UNAWE

UNIVERSE AWARENESS

TEACHER MODULE I – March 2008

THEMES

- NIGHT AND DAY
- THE NIGHT SKY AND THE MULTICULTURAL MOON
- SOLAR AND LUNAR ECLIPSES
- THE FOUR SEASONS
- THE STRUCTURE OF THE UNIVERSE

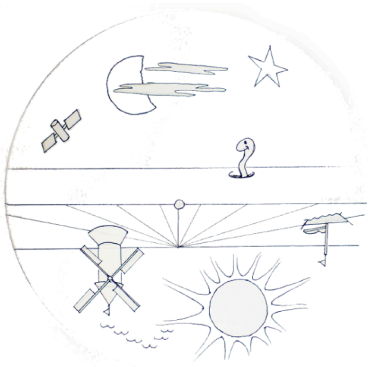
Universe Awareness, Leiden Observatory, PO Bo 9513, 2300 RA Leiden, Netherlands
Tel: +31 71 527 58 16 Fax: +31 71 527 57 43 http://www.unawe.org/

Night and Day

Night and day are like two different worlds.
In this topic, we aim to introduce the concept of the spinning Earth and show children how we move (approx) every 12 hours into the shadow and then back into the light.

Activity #1

AS THE WORLD TURNS



Requirements
Pencils
Paperclip
Paper plate

- Children draw or colour in two scenes on a paper plate that represent day and night.

- Discuss in a group and make a list of the differences between the two, e.g.
"What do we hear at night? What animals do we see? What do we only see in the daytime?"

- Place another paper plate on top of the first one and cut out a semi-circle so that only one scene can be seen at a time. Pin the plates together with a paper fastener and segue day into night.

Source: Paper Plate Education
http://analyzer.depaul.edu/paperplate/As%20World%20Turns.htm

Activity #2

THE EARTH IS A BALL

When we speak of day and night, we say "Getting up with the Sun", "The Sun sinks slowly in the West", "The Sun goes down like a big bald head".

Our language indicates that it is the Sun that is doing the moving, when - as we know - the Sun doesn't move around the Earth. Yet most children can recognize pictures of Earth from space. They know that the world is round and many also know or have been told that it is perpetually spinning.

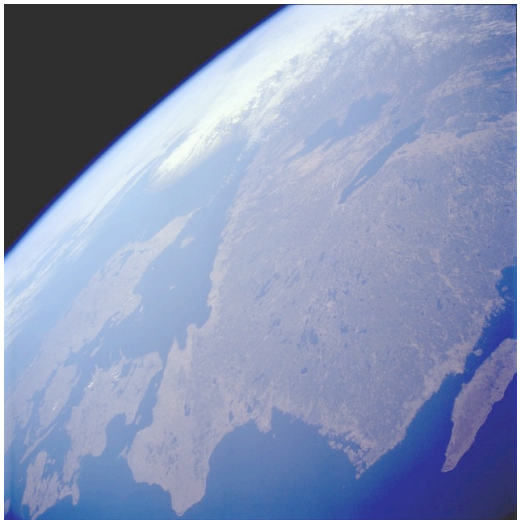
In this activity, teachers take the details that children are aware of and put them together to demonstrate how night and day occur.

Requirements
Earth ball
Pictures of Earth from space

- Show the ball. What is this? This is the Earth. This is your home. This is the home of everybody.

- Elicit what you can do with a ball: kick it, throw it, catch it and spin it. The Earth is spinning.

- Show images of the Earth from space including pictures taken of the Earth in some shadow. This is proof that the Earth is indeed round.



Source: UNAWE International

Activity #3
SIMULATION OF THE EARTH'S ROTATION

Requirements
Lamp

- Choose a volunteer to hold a lamp: this is the Sun
- Choose a volunteer whose name begins with E or who is wearing blue and green: "Edna you are the Earth."
- Both volunteers take place before the other children. The Earth in the middle and the Sun to the left.

