HANDS ON- IDEAS AND ACTIVITIES

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FUN WITH STONES

When big-big stones
Roll down the hill
They hit and split
In a tumble-mill.

Their corners rub
And angles grind
They feel so good
They boggle the mind.

These rounded stones
Some big, some small
Two stones don't look
The same at all.

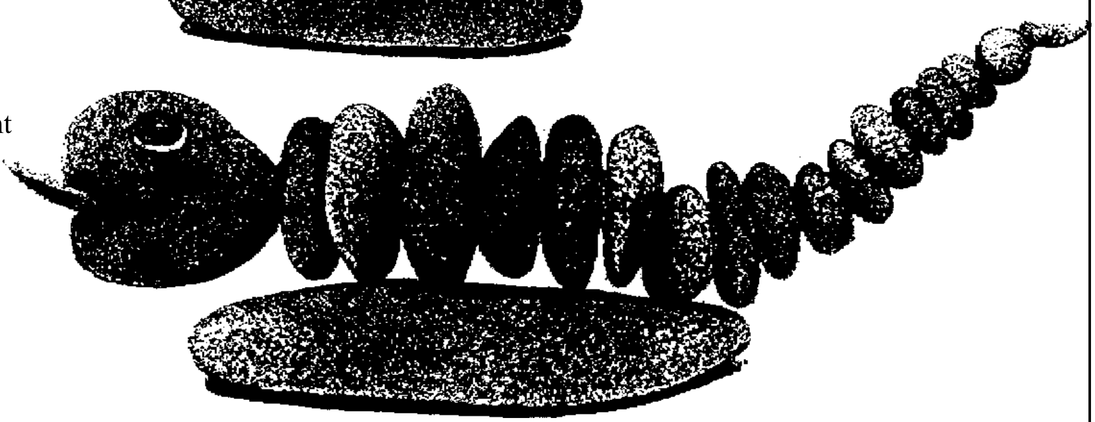
This little stone
Will make a beak
This rounded one
Looks like a cheek.

Look at these stones
With a little love
You'll find in them
A stony dove.

Look up and down
Then turn around
Seek in the stone
A sleepy hound.

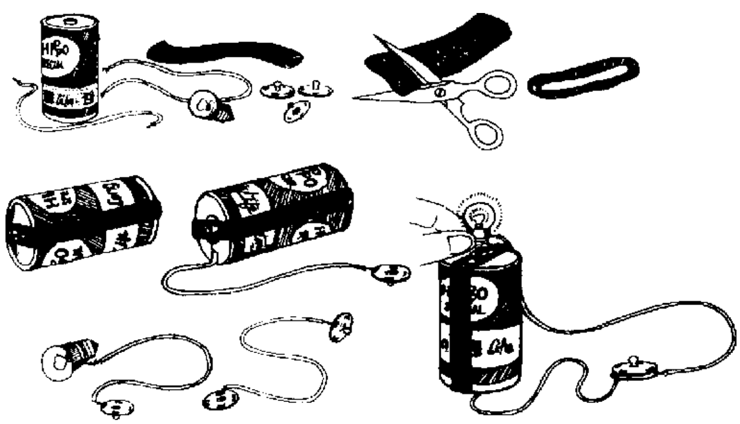
Paint your pebbles
Crisp and bright
These lovely birds might
Tweet at night.

Put stone on stone
To make a bird
Some day you might
Just make a herd!



(Pix: Avinash Deshpande)

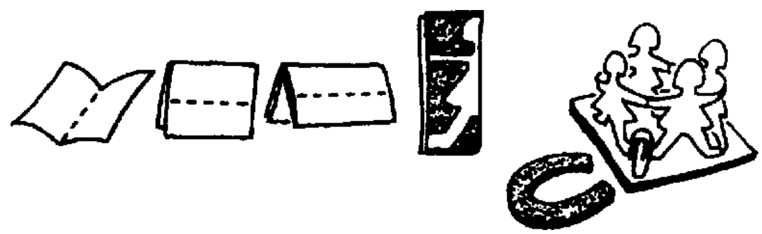
PRESS BUTTON SWITCH



Cut a 1-cm wide rubber band from an old bicycle tube. Cut two circular holes at the diametrically opposite ends of this band. Stretch and slip the band on the battery. The positive top of the battery top sits in one hole. A press button half (with the pip) sits in the other rubber band hole at the bottom of the battery. Place the bulb on the battery top and snap close the two parts of the press button to close the switch. The bulb will light. Press buttons are made of brass so they don't rust.

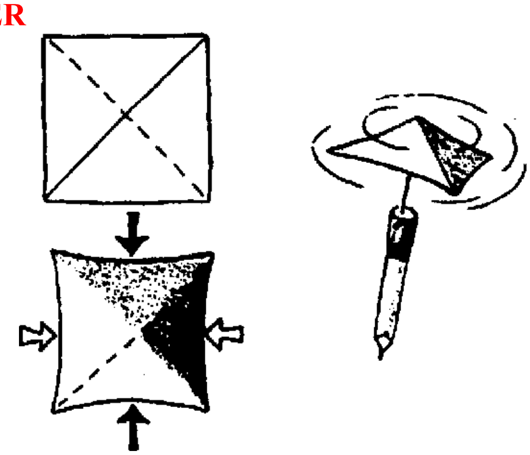
DANCING DOLLS

Fold a stiff paper as shown and cut off the shaded portion. Form a circle of dolls by taping them. Attach paper clips for the dolls to stand on. Stand the dolls on a piece of cardboard. Bring a magnet from below to make them dance.

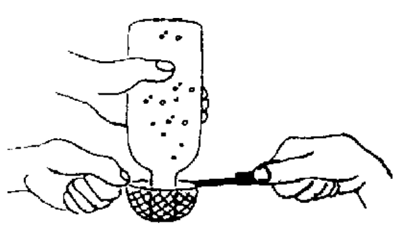


HOT AIR TWIRLER

Cut a 7.5-cm square from the thinnest paper you can find. Fold along both diagonals to make a small roof. Next push a pin in the rubber of a pencil so that 2.5-cm of the pin juts out. Sit down and hold the pencil between your knees. Place the centre of the square on top of the pinhead. Place your cupped hands on either side of the paper. Within about a minute the paper fan will begin to turn. Keep your hands cupped close just leaving enough place for the fan to turn. The lighter the paper and warmer your hands the faster it turns. The hot air from your hands rises, turning the twirler.

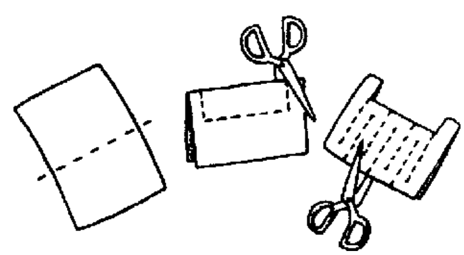


WATER DOES NOT SPILL



Fill a bottle completely with water. Keep a strainer tightly against the mouth of the bottle. With the strainer held tightly against the bottle's mouth quickly turn the bottle upside down. The water doesn't run out. Surface tension is helping. It also helps to have the bottle full of water, so that there is no air trapped inside to push down on the water.

WALK THROUGH A POSTCARD



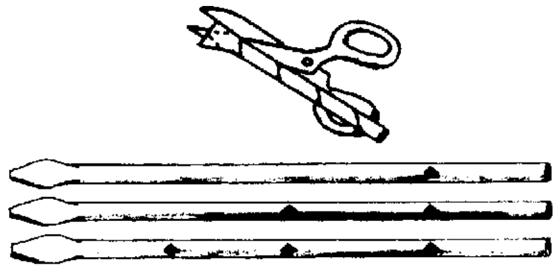
Fold a postcard down the middle from the top to the bottom. Cut a strip as shown. Then make seven or nine deep cuts (any odd number will do). The cuts must alternate between the fold and the edges of the card. Unfold the postcard and stretch it out. You can walk through the postcard without tearing it.

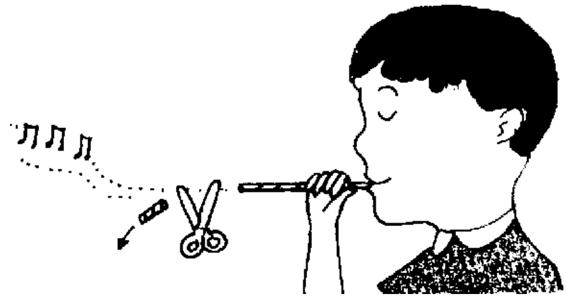
FUN WITH DRINKING STRAWS

STRAW FLUTE

The first wind instruments were probably hollow reeds picked and played by shepherds in the fields. You can make a flute with a plastic straw. The very soft or hard straws don't work well. You need a medium stiffness straw. Pinch flat 2-cm at one end of the straw. Cut off little triangles from the corners to form a spear shaped reed. Put the straw deep in your mouth and blow hard.

Later cut three small slits along the length of the straw about 2.5-cm apart. You can play a simple tune by covering and uncovering the holes. Make a long flute. Blow to make sound and simultaneously keep cutting the other end to make the straw shorter and shorter. You will be able to produce many melodious notes!

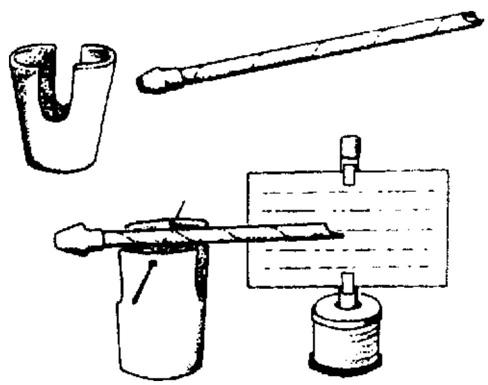




MICRO BALANCE

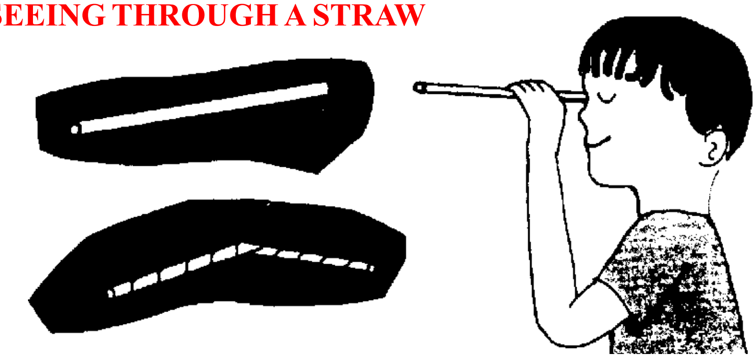
This is a very sensitive balance.

Make two cuts on opposite sides of a paper cup as shown. Cut away part of one end of a straw to form a little scoop. Put some putty on the other end of the straw. Push a long needle through one-cup wall then through the straw and then the other cup wall. Tape a card sheet to a pencil and stand it in a spool. You can mark the weight of things you weigh on the card. An ordinary postcard (area 126-sq cm = 14-cm x 9-cm) weighs 2.5-gm. Each square-cm of the postcard weighs 20-milligrams. Use these to calibrate your microbalance. Weigh a grain of rice or wheat?

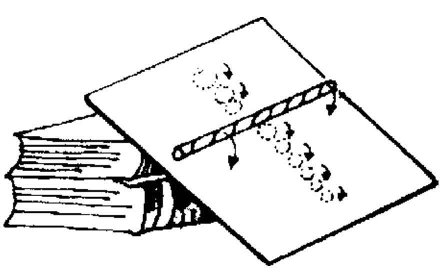


SEEING THROUGH A STRAW

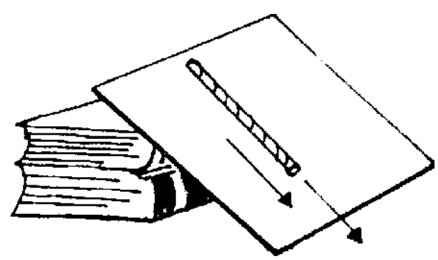
You can see clearly through a straight straw.
But what if the straw is bent?
Then you can't see.
This is one way of showing that light does not bend and travels in straight lines.



ROLLING AND SLIDING

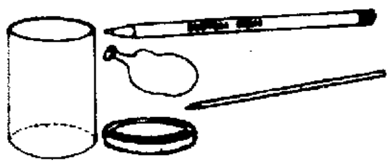


Keep a straw horizontally on a ramp. It rolls down.
Now keep it vertically and it slides.

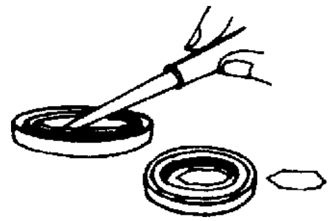


BOTTLE *BEEN*

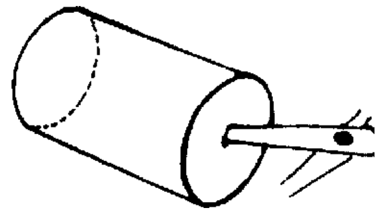
This toy will remind you of the ***Been*** – the snake charmer's musical instrument.



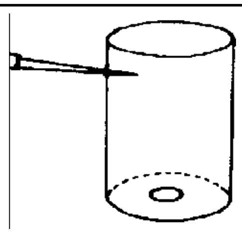
1. Materials needed to make it are a film reel bottle, a dry sketch-pen, an old ball-pen refill, a torn balloon and ordinary hand tools.



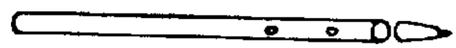
2. Cut the middle portion of the film bottle cap with a knife. The hole should be 1.5-cm in diameter. The shape of the hole is not important.



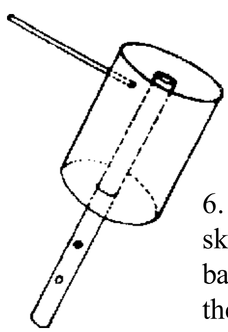
3. Make a hole in the centre of the base of the bottle. Widen this hole by rotating a tapered scissors. The hole should be large enough to squeeze a sketch pen through it.



4. Make a small hole on the cylindrical surface of the bottle about 1-cm from the open end. This hole should be just big enough to enable a ball pen refill to tightly fit into it.

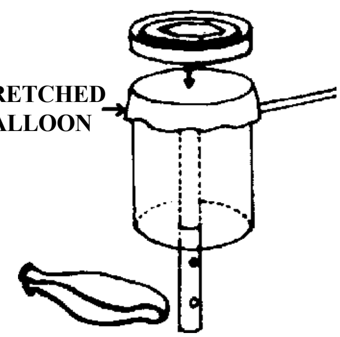


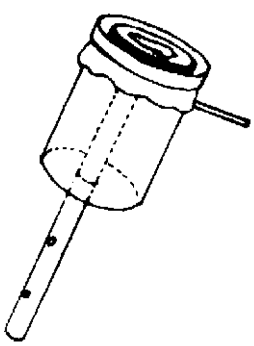
5. Cut the pointed writing end of the sketch pen. Make two small holes at a distance of 1 and 3-cm from this end.



6. Press fit the sketch pen and ball pen refills in the film bottle.

7. Cut a balloon. Stretch the balloon on the mouth of the bottle. Snap the cap on the bottle to keep the stretched balloon in place.





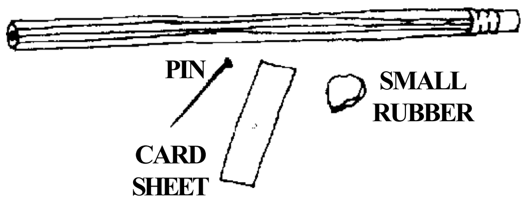
8. This is the complete assembly. Now gently slide the sketch pen upwards so that it just touches the stretched balloon. Simultaneously, blow through the refill. At one particular position you will hear a clear and loud musical note. By opening and closing the holes, as in the case of a flute, you can play a few notes. The balloon acts like a stretched membrane or diaphragm and begins to vibrate when you blow in. The bottle acts like a sound box.

If you want lasting results:
***POINT*............but don't push**

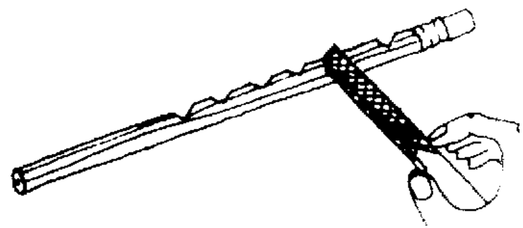
People will move by themselves
once they see the need clearly
and discover a way.

PERPLEXING PENCIL

This toy has been around for over a hundred years.
It has been a darling of physicists and has been quite a hit with children. It is very easy to make it.

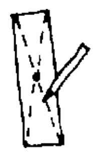


1.You need a pencil with a rubber on one end, along with a paper pin, thick card sheet, a small piece of rubber and a penknife or a triangular file.



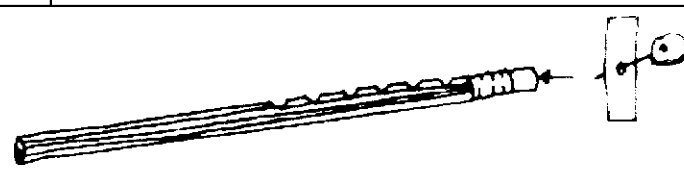
2. Make 5 or 6 “V” shaped (deep) notches on the pencil with the penknife or a triangular file.

3. Cut a 5-cm x 1.5-cm rectangle from a greeting card. Mark its diagonals and make a hole in its centre. This makes the propeller fan.

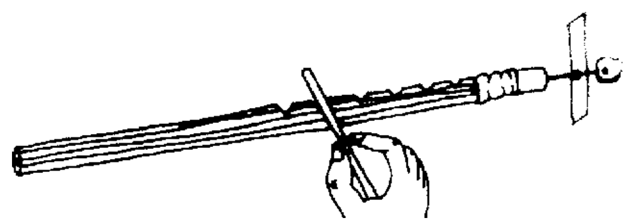


4. Poke a paper pin through a small piece of rubber. The rubber acts like a stopper and prevents the fan from flying away.

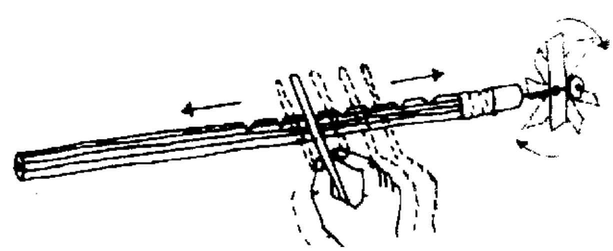
5. Weave the pin through the fan and insert it deep into the rubber end of the pencil. Make sure the fan rotates smoothly on the pin.



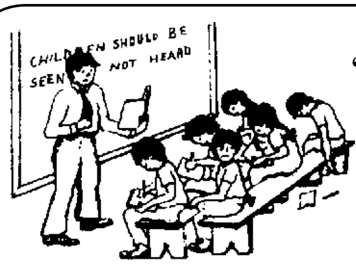
6. Now rub an old ball pen refill along the notches of the pencil.



7. For best results hold the refill near one end and rub it hard. The fan will start rotating.
Can you make the fan rotate in the opposite direction? Children have been doing this for a long time by pressing the index finger of the hand holding the pencil next to the rubber on the pencil. Will the fan rotate if you rub it with your finger? What can the biggest size of fan? The fan rotates because of the vibrations in the pencil produced by the refill. The physics behind the toy is a bit complex and several learned research papers have been written on it!



(Pix: Anu Gopinath)

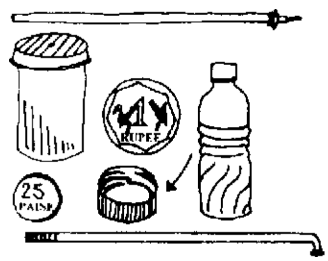


“The lecture method of teaching is the best way to transfer the teacher’s notes to the student’s notebooks without ever passing through their minds.”

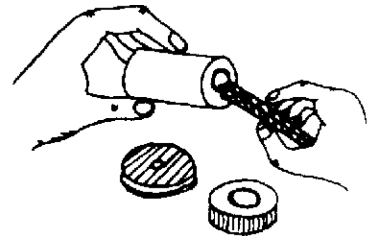
WATER PUMP

You need a water bottle cap, which can fit into the film bottle like a piston.
Two coins are used as valves in this pump.

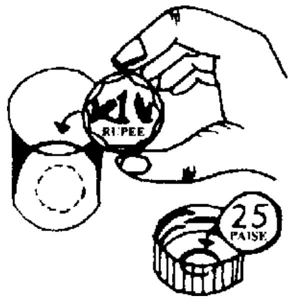
1.You need the following materials: a film roll can, one-rupee coin, 25-paise coin, used *Add-Gel* pen refill, mineral water bottle cap, a bicycle spoke and simple hand tools.



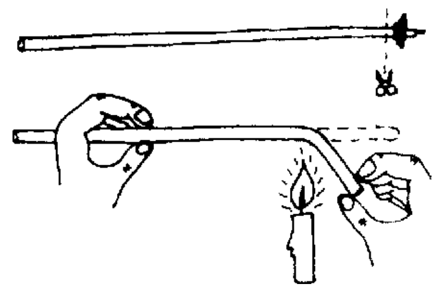
2. Make a 1-cm diameter clean hole in the base of film bottle. Make an 8-mm hole in the base of the water bottle cap. Make a small hole in the centre of the film bottle cap so that an add-gel refill can snuggly fit into it.

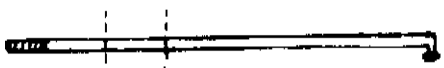


3. Put a one-rupee coin in the film bottle and a 25-paise coin in the water bottle cap.

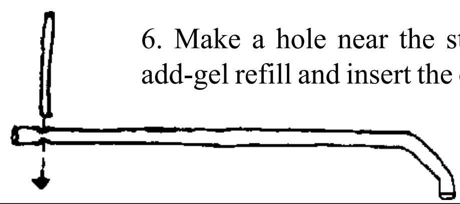


4. Cut a 10-cm clear *Add-Gel* pen used refill. Heat the refill gently to bend it on one end.

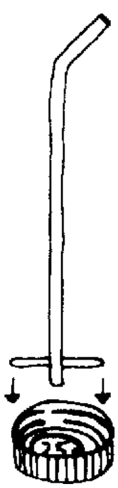




5. Cut a small piece from a cycle spoke (exactly the diameter of the water bottle cap).

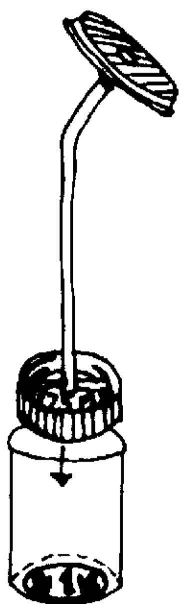


6. Make a hole near the straight end of the add-gel refill and insert the cycle spoke piece.

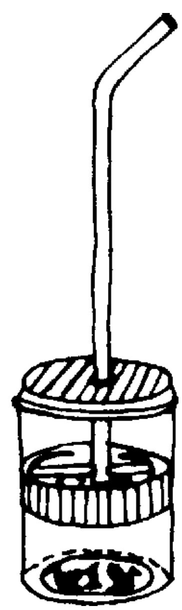


7. Rotate the cycle spoke in the water bottle cap so that it gets wedged between the internal threads of the cap.

8. The refill will act both as a connecting rod as well as a delivery pipe.



9. Put the water cap piston assembly in the film bottle. Shut the lid.



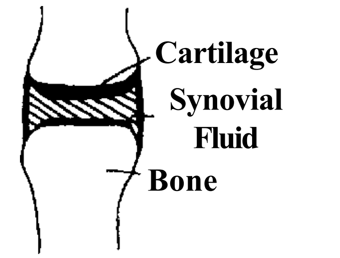
10. The water pump is now ready. Hold it in a glass of water and move the *Add-Gel* pen refill up and down. The coin valves will open and close. Water will gush out in every upward stroke.

(Pix: Anu Gopinath)

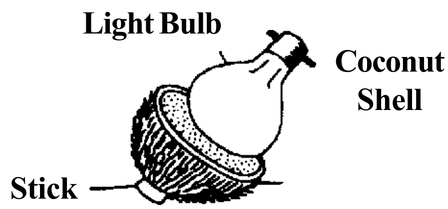
BODY BONES AND JOINTS

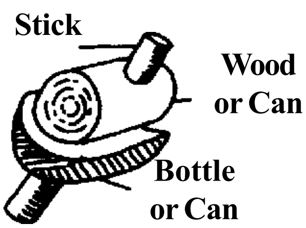
Our skeletons, like those of many animals, are made of bone. Muscles are attached to the skeleton. Joints allow movement between bones, each type allowing movement in a particular direction. Joints and limbs, are moved by muscles. Muscles can only pull, not push, so they always occur is places where there is something pushing. Muscles not only give movement, they also support parts of the skeleton.

Joints prevent the bones from wearing away. The end of the bone is covered by a layer of cartilage, which is slightly springy and so acts as a shock absorber. Between the two layers of cartilage is a lubricating fluid, the synovial fluid. Collect some bones from the butchers to demonstrate particular joints.



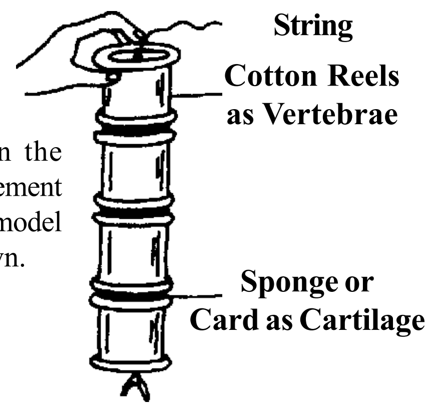
The hip joint, which allows the thigh to move is a ball and socket joint. You can demonstrate such a joint by cupping your hands and moving them as shown.

