help you earn some extra spending money.

You can use the crusher for "tin" as well as aluminum cans. "Tin" cans, as you probably know, are actually made of steel. But make sure you don't mix the steel and aluminum. You'll need a magnet for that job. Don't be fooled, though. Some cans with pull-off tabs have aluminum tops and steel bodies. So test the can all over with the magnet before you start crushing.

One more thing: Most frozen food trays are aluminum. These items, too, are worth money and can likewise be flattened in the crusher you are about to build.



Your crusher will only be as strong as the hinge you use. So the huskier the hinge, the better. Position each hinge plate on the boards as shown in the drawings (you don't have to take the hinge apart to do this). Note that the hinge-pin loops extend beyond the board edges. Also be sure the countersunk screw holes are facing upward.

Mark the hole locations. After drilling the holes, screw the plates in place. That just about does it, except for drilling five holes down the center of the base board for the lag bolt. Start the hole 7 inches from the hinge end of the board, and space them 1 inch apart. The purpose of the lag bolt is to prevent the cans from sliding when you apply pressure on the arm. Put the lag bolt in whatever hole is necessary for the length of the can you're going to crush.

The amount of force transmitted through the hinge during crushing will be very high. The wood screws may eventually pull out. If that happens, re-mount the hinge using 2-inch flat-head machine screws, washers, and nuts. You might also have to drill two more holes in each hinge plate as shown, to keep the ends of the plates from bending upward. Wait and see on this point.

Good luck in the materials conservation and metal-selling business.

EXPERIMENT 11

MAKING NEW PAPER FROM OLD

> THINGS YOU NEED: Newspaper. Mixing bowl. Electric mixer or egg beater. Tablespoon of wall-paper paste or laundry starch. Section of window screen. Cake pan. Waxpaper. Drinking glass or jar.

Paper and paper products make up about 40 percent of the solid waste produced by America's cities and towns. So you can see that recycling paper waste makes good sense.

Look at what recycling saves: Only one-half of the energy is required to produce paper from paper waste rather than from trees. In addition, recycling one ton of paper waste conserves 17 trees, 7,000 gallons of water, and 3 cubic yards of landfill space.

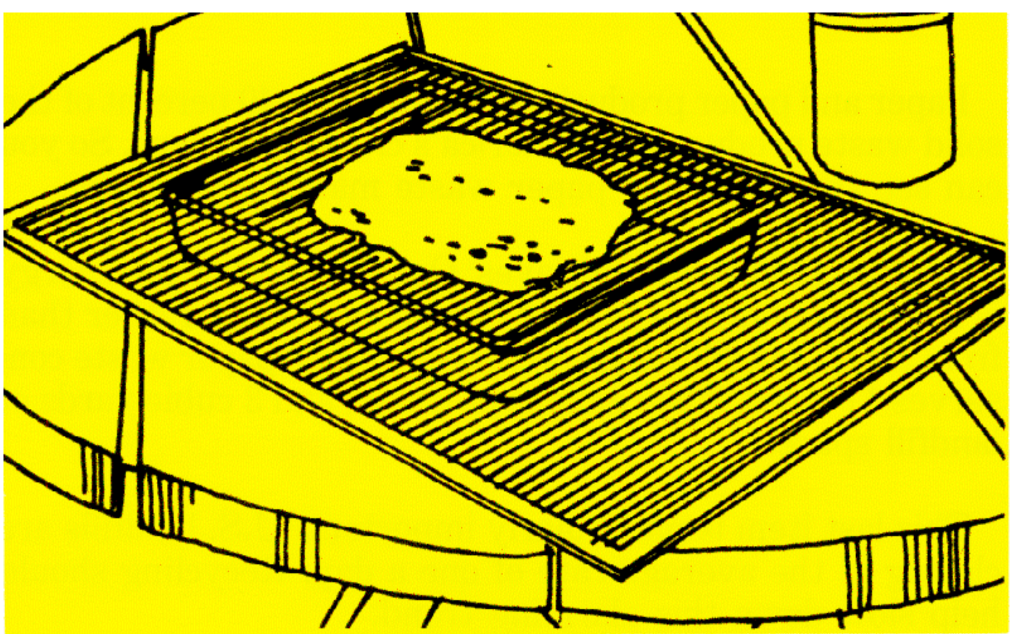
This last item is particularly important. U.S. landfills are closing at the average rate of one a day. Recycling should help slow down this alarming trend.

All right, let's roll up our sleeves and see if we can demonstrate the general principle behind recycling paper waste . . . in this instance, old newspaper.

Here we go. Cut into small pieces a 12-inch by 12-inch section of newspaper. Put these pieces into the mixing bowl, and add a cup of warm water. Let the paper soak for a little while.