- Demonstrate the Earth's rotation with Edna facing the audience with her arms out-stretched and her left hand pointing towards the light. Edna sees Sunrise.
  At what time do the children think the light starts to shine on the Earth?
- Edna turns a quarter to the left until her face is fully in the light. Edna sees Daytime.
  At what time do the children think the light is brightest on the Earth?

- Edna turns a quarter to the left until she has her left hand pointing into the light. Edna now sees Sunset. At what time do the children think the light leaves the Earth?

- Edna turns a quarter to the left until she her face is looks away from the light. Edna sees the Night. At what time do the children think the Earth is darkest?

Extensions

Repeat the Earth's revolution and talk about the differences children identified in Activity #1.
Narrate and animate the process inviting all children of the group to play a role. They can make sound effects of nightly noises and enact the changes as prompted by the teacher: "Here come the frogs and the owl. The stars start to twinkle, the birds fall sleep."

Two children stand back to back. One child is in Ireland (or the country where the activity is taking place). The other child is in New Zealand (or the opposite point on Earth. The pair repeats the Earth's rotation, thus demonstrating that when one child is in the dark (night time) some other child is in the light (daytime) and vice-versa.

Source: UNAWE International

Activity #4
NORTH, SOUTH, EAST AND WEST

Requirements
Compass

- Introduce a compass and find North, South, East and West.
- Orient children to the compass and pick a landmark in the schoolyard that marks the North.
- Predict where the Sun will rise (East) and set (West).
- Ask children to start observing the locations of the rising/setting Sun. Can they find the North every time?

Source: UNAWE International

Activity #5
LIVING ALL OVER THE EARTH

Requirements:
A round honeydew melon
Pearl headed pins
Globe/Earthball
Marker pen

Ask the children to indicate on the globe where people live on the Earth. If some think that it is only on the top, or perhaps even inside the ball, then this simple activity can show how people live on all sides of the Earth's surface.

- Take the melon and draw your own country on the surface.

- Ask the children to name other places
  "Where do all the elephants live"
  "Where do penguins come from?"
  "Where do Ravi's parents come from?"
  " Where does Magdalena come from?
  "What country has lots of kangaroos?"
  Draw those on the melon as well.

- Pierce the melon with the pins so that they are secure and facing into the centre.

- Turn the melon around and upside down and point out that the pins do not drop out but are attached to the ball the way the Earth attracts all objects towards its centre.

WHAT IS UP AND WHAT IS DOWN?

- On this Earth with pins, it is fun to ask the children what is 'up' and what is 'down' for each person. If children point to the pin at the top and say that it is 'up', ask how somebody would jump 'up' in that country?

- Demonstrate with the pin and make it jump up and down.

- Go to a country on the side of the melon and ask the same question. How would this person jump 'up'?

- Now go to a country opposite to your own and ask the same question. How would **this** person jump 'up'?

- Demonstrate with the pin and make it jump up and down. The directions are exactly opposite. Up is down and down is up!

- Finish with the riddle

"What's the mysterious force that tries to pull you off your bike and keeps the Earth in orbit?"

Answer: Gravity!

Source: AID/PRATHAM for UNAWE India

Activity #6
THE MOON ON A STRING

What is an orbit?
What is rotation?
How do the planets move?
What is gravity?
Hearing about the the forces of motion is nothing like seeing them in action.

In this simple out door activity, children get to see a spinning ball tethered on a string, moving by centripetal force, just like the Moon satellites around our Earth and the planets around the Sun.

But what happens when you let the ball go?
Will it keep spinning or will it go in a straight line?
Watch the ribbon.

Requirements
I-2 meter long ribbon(preferably bright coloured and silky)
Tennis ball or rubber ball
A big needle or skewer

- Take your ball and pierce it twice with a skewer or big needle. Thread a long shiny ribbon through the ball. Knot one end tightly and then pull the knot back inside the ball so that it now has a long tail. Make sure that the tail is secure

- Hold the free end of the ribbon and swing the ball in a circle.

- Let go of the ribbon and watch which direction the ball travels. The ribbon makes it easier to follow

the direction of the ball.
- Where did the ball go?