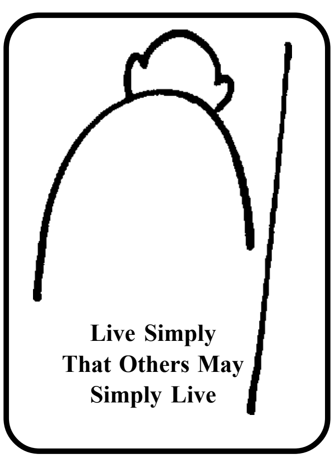


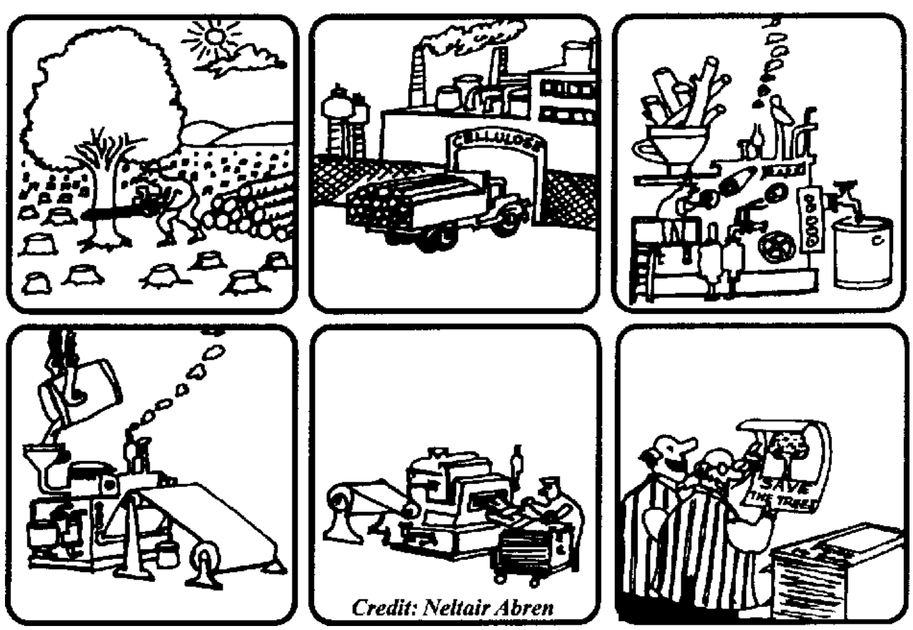


The elbows and the knee are both hinge joints and allow movement in only one direction - like a hinge. You can make a model of a hinge joint as shown.

The joints between the vertebrae allow movement of the spine. Make a model of the spine as shown.

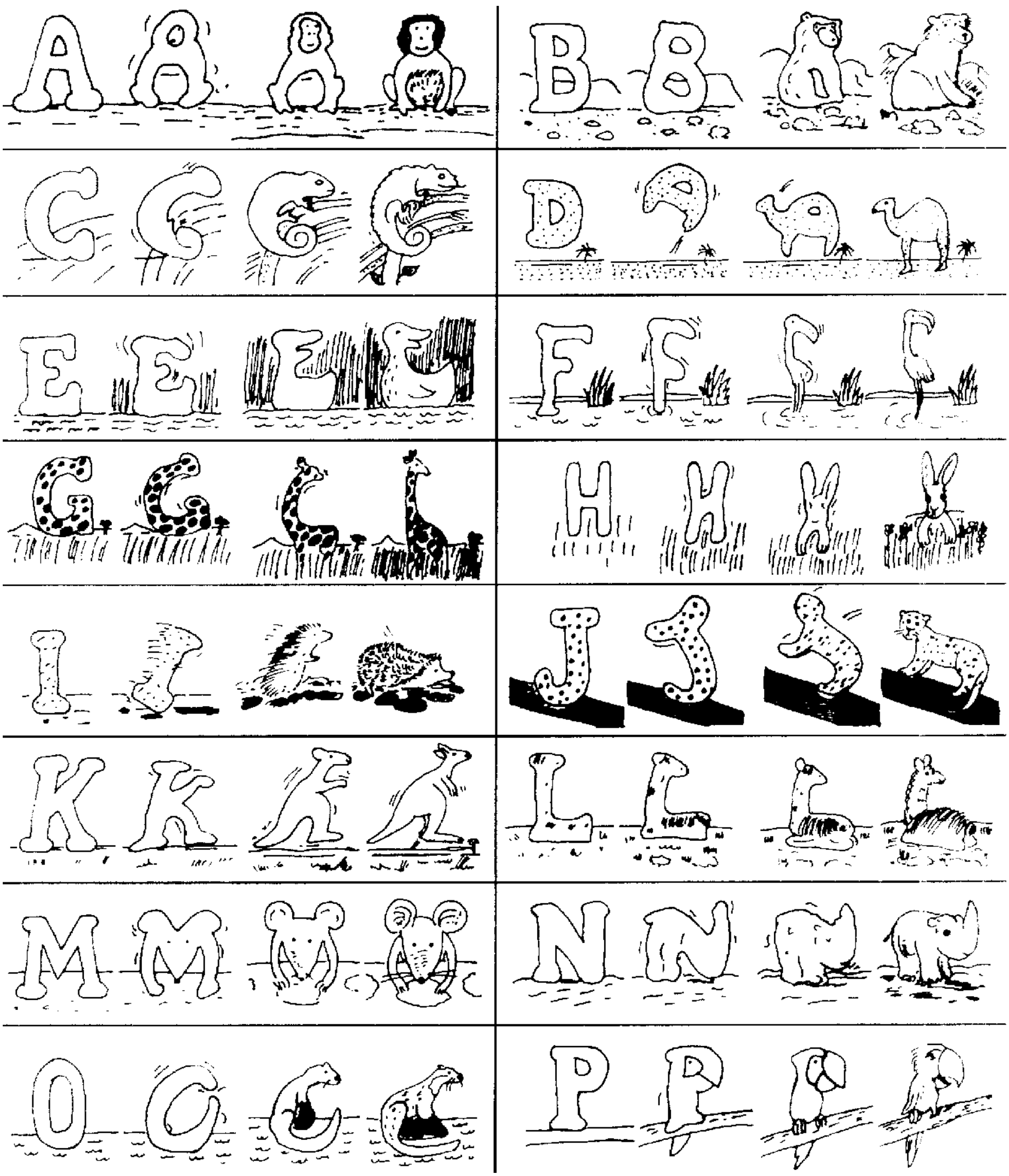


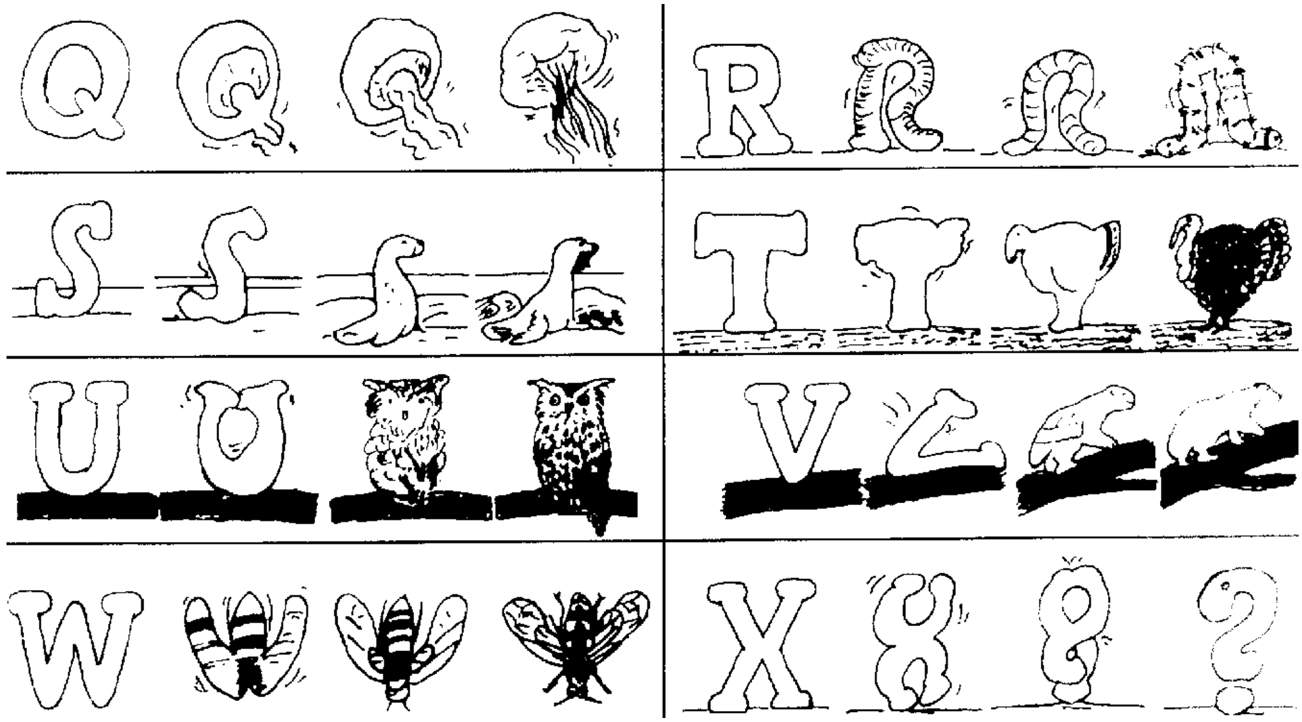




MORPHING

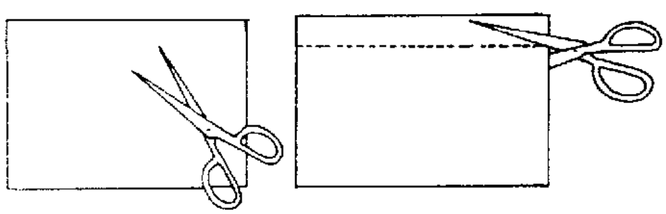
Morphing is a technique where by a form gradually transforms into another.
The familiar alphabets have been used to illustrate the point.
You could of course transform a stone into a face in a few steps!
Computer animation techniques have made morphing very popular.



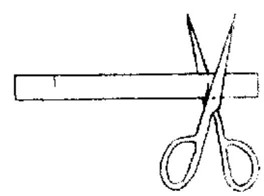


FLYING FISH

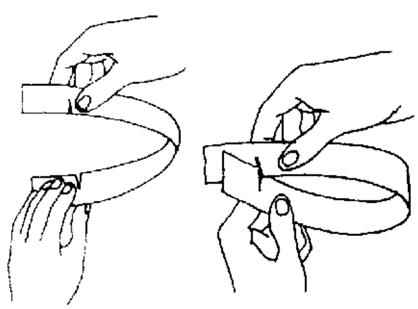
This fish is fun. It twists and turns and comes down like a Zeppelin plane!



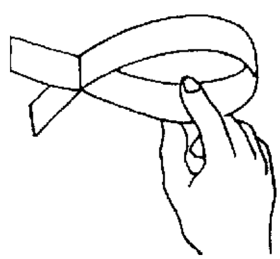
1. Cut a long strip of paper about 2-cm wide.



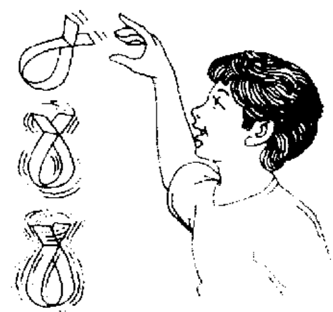
2. Leave 1-cm from the ends and cut halfway slits as shown.



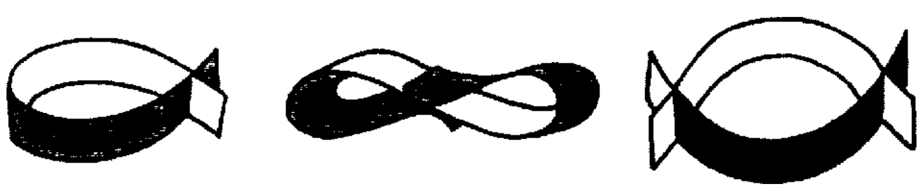
3. Interlock the slits to make...



4. .. the Flying Fish.



5. Throw it in the air see it come tumbling down.

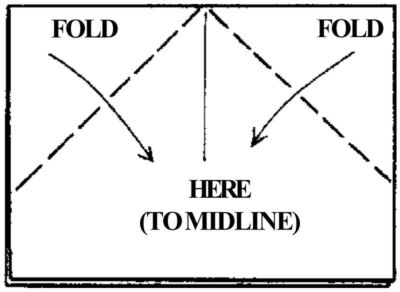


6. Experiment with different papers, shapes and sizes of fishes.

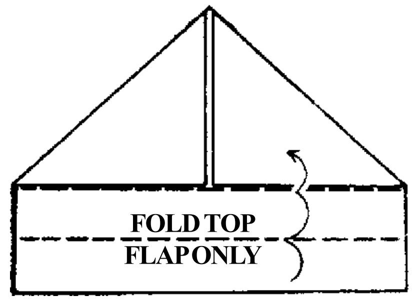
PRINTER'S HAT

This is a very easy and useful cap. You can wear it in the sun. On inverting, it becomes a good box.

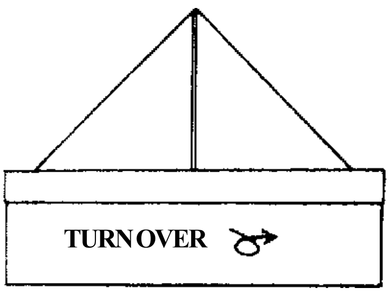
1.Take one old double spread newspaper and fold it into half.



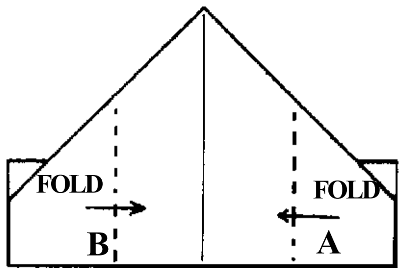
2. Keep the folded edge on the top. Fold the top left and right corners to the vertical midline.



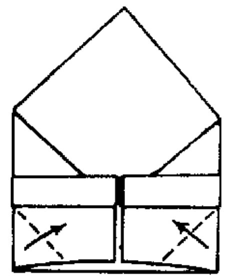
3. Fold only the top layer of the paper from the bottom into half. Then double fold.



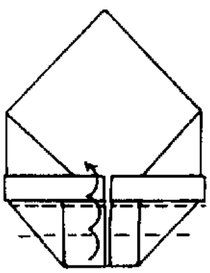
4. Now turn over the paper.



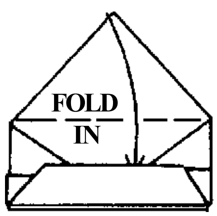
5. Bring the left and right edges to the midline and crease.



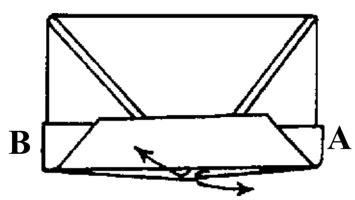
6. Fold the bottom left and right hand corners.



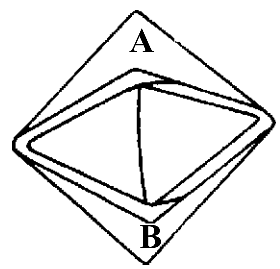
7. Fold the bottom portion in half. Fold it up once again and tuck the edge inside.



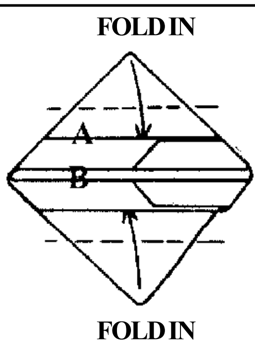
8. Fold the top point to the midpoint on the base and tuck in.



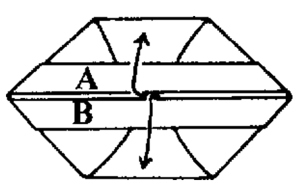
9. Open out the long edges.



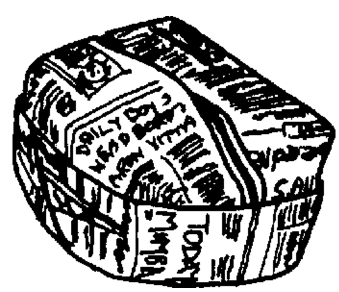
10. So that point **A** meets point **B**.



11. Bring the top and bottom corners to the centre and tuck them in.



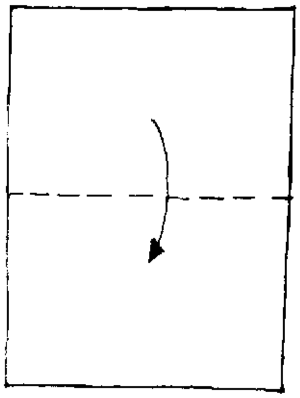
12. Now open out the midline and shape the model into a lovely cap.



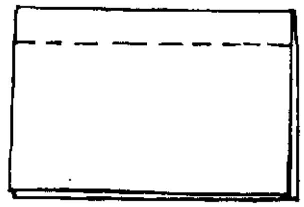
13. The inverted cap makes for a lovely box. With another cap you can make a lid for the box.

NEHRU CAP

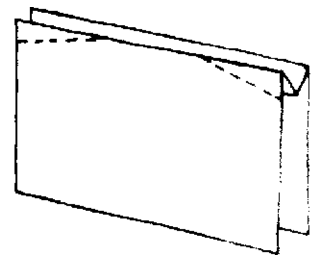
Boys in rural schools still wear this national cap to school. It just needs half a newspaper.



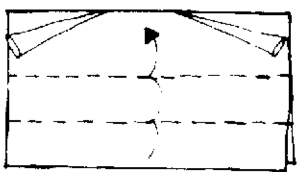
1.You just need a single sheet of newspaper for making this cap. Fold it in half from top to bottom.



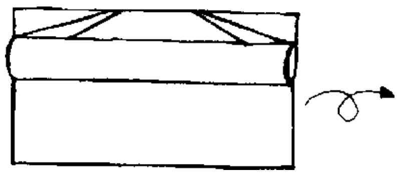
2. Fold a strip of 3-cm from the top into a channel.



3. Fold the left and right hand corners of the top layer along the dotted lines as shown.

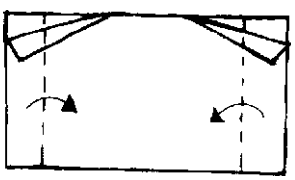


4. Fold the bottom edge of the top layer twice over along the dotted lines.

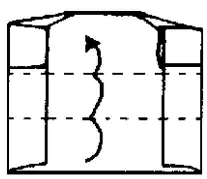


5. At this stage the model will look like this. Now turn over.

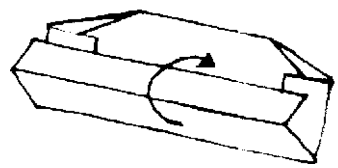
6. Fold the left and right corners along the slanted dotted lines as earlier.



7. Fold the two vertical edges inwards along the dotted lines.

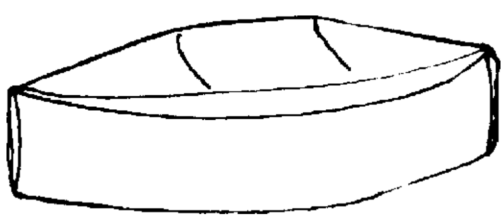


8. Fold the bottom edge twice over along the dotted lines.



9. Finally tuck the flap into the pocket.

10. This cap can be made to fit any size of head by adjusting the vertical folds in step 7.



11. This sleek and elegant cap can be flattened when not in use.

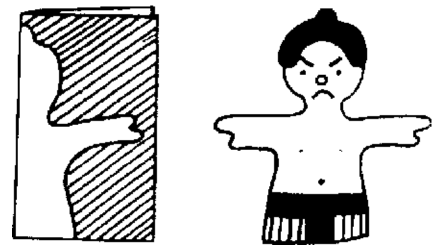
(Pix: Avinash Deshpande)

DANCING DUO

This traditional Chinese / Japanese toy is simple to make and great fun to play with.

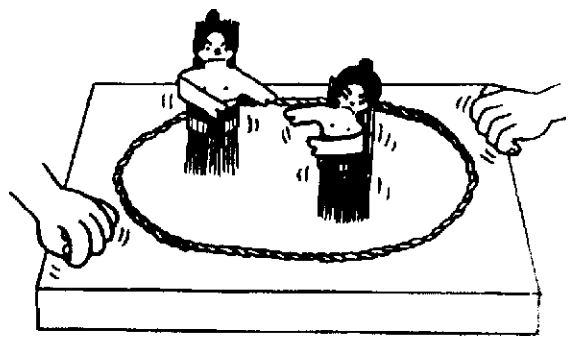
1. Trim a few coconut broom sticks (6-cms) to uniform length.

2. Tie them into a flat mat with string.



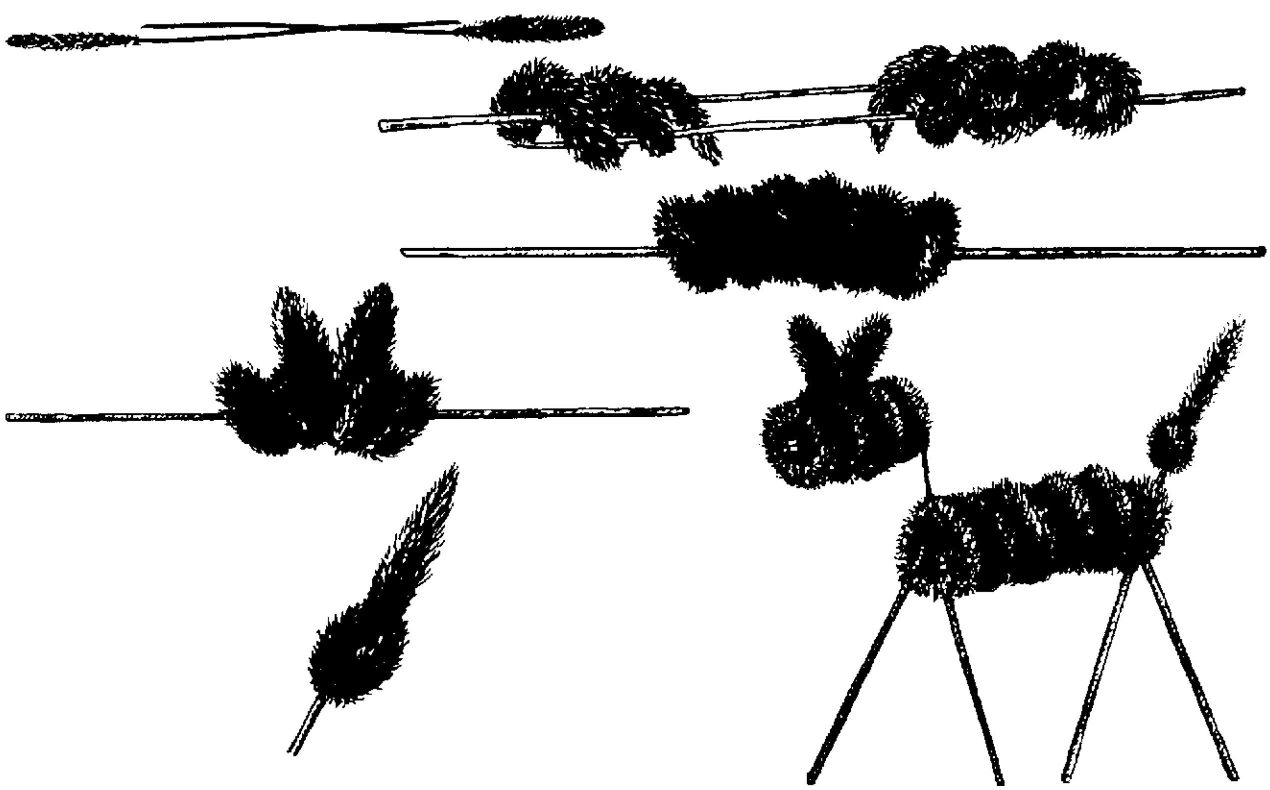
3. Cut a doubled up card sheet into a Sumo wrestler.

4. Stick the broom sticks on the wrestler to make it stand. Stand the figure on a cardboard box or an inverted metal *"thali"* and tap. The figures will execute a dance. They may appear like fighting Sumo wrestlers.



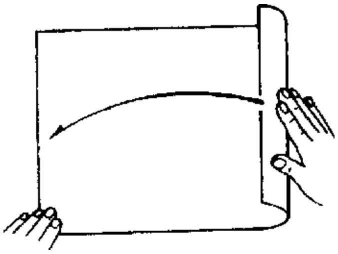
VELCRO GRASS ANIMALS

This grass is popularly known as Velcro grass. During monsoons it easily sticks to clothes. Collect this sticky grass and join it together to make some beautiful animal figures.

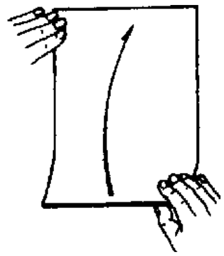


BOOKLET

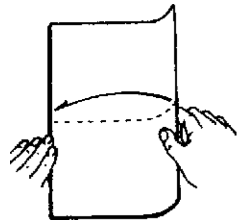
This booklet is very easy to make and can be used for making a small brochure, or picture book. To make it you will need a sheet of white photocopy paper and a scissors.



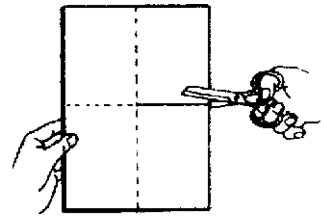
1. Place the sheet of paper on a table. Fold it half from right to left.



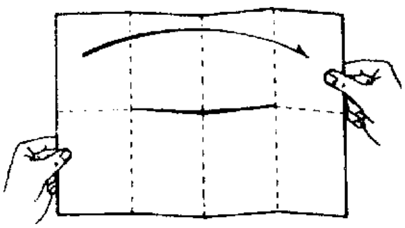
2. Fold and unfold it in half from bottom to top.



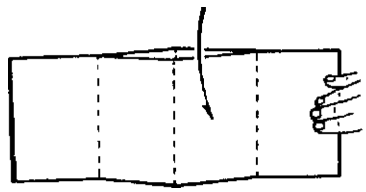
3. Fold and unfold it in half from right to left.



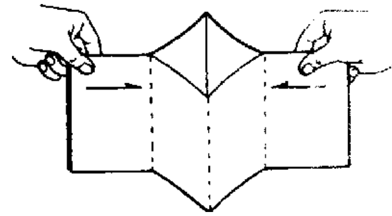
4. Cut from the right folded side into the middle of the paper, as shown.



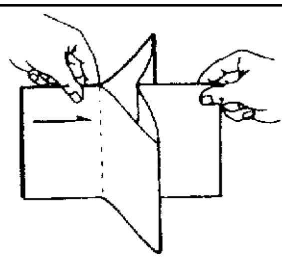
5. Open out the paper completely.



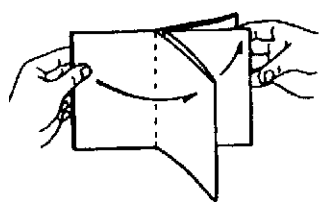
6. Fold it in half from top to bottom.



7. Hold the paper as shown, and push your hands together. The two centre layers will start to separate, making the middle pages of the booklet.



