

CHEESE!

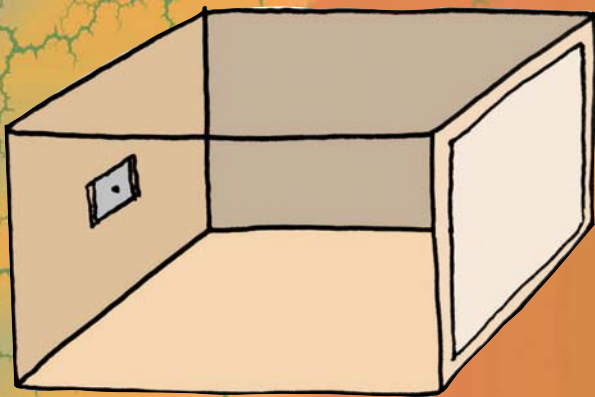
The holidays have finally arrived and it is time you take a good break. But sometimes a long holiday can get boring and you might look for a challenging project to tackle. Why not build your own camera and take some pictures with it? This is a good project for a creative person, and you will learn a lot about light and the way light waves travel.

Did you know that a camera sees the world upside-down? Light waves travel straight ahead. When they go through the lens of a camera, though, they project an upside-down image.

Our own eyes see things in much the same way. The light waves enter the lens of the eye and project an upside-down image on the retina, the back of the eye. So why don't we see everything upside down? Our brains make the correction and turn everything right side up again.

Once, for an experiment, scientists fitted some people with glasses that turned images upside down. After the people wore the glasses for while, their brains turned everything right side up again! But when they took the glasses off, they once again saw everything upside down. Their brains took a while to readjust and turn things right again.





Photography is simple in principle. All you need are a camera and a light-sensitive material. A camera can be just a light proof box with a tiny hole instead of a lens. The light-sensitive material may be film or paper coated with an "emulsion" dotted with silver salt crystals. When the hole is opened to take the picture, crystals hit by light are changed so that when the film is developed in chemicals, they change into silver. The film is then "fixed" in more chemicals to remove the unchanged salt crystals. The image is preserved in the pattern of silver grains.



TO SEE HOW IMAGES TURN UPSIDE DOWN WHEN YOU SEE THEM THROUGH A LENS...

BUILD YOUR OWN VIEW BOX

You will need:

- ❖ Scissors
- ❖ An empty cereal box in excellent condition (no tears, dents or holes)
- ❖ A small piece of aluminium foil
- ❖ A thin needle
- ❖ White tissue paper or wax paper
- ❖ Sticky tape
- ❖ A candle
- ❖ A dark room

With the scissors, remove the cover of the cereal box. In the center of the other end, make a hole about 1 cm across. Cover the hole with a small piece of aluminium foil, shiny side in. Use the thin needle to make a tiny hole in the center of the aluminium foil.

Cover the open end of the box with one thickness of the tissue paper and fasten it with the sticky tape.

With an adult's assistance, light the candle in the dark room. Point the pinhole toward the candle. You should be able to see an upside down image of the candle on the tissue/wax paper. That's how a camera projects an image onto film.

Why do you see an upside down image? Light rays from the object you are looking at travel in straight lines, but cross as they pass through the hole.

USE YOUR CAMERA TO TAKE PICTURES

A pinhole camera can be built from just about anything that is boxlike and is sealed tightly. Your cereal box camera might not take perfectly sharp pictures like a regular camera, but some people will think they are very attractive. You will need some patience and will have to experiment a bit before taking good pinhole camera pictures, but the results are worthwhile.

You will need:

- ❖ An empty cereal box, like an oatmeal box
- ❖ Mat black paint or spray paint
- ❖ Glue
- ❖ Scissors
- ❖ Black construction paper
- ❖ Strong sticky tape (preferably black electrical tape)
- ❖ Removable tape (such as masking tape)
- ❖ A roll of black and white film
- ❖ Lightproof container (such as a black film spool holder or the wrapping of photographic paper)
- ❖ A pitch-black room or closet

Ask an adult to help you to carefully cut off about 5 cm of the top of the cereal box with a serrated knife. Put the box on old newspaper and paint or spray paint the inside of both parts mat black. Do not soak it in paint, though. Let it dry.

Cut small slices out of the corners of the larger, bottom part of cereal box and stick it together again with black tape. This is the body of your camera.

The other, smaller part will form the back cover of your camera and should now fit snugly over the back of the body of your camera. See that you get can get the back cover over the body quite easily, because you will have to be able to do this in the dark.

Stick tape down the insides of all joints to make sure that the boxes are light proof.

Create a pinhole lens just like in the previous activity. Cover the pinhole of your cereal box camera with a piece of the black construction paper. Tape it at just one end with the sticky tape. Tape the other edges in place with the removable tape. That way you can lift the paper and fold it back to form a flap.

Cut six pieces of sticky tape, each about 5 cm long. Stick one end of each piece of tape to the rim of the box cover. Leave the other ends loose.

Take the box, the cover, and the roll of film into the dark room. In the dark, pull a piece of film out of the cartridge that will fit over the open end of your camera body. Pull this piece of film across the open back of the box. Push the cover into place over the film. Cut the film, and tape the edges of the cover in place. Now you are ready to take pictures!

On a sunny day, set the camera firmly on a solid base, like a small table. Aim it at something you would like to photograph. The scene must be still, with the sun shining on it. Watch out for a breeze! You can keep the camera box still by propping it in place with weights like bricks.