Extensions

Swinging a tennis ball from the end of a ribbon, exerts a centripetal force.
The ribbon transmits that force and pulls the ball into a circular path.
But there is no visible ribbon tethering our moon.
Some force keeps the moon and the planets spinning in circles.
Discuss with kids the possibility of an invisible ribbon.

Source: UNAWE International

Activity # 7
PLAYING WITH SHADOWS

Have fun with shadows. See how they change and are affected by the time of day (and the movement of the Earth around the Sun)
Try to get rid of your shadow.
Understand how they are made when an object obstructs a light source.

Requirements
Sunny outdoors,
Chalk or something to mark the ground,
Sticks

A piece of string
A round item (fruit, ball, etc.)

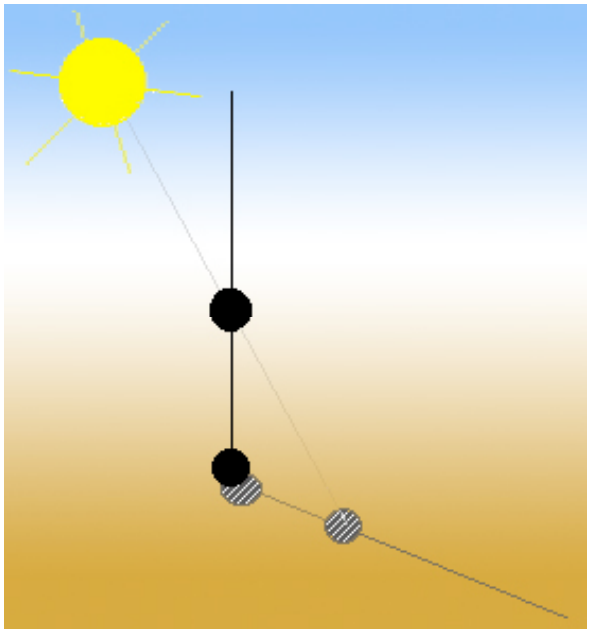
- Have the children stand outside and look at their shadows.

- Using a stick in the sand or a piece of chalk on a hard surface, ask the children to try to outline their own shadow. Working in pairs or groups makes it easier

- Note what time it is and draw the time inside the shadow as well. Repeat the same step at least three times during the day, noting how the shadow and its shape will change.

- Ask the children how they can disconnect from their shadows. Jump up and down and observe how the shadows leave the feet.

- Take a round item and put a piece of string through it. Hold the string straight vertically. Pull it up and down the string to illustrate how the shadow moves away from the object and back



- Take a stick and stick it in the ground where the shadow of the round object is. Lean the stick against the round object and observe that it points towards the sun or the light source.

- Remind the children that if they are climbing somewhere and their shadow is on the ground, the sun is in exactly the opposite direction.

Extension

Paint one of your shadow outlines to make a permanent comparison. Do this game with shadows at the same time on different days of the year and note how the shadow changes.

Source: UNAWE International

The Night Sky and the Multicultural Moon

"The moon leaps
In the Great River's current...
Floating on the wind,
What do I resemble?"

DU FU, "Travelling at Night" (China, Tang Dynasty, 765)

What do we see when we walk outside at night time? Stars, the lights from aeroplanes, planets, the Moon. Of all the objects in the sky, it is perhaps the Moon we love the most. All over the world, regardless of where they live, children search for and feel connected to the Moon. What do they see?

Activity #1
WHAT DOES THE FULL MOON LOOK LIKE?