8. Fold the pages of the booklet together.



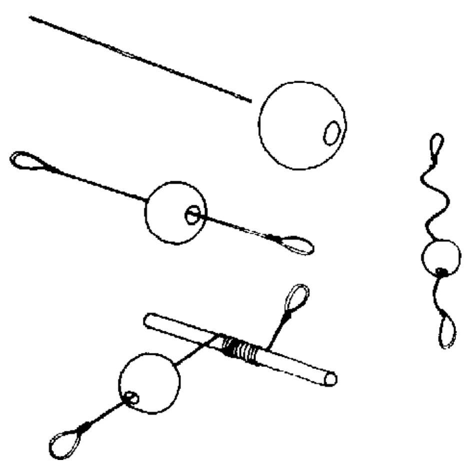
9. Using your imagination to make a lovely picture book.

SPIRAL BEAD

Take a 40-cm long thin wire. Make a loop on one end. Thread a bead on to the wire from the open end and then make a loop at this end too. Make sure that the sharp points of the wire on both the loops are pressed firmly and safely. Wind the looped beaded wire over an empty thread spool to shape it into a spiral.

Remove the wire carefully from the spool and stretch it by gently pulling it lengthwise, creating an elongated spiral.

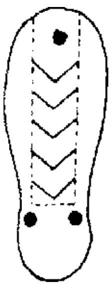
As you hold the spiral the bead will roll down in a very intriguing manner.



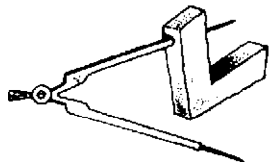
(Pix: Aga Khan Foundation)

CLIMBING CAT

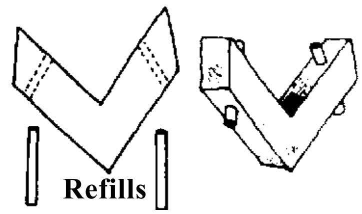
The material required is an old rubber (*Hawai*) slipper, a divider, one used ball pen refill, one small bamboo or ice-cream stick, thin but strong thread, and a few matchsticks. You also need an old magazine to keep the rubber for cutting. This will protect the knife blade.



1. Cut a 5-cm strip from the rubber slipper. Cut "V" shapes from this slipper.



2. Use the compass point to make two holes in the "V" rubber pieces as shown. The holes should be at a slant.

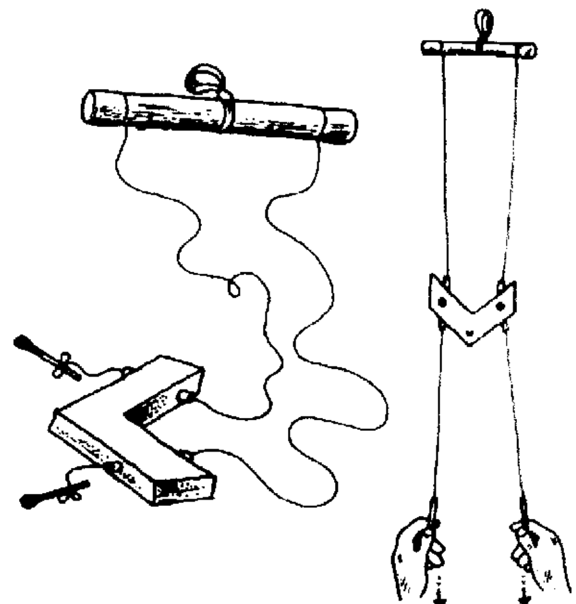


3. Insert small pieces of used ball pen refills in the rubber holes.

4. Take two 125-cm long pieces of strong but thin thread. Tie them tightly to the ends of a 12-cm long bamboo stick. Make a notch in the middle of the stick. Tie a loop of thread in this notch. The notch will prevent the loop from sliding.

Weave the threads through the two refill pieces of the "V" rubber. Finally tie two pieces of plastic straw or two matchsticks to the ends of the threads. Now hang the middle thread loop of the stick on a nail.

Hold the matchsticks in your hands, and pull the thread so that it is tight. Now pull the left and right hand threads alternately. You will find the "V" rubber piece climbing up. On loosening the tension in the strings it slides down. If you make two eyes and a mouth on the "V" rubber it almost looks like a climbing cat.



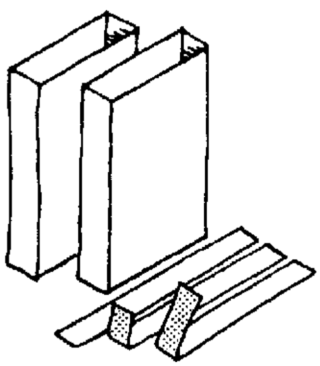
(Pix: LOW-COST, NO-COST TEACHING AIDS by Mary Ann Dasgupta)

They chop down 100-ft trees
To make chairs.
I bought one.
I am six-foot one inch.
When I sat on the chair
I am four-foot two.
Did they really chop down a 100-ft tree
To make me look shorter?

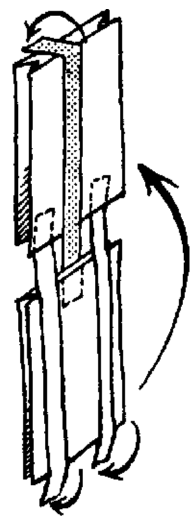
- *Spike Milligan*

JACOB'S LADDER

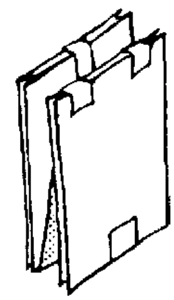
The Jacob's Ladder was an extremely popular toy during the late nineteenth century.
The toy takes its name from the *Bible*. In his dream prophet Jacob saw a ladder extending from earth to heaven on which angels could be seen coming and going.
The design of the Jacob's Ladder is extremely simple.
Basically a chain of cardboard rectangles are connected to one another by means of paper or clothe strips.
The strips are connected to the cardboard pieces in such a way that an illusion is created of the cardboard pieces tumbling or falling over one another when the toy is used.
You will need two cigarette packets, scissors, glue and strips of paper white on one side and tinted on the other.



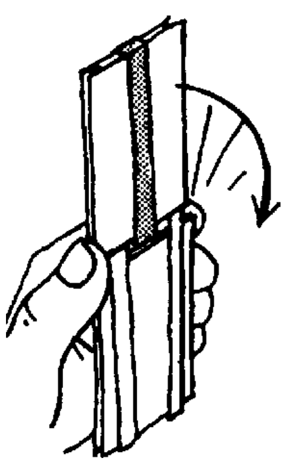
1. Take the outer shell of two cigarette packets and squash them to make V shaped channels on the sides. Cut 3 strips of paper. They should be 3-cm longer than the cigarette packets.



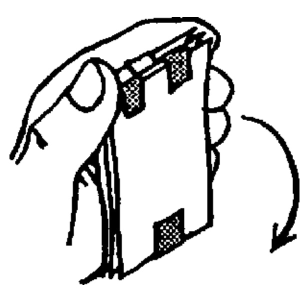
2. Stick the paper strips to the cigarette packets as shown.



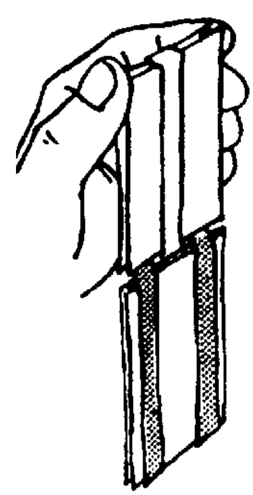
3. Fold the toy in half.



4. When you hold the toy at the centre of the packet and give it a gentle nudge than the other packet comes down.

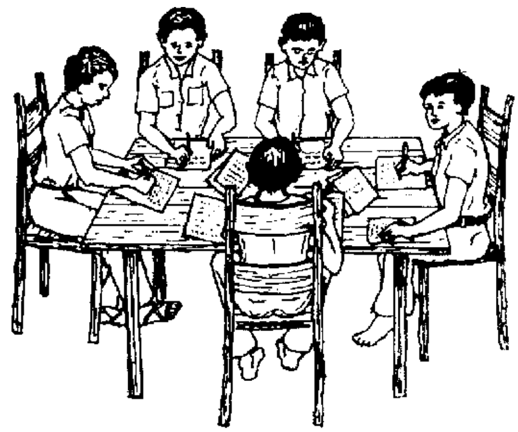


5. Repeat the same process.



6. With every flip the paper hinges change colour.

SCHOOL IS A WAR AGAINST THE POOR!



In the late 1960s a book entitled ***Letter To A Teacher*** was written by a group of Italian peasant children from the School of Barbiana. The school was not an Italian State school, nor was it a public school for the wealthy middle-class. It was founded by a young radical priest Don Lorenzo Milani and was named after a community of about twenty farmhouses that lay in the Mugello region of Tuscany. Originally intended as a night school for working people it soon became evident that the children of the region were being let down by the state schools, they often failed exams and were discouraged by the nature of authoritarian education.

Don Milani gathered together a small group of children and, over a many long hours, they formed a system that was more relevant to the needs of the poor. The older children actually began teaching the younger children and many "failures" became successful. Don Milani died in 1967 and the school died with him. But the book that the children wrote became a world wide best seller.

The schoolboys of Barbiana lucidly examined the class bias of public schools. Using clear (and angry) language, challenging ideas, armed with data and examples the children exposed the variety of overt and covert mechanisms used by schools to discriminate against poor students.

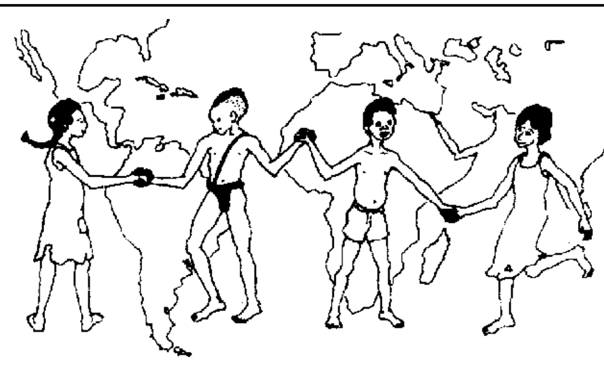
Letter to a Teacher brought about many themes that still resonate strongly today. Among them are the problems of two-tiered education systems, of emphasizing testing and grades, of rating schools, of teacher's authoritarianism, of poor quality education for poor children, of irrelevant curricula, of repetition and dropouts, and of business-like management models in schools.

The first paragraph of the book announces the angry and eloquent tone of the remainder of the text:

Dear Miss, You don't remember me or my name. You have flunked so many of us. On the other hand I have often had thoughts about you, and the other teachers, and about the institution which you call 'school' and about the kids that you flunk. You flunk us right out into the fields and factories and there you forget us.

The children of Barbiana feel that, "**school is a war against the poor!**"
They say the school system often makes the children of the poor feel worthless, lazy or stupid.
These Italian school boys join hands with the children of the world saying:

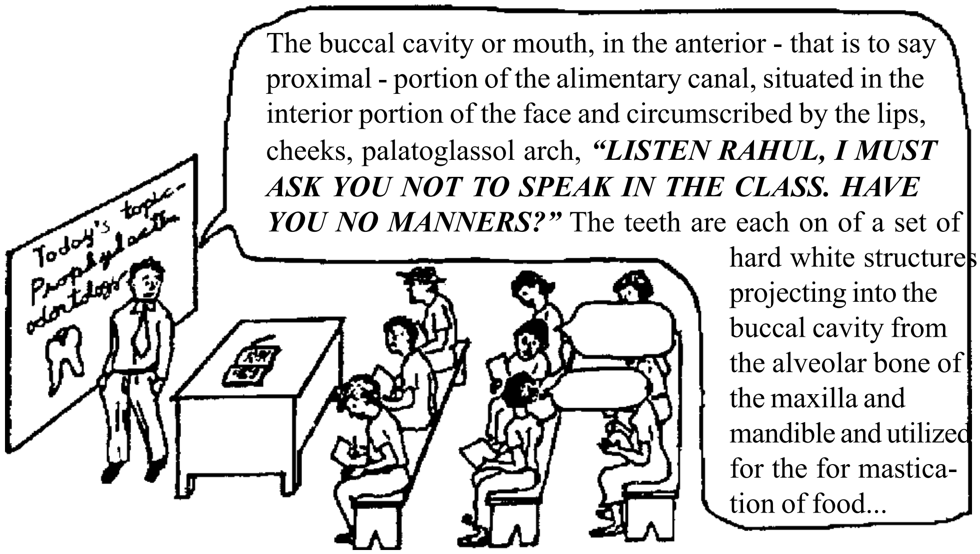
"In Africa, in Asia, in Latin
America, in southern Italy,
in the hills, in the fields,
millions of children are waiting
to be made equal.
Shy like me,
stupid like Sandro;
lazy like Gianni.
The best of humanity."



(Pix: HELPING HEALTH WORKERS LEARN by David Werner)

THE BOSSY TEACHER

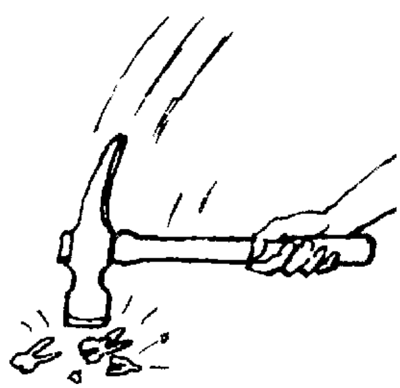
The teacher talks over the heads of bored and confused students like this:



This lecture goes on and on – all very serious.
At the end of the class the teacher may simply walk out.
Or he may ask the children some questions like,
"RUPA, WILL YOU GIVE ME THE DEFINITIONS OF CARIES?"
and when he gets no answer, scolds her by shouting,
"SO, YOU WERE SLEEPING TOO! THE GROUP HAS THE ATTENTION SPAN OF 5 YEAR OLDS!"
and so on.

A GOOD TEACHER

Would encourage children to sit in a circle, so that they can see each other's faces.
Would try and 'draw out' information out of the students from their own experience.
Would be careful and use words the students understand.
Would ask lots of questions.
Would encourage children to think critically and figure out things for themselves.
Emphasise the most useful ideas and information
(in this case what the children can do to prevent tooth decay).
Use teaching aids that are available locally and are as close to real life as possible.
For example a young child could be invited to the class
so students can see for themselves
the difference between baby teeth and permanent teeth.
Have student's look in each other's mouths for cavities.
Pass around some rotten teeth that were pulled at the health centre.



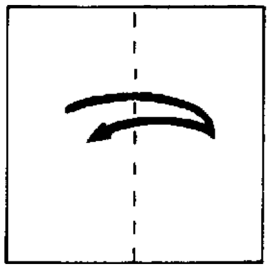
Let children smash the teeth open with a hammer or rock, so that they can see the different layers (hard and soft) and how decay spreads inside a tooth. Ask someone to draw the tooth on the blackboard.

Encourage children to relate what they have seen and learned to real needs and problems.

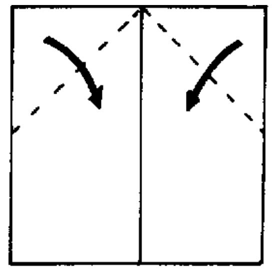
(Pix: HELPING HEALTH WORKERS LEARN by David Werner)

TALKING FROG

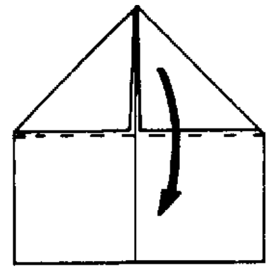
The talking frog is a very dynamic and interesting paper model.



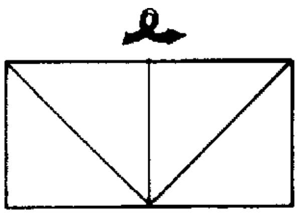
1. Fold the left edge over to the right and unfold.



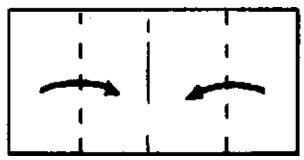
2. Fold the top corners in the crease.



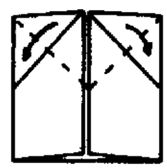
3. Fold down the top triangle.



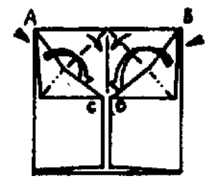
4. Turn over.



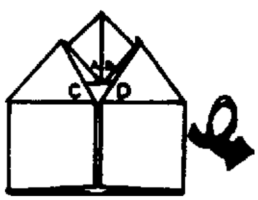
5. Fold the sides in to the middle.



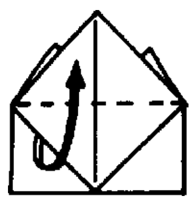
6. Fold the top inside corner of each flap to the outside edge.



7. Reverse fold A and B in to the centre crease to lie behind C and D.

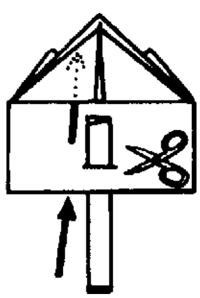


8. Turn over.

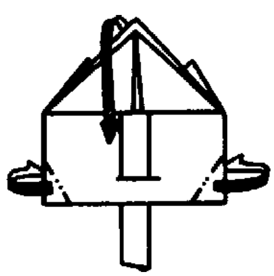


9. Fold the bottom corner of the diamond up to the top.

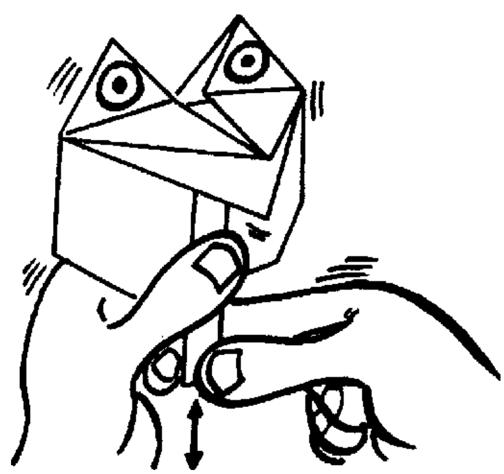
10. Fold over and over a strip of paper, which is a little longer than the height of the model.



11. Make a small tear across the middle of the model near the bottom edge. Put the strip through the tear and push it up under the top triangle as far as it will go.



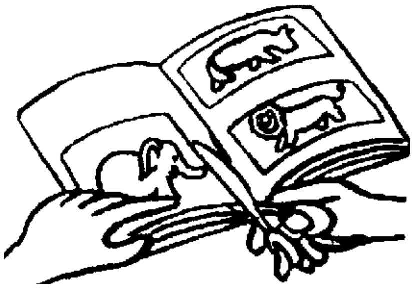
12. Fold the bottom corners behind. Fold down the front and back triangles at the top to make the mouth come forward.



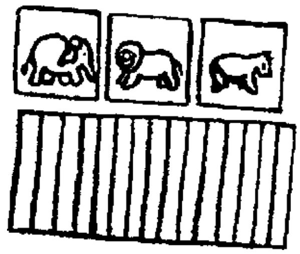
13. The Talking Frog is now complete. Draw the eyes. Hold as shown and move your right hand up and down. The frog will talk.

THREE-WAY PICTURE

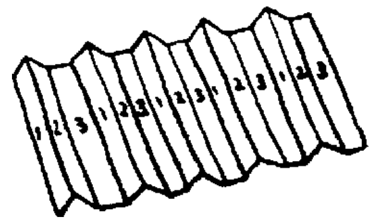
For making this delightful display you will need - three pictures from an old magazine, trimmed to the same height, a piece of thin cardboard, scissors, pencil, ruler and glue.



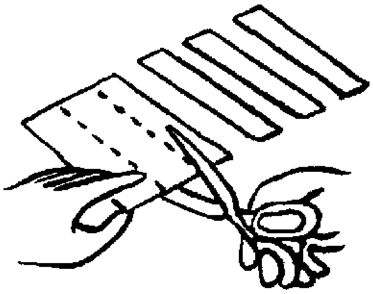
1. Trim the pictures. Label them 1, 2 and 3.



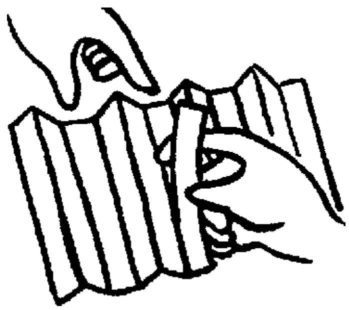
2. Cut thin cardboard to the same height and total length of all the pictures.



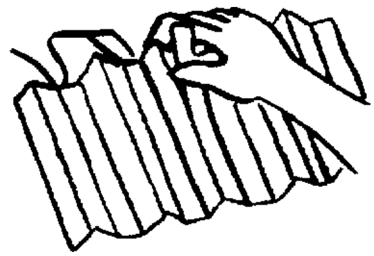
3. Mark the cardboard into 1-cm sections. Number the sections and fold the cardboard along the lines, as shown.



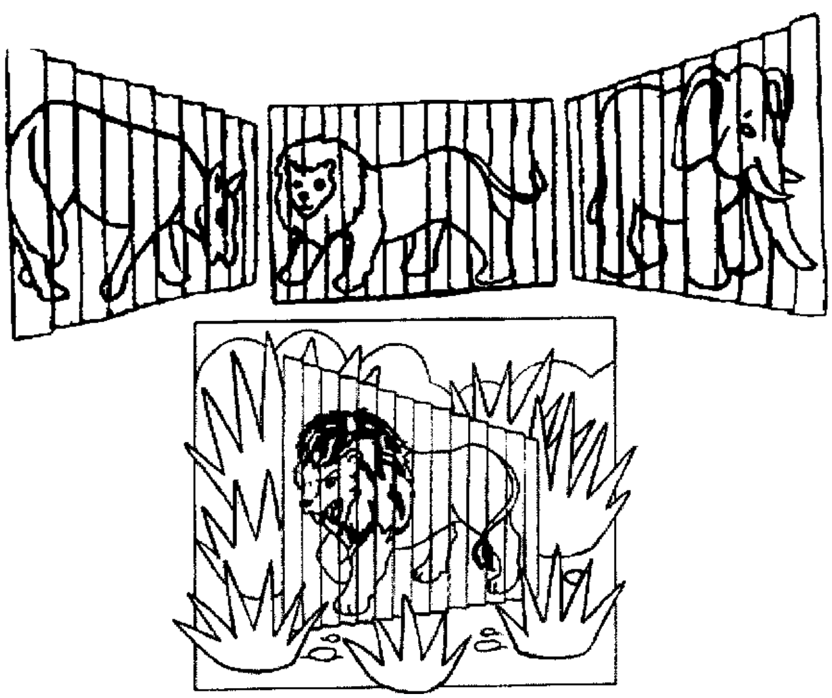
4. Mark each picture into 1-cm sections. Cut each picture into strips.



5. Glue the strips from picture 1 (in order) onto the sections marked 1.



6. Glue the strips from pictures 2 and 3 (in order) in the same way.

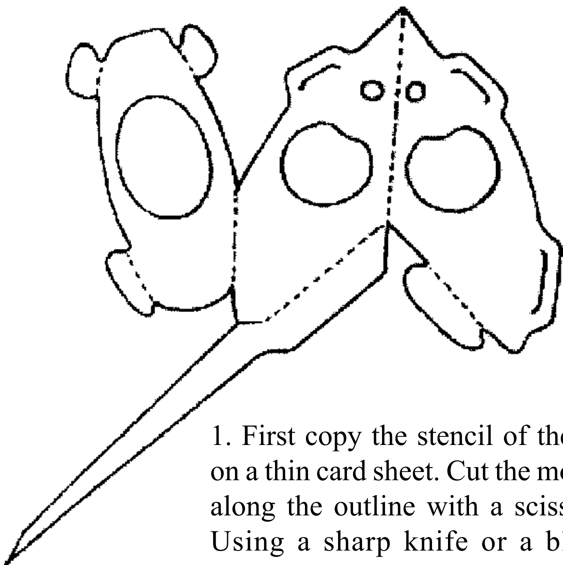


7. Stand the cardboard up and you will see a different picture from the left, the front and the right.

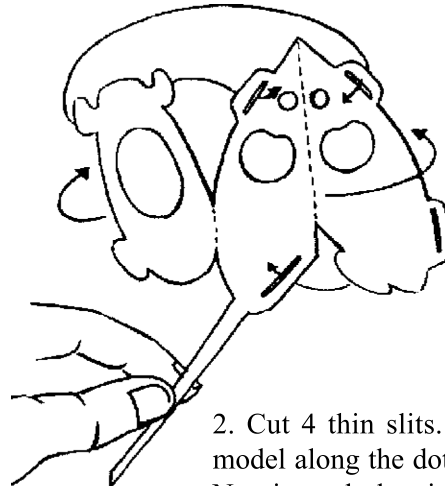
(Pix: Avinash Deshpande)

MARBLE MOUSE

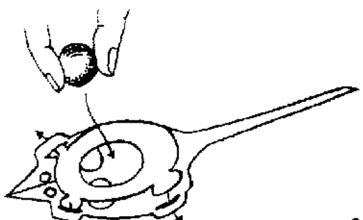
A truly marvellous mouse. Esther of *Play Rights*, Hong Kong presented it to me.



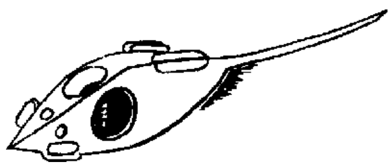
1. First copy the stencil of the rat on a thin card sheet. Cut the mouse along the outline with a scissors. Using a sharp knife or a blade remove the 2 ovals and 1 ellipse.



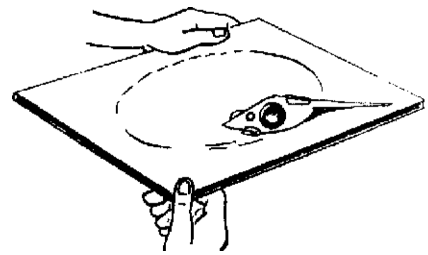
2. Cut 4 thin slits. Fold the model along the dotted lines. Now insert the lugs into the slits (you can also stick them), to give the mouse its 3-D shape.



3. Next insert a marble through the elliptical hole in the stomach of the mouse.



4. The mouse is now all ready to roll.



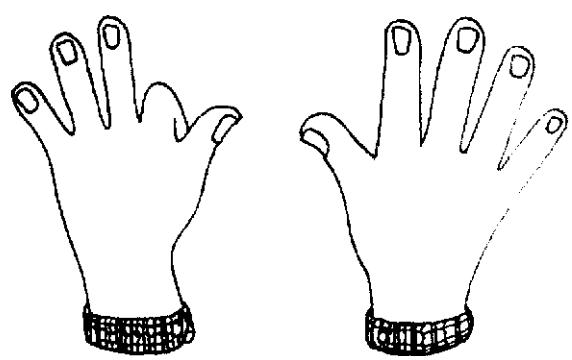
5. Place the mouse on a file cover and it will start rolling. You can make the mouse go round and round in circles.