People - especially younger brothers or sisters - usually cannot hold still long enough, so rather start off by taking a picture of an object like a vase of flowers or a bowl of fruit.

When the camera is all set, fold back the flap and hold it in place with a piece of removable tape. Let the camera sit about five seconds to register the picture. Count slowly to five, and then cover the pinhole.

Bring the camera back into dark room. Remove the film and place it in a lightproof container or lightproof paper.

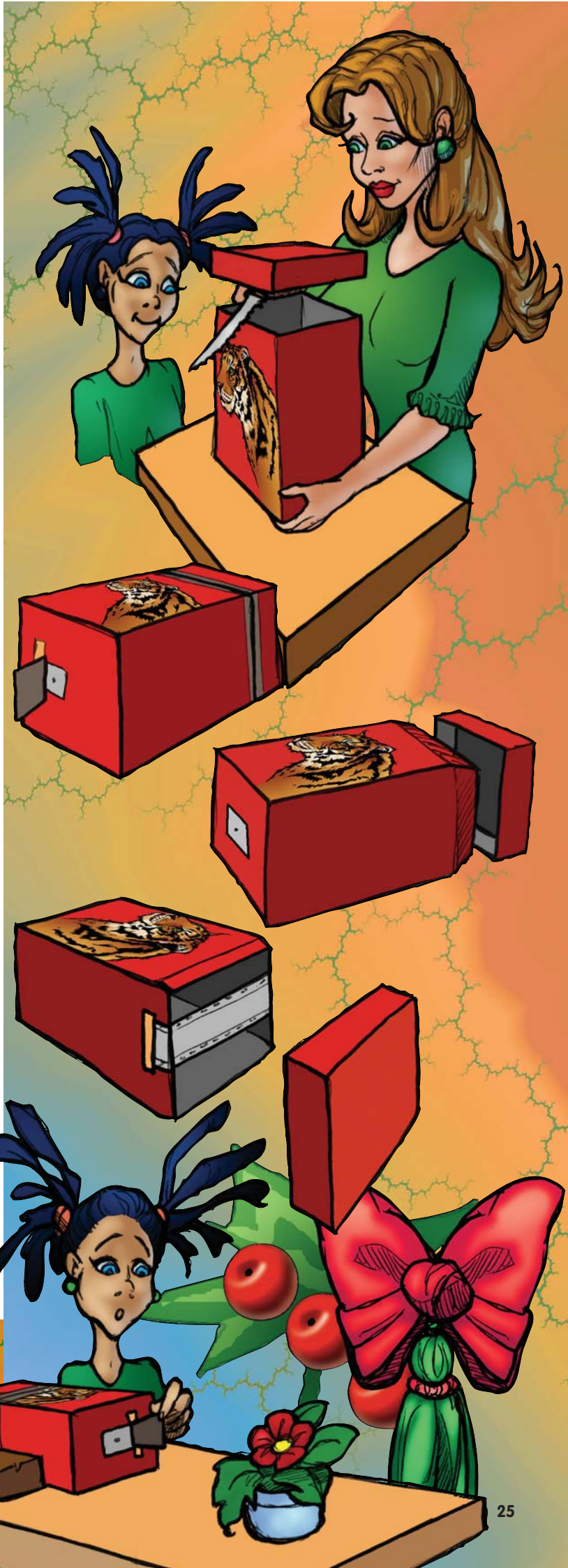
Have the picture developed at a photo store or in a home darkroom. If your first picture is too dark, try to expose the film longer next time. If your picture is too light, expose it for a shorter time. You will have to experiment a bit to get it right. The size of the pinhole is another factor that will influence the brightness or darkness of your picture.

Now you know how a camera works. Expensive, complicated cameras take pictures in just about the same way as your own homemade one.

HOW TO MAKE A DARK ROOM

A small bathroom or a closet makes a perfect dark room. Make the room completely lightproof by taping thick black plastic over any windows and hanging a thick blanket over the door frame. Check that there are absolutely no light leaks by waiting a few moments inside the room or closet while your eyes adjust to the dark. Remember, you are working with light sensitive material (film and photographic paper) that will be damaged by even the smallest amount of light.

EASY SCIENCE



BRIGHT YOUNG MINDS TAKE UP THE CHALLENGE

Over 600 scholars with more than 460 of the best science and technology projects from South Africa, as well as some from abroad, competed in this year's Eskom Expo for Young Scientists National Finals. The expo took place at the Sports Centre of the University of Pretoria early in October. Young scientists from South Africa, Namibia, Nigeria, Russia and the USA were vying for superb prizes, including bursaries.

The Eskom expo attracts learners from around the country who first have to submit science and technology projects to 26 regional expositions. The regional winners are then invited to compete in the annual national expo. It also serves as a stepping stone for young females who have the potential to pursue a career in science and technology. More than 300 young females competed in the finals this year.

The Eskom expo creates opportunities for participants to take their projects to another level by opening doors for them through local and international exposure. Gold medallists are chosen to participate in numerous international expos every year, including fairs in the USA, China, Taiwan, Sweden and Namibia.

Get some inspiration for next year's expos from this year's winners:



A grade 7 learner, Samuel Lombard from Laerskool Lynwood in Pretoria with his project on pigeons..

Given Sibiya and Phillemon Mankge, both grade 11 students from Ribane-Laka High, presented their Windless Water Pumping System at the Eskom Expo National Finals.



Left: Christian Basson of Klerksdorp Primary with his hydrogen fuel cell project



EASY SCIENCE