Requirements
Transparencies
Projector
Marker pens
Big pictures of the moon

- Project a big picture of the Moon. Add transparencies on top of it, illustrating figures from stories that come from all over the globe. These include a story about the phases of the moon, a Chinese rabbit, an African crocodile, the man in the Moon etc.
  See http://en.wikipedia.org/wiki/Man_in_the_moon

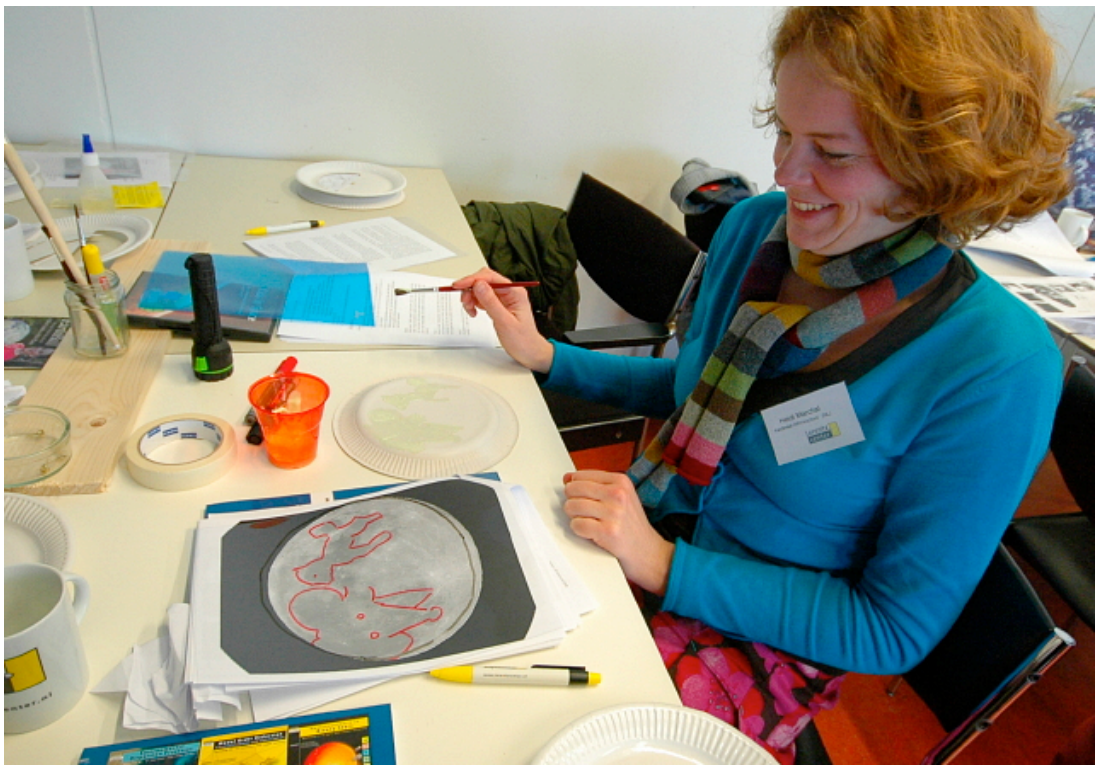
- Give the children their own Moon printout, marker pens and a clear transparency and ask them to find these same figures.

- What other figures of their own invention can children find in the Moon?

- Clean the transparency and ask children to outline their own shapes on the surface of the Moon

- Project the outlined children's transparencies onto its surface.

- Ask the children to explain to the whole group what they see and point out the particular features.



Extensions

Colour in the outlines.

Write a story to explain the origins of the figures.

Reiterate that all over the world, we all see the same 'face' of the moon, but at different angles.

Source: UNAWE Germany

Activity #2

MOON MASKS

Requirements
Paper plates
Large rubber bands
Crayons, sparklers
Fluorescent paint

- Choose an image from the previous activity and draw it on a paper plate.
- Cut out big eyeholes to ensure the wearer's vision is not impeded.
- Decorate with crayons, sparkles, etc.
- Staple a large rubber band to the back of the mask and secure to one's face.
- As a variation that excites children even more, detail the masks with fluorescent paints and wear the masks under a black light.

Source: UNAWE International with inspiration from Paper Plate Education
http://analyzer.depaul.edu/paperplate/

Activity #3
REFLECTIONS FROM THE MOON

The Moon moves around the Earth. We call this movement an orbit. It takes about **one month** (28 days) for the Moon to orbit the Earth. During that time the Moon appears to change its shape. It also seems to shine like a light.
In this activity we can do a whole month of observations in just eight steps. Prepare to be surprised!