DIGITAL COMPUTER

In your head and hands you've got a computer!
It's a marvellous machine that can make multiplications by 9, for example a very simple operation.

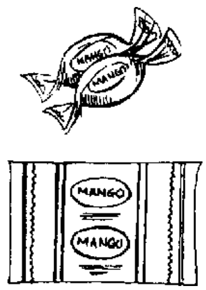
Let's multiply 4 by 9 just to show you how your digital computer works.

Hold out your hands.
Count off from left to right until you reach the fourth finger. Fold it down.
Now look at your hands and you've got the answer: there are 3 fingers to the left of the folded finger and 6 to the right: the answer is 36.
Try it out a few times and you'll find it never fails.
Show your friends how to multiply 3 x 9;
7 x 9; 5 x 9; 8 x 9 and 9 x 9 on their fingers.

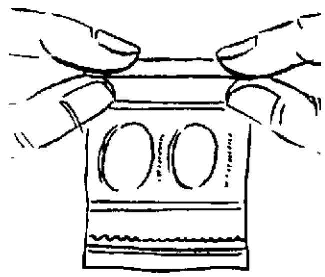


TOFFEE WRAPPER WHISTLE

This whistle is a children's delight, but a teacher's nightmare.



1. Toffee wrappers are not for throwing, for you can make a lovely whistle out of them.

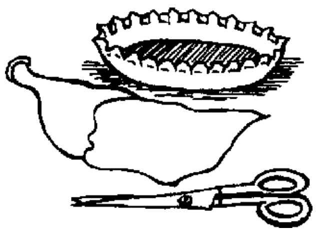


2. Take a toffee wrapper. Hold its short edge tightly between the thumbs and first fingers of both the hands.

3. Place the edge close to the mouth and blow hard. The edge will vibrate and give out a shrill whistle like sound.

SODA CAP ORGAN

With a soda water bottle crown cap and a torn balloon, you can make a musical organ.



1. Take a soda water bottle crown cap. Take a piece of torn balloon.

2. Stretch a single layer of the balloon rubber on the cap. The serrations on the rim of the crown cap will hold the balloon in place.

3. The stretched balloon acts like a membrane in tension.

4. Now keep the cap close to your lips and blow at an angle. You will be able to hear loud and musical notes from this organ. With a little practice you will find out the correct angle of blowing the air.

(Pix: Avinash Deshpande)

PAPER ALIVE

As soon as you cut a small strip of paper and place it on your hand, it begins to twist and turn as if it were alive!

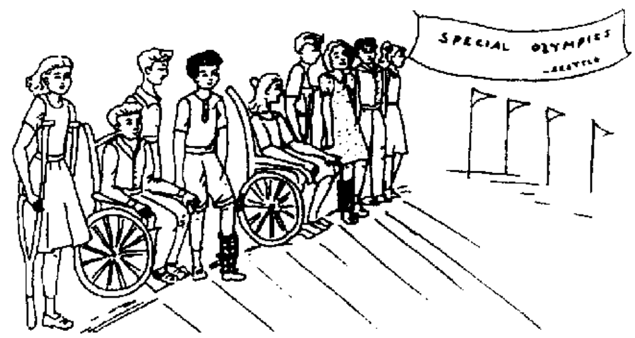
1. You need a piece of cellophane paper - the kind used for packing sweet boxes. Cut a 1-cm x 4-cm strip and a flower with 4 petals with this gelatine paper.

2. Keep the strip on your hand. Soon the strip will begin to curl up. It will twist and turn as if paper had life in it! The four petals of the flower will curl up into a bud shape.

SPECIAL OLYMPICS

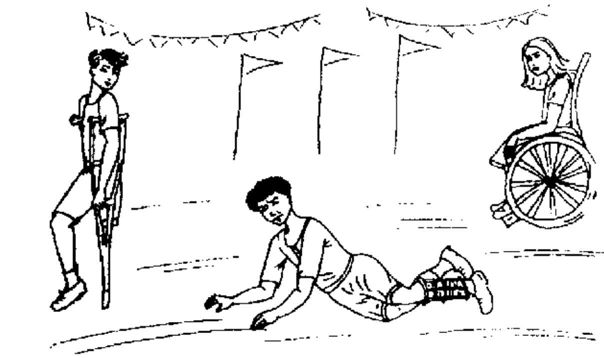
This is a special story. We need more co-operation than competition.

Several years ago, something amazing happened at the Special Olympics in Seattle.



The race was the 100-meter dash and nine contestants, all with physical disabilities, stood ready at the starting line.

The gun fired and everyone took off, not exactly in a dash, but all eager to win. All, that is, except for a little boy who stumbled and tripped, then fell to the ground and began to cry.



Hearing him, the other contestants stopped running to see what had happened. Then one by one, they turned around and went back to help him up. Every single one of them.

When he was back on his feet, dusted off and tears dried one girl with Downs Syndrome had put her arms around him and kissed him gently, saying, 'This will make him better.'

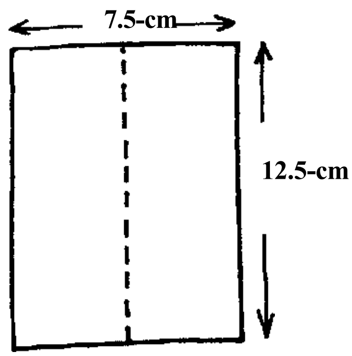
Afterwards all nine children joined hands and they all walked together to the finish line. The audience watched spellbound in disbelief.

Nine gold medals were awarded in that race and the crowd that cheered the winners on with a standing ovation learned something about friendship that day that they would never forget.

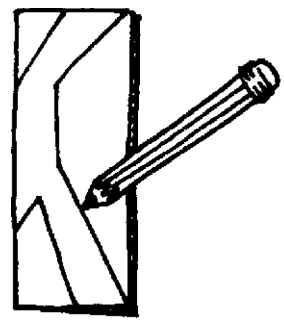
Chicken Soup for the Soul
(Pix: Abha Mehrotra)

BALANCING BOY

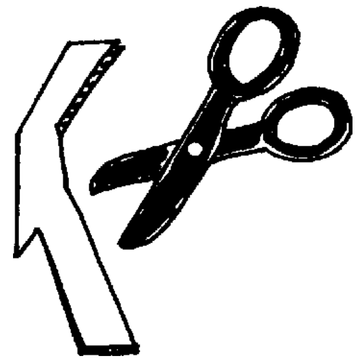
This is a fun toy. You could try lots of variation. Instead of the notch, put a small pulley. Then the Balancing Boy will not “walk” but “run” on the tightrope.



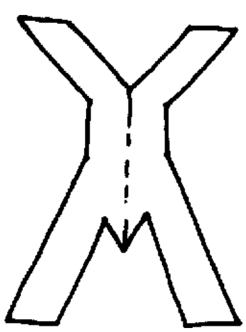
1. Fold a 7.5-cm x 12.5-cm thick card sheet in half along the length.



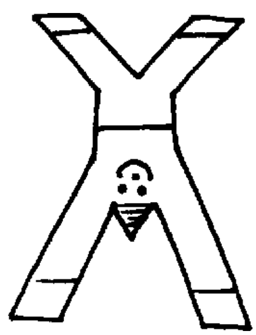
2. Draw the outline of the Balancing Boy on the folded card.



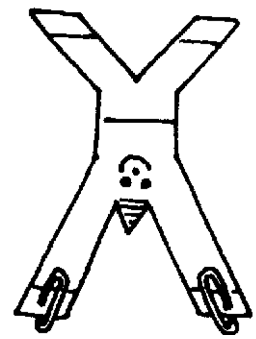
3. Cut the folded card. ***(For good balancing the Balancing Boy must have very long arms.)***



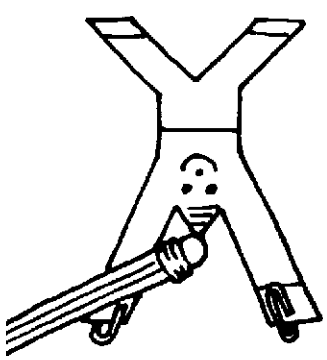
4. Open and flatten it. If you feel it is not stiff than stick on a cardboard.



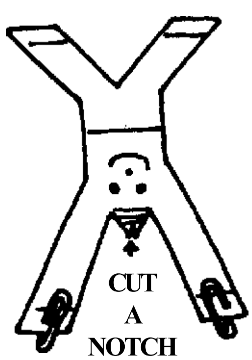
5. Now draw the face of the Balancing Boy and colour it.



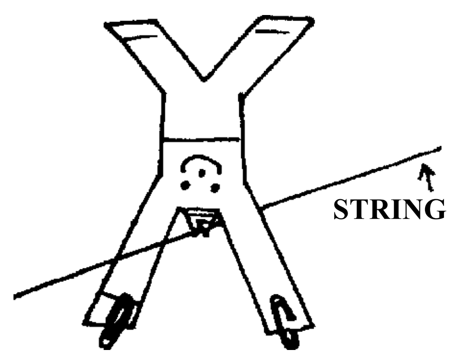
6. Attach a heavy paper clip to each arm. Actually sticking a coin on each hand is better.



7. Test the model by balancing it on a pencil eraser or your finger.



8. For balancing the model on “tightrope” you can cut a notch in the Balancing Boy’s Cap.

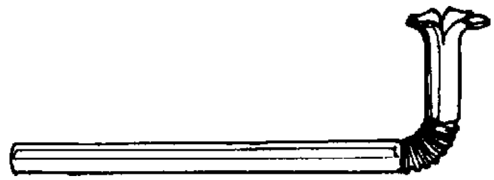


9. Now you can hold a “tightrope” between your two hands and make the Balancing Boy walk the rope. You can put a small pulley to make the Balancing Boy “run”.

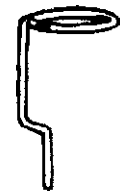
FLOATING BALL

You can make a very simple Floating Ball toy with simple materials found at home.
The floating ball could be carved from a piece of thermocole or just use a pea seed.

1. Take a flexible soda straw. Carefully cut the small end so that there are four small fingers of plastic sticking out as shown. Gently bend these pieces down to make a cradle for the pea or a thermocole ball.



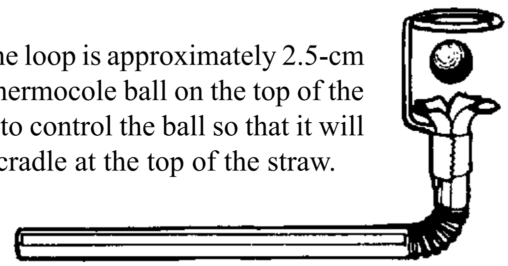
2. Bend the short end of the straw at right angles to the longer piece.



3. Bend a piece of thin wire as shown with a pliers.

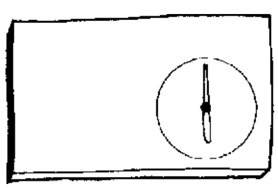
4. Tape the wire loop to the top of the soda straw so that the loop is approximately 2.5-cm above the opening of the straw. Now place the pea or a thermocole ball on the top of the straw and blow gently. With practice you should be able to control the ball so that it will rise above the loop and settle back down again into the cradle at the top of the straw.

BLOW →

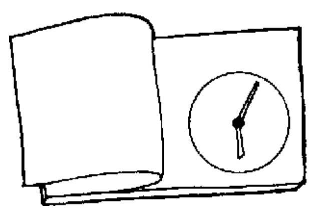


FLIP-BOOK

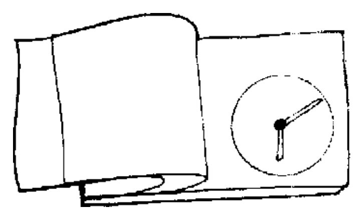
In order to make this flip book you will need a small notebook, and a sketch pen.
You must decide on a moving thing - a bouncing ball, a running horse or a moving clock.
The book consists of a series of sequential pictures put on separate sheets of paper, one after the other.
When the book is quickly flipped through, the pictures provide the illusion of a moving picture.



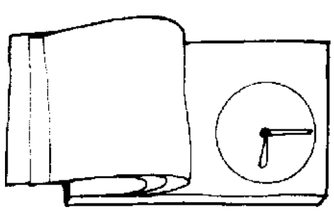
1. Draw a clock dial with its two hands on the first page.



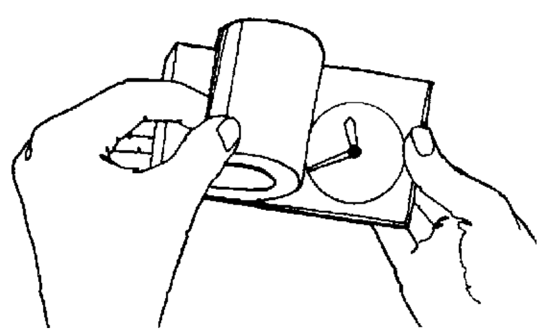
2. Rotate the minute's hand clockwise a little bit.



3. And a little more...



4. And a little more....

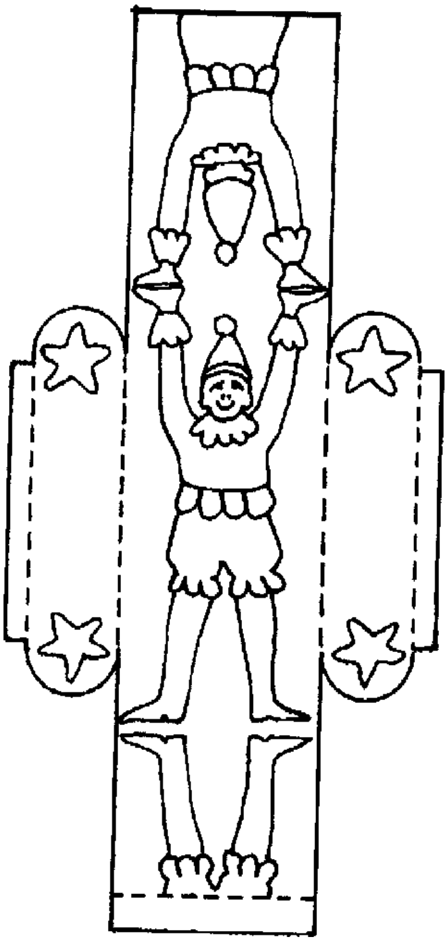


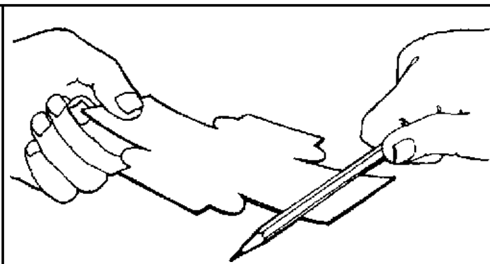
5. On flipping through the pages you will see the clock moving!

TUMBLING ACROBAT

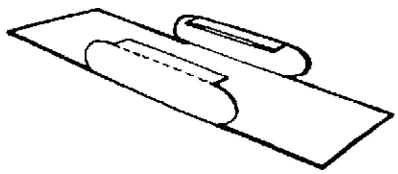
Earlier children used to make this toy using an empty medicine capsule and a bicycle ball bearing. This toy employs the force of gravity to move. It is simple and great fun.

1. Copy the given pattern on a card sheet. Then cut the pattern.

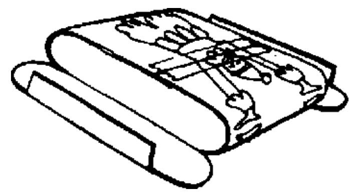




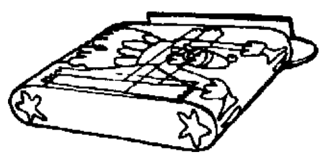
2. Press the cut-out pattern on a table with a pencil. Pull the pattern a few times to make the paper flexible.



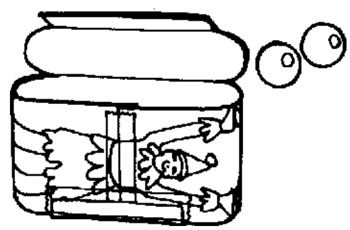
3. Fold the flaps on the pattern along the dotted lines.



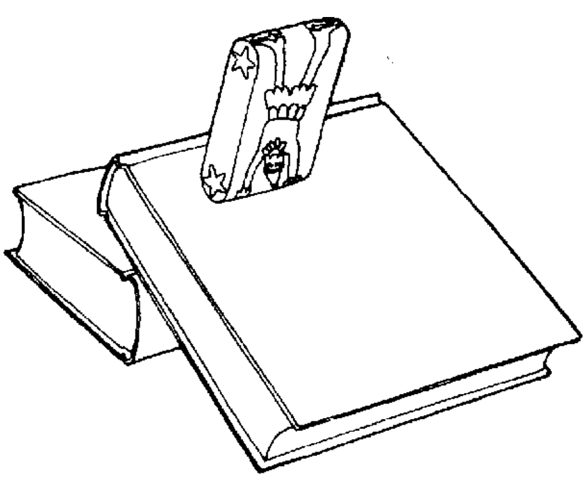
4. Now make a loop out of the pattern and tape the ends on the inside.



5. Tape one flap to the inside of the loop.

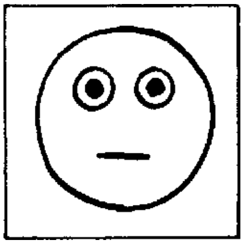


6. Place two marbles inside the loop and tape the other flap closed.

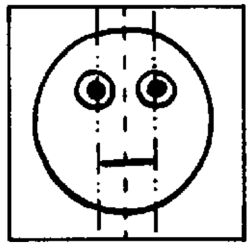


7. Now rest the Tumbling Acrobat on an inclined surface. The Acrobat will tumble down. If the Acrobat just slides down, it means that the surface is too smooth. Then you can try using a rougher surface.

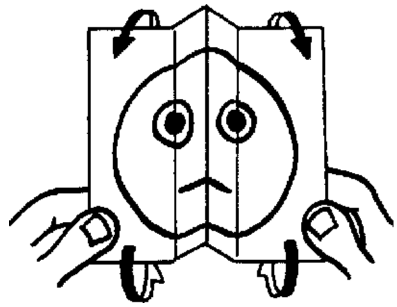
HAPPY OR SAD



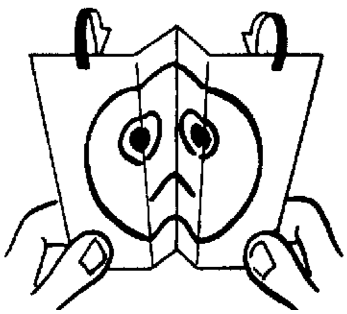
1. Draw a simple face on a piece of paper. It can be any sort of face. But the mouth must be a horizontal line.



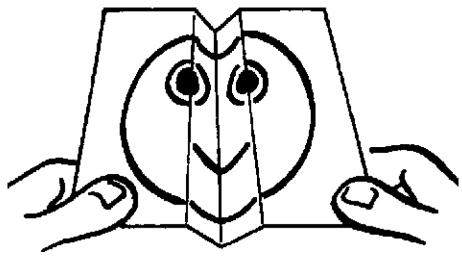
2. Put a mountain fold across each end of the mouth line and extend them to the top and bottom edges of the paper. Put a valley crease between them.



3. Hold the paper by the bottom corners and tilt the top edge towards you.



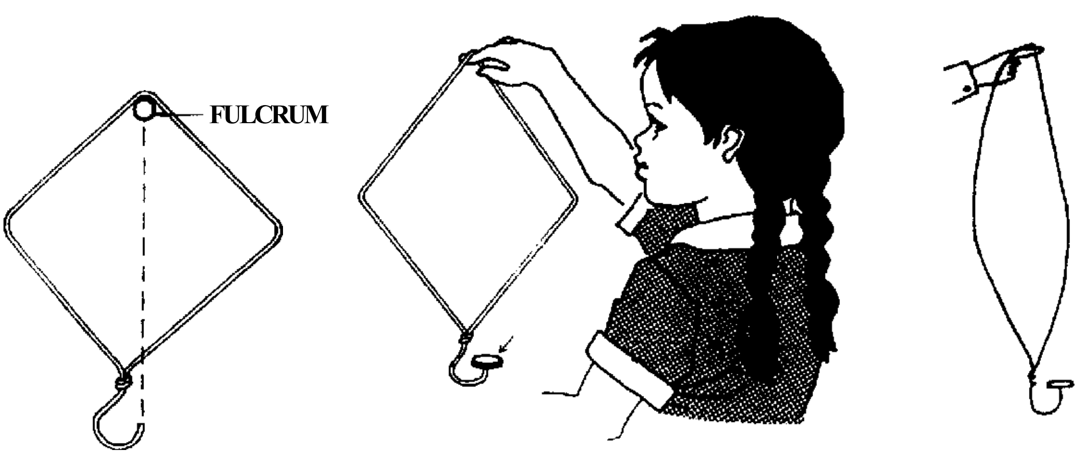
4. The face will look sad.



5. Tilt the bottom edge towards you and the face will look happy!

FUNNY MONEY

Hold an aluminium hanger by the hook and midway along the longest side, stretch it into an elongated, diamond shape. Now bend the hook slightly so that it points back toward the opposite end of the diamond. File the end of the hook flat, so that a coin will balance on it. Dangle the hanger from your index finger and carefully balance a coin on the end of the as shown. The balancing is a bit tricky but this makes the demonstration all the more impressive. A little practice, a steady hand, and a lot of patience are all desirable at this point! Rock the hanger to-and-fro and then swing the hanger all the way around. If you are careful then the coin will remain "balanced" on the end of the hook even when you slow and stop the hanger. You can also rotate the hanger with the coin "balanced" around your head. Where is the coin? Is it still on the hanger?



(Pix: UNESCO)

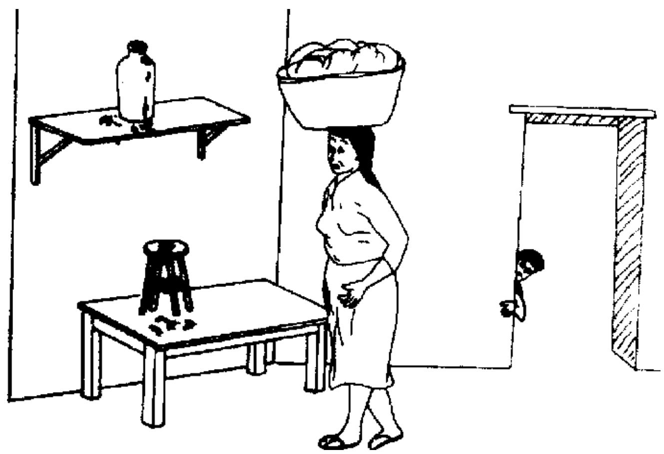
THE SCIENTIFIC METHOD OF PROBLEM SOLVING

The scientific method can be explained using big words like hypothesis, theory, etc. But it might be more useful to look into a situation where these steps have actually been used.

One morning Mama prepares some *Jamun* (a purple fruit) jam, and then goes to the river to wash clothes. In the afternoon Mama comes back from the river. She sees that someone has eaten the jam and left behind a big mess.

What is her first idea about how this happened? That one of her children stole the jam. How can she find out which of her 5 children did it? She could call all the children and ask them? But what if they don't tell? She could find out what the children were doing when she was at the river.

Maybe some were away so she can be sure that they didn't steal the jam. One boy was away getting firewood and had the wood to prove it. One daughter was at the grandmother's house. So how many culprits remain? Just three. Why doesn't she look at their hands and mouths? *Jamun* jam leaves a purple stain. Good, suppose she finds that all three of them have purple stains on their fingers and tongues. Then what? Punish all three! But suppose each one says he didn't steal the jam; that another gave it to him.



How can Mama be sure which one actually stole it? Maybe the one who stole left a 'handprint' in the kitchen, so she can tell which one it was. But what if the children's hands were all about the same size? Then what? Some detectives take 'fingerprints'. Maybe she could take their fingerprints with ink. Then she could be sure who stole the jam. What should Mama do next? Counsel the culprit! And after counseling how can she tell if she was right about who did it, and if the counseling was effective.

By seeing whether any more jam is stolen!

Now let us look at the various steps Mama took to find out about the jam thief. The steps will be something like this:

1. Mama becomes aware of the problem. 2. She is certain about how it happened. 3. She guesses that one of her children is responsible. 4. She notices the details or 'evidence'. 5. She asks questions. 6. She examines her children's fingers. 7. She considers all possibilities. 8. She conducts tests to prove or disprove the different possibilities. 9. She decides who is probably guilty. 10. She provides punishment. 11. She sees whether the results were effective. 12. She starts over again with step 1 if the results were not effective.

THIS IS THE SCIENTIFIC METHOD

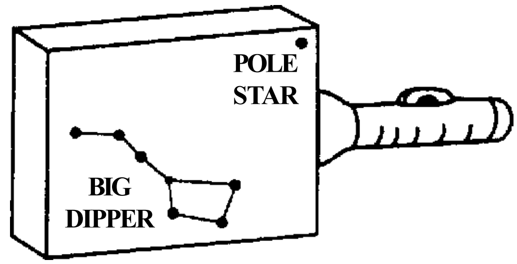
(HELPING HEALTH WORKERS LEARN by David Werner and Bill Bower)

MINI PLANETARIUMS

You can make some working models that show the positions and apparent motion of the stars much like a real planetarium.

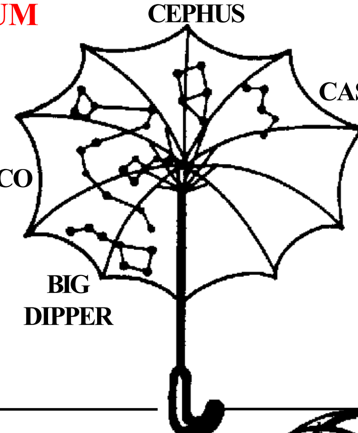
CARDBOARD BOX PLANETARIUM

Collect a few thin cardboard boxes. Each box can be used to show a different constellation. Mark out the pattern of the constellation on the box and then punch holes in the wall. Make a small opening on the side of the box for a torch. Take the box in a dark room. Shine the torch in the box to make the constellation glow!



UMBRELLA PLANETARIUM

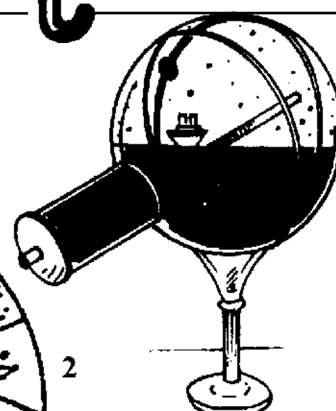
Use chalk or markers to draw star patterns on an umbrella. You can even cut out stars and stick them on the umbrella. Put the Pole Star along the stick of the umbrella. The Pole Star is at end of the handle of the Little Dipper (*Saptarishi Mandal*). Mark the positions of some other constellations like the Big Dipper, Draco, Cassiopeia and draw lines to connect the stars. Turn the umbrella counter clockwise to see how the stars appear to move through the night sky.