The next step is going to be slightly messy. So either in the laundry room or outside the house, start churning the paper and water with an egg beater or electric mixer. Keep this up until the paper breaks up into oat-size pieces. In fact, the mixture will look something like rolled oats cereal.

At this point, we'll have to add a binder to hold the paper particles together after the mixture dries. If you have some dry wallpaper paste, dissolve about a tablespoon of it in a little water. Then pour it in the bowl, and stir it in well. If you don't have any wallpaper paste, try either dry or liquid starch. Ordinary flour might also work.



To remove excess water, we'll need a screen. For this purpose you can use part of a removable window screen. You won't hurt it; it's just going to serve as a strainer.

Have someone hold the screen over a cake pan while you pour the mixture onto it. Spread the mixture out like a very thin pancake. Then lay a sheet of waxpaper over the mixture, and roll a glass or jar over it to squeeze out the water. Remove the waxpaper carefully, and allow the mixture to dry.

When the mixture dries completely, the paper can be peeled off the screen. It will probably look and feel more like gray cardboard. Nevertheless, it will be recycled paper. And you will have done it . . . basically the way it's done in industry.

Oh, by the way, if you borrowed the screen from a window, better wash it off and put it back (or else).

EXPERIMENT 12

RECYCLING PAINT SOLVENT AT HOME

THINGS YOU NEED: 2 large coffee cans or glass jars. Used mineral spirits (paint thinner) or turpentine.

Have you ever done any painting? Not the kind an artist does (we just know you can do that). We mean the kind of painting a handyman does. If you've managed so far to escape this bit of joy, then you probably don't know much about removing the paint from brushes, rollers, and trays (and hands and arms and face and neck and . . .).

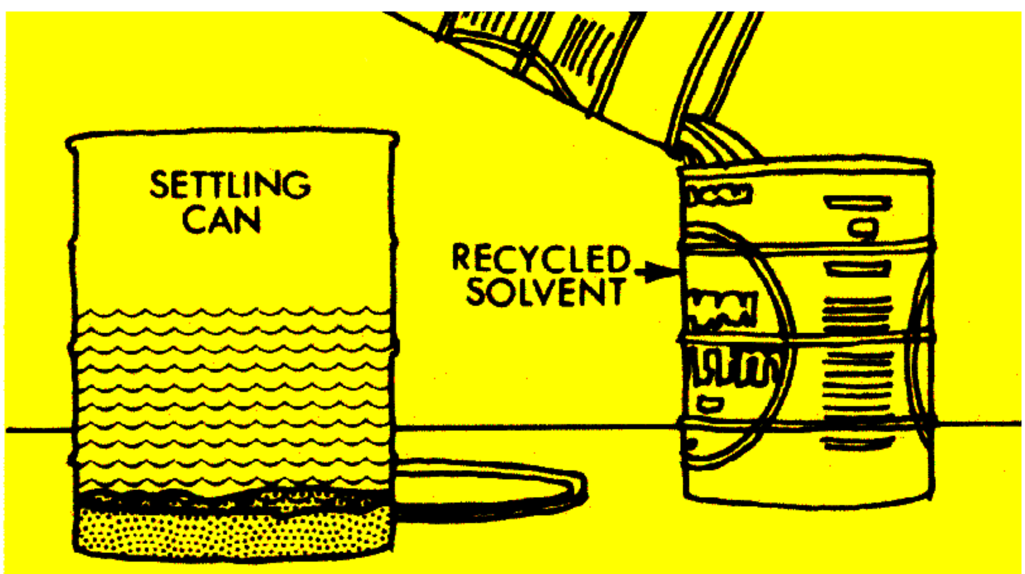
With latex paints, this job isn't so bad. Everything is washed with water. But with oil-based paints, it's not as convenient because a special solvent is needed: either mineral spirits (commonly known as paint thinner) or turpentine.

Now let's suppose you did some painting with oil-based paint and just finished cleaning a brush with paint thinner. What do you think you'd do with the dirty thinner? If you're like most people, you'd probably toss it out.

Well if you did, you'd be wasting it, as well as polluting the environment. For that solvent can be reclaimed and used over and over and over again, at least for cleaning purposes. The following experiment will tell you how.

Actually, what you're going to do is more than just an experiment. It's a genuine and practical act of recycling. And it couldn't be easier.

All you have to do is put the dirty thinner in one of the coffee cans, cover the can, and put it on a shelf. That's it. In a couple of weeks, the suspended material will settle to the bottom of the can, leaving clear thinner at the top. Pour the clear thinner into the other coffee can; and presto, there's your recycled thinner, ready for action.



In case you're wondering, you can mix dirty paint thinner and turpentine freely, no matter what color paint was cleaned from the brushes. But don't put anything else in the settling can except paint thinner and turpentine.

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701 Pennsylvania Avenue, N.W.
Washington, D.C. 20004-2696
07-92-16

Printed in U.S.A.
on recycled paper