Requirements
Football
Torch
Aluminium foil

- Using the reverse side of the aluminium foil, cover the ball so that every bit of the surface is covered. This is the Moon.

- Choose a child whose name starts with S or one who is wearing bright yellow or orange. They are the Sun. The Sun holds the torch.

- Choose a child whose name starts with E or who is wearing the Earth's colours from space: blue and green. Their head is the earth. The Earth holds the Moon.

- Darken the room and turn on the torch. Don't move Sun!

- Earth faces the torch and holds the Moon ball straight out in front. The ball will appear dark to Earth because the lit side of the ball is facing away from the group. We call this the New Moon: dark and about to be born.

- Earth turns a little bit to the left, still holding the Moon ball straight out. Earth will see only a thin, lit

crescent on the right side of the ball. We call this the Waxing Crescent.

- Earth turns to the left a little more until the Sun is on its right. Earth sees that half the ball is lit. We call this the First Quarter of the Moon.

- Earth turns to the left again, so that the lamp is almost behind him/her. We call this the Waxing Gibbous. A gibbous Moon is one that is less than a full Moon, but more than a half Moon. (Gibbous is a very old word meaning 'hump', Do you think the moon looks like the shape of a camel's hump?)

NB* (If the ball is directly in the shadow of Earth's head or body, raise the ball up a little higher.)

- Earth turns to the left again, so that the torch is right behind him/her. Hold the Moon up high! Earth sees the entire side of the Moon ball lit. This is Full Moon.

- Earth keeps turning a little to the left so that the Moon appears to move into the darkness again. This is called the Waning Gibbous (there is the hump again!)

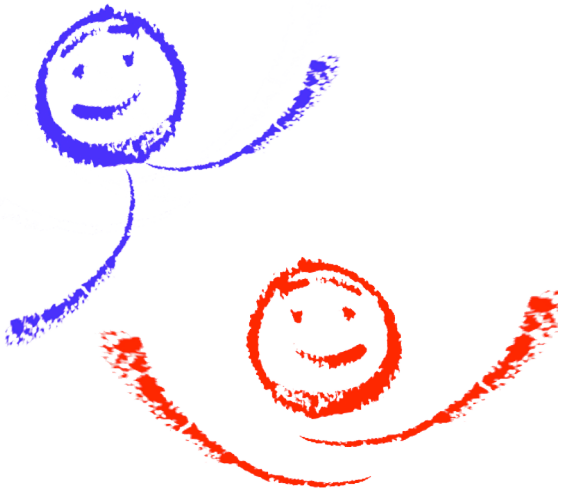
- Another move towards the left and Earth sees the Moon ball half in the light and half in the dark. This is called the Third Quarter.

- Earth keeps moving to the left until the moon shows only a thin sliver of light. Earth now sees the Waning Crescent.

- Earth makes one final turn towards the light and the side of the moon facing the Earth becomes completely dark. We are back to the New Moon again.