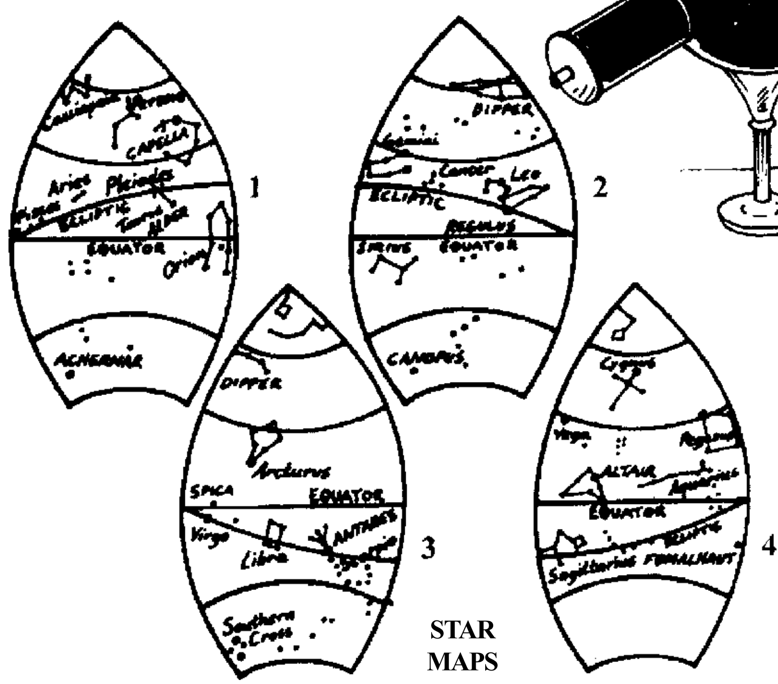


FLASK PLANETARIUM

You can make a nice planetarium using a round bottom chemist's flask. You can enjoy the rising and setting of constellations below the horizon of the blue sea. The picture is self-explanatory. Fill the flask midway with a blue liquid to represent the ocean. Plug the mouth of the flask with a stopper. Now place a rubber band around the middle of the flask for the equator. Place another rubber band at 23-degrees (use a protractor) to the equator to depict the ecliptic – the path of planets, moon and the sun.

Use tape to divide the distance between the equator and the poles into 3 equal parts. Each third stands for 30-degrees. Now transfer the quarter-sphere maps below onto the surface of the flask with a glass marker.

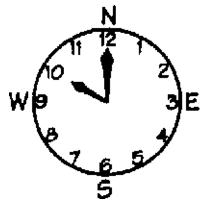




(SCIENCE IS by Susan Bosak)

STARRY STARRY NIGHT

How do you describe the position of a star or tell distances between stars?
Here are some simple ways of doing it.

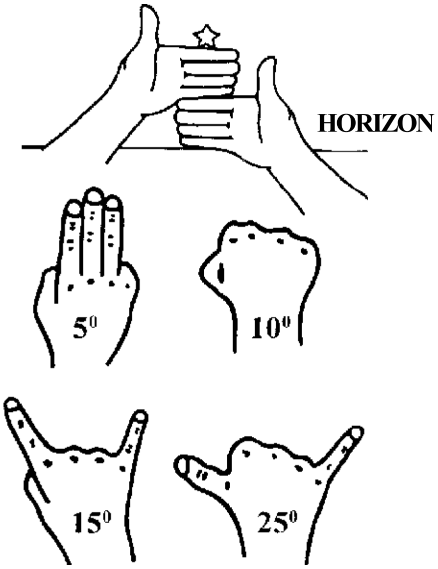


To indicate the direction of a star you can simply say look 'east' or 'north-east'. But this is not very accurate. You can do better by imagining you are facing a big clock and the number 12.00 is north. You can now indicate the position of a star by saying, "Look for the star at 5.00 O'clock position."

To find the star's altitude look at the point on the sky directly over your head – the 'zenith'. For this you will either have to lie down or lean your as far back as possible. All luminous objects in the night sky are found between the horizon (0 degrees) and the zenith (90-degrees). If a star is midway - between the horizon and zenith, than it is at 45-degrees.

You can find a star's altitude with the help of your hands. Hold one hand an arm's distance from you in the position shown. Bring your hand down to meet the horizon. Then the top of your index finger will be 'one hand high'. A star could be two hands plus three fingers high. To point out a star, combine the imaginary clock and the divisions of 90-degrees. For example if you see a star in the north direction about halfway between the zenith and the horizon than you could say, "The star is at 3.00, 45-degrees."

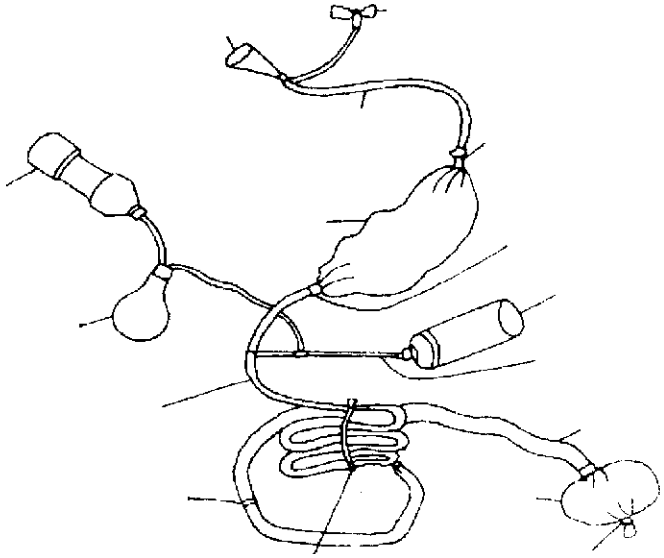
You could find the apparent distance between stars in degrees with the help of your hands and fingers. For this is one measuring instrument, which you are unlikely to forget! The width of the tip of your little finger is about 1-degree. Some others hand / finger measures are shown. The Big Dipper is a good way to test this measuring system. The distance between the two pointer stars in the Big Dipper is 5-degrees (three middle fingers). The distance across the top of the bowl is 10-degrees (one fist).



MODEL OF DIGESTIVE SYSTEM

You can make a model of the digestive system using everyday common objects like:

Plastic Bottle - *Liver, Pancreas*
Used Light Bulb - *Gall Bladder*
Tape or String - *Cardiac Sphincter*
Funnel - *Mouth*
Sweet Paper - *Salivary Glands*
Thin Plastic Tube - *Ducts*
Bicycle Inner Tube - *Large Intestine*
Plastic Bag - *Rectum*
Rubber Tube - *Duodenum, Small Intestine, Oesophagus*

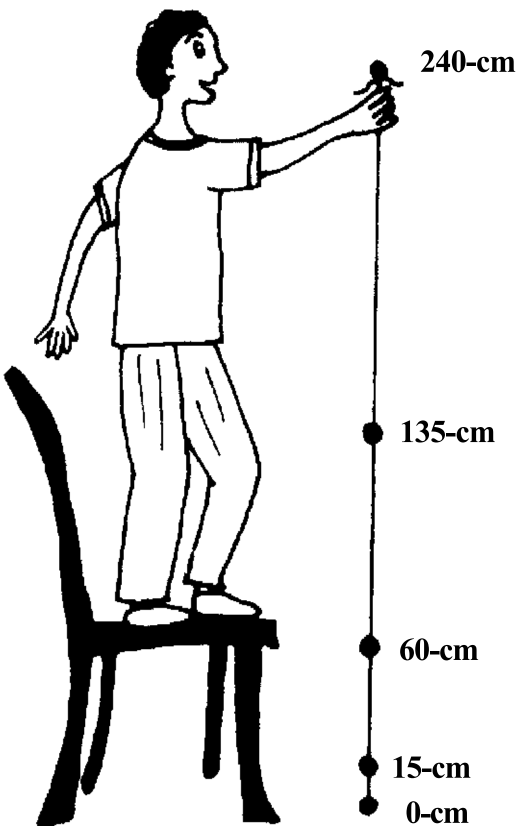


(VSO SCIENCE TEACHERS HANDBOOK)

DROPPING A STRING OF MARBLES

Our ears are very sensitive to the beat of music. An experiment on the acceleration due to gravity "g" can be easily performed using this ability. For doing this experiment you will need 5 marbles, a piece of string and some sticky tape. The string should be as high as the room. So take a 3-meters long string. The marbles are taped to the string in relative proportions to the square of the whole numbers i.e.

Number		0		1		2		3		4
Square	0		1		4		9		16	
Distance	0		15-cm		60-cm		135-cm		240-cm	
Difference		15-cm		45-cm		75-cm		105-cm		



(Pix: Dulari Gupta)

Now, stand on a chair holding the string as shown. The bottom marble should not quite touch the floor. Drop the string, and listen to the clicks. The clicks are more audible if the string is dropped on a metal plate - a *"thali"*.

You can repeat the experiment with a string having marbles spaced at uniform 60-cm intervals. Do you hear the time between clicks get shorter as the higher marbles from this last string strike the floor? Qualitatively the higher marbles have been accelerated for a longer time, and so they are travelling faster, covering the same distance in a shorter time as they approach the floor than do the marbles starting near the floor.

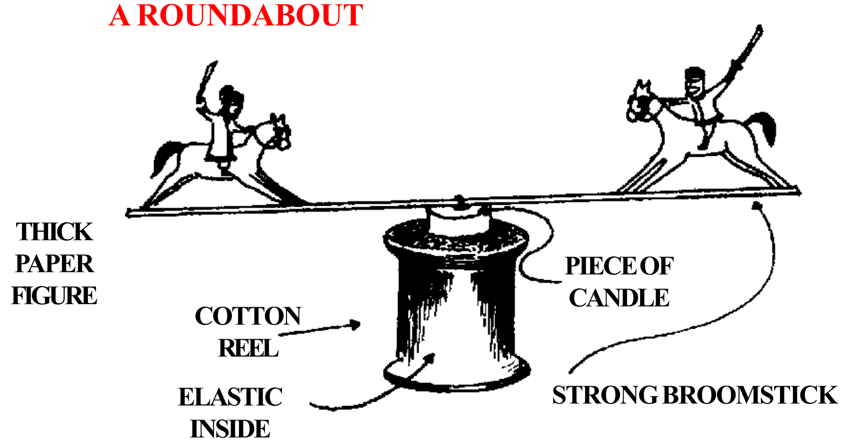
Quantitatively we have the familiar formula

$$\text{Distance} = 0.5\ g\ (\text{time})^2$$

We spaced the marbles on the non-uniform string so the square roots of successive distances are proportional to the whole numbers. The time taken between successive clicks should then be constant, about 0.176 seconds. Shift one of the marbles up or down the string to test the sensitivity of your ear to the time between clicks. A change of 20% is easily detectable.

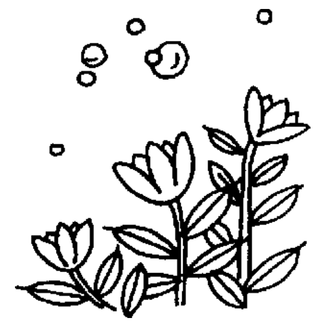
A ROUNDABOUT

This roundabout is just like the reel tractor shown earlier. Once you wind up the rubber band it will keep rotating on its own for a little while.



(Pix: David Horsburgh)

THREE DAYS TO SEE



What would you look at if you had just three days of sight? Helen Keller, blind and deaf from infancy, gives her answer in this remarkable essay.

I have often thought it would be a blessing if each human being were stricken blind and deaf for a few days at some time during his early adult life. Darkness would make him more appreciative of sight, silence would teach him the joys of sound.

Now and then I have tested my seeing friends to discover what they see. Recently I asked a friend, who had just returned from a long walk in the woods, what she had observed. "Nothing in particular," she replied.

How was it possible, I asked myself, to walk for an hour through the woods and see nothing worthy of note? I who cannot see find hundreds of things to interest me through mere touch. I feel the delicate symmetry of a leaf. I pass my hands lovingly about the smooth skin of a silver birch, or the rough, shaggy bark of a pine. In spring I touch the branches of trees hopefully in search of a bud, the first sign of awakening Nature after the winter's sleep. Occasionally, if I am very fortunate, I place my hand gently on a small tree and feel the happy quiver of a bird in full song.

At time my heart cries out with longing to see all these things. If I can get so much pleasure from mere touch, how much more beauty must be revealed by sight. And I have imagined what I should most like to see if I were given the use of my eyes, say for just three days.

On the first day, I should want to see the people whose kindness and companionship have made my life worth living. I do not know what it is to see into the heart of a friend through that "window of the soul," the eye. I can only "see" through my fingertips the outline of a face. I can detect laughter, sorrow, and many other obvious emotions. I know my friends from the feel of their faces.

For instance, can you describe accurately the faces of five different friends? As an experiment, I have questioned husbands about the colour of their wives' eyes, and often they express embarrassed confusion and admit that they do not know. I should like to see the books which have been read to me, and which have revealed to me the deepest channels of human life. In the afternoon I should take a long walk in the woods and intoxicate my eyes on the beauties of the world of Nature. And I should pray for the glory of a colourful sunset. That night, I should not be able to sleep.

On my second day, I should like to see the pageant of man's progress, and I should go to the museums. I should try to probe into the soul of man through his art. The things I knew through touch I should now see. The evening of my second day I should spend at a theatre or at the movies. The following morning, I should again greet the dawn, anxious to discover new delights, new revelations of beauty.

Today this third day, I shall spend in the workday world, amid the haunts of men going about the business of life.

At midnight permanent night would close on me again. Only when darkness has descended upon me should I realize how much I had left unseen.

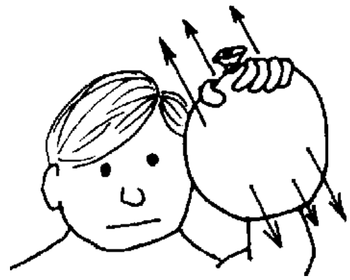
I am sure if you faced the fate of blindness you would use your eyes as never before. Everything you saw will become dear to you. Your eyes will touch and embrace every object that came within your range of vision. Then, at least, you would really see, and a new world of beauty would open itself before you.

I who am blind can give one hint to those who see: Use your eyes as if tomorrow you would be stricken blind. And the same method can be applied to the other senses. Hear the music of voices, the song of a bird, the mighty strains of an orchestra, as if you would be stricken deaf tomorrow. Touch each object as if tomorrow your tactile sense would fail. Smell the perfume of flowers, taste with relish each morsel, as if tomorrow you could never smell and taste again. Make the most of every sense; glory in all the facets of pleasure and beauty, which the world reveals to you through the several means of contact which nature provides.

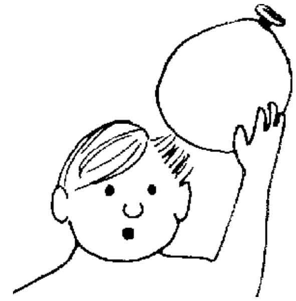
But of all the senses, I am sure that sight must be the most delightful.

STATIC ELECTRICITY

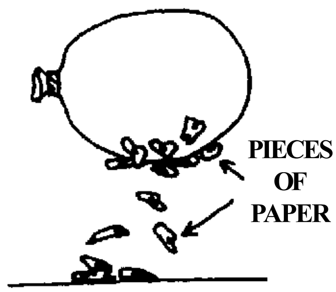
1. Blow up a balloon and tie its knot.



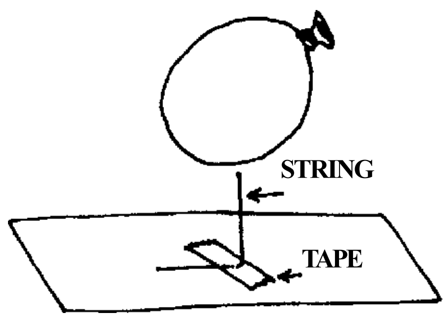
2. Rub the balloon against your hair several times. This will give the balloon an electric charge.



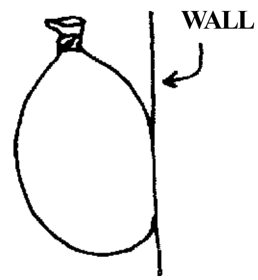
3. If you hold the charged balloon over your head, your hair will stand on edge.



4. Tear small pieces of newspaper. Bring the charged balloon near them. The bits of paper will stick to the balloon.

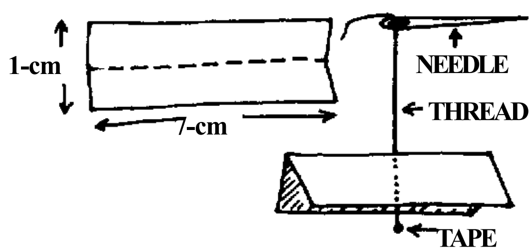


5. Tape a thread to the table. Raise the thread with the help of the charged balloon.

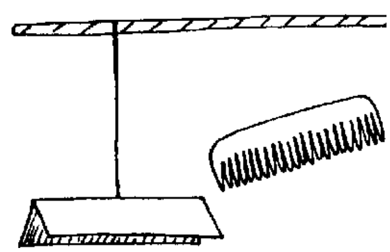


6. You can easily stick a charged balloon to the wall.

7. Try to charge a plastic comb by combing your hair.



8. Fold a rectangle of paper and hang it from a thread.



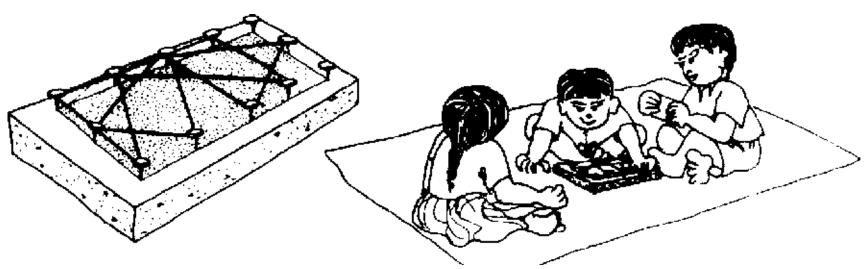
9. What happens when you bring the charged comb near the paper?

NAIL BOARD

Hammer a few nails on a wooden board to form a grid.

Ask children to make different shapes by stretching rubber bands on the nails.

Encourage children to make their own designs.

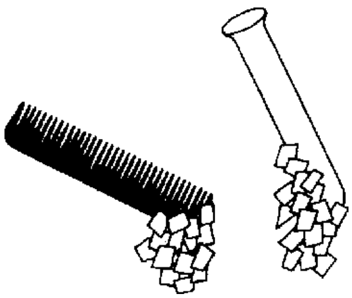


(Pix: Aga Khan Foundation)

STATIC ELECTRICITY

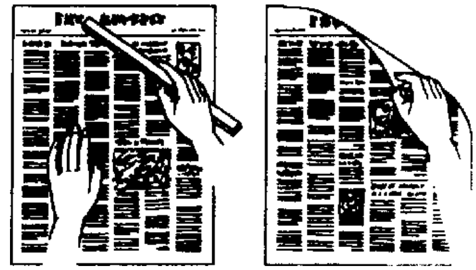
All these experiments work best when the air is dry.

ELECTRICITY BY RUBBING



Rub a plastic comb, pen, a piece of wax, a rubber balloon, a glass dish - any non-metallic object briskly with your hair or with wool and bring them near the pile of paper pieces. Observe what happens.

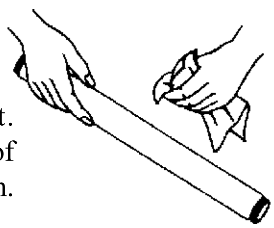
NEWSPAPER STAYS ON THE WALL



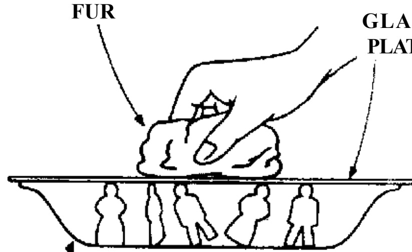
Press an old newspaper smoothly against a wall. Stroke the newspaper with a pencil all over its surface several times. Pull up one corner of the paper and then let it go. Notice how it is attracted back to the wall. If the air is very dry, you may be able to hear the crackle of the static charge.

FUSED TUBELIGHT GLOWS

Take a fused tube light. Rub it briskly with a piece of fur or flannel in a dark room. What do you observe?

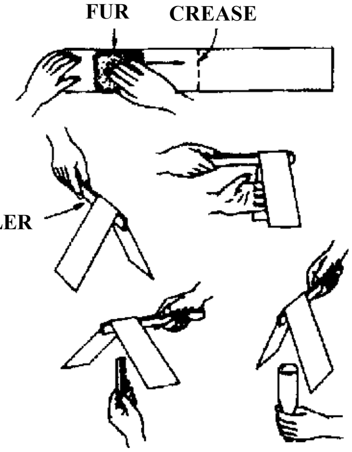


DANCING DOLLS



Take an aluminium foil plate about 2.5-cm deep and cover it with a glass plate. Cut some little doll figures from thin tissue paper as shown in the drawing. The figures should be a shorter than the depth of the plate. On rubbing the glass plate with fur you can make the figures dance.

NEWSPAPER ELECTROSCOPE



Cut a strip of newspaper 60-cm long and 10-cm wide. Crease it in the centre and hang it over a ruler as shown. Hold the strip on the table and stroke it several times with a piece of fur or flannel. Lift it from the table with the ruler and observe how it acts. Bring other charged objects between the extended leaves of the newspaper, and notice the change.

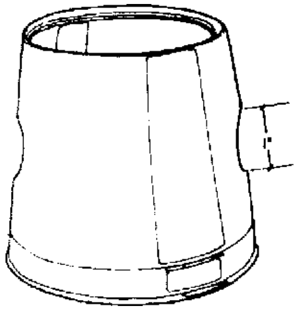
STATIC ELECTRICITY EVERYWHERE

Hold two strips of newspaper about 5-cm wide and 30-cm long, together. Stroke them lengthwise with the thumb and finger of your free hand. What happens? Try and devise other experiments showing that there is static electricity everywhere.

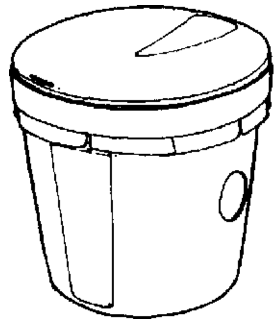
(700 SCIENCE EXPERIMENTS FOR EVERYONE - UNESCO)

SIMPLE MICROSCOPES

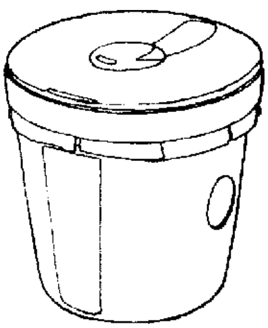
Here are two different ways of making a simple microscope.



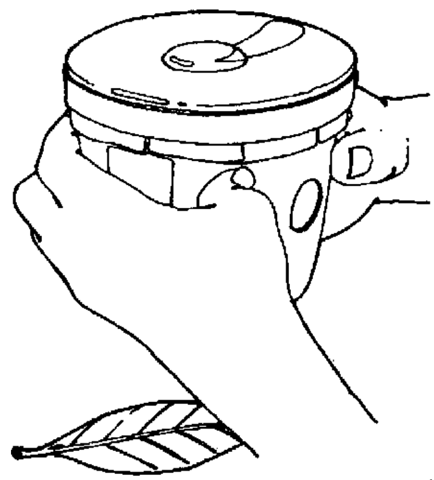
1. Take an ice cream, or thermocole cup. Cut out its bottom. Then cut two holes 2.5-cm in diameter, opposite each other to let in the light.



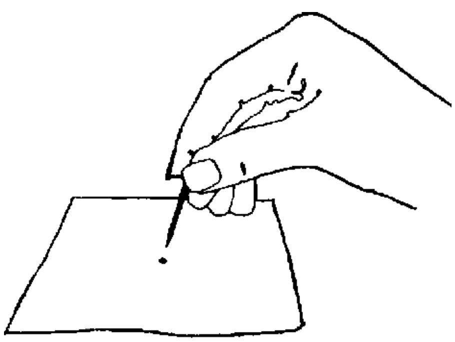
2. Cover the top of this container loosely with a piece of plastic. With a rubber band keep the plastic in place.



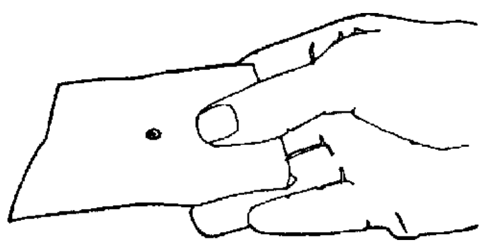
3. Slowly pour a small amount of water, onto the plastic. The weight of the water will make the plastic sag, causing it to take the form of a lens.



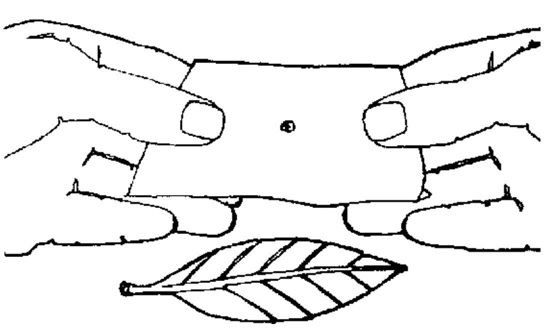
4. Put various objects underneath the water lens. Experiment with different amounts of water, which will change the shape of the lens and make it work more effectively.



5. Another simple microscope can be made by a small hole through a piece of aluminium foil with a pin.



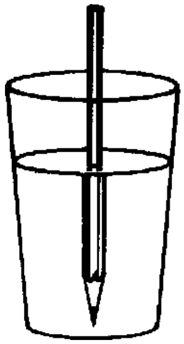
6. Drop a very small amount of water into the hole. Surface tension will keep the water from falling through the hole.



7. Place an object underneath the lens and examine it. With this microscope it is possible to get a magnification of 150 times the size of the object!

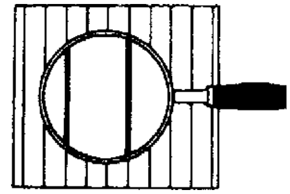
HOW LENSES MAGNIFY

Dip a pencil or your finger into a glass of water, and look at it from the side. Is it magnified? Clear glass marbles act as lenses too.