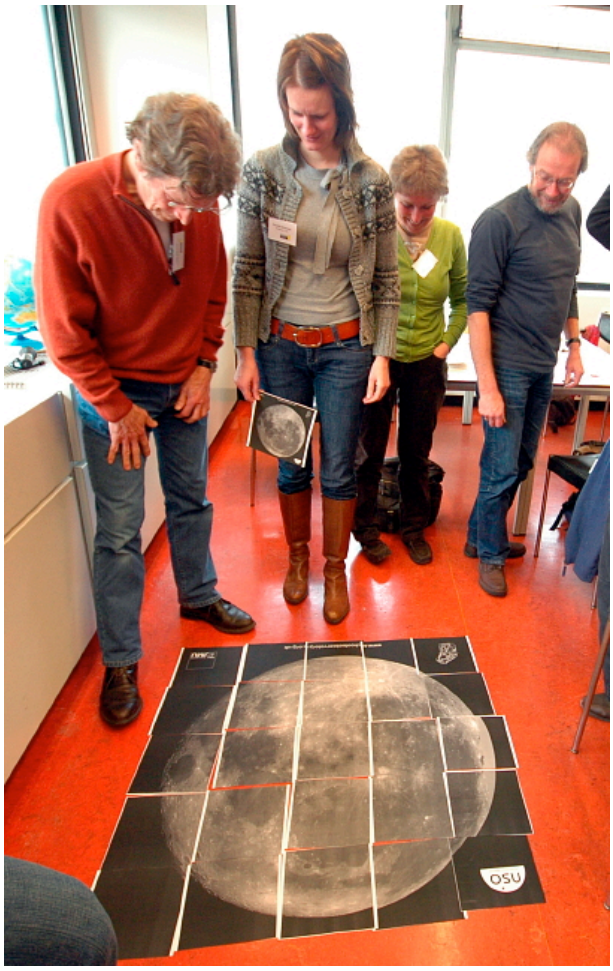
Did you notice how the torch reflects off the shiny foil? It isn't the Moon shining (what people call "moonlight"). Actually, it is the torch or sunlight reflecting off the Moon's surface that causes it to glow. The Moon itself puts out no light at all!

Source: UNAWE International



Activity #4

MOONSAIC



Requirements

A set of 25 jpeg images (each approx 150k) of lunar observations taken recently by the Liverpool Telescope

This is a fun group task. The idea is to print out the images (A4 size) and to stitch them together to form a complete picture.

The completed mosaic would make a spectacular poster. The whole picture actually required a mosaic of 64 telescope images that were later combined. Note that on two of the edges there are small grey patches where it was impossible to get suitable observations.

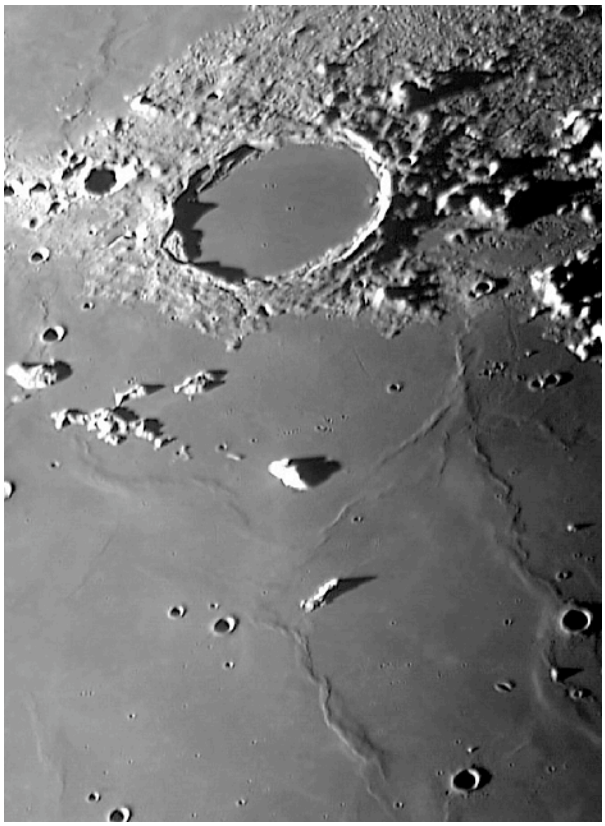
Liverpool Telescope for National School's Observatory
http://www.schoolsobservatory.org.uk/obs/ulab/moonsaic

Activity #5

MAKING THE MOON

Look at some pictures of the moon. See the great dents or craters. What do they look like? Raindrops? Something, sometime, somehow, dropped and made those marks.

Children can explore what happens when objects of different sizes and weights impact on a soft dust-covered surface. Let them make their own moon picture.



Requirements

A couple of wide containers at least 20cm deep, something like a shoe box, cooking pan or basin
Dirt or sand
'Lunar' dust (flour, fine sand, salt)
Surface dust of a contrasting colour (cinnamon, tempera paint powder, cocoa, baking soda)

Find or make four different types of balls: An ordinary ball (a cricket ball), a small ball (a pea), a very light ball (a Ping-Pong ball) and a very heavy ball (a marble or lead ball)

- Begin by looking at pictures of the moon taken with the unaided eye.
  Colour in the darker bits.
  Now look at pictures taken of the moon with a telescope.
  The Moon is not so smooth after all!
  What might have happened to make those marks and craters?