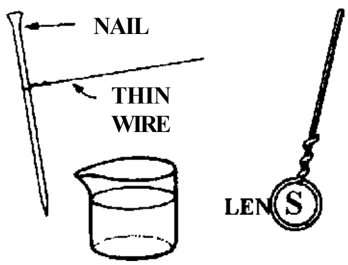


MEASURING MAGNIFYING POWER

Focus a hand lens over some lined paper. Compare the number of spaces seen outside the lens with a single-space seen through the lens. The lens shown in the diagram magnifies three times.



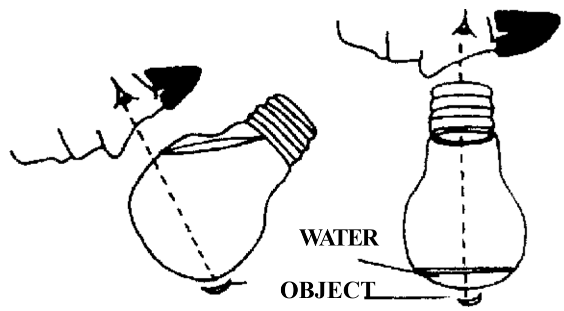
WATER DROP MICROSCOPE



Make a single turn of copper wire around a nail to form a loop. Dip the loop into water and look through it. You will have a primitive microscope. Often such a lens will magnify 4-5 times. If you tap the wire sharply against the edge of the glass a drop of water will fall off. Because of adhesion between the wire and the water, the liquid remaining will form a lens, which is very thin at the centre, i.e. a concave lens.

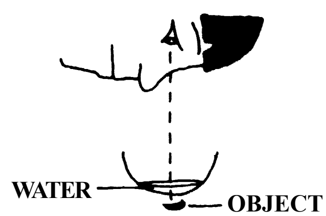
EMPTY LIGHT BULBS

Varying the amount of water in the bulb alters the magnification.



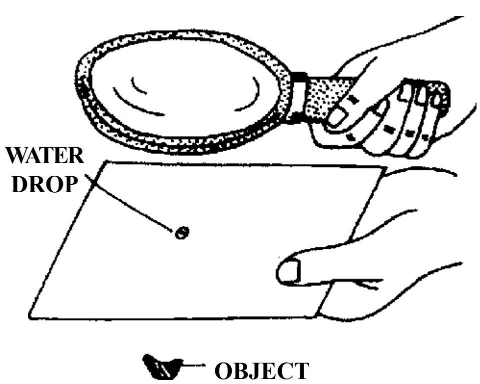
CURVED GLASSES

Putting water into curved glasses alters the magnification. Experiment with different depths of water.



SIMPLE COMPOUND MICROSCOPE

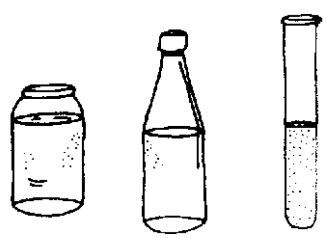
Using two lenses together allows much greater magnification. Use a hand lens to make a water drop into a more powerful magnifier.



CLEAR CONTAINER MAGNIFIERS

Any of these containers filled with water will make good magnifiers.

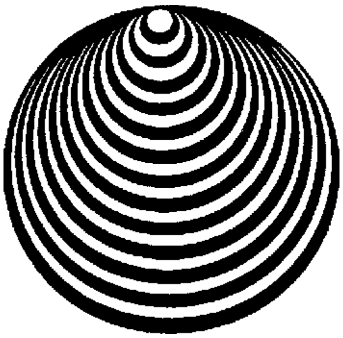
A clear marble magnifies.



(VSO SCIENCE TEACHER'S HANDBOOK)

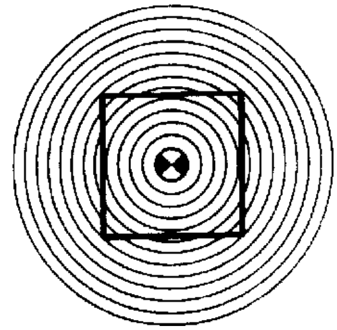
OPTICAL ILLUSIONS

What on earth is an optical illusion? It is something you see that is not exactly what it appears to be. Some of the pictures at first glance appear "normal", but look again and you will see something surprising! Sometimes we seem to look, but still don't see!



1. Are you looking at - the inside of a tunnel - or the top of a mountain.

2. What you see is the pig, but where is the farmer?

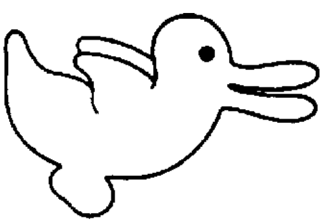


3. What's wrong with the square?

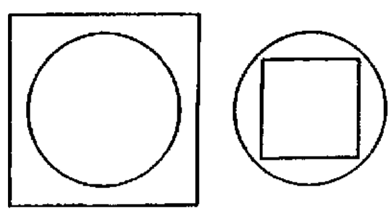
4. What is unusual about this sentence.

5. What's the title of this book? Are you sure?

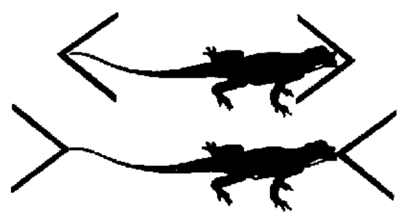
6. The man looks unhappy because his wife left him. But where is the wife?



7. Can you turn the duck into a rabbit?

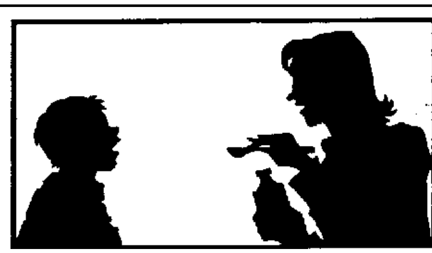


8. Which circle is bigger?



9. Which lizard is longer?

10. How many prongs are there on this fork - 2 or 3?

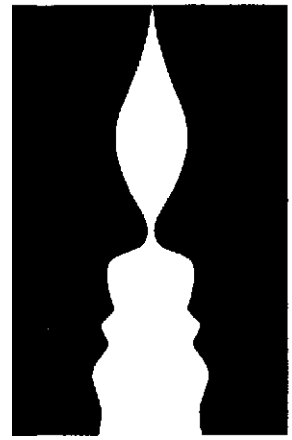


11. Can you help this boy take his medicine?

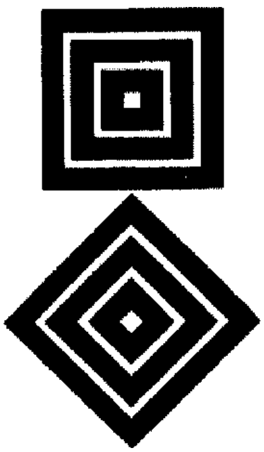
12. Appu the elephant is sad. Can you cheer him up?

13. The magician has lost his rabbit. Can you find it?

14. What happens if you turn this wavy design upside down?

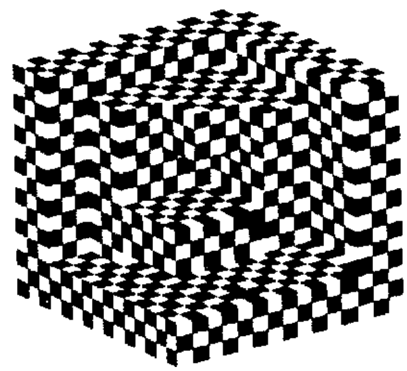


15. Do you see a candle or two faces?

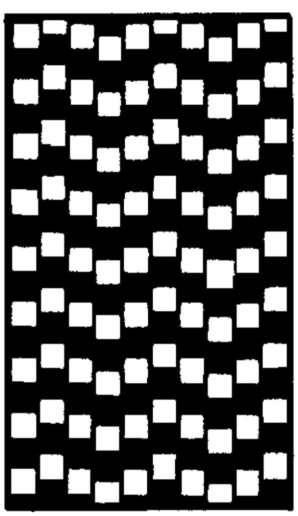


16. Which of the two squares is bigger?

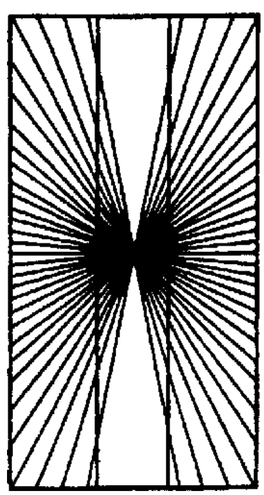
17. You see the horse, but where is the farmer?



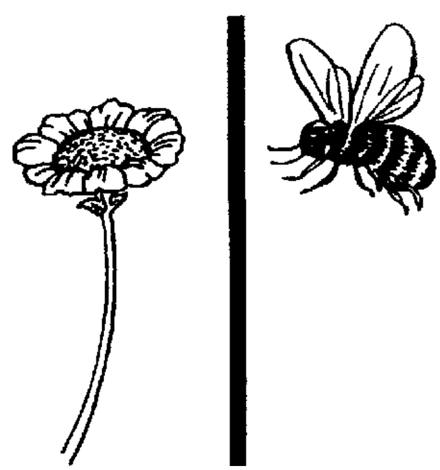
18. This cube is strange. What is wrong with it?



19. These black and white tiles look uneven. Are they in a straight line?



20. Are the two vertical lines parallel?



21. How can you get the bee closer to the flower?

danger : *SCHOOL!*

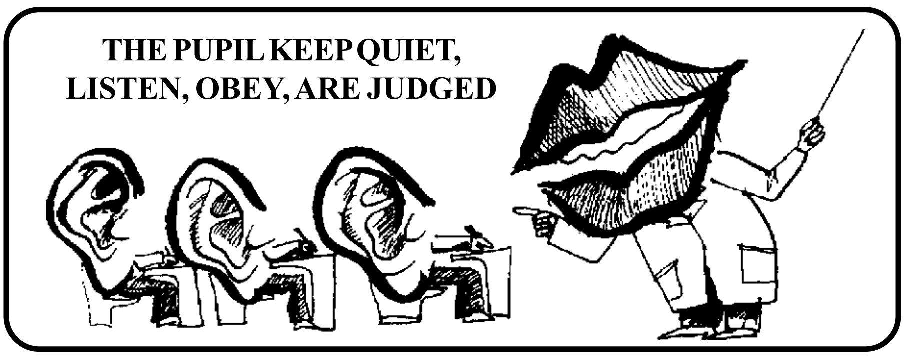
"Do not let schools interfere with your education." Mark Twain.

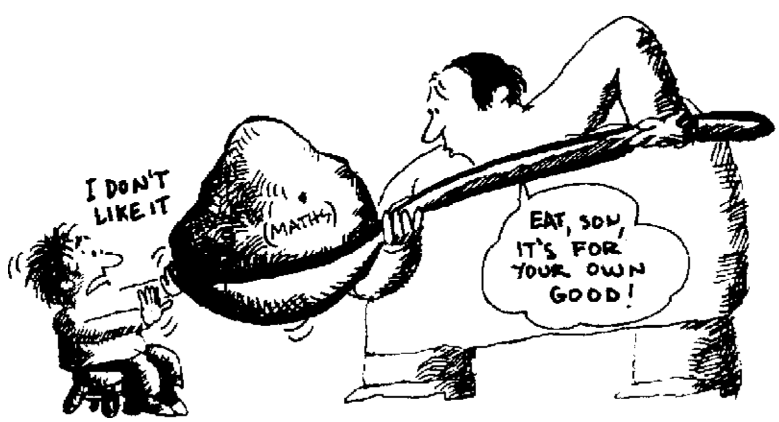
danger: School! is a landmark book. Paulo Freire was a Brazilian educator. For years he taught unschooled adult peasants to read and write in remote and poor villages. His method was a politically radical, grown up version of the method Sylvia Ashton Warner described in her book ***Teacher***. Sylvia, who taught Maori children in New Zealand for 24 years, realised the incongruity of teaching language by using English primers that had little respect for, or reference to their lives. She devised an ingenious method – every day she asked children for an "emotive" word – a word about which children wanted to learn. If they said "drink" (as many children had alcoholic fathers) that word would be up on the blackboard and etched forever in the children's minds.

Following a similar method, Freire began by talking with Brazilian peasants about the conditions and problems of their lives, and showed them how to read and write those words which were most important for them. He found that it took only about 30 hours before the wretchedly poor and demoralised peasants were able to explore reading on their own.

Thirty hours! One school week! That is the true size of the task. Of course, the Brazilian army did not like Freire making peasants literate and politically conscious and threw him out of the country.

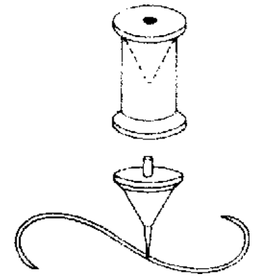
How many hours, weeks, months, years do our children spend in schools without even learning the basics? By nature children are inventive and full of curiosity. All children have a 'gleam in their eye' before they go to school. But soon this gargantuan Educracy (education + bureaucracy) fails them, calls them impaired and stamps an indelible scar on their hearts. Many parents have always felt that there was something seriously wrong with schools. But they have never been able to pinpoint the 'crimes' which schools constantly perpetuate. ***danger: School!*** does that. It is perhaps the world's most subversive cartoon book on education. Drawn by Brazil's ace political cartoonist Claudius, the scathing illustrations and crisp text graphically document the authoritarian, artificial world of the school.





danger: School! is published by Other India Press, Mapusa, Goa 403507.
The entire book can be freely downloaded from http://vidyaonline.net

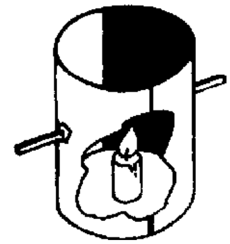
A MAGNETIC SPINNER



Make a spinning top from a wooden thread spool. Cut the spool in half and then shape one half into a cone. Find a nail to fit tightly into the hole of the spool. Cut off a length that will go through the cone and stick about 1-cm above the top. Grind the end, which juts out to a point. Magnetise the nail and insert it in the wooden cone. Form a large S-curve from a piece of soft iron wire. Place it on a smooth surface. If you set the top spinning near the curve it will follow the wire to the end.

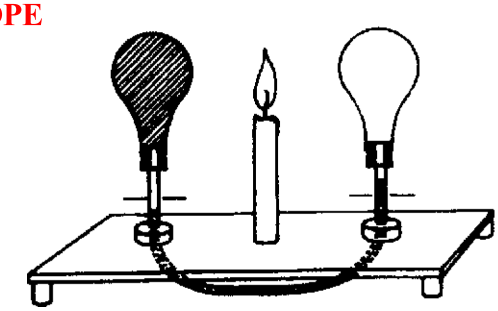
(700 SCIENCE EXPERIMENTS FOR EVERYONE - UNESCO)

BLACK HOT, WHITE COLD



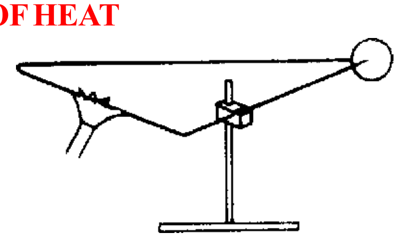
Cut two vertical slits opposite each other on the side of a cylindrical tin, so that the surface of the tin is divided into two parts. Blacken the inside of one half leaving the other half shiny. Put a lighted candle inside the tin, in the exact centre of the base. A difference in temperature of the two surfaces can be detected with the fingers. Matchsticks fastened to the outside with wax can also be used as indicators.The one behind the black surface will fall off first.

SIMPLE THERMOSCOPE



Fit two empty electric bulbs with corks and 15-cm long tubes. Fix the bulbs in a vertical position on a board so that they are 22-cm apart. Connect the end tubes of the bulbs with rubber tubing. Now blacken one bulb in a candle flame. Pour water into the U tube so formed until the level is about 8-cm above the board. Slide the tubes to make the water level the same in both vertical tubes. Place a lighted candle equidistant between the bulbs and wait for results.

TRIANGLE TO SHOW EXPANSION OF HEAT

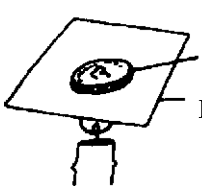


Bend a piece of stiff metal wire into a triangle. Support it in the horizontal plane and suspend a coin between the two free ends forming one corner. Heat the opposite side of the triangle and the coin will fall off.

HEAT CONDUCTION

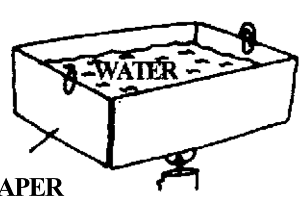
Use candle wax to stick small stones or shoe-tack nails onto the metal rod at regular intervals. Put a cloth or handle around one end of the rod. When the rod is held in the flame the stones or nails will drop off as that part of the rod gets hot.

NON-BURNING PAPER



A coin on a conducting piece of paper conducts away heat before the paper burns.

PAPER PAN



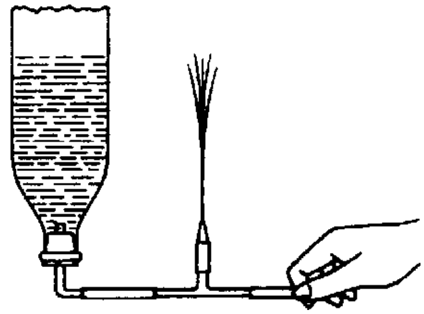
The paper pan will never burn as the temperature of the paper will never rise above 100^0 C.

FIRE PROOF CLOTH

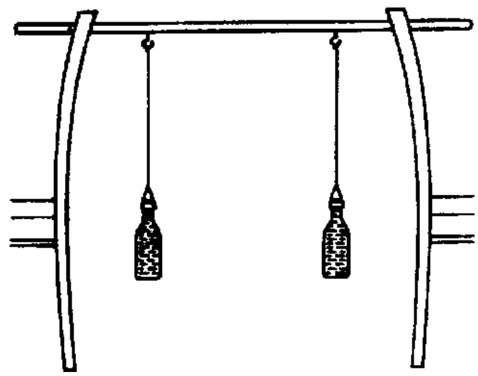
Wrap a coin tightly in a cotton cloth and bring it near a flame. A coin conducts heat away before the cloth can burn.

MODEL HYDRAULIC RAM

Hydraulic rams are sometimes used to raise water in hilly areas from a low level to a higher level. A flowing stream of water operates them. You can make a model hydraulic ram using a plastic water bottle (with the bottom removed). Rig up the arrangement as shown. Fill the bottle with water and allow water to flow through the extreme right hand rubber tube. Stop the flow by quickly pinching the tube and note the height to which the water squirts from the jet tube. Let the water flow and stop alternately, and you have a working model of the hydraulic ram.



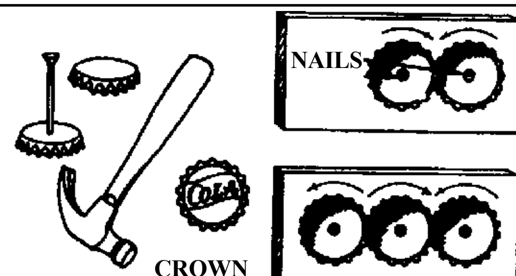
SHIFTING PENDULUMS



Fill two similar bottles with water and tighten the lids. Place a wooden rod across the back of two chairs. Suspend the bottles as pendulums from the rod. Make sure that they are the same length. Hold one pendulum and start the other swinging; then release the other one so that it hangs at its zero point. Soon the swinging pendulum will slow down, and the one that was quiet will take up the swing.

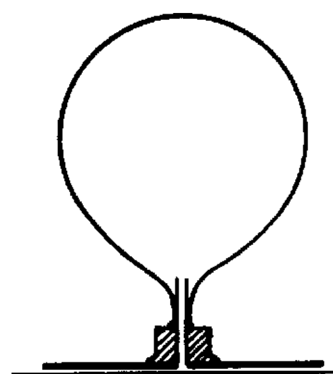
SIMPLE GEARS

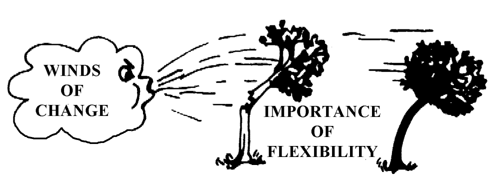
With a nail and a hammer, make holes in the centres of a few bottle crown caps. Lay two caps on a block of wood so that the tooth-like projections mesh together. Fasten them down with nails, but make sure that they still turn easily. Turn one of the caps and note the direction that the other turns. Add a third cap and note the direction that each turns.



SIMPLE HOVERCRAFT

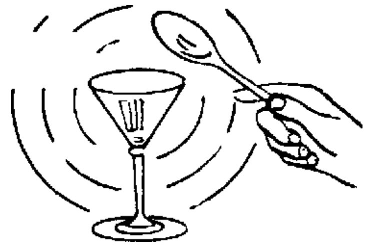
You can use an old CD to make this simple hovercraft. Stick a cardboard disk to cover the hole of the CD. With a pin, make a small hole through the centre of the cardboard. Stick a small cotton reel in the centre of the CD. Find a tube, which just fits, into the centre of the reel. Push this tube into the neck of a balloon and secure it in place with a rubber band. Blow up the balloon, pinch the neck, and insert the tube into the hole in the cotton reel. Place the CD on a table and release the air. The expanding air, escaping through the hole in the disc, will cushion the card, so that, given a flick, it will shoot across the table with practically no friction.



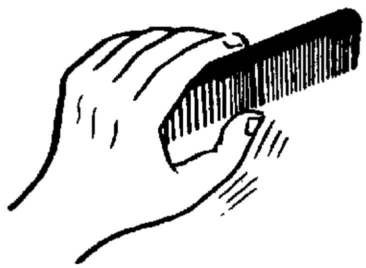


SOUND

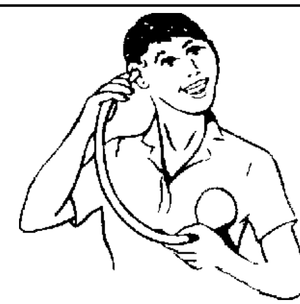
You can make sound by tapping the table with your knuckles. You can blow a stream of air with your mouth and intercept it with your finger to make sound. You could tap a glass with a spoon to make noise. In every case you make a sound by doing something. Sound is always connected with doing something. Sound is connected with motions of objects or materials. When two objects strike each other they begin to vibrate rapidly, faster than the eye can see. This vibration shakes the air and sets it in motion. The vibrations of the air move outward in the form of a wave. These vibrations are heard as "sound" by the ear.



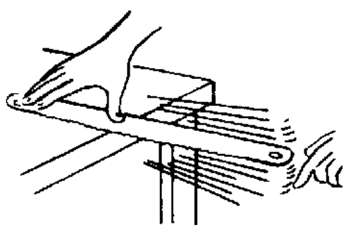
Rub the teeth of a comb with your fingers.



Make a stethoscope from a large funnel and a flexible tube. Use it to listen to your heartbeats.

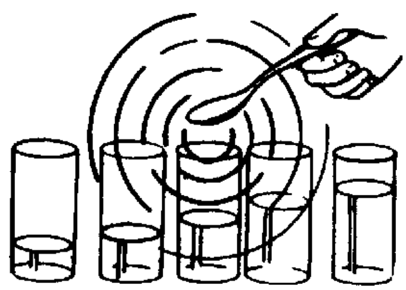


Place a hacksaw blade on the table, with most of it sticking out. Hold one end and pluck the free end. You will hear a noise. Shorten the sticking piece and try again. Continue to shorten it. Soon you will hear a low musical sound.



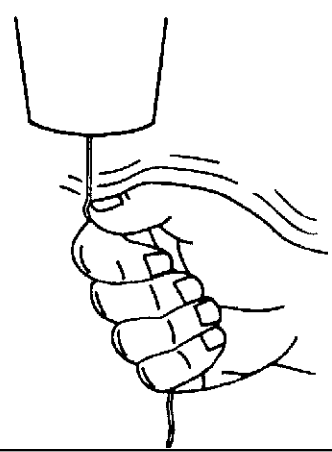
Blow across the top of a small pen cap or test tube. The air in the tube is set into rapid vibration and makes a high-pitched tone. A taller bottle will give a lower tone.

Take several glasses and fill them up with different amounts of water. Tap them with a spoon to make sound. Make a *Jaltarang* by adding water to the glasses.
Instead of glasses you can also use beer bottle containing different quantities of water.

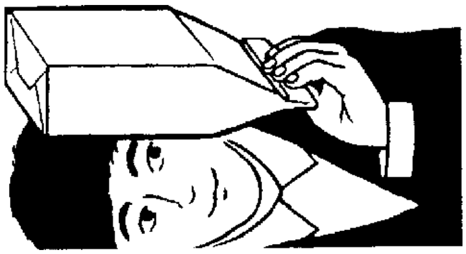


ROARING CUP

Take a paper or thermocole cup. Tie a large knot at one end of a string about 40-cm long. Make a small hole in the centre of the bottom of the cup. Weave the string through the hole. The knot should prevent the string from coming out. Rub your thumbnail down the string while squeezing and pulling the string tightly. You should hear a roaring sound. Why?
The cup acts as a cavity, which increases sound. A cavity helps to amplify and prolong sound because sound waves inside the cavity hit the walls, bounce back and reinforce each other. The roaring cup is a popular toy.

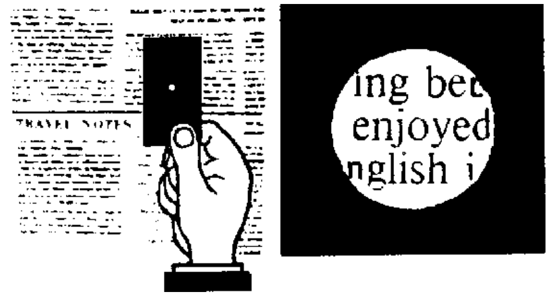


FOOTSTEPS IN THE BAG



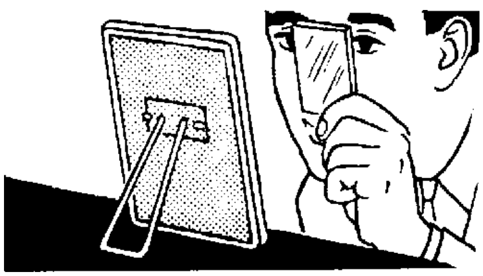
Put a housefly in a paper bag and close it. Hold the bag horizontally above your ear. If you are in a quiet room you can hear the patter of the six legs and other rather curious noises quite clearly.
The paper behaves like the skin of a drum. Although only the tiny legs of the fly beat on it, it begins to vibrate and transmits such a frightening noise!

UNUSUAL MAGNIFICATION



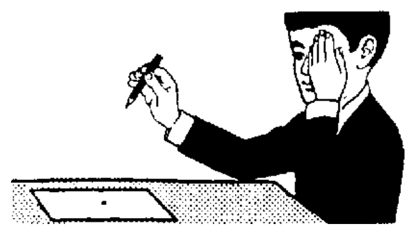
Make a small hole in a card with a needle. Hold it close to the eye and look through if. If you bring a newspaper very close you will see to your surprise the type much larger and clearer.
The phenomenon is caused by the refraction of light. The light rays passing through the small hole are made to spread out, and so the letters appear larger.

VIEW INTO INFINITY



Hold a pocket mirror between your eyes so that you can look to both sides into a large mirror. If you place the mirrors parallel to one another, you will see an unending series of mirrors stretching into a distance.

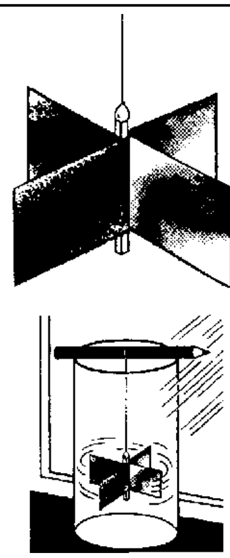
MEASURING DISTANCE

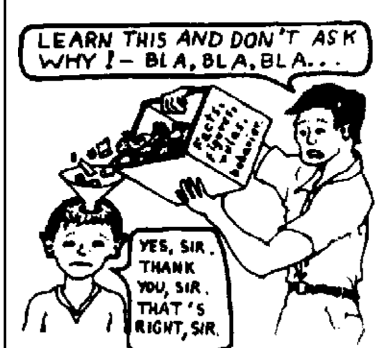


Make a point on a piece of paper and place it in front of you on the table. Now try to hit the point with the pencil held in your hand. You will manage it quite easily. But if you close one eye, you will almost always miss your target. The distance can only be estimated with difficulty with one eye. One normally sees a composite image with both eyes and so can discern the depth of a space.

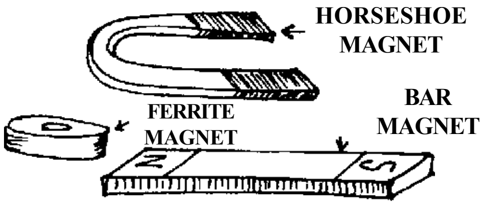
LIGHT MILL

Cut four pieces of aluminium foil 2.5-cm x 4-cm. You can use the silver paper from cigarette packs after removing the backing. Stick the sheets on to a matchstick like the blades of a windmill, with the bright sides all-facing in the same direction. Blacken the matt sides over the candle. Put a drop of glue at one end of the match and attach a fine thread. Place a tall jar in the sun, hang the mill inside, and it soon turns without stopping.
We know that dark surfaces are more strongly heated by sunlight than the light ones. And this heat difference is the secret to the light mill. The sooty side of the foil absorbs the light rays and is heated about 10 times more strongly than the light reflecting bright side. The difference in the amount of heat radiated from the sides of the blades causes the rotation.

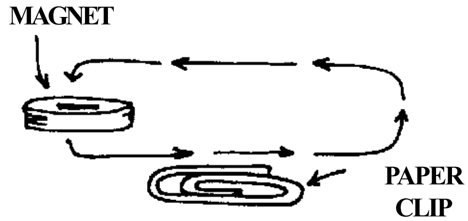




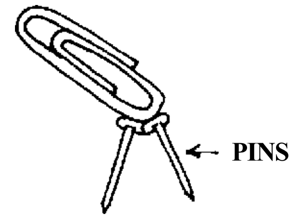
MAKE A MAGNET



1. Any kind of magnet can be used to convert a steel object into a magnet.

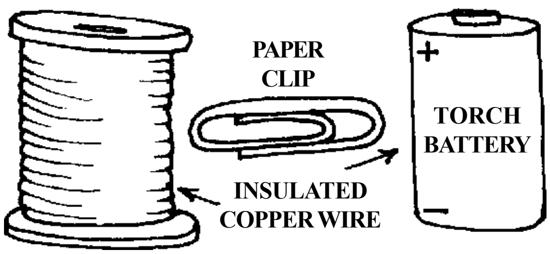


2. To magnetise a paper clip, rub the paper clip with a magnet. Rub many times but only in one direction.

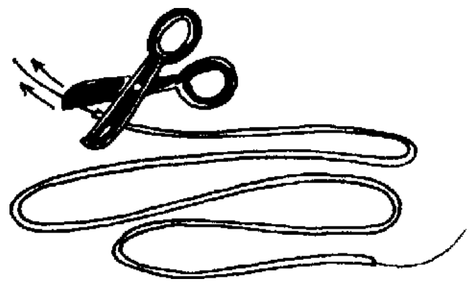


3. Now your paper clip magnet will be able to attract and lift a few paper pins.

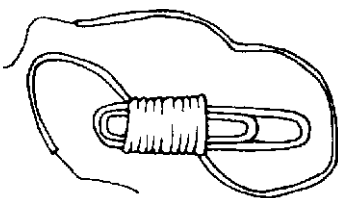
MAKE AN ELECTROMAGNET



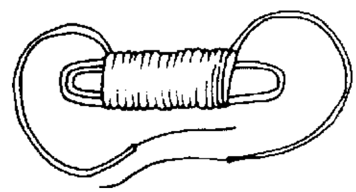
1. You will need a large paper clip or nail, 30-cm of bell wire and a torch battery.



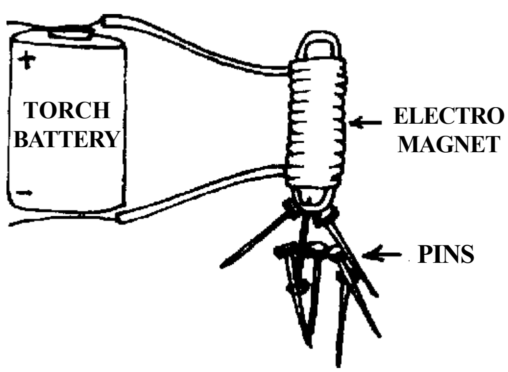
2. With a scissors or blade carefully strip the plastic insulation off both the ends of the wire.



3. Wind the wire neatly onto a large paper clip.



4. Keep winding until only two tails remain.

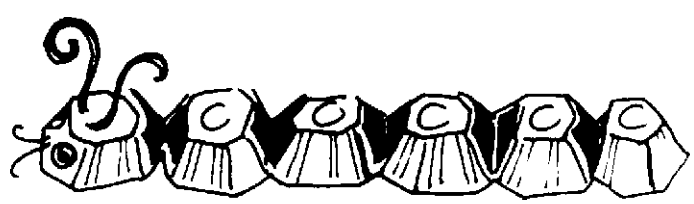


5. Connect the ends of the wire to the two terminals of a torch battery. The clip should be able to attract a few pins.

6. Perform a few experiments with your electromagnet.
- How can you measure the strength of your magnet?
- What types of things can be made into a magnet?
- Which materials are attracted to the magnet?

EGG CARTON CATERPILLAR

Join the modular units of an egg carton to make a caterpillar. Make horns and antennae using wires. Paint it make it look realistic.



(Pix: MAKING THINGS by Ann Wiseman)

RUBBER BAND ENLARGEMENTS

This is a simple mechanism to enlarge pictures.

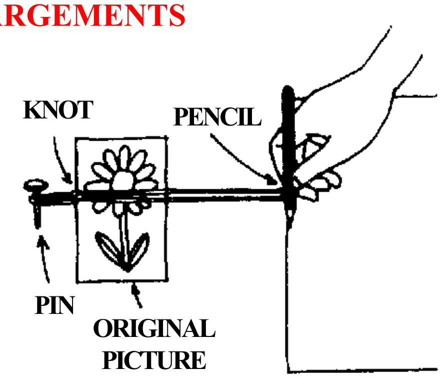
Knot a small and large rubber band together.

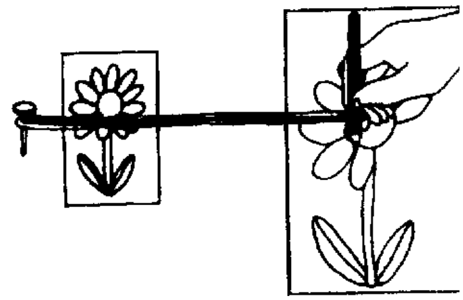
Hook one end of the small rubber band to a drawing pin and attach it to a drawing surface.

Place your original picture so that its left edge is lined up underneath the knot. The rubber band should be tight.

Insert a pencil at the other end of the rubber band.

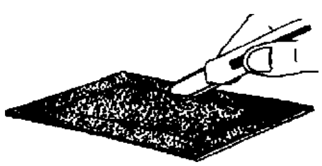
Hold the pencil firmly (and vertically) in the rubber band. With the knot follow the outlines of the picture. The pencil will produce an enlarged picture.



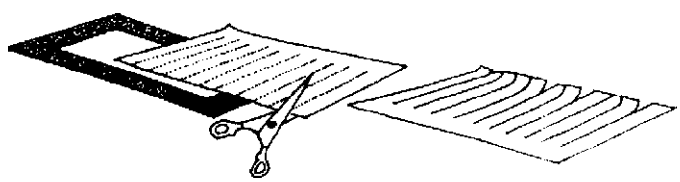


PATHFINDER

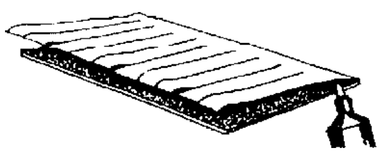
This brilliant idea won the National Award in China, for the best designed teaching aid in 1988.
To locate the position of a moving particle you will require some fairly expensive and sophisticated gadgets.
The paper reed pathfinder enables you to do that at almost zero cost.



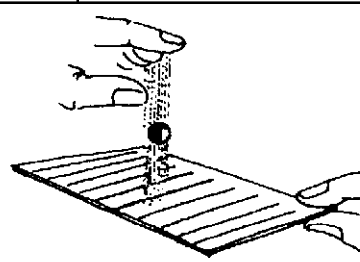
1. Remove the centre from a 10-cm x 20-cm piece of cardboard leaving a 1-cm wide frame.



2. Take a 10-cm x 20-cm sheet of paper, and leaving aside 1-cm along its length, cut parallel strips along its width.

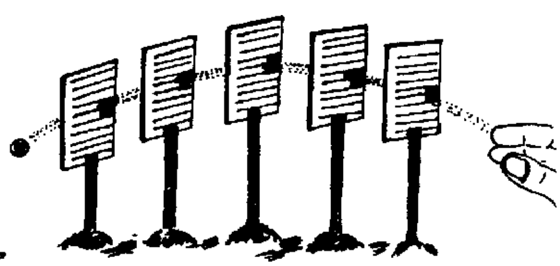


3. Apply glue along the uncut length of this paper reed and stick it along one long edge of the frame.



4. Hold the edge of the frame with one hand and drop a marble into the frame. The marble will strike the reeds and at the point of strike, the reeds will go below the frame.

5. This enables you to locate the position of the particle.

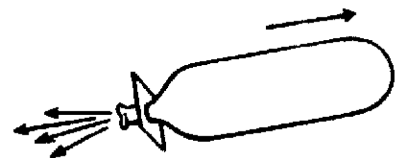


6. The path of a moving marble can be found by placing several such mounted frames along its approximate trajectory. On throwing, the marble will pass through all the frames. The reeds will go behind each frame at the point of strike. Of course, the thinner the strips the more precise can the position of the particle be located.

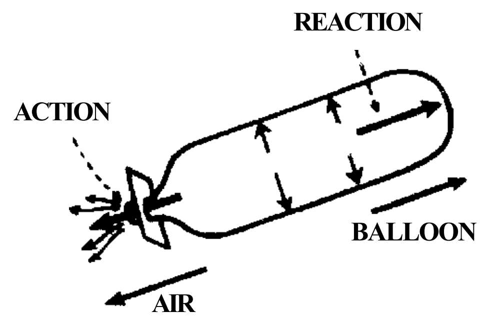
SIMPLE SATELLITE MODELS

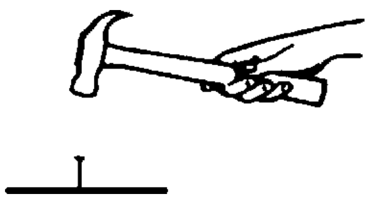
With a few balloons, thread spool, cardboard and other trinkets you can make a simple satellite model.

When you release a blown-up balloon it will zoom around the room. You can give this simple rocket a bit more control and make it last longer by putting a cardboard collar around the open end.

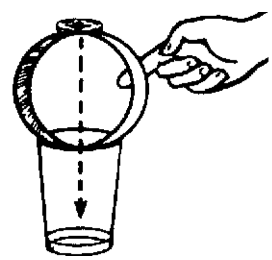


For the collar cut a 2.5-cm square card. Punch a hole right in the centre with a pencil point. Push the pencil all the way to enlarge the hole. Now put the mouth of the deflated balloon in the card hole. Blow up the balloon as much as you can and let it go. When you blow up a balloon the air inside presses equally against all sides of the balloon and therefore blows it up. As the open end is released the air rushes out. That's the action, in a backward direction. An equal and opposite reaction inside the balloon sends it forward.





Drive a nail into a plank of wood using a very light hammer. The nail moves into the wood very slowly. With a heavy hammer the nail will move in fast.

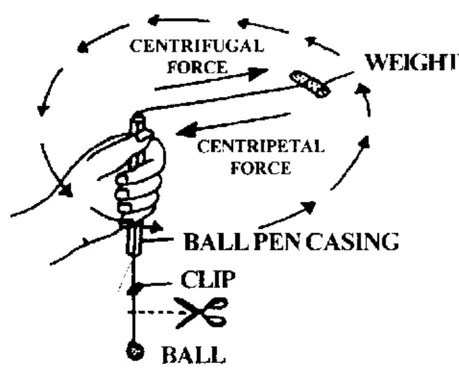


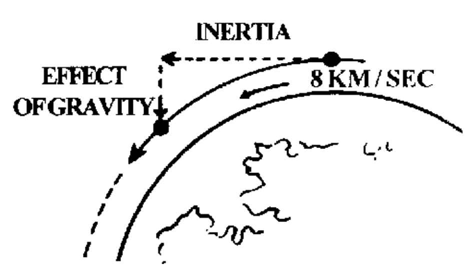
Put a coin on a paper hoop on a open glass. Pull out the hoop suddenly. Inertia leaves the coin in mid-air. Gravity then pulls it down into the glass.

SIMPLE SATELLITE MODEL

Make a simple model of an earth satellite using a ball pen casing, thread and a few small trinkets. Tie a weight to one end of the string and a ball on the other. Hold the pen and rotate so as to set the weight whirling over your head. If you now cut the thread you will find the weight flying away.

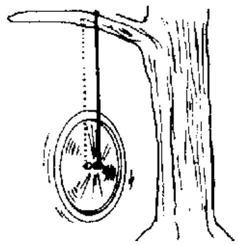
An earth satellite stays up for a similar reason. Scientists have figured out that at a speed of 8 km /sec the effect of inertia is exactly right to balance the weight of an object moving parallel to the ground. In fact, if it were to go any faster than 8 km / sec it will actually pull itself away from the earth and take an enlarged oval path. At 11.2 km /sec, inertia would be so great that a rocket could actually coast out into space and get away from the earth completely.



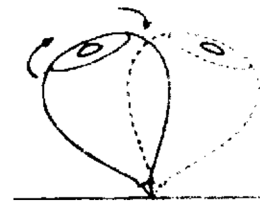


BICYCLE SCIENCE

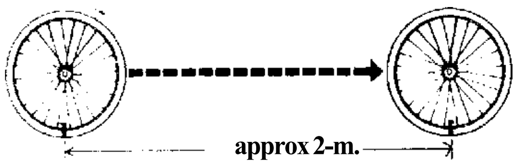
Take an old bicycle wheel. Support both sides of the axle with ropes and spin the wheel rapidly. Remove one rope from the axle. The spinning wheel does not fall because of gyroscopic action. Instead, it slowly turns around.

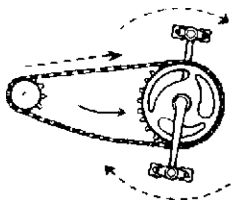


Try to knock over a spinning top. It resists your force and maintains its upright position. As it slows down it wobbles and finally topples over. These actions are similar to those of the spinning wheels of a bicycle.



DISTANCE IN ONE ROTATION

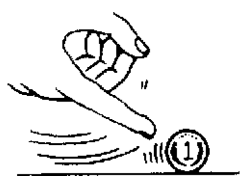




Measure the distance on the ground when the cycle wheel makes one complete turn. The distance will be approximately 210-cm (7 feet). This is the distance that your bicycle moves when the rear wheel turns around once.

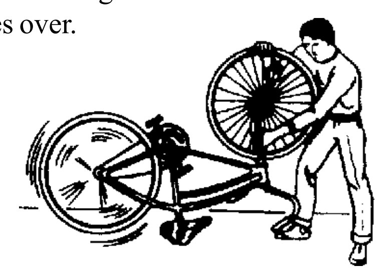
How far does the bicycle move when you rotate the pedal once? One turn of the pedal makes the wheel turn about 3 times. It is therefore approximately 630-cm (21 feet). Check this by actually riding the bicycle.

GYROSCOPIC ACTION



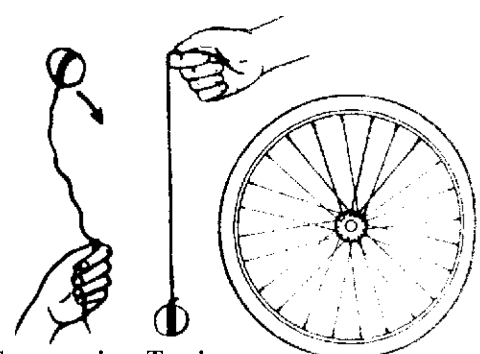
Why is it easier to keep your balance on a bicycle when it is moving fast? Why does it become imbalanced when it is moving very slowly? Make a coin stand on edge. It is difficult and you are likely to fail. But give it a push so that it rolls. Now it remains on edge. As it slows down it begins to wobble and finally topples over.

A similar action occurs when the bicycle wheels spin. Turn the bicycle upside-down, standing it on the seat and handle. Turn the pedals by hand and make the back wheel spin rapidly. While it is spinning try to tilt the bicycle slightly, sideways. You will feel a resistance to your toppling force. Once the wheel stops spinning you can turn the bicycle over more easily.



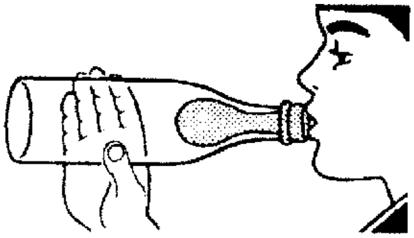
RIDING ON WIRES

Notice the bicycle wheel is made of spokes. It would be easy to make a strong wheel out of solid steel. But that would make the bike heavy and harder to move. The bicycle is made much lighter by using thin, spokes for the wheels. How do these wires hold up your weight? Fasten a thin wire to a stone. Try to have the stone stay up in the air over the wire. It falls and twists the wire. But when you hang the stone, the wire becomes very strong and holds a great deal of weight. The bicycle wheels are made in such a way that there is always a group of wires in position to be stretched to hold up your weight. As the wheel rotates, different spokes come into proper position to exert their maximum strength and hold up weight.



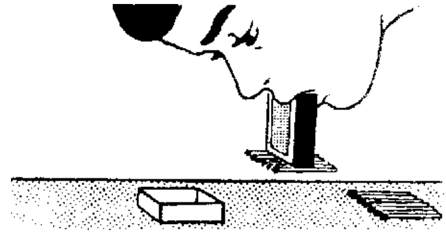
Compression Tension

BALLOON IN A BOTTLE



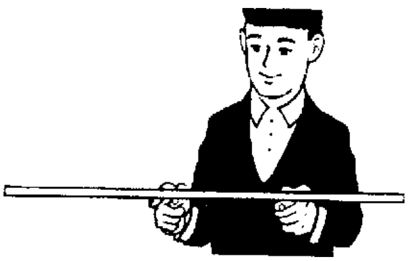
Push a balloon into a bottle and stretch its mouth over the opening. Blow hard into the balloon. You will not be able to blow up the balloon, no matter how hard you try. As the pressure in the balloon increases so does the counter-pressure of the air enclosed in the bottle.

MATCH LIFT



It is simple, using air to lift matches from the table into their box. Hold the case between your lips and lower it over the matchsticks. Draw a deep breath, and the matches hang on to the bottom of the case as if they were stuck on.

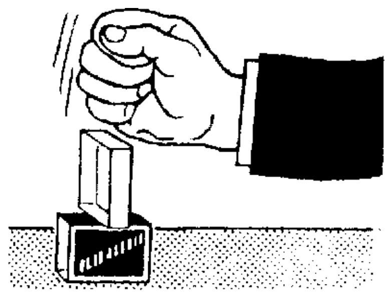
MAGIC ROD



Lay a rod over your index fingers so that one end sticks out further than the other. Will the longer end become unbalanced if you move your finger further towards the middle?

The rod remains balanced however much you move your finger. If one end becomes overweight it presses more strongly on the finger concerned. The less loaded finger can now move further along until the balance is restored. The process can continue under the combined effects of the force of gravity and friction until the fingers are exactly under the centre of the rod.

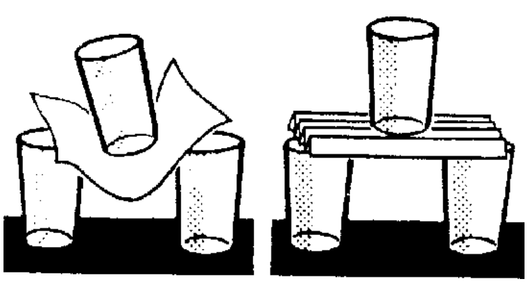
UNBREAKABLE MATCHBOX



Put the outside case of a matchbox on the table. Place the inner drawer on its striking surface. Now challenge someone to smash the matchbox with one blow of the fist! Try it. The box nearly always flies off undamaged in a high curve.

The matchbox is so strong because of its vertical joined sides that the pressure of the striking fist is transmitted to the outside without smashing it.

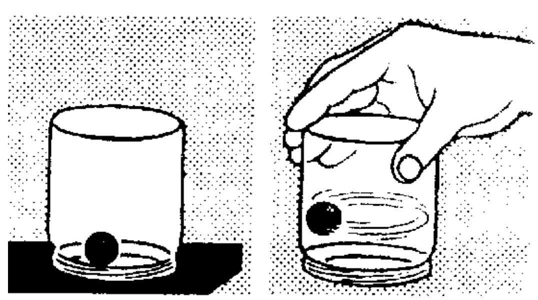
PAPER BRIDGE



Lay a postcard as a bridge between two glasses, and place a third glass on it. The bridge collapses. But if you pleat the postcard, then it supports the weight of the glass.

Now think about corrugated paper and corrugated galvanized iron sheets used for roofs.

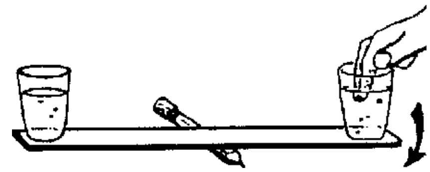
SPINNING BALL



Place a marble on the table, with a wide-mouthed bottle upside down. Make turning movements with the bottle and thus set the ball rotating too. The ball is pressed against the inner wall of the bottle by centrifugal force. You can now carry the ball in the bottle as far as you like.

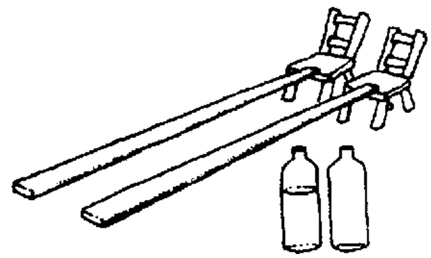
A DELICATE BALANCE

Fill two glasses nearly full of water. Place a pencil under a ruler to make a balance. Put one glass of water on each end of the ruler. Hold each glass until it is balanced. Now move the pencil along under the ruler until the raised end is almost ready to tip downward. Put two fingers into the water without touching the glass. As your fingers move down the glass will also move down. The level of water will rise in the glass as your fingers push into the glass. Your fingers displace water, which causes the water level to rise. The glass's weight is increased by exactly the amount of water that is displaced.



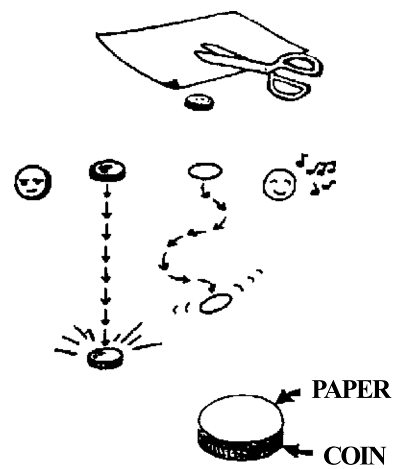
BOTTLE RACE

Fill a plastic bottle half with water. Screw on the cap. Leave the second bottle empty. Roll them down two ramps and notice what happens. The water filled bottle starts faster. But when the bottles reach the level floor the empty bottle rolls further than the water bottle.
The water in the bottle gives it extra weight. This added weight makes it takes off faster down the slope. But the water rubbing against the sides of the half-filled bottle creates friction, which slows it down.



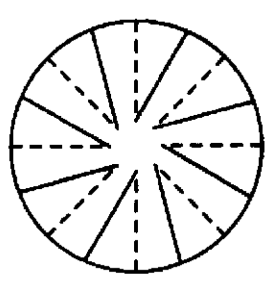
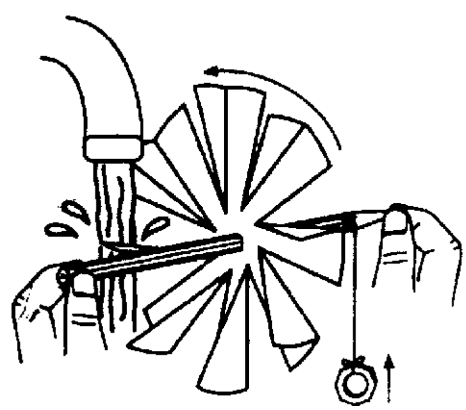
COIN AND PAPER RACE

Cut a round paper, which is little smaller than the coin. Now hold the coin in one hand and paper in the other about 1-meter above the floor. Drop them both at the same instant.
The coin - being heavy takes off for the floor in a straight line. The paper being light flutters in the air and takes a longer time to reach the floor. Now hold the paper and the coin in the same hand. Keep the paper on top of the coin. Hold the coin by the edges so that you don't touch the paper at all. Drop them together. What happens? The coin and the paper should travel together all the way to the floor. If however, any air gets in between them then the paper will flutter as before. If this happens, try again. The coin and the paper travel together because of the moving air. The paper 'rides' on the coin because it is caught in the air travelling with the speeding coin.



WATER WHEEL

Mark 8 equally spaced cuts (dotted lines) on an aluminum foil disk. Each end cut should be 2-cm from the centre. Phase out the cuts to make the vanes of a water wheel. Make a hole in the middle to press fit a pencil. A dab of adhesive will keep the wheel in place. Hold the wheel under a stream of water to make it turn. Tie a string at one end of the pencil and attach a small steel washer to the other end. The water wheel should wind the string onto the pencil, lifting the weight. How much load can it lift?

RECYCLE! REUSE! REDUCE!

This ancient story carries a deep lesson about conservation in a consumerist society.

We buy, use and throw. Often we buy much more than we actually need. The whole consumerist culture is based on the principle: "Buy more! Throw more!" Today as we splurge - we plunder the earth's scare resources and produce so much junk that not only our garbage dumps but even our parks overflow with rubbish.

But has it always been like this? Have we Indians always been so profligate and wasteful? No. History tells us that Indians have been fairly austere. They have had a different way of looking at the material world. According to this viewpoint a thing can have several uses. Not just one, but several lives. The concept of reuse/recycle has very deep roots in the Indian culture. This 5,000 year old story shows a deep respect and sensitivity for the material world. It has many lessons for modern day environmentalists.

One day the great Buddha was taking a round of the monastery.

He was approached by a monk who wanted a new woolen shawl *(angarkha)*.

Buddha asked him, "What happened to your old shawl?"

"It had become very old and worn out. So I am presently using it like a bed sheet," replied the monk.

Buddha asked again, "But what happened to your old bed sheet?"

"Master, that bed sheet got old with use. It was worn and torn. So I cut it up and made a pillow cover out of it," replied the monk.

"But there certainly was a pillow cover before you made a new one. What did you do to your old pillow cover?" asked the Buddha.

"My head had rubbed a million times against the old pillow cover and made a big hole in it. So I made a foot mat out of it," replied the monk in earnest.

Buddha was not satisfied by this answer. He always delved deep into any issue. In the end he asked the monk, "Tell me what did you do with your old door mat?"

The monk replied with folded hands, "Master the old door mat had got totally worn with use. Because of repeated use the warp and the weft had come out. So I took the cotton fibers and braided a wick out of them. Later I burned the cotton wick in the oil lamp."

Buddha smiled after listening to the monk. The monk got a new shawl.

FUN WITH LEAVES

It is possible to make many animals, birds and insects using leaves.

(Pix: Avinash Deshpande)

HOW KIND ARE WE TO OUR EARTH ?

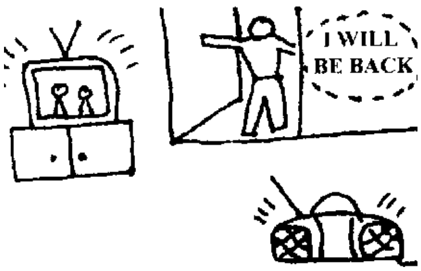
Earth has enough for everybody's need, but not for anybody's greed.

Our wasteful lifestyle puts additional stress on the natural resources. Below are some examples of our daily actions, which harm the earth. Are you responsible for some of them? *(Courtesy: Delhi Environment Action Network)*

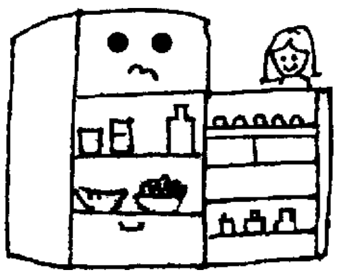
1. He does not turn off the tap while brushing his teeth.

2. She takes a long shower instead of using a bucket.

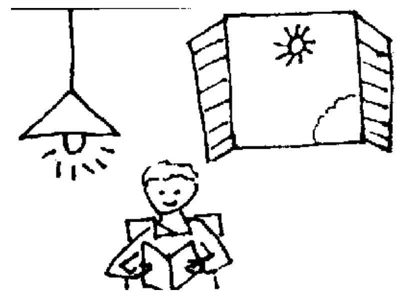
3. She uses a lot of soap and shampoo, while bathing and washing.



4. He leaves the TV and music on even when he is not around.

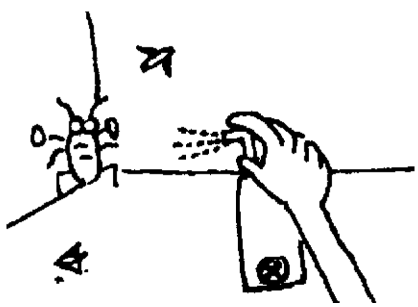


5. She is opening and closing the refrigerator all day.

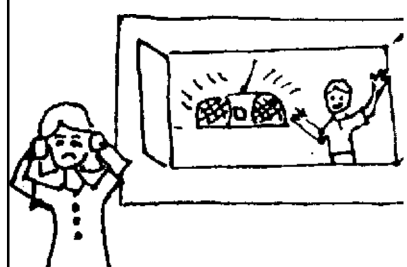


6. He uses lamps even during day time.

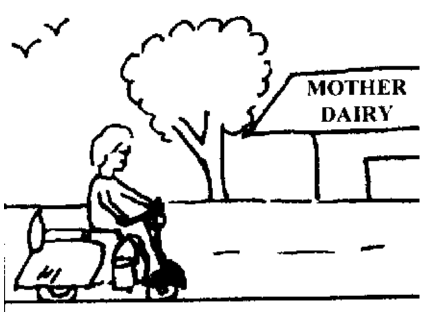
7. She does not eat everything on her plate and has many leftovers.



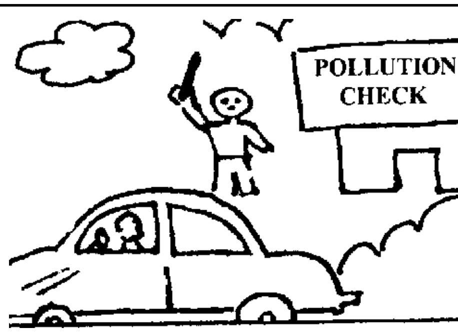
8. He uses insecticides and sprays to kill insects.



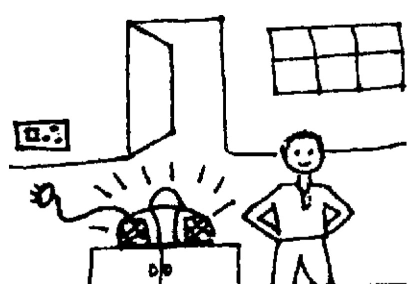
9. Whenever he plays music or TV, it is at a loud volume.



10. He uses his vehicle even if the distance is walk able.



11. She does not get pollution checked for her vehicle.



12. He uses battery rather than electricity (mains) for his gadgets.

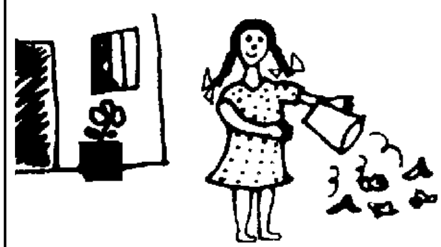
13. He bursts crackers on *Diwali* and other occasions.

14. She submerges idols painted with harmful colours into the river.

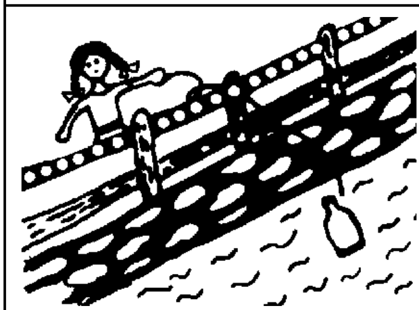
15. He plays *Holi* with toxic colours and dyes.

16. She likes to use disposable plates and glasses.

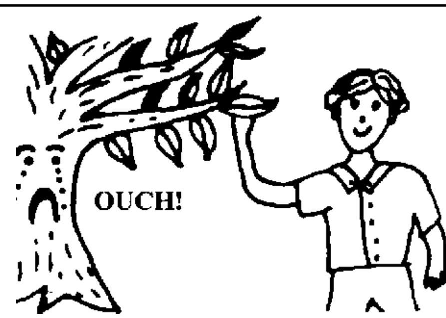
17. He uses disposable and one time usable things - razors, jotter pens etc.



18. She cleans her house and throws the garbage outside.



19. She throws litter on streets and rives.

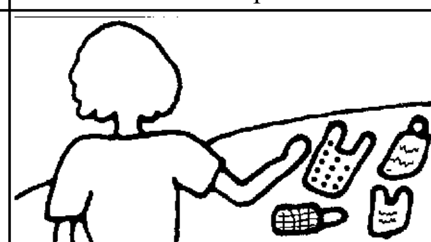


20. He breaks leaves and stems of trees in public parks.

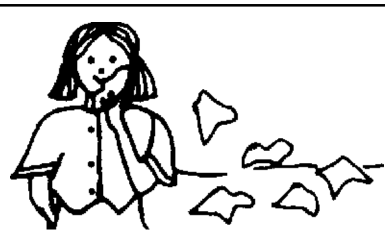
21. She burns her garden waste and does not compost it.

22. She buys animal products like fur, leather, ivory, skins etc.

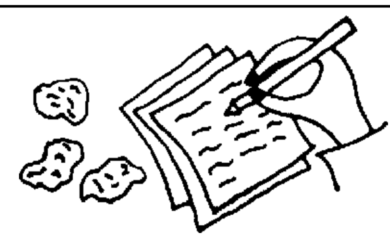
23. She shops in separate plastic bags and not uses jute or cloth bags.



24. He throws plastic bags after using them only once.



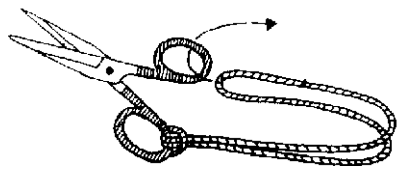
25. She uses tissue paper endlessly.



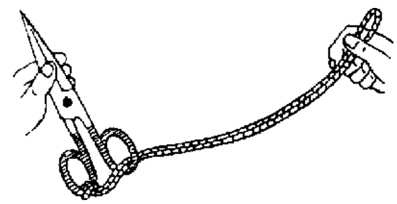
26. He photocopies / uses only one side of the paper.

27. On picnic / holidays she leaves behind her garbage carelessly.

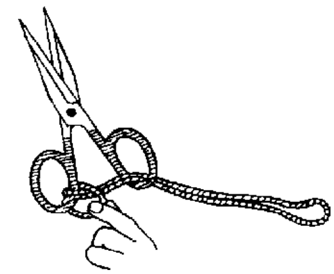
THE GREAT ESCAPE



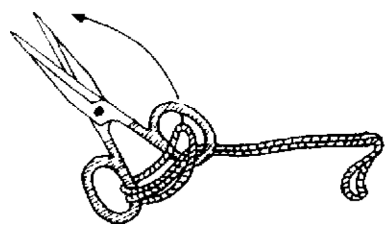
1. Loop the string as shown.



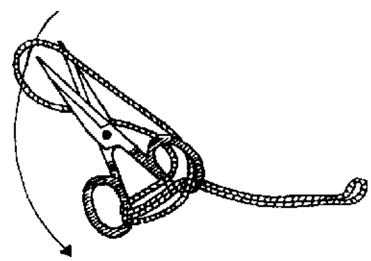
2. Hold one end of the loop and give the scissors to a friend and ask him to free the scissors from the loop of string without cutting it.



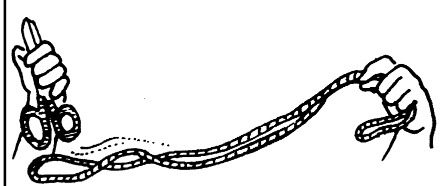
3. The way to do this is to loosen the loop knot made in Figure 1 and pull the loop through….



4....the opposite finger hole.

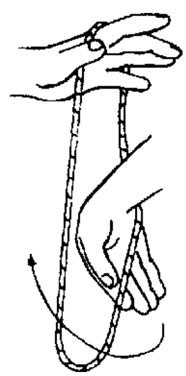


5. Pass the loop all the way over the scissors. Do not twist it around.

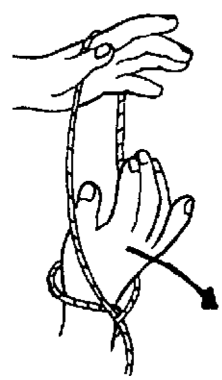


6. By pulling on the other end of the loop string you will be able to free the scissors.

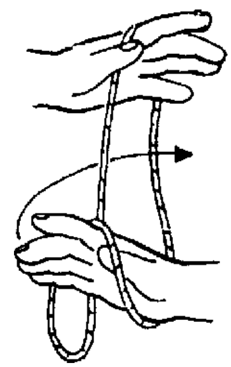
HAND TRAP



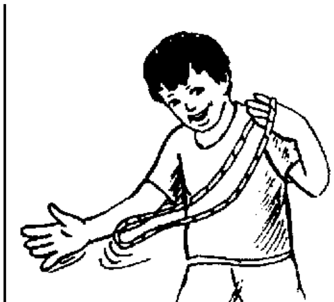
1. In front of a friend place a loop of string over your left hand. Put your right hand (downwards) inside the loop and swing it around and up.



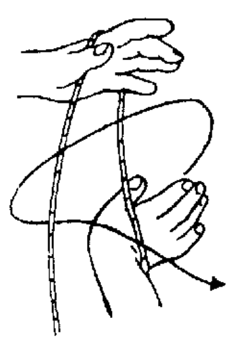
2. Put your hand right into the back of the loop.



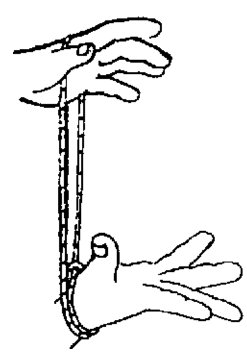
3. Pull your hands apart.



4. The string will be freed from your right hand.

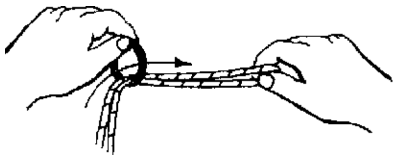


5. Now give the loop of string to a friend and ask if he can repeat the trick. Your friend will probably mistake the direction of the swing and go around the loop in the wrong direction.

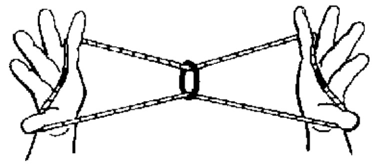


6. And his hand will be caught in a trap.

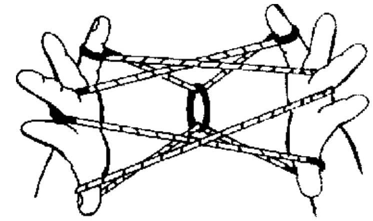
RING AND STRING



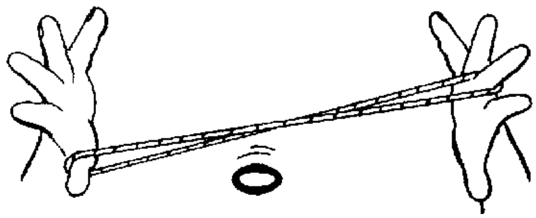
1. Put one end of a loop of string inside a ring. Pull the string to bring the ring in the middle.



2. Now loop the string across both your palms and behind your little fingers and thumbs. Do not twist the loop of thread around.

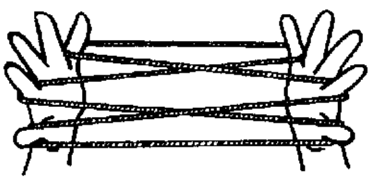


3. Pick the left palm string with your right middle finger and your right palm string with your left middle finger. Now release the strings of the little fingers, the left middle finger and the right thumb.

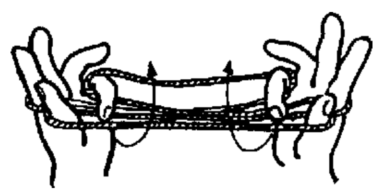


4. Be careful not to release the right middle finger and left thumb strings. On pulling your hands apart the ring will get freed.

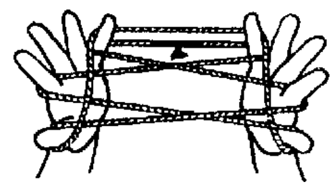
MAN CLIMBING A TREE



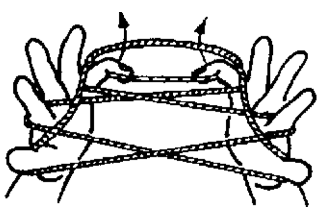
1.Start with the Index Finger Base, as shown.



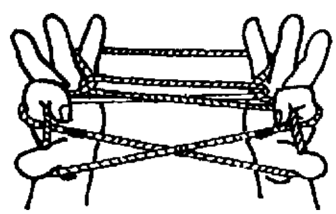
2. With your little fingers scoop up the near string and pull it back.



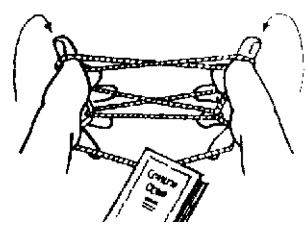
3. This should be the finished result. Release the string indicated by the arrow.



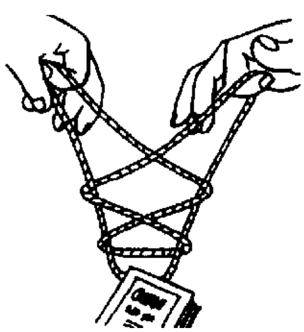
4. This picture shows the releasing action.



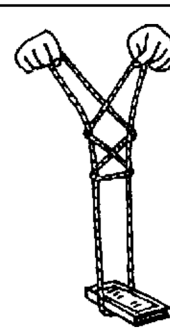
5. Bend your index fingers down and tightly hold the string that goes across them.



6. Twist your hands away from you. Use a book to hold down the far bottom string on the floor.



7. Now hold the index finger strings tightly and release all the other strings.

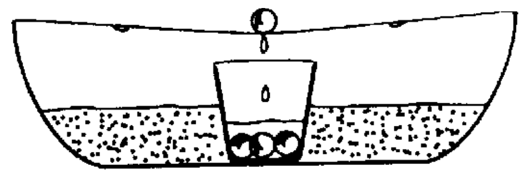


8. By alternately pulling upwards on each of the index strings you can make the man climb up the tree.

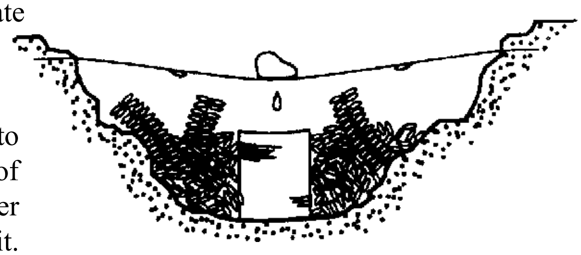
SIMPLE SOLAR STILL

The sun can help you purify water.

Take a large pan. Fill it with some muddy water. Place a glass in the middle. Place some clean marbles in the glass to weigh it down. Cover the pan with a thin plastic sheet. Tie a string all around the pan to secure the sheet in place. Place a small stone on the sheet to make it dip in the centre. The plastic should not touch the glass.



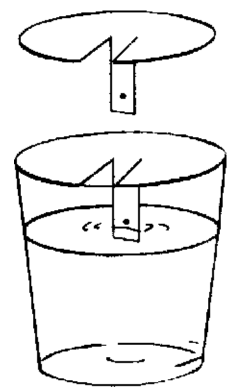
Now place the pan in direct sunlight. Heat will evaporate the water, which will condense and collect in the glass.



Make a hole in the ground. The hole should be big enough to sink a clean container. Surround the container with a lot of fresh leaves and plants. Place a sheet of plastic loosely over the hole. Secure the plastic by placing stones all around it. Put a stone in the middle to make the plastic sag.

Dewdrops can meet the drinking water requirements of a desert village. By harvesting the dew that collects on rooftops, each house in a desert village in Gujarat can get about 20-liters of potable water overnight. Dew is nearly as clean as distilled water. Plastic and tin cool quickly and so will easily gather dew from the water vapour in the air. Roofs can be made of sloped tin or plastic sheets. Plastic pipes fitted to the edges of the roof can gather the dew and run it to a container at ground level. A roof of 200-square meters can harvest nearly 20-liters of water a day and with hardly any dissolved salts.

SKETCH PEN SECRETS



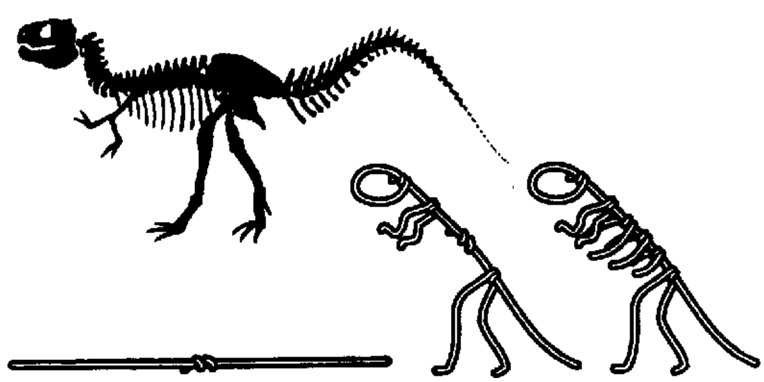
The inks in markers, sketch pens are often combinations of several basic coloured dyes. Here is a simple way of checking the combination of colours in your sketch pen. Cut a 10-cm disc of blotting as shown to make a strip that will hang down. Make a different strip for each colour. Make a large dot, about 2-cm up from the bottom of the strip.

Fill the water with glass so that the water is below the colour mark. Place the disk on the glass with the end of the strip just touching the water. The colour separation will take a few minutes. Which colour contains the most other colours? Which colours refuse to separate? Which colours move the highest on the strip? Does the temperature of water affect the separation?

WIRED UP DINOS

Dinosaurs lived millions of years ago. They disappeared because they could not adapt to the changes around them.

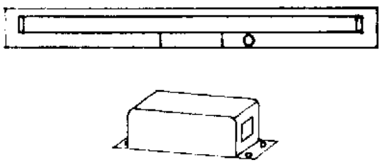
Using thin aluminium wire you can make skeletal models of a few dinosaurs. Start with the backbone and later add the head. Then connect the hands and the legs at the correct positions. In the end model the ribs.



WORD PICTURES

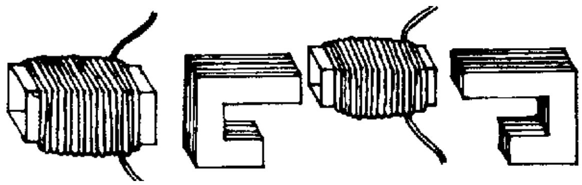
220 - VOLT A. C. MOTOR

This motor was designed by Somnath Dutta. Prof C. K. Desai of the *Exploratory*, Pune presented me a model.

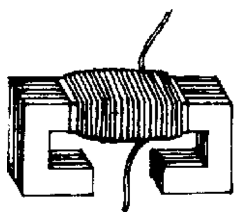


1. Open a burnt tube light choke.

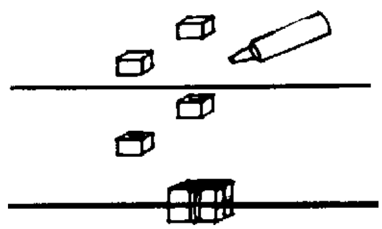
2. Inside the casing you will find copper wire wrapped on two U shaped laminations. Discard the burnt copper wire.



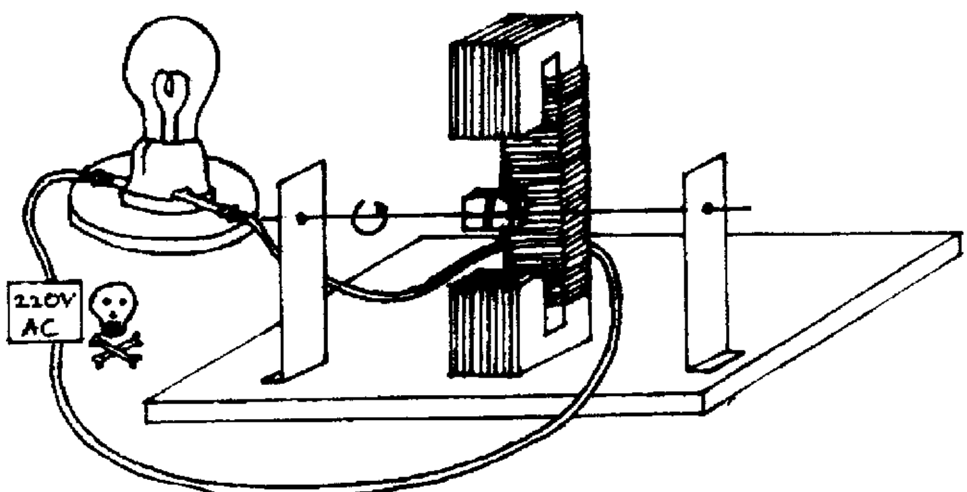
3. Make a cardboard square section spool. The two U shaped laminations will fit in this spool. Wind 1,200 turns of 30 gauge insulated copper wire (motor rewinding wire) on this spool. Insert the U shaped laminations in the spool. Mask the laminations with insulation tape.



5. This will be the finished coil.



6. Take a 20-cm long bicycle spoke and stick four small rectangular magnets on it as shown. You can also tie the magnets with thread to anchor them.



7. Place the coil on a wooden board as shown and anchor it in place. Connect one end of the copper wire of the coil in series to a 75-watt light bulb (220-volt). The other end of the coil and the bulb can be connected to the 220-volt A.C. Mains through a switch. Mount the cycle spoke on two brackets so that the spoke can rotate freely and the magnet block is between the facets of the lamination. Now, put the switch **ON**. If you now give a small rotation to the spoke, it will keep rotating.

CAUTION: THIS EXPERIMENT SHOULD BE STRICTLY DONE UNDER ADULT SUPERVISION. UNDER NO CIRCUMSTANCES TOUCH THE "U" SHAPED LAMINATIONS OR WIRES WITH YOUR BARE FINGERS, AS THE 220-VOLT A.C. CURRENT CAN GIVE A FATAL SHOCK.

(Pix: Dr. Vidula Mhaskar)

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26. **Teacher**, Sylvia Ashton Warner, available from Arvind Gupta email: arvindguptatoys@hotmail.com
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28. **Environment & Self-Reliance**, Yona Friedman, Eda Schaur (Eng/Hin) Vigyan Prasar, New Delhi, vigyan@hub.nic.in
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