- Make a 'wet moon' by filling a pan with a firm pile of wet sand and then drip or pour water on to the surface. Could it have been really, really big raindrops that dripped on the Moon? (Not likely; rain and the atmosphere don't go that far!)

- Make a 'dry moon' by filling a basin or container with the lunar dirt. Smooth the surface flat and cover with a light layer of lunar dust (remember that the colours should be different.)

- From crouching positions, kids drop the balls one at a time into the container and then carefully remove balls. What can they see? Craters of different size and depth; some bigger than the balls that made them. What happened to the 'lunar dust'?

- Smoothen the Moon surface and then drop the balls from higher up. Have kids drop balls into the box from shoulder height and above the head, from a chair, even from a stairwell. Experiment using different balls and heights until they have made the moon picture that they like the most.

NB* Always resurface the Moon before a new round of drops. Consider doing this activity outside. Kids will soon realise that the higher the drop height, the greater the velocity of the ball, the bigger the crater and the further the ejecta! That means loads of fun as the flour, sand, cocoa, or dry paint can end up on the floor, in the air and everywhere. Be prepared!

Extension

What would happen if they dropped objects that aren't round into the container? What would happen if you change the angle of impact? Try it!

MAKING THE MOON – PART II

Good News! The Earth has some protection against meteors. Fortunately, our planet has an atmosphere and this situation changes our luck. How?

Requirements:
Adhesive tape
Thread
'Comet paper' i.e. silk paper

- Repeat the activity shown above.
- Construct a parachute using some 'comet paper' (silk paper works well). Tape some string or thread to the 4 corners and connect the parachute to one of the balls you have already made a crater with.
- Let the ball fall with this new device but at the same height.

- Compare the craters made by the ball with and without a parachute.

Note how the parachute diminishes the impact – put simply, the ball falls more slowly. Any meteorite passing through the Earth's atmosphere experiences such friction that it burns! Most are completely burnt out by the time they should reach the ground. The atmosphere is our big shield! Hooray!

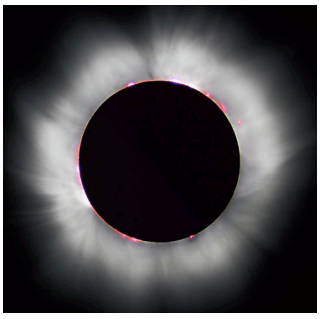
Source: UNAWE International with thanks to UNAWE Colombia for developing this extension.

Solar and Lunar Eclipses

The ancient Chinese believed that solar eclipses occur when a legendary celestial dragon devours the Sun. They also believed that this dragon attacks the Moon during lunar eclipses. In the Chinese language, the term for eclipse is "chih", which also means "to eat".

It was a tradition in ancient China to bang drums and pots and make loud noise during eclipses to frighten that dragon away. So what is a lunar or solar eclipse? How do they happen? Is there a dragon involved?

We know that the Moon doesn't shine, and that it is just reflecting sunlight. However, every so often, the Earth gets directly in the way of that light. That is when we have **a lunar eclipse**. From Earth we see the moon travel across the shadow of the planet and take on a beautiful dim red glow as if in an Earth-wide sunset. If you are ever lucky to see a lunar eclipse it is very beautiful and completely safe to look at.



Solar eclipses are different and much more rare. They happen when the Moon passes exactly in front of the Sun. The sky takes on a spooky twilight and animals get confused. Suddenly night falls, but only for a few minutes at most. The air cools and the full Moon appears like a black disk in the sky surrounded by a crown of fire. That fire is actually the Sun behind the Moon. When a solar eclipse occurs it is also very beautiful, but it is very dangerous. As soon as the Moon has passed, the full burning light of the Sun comes back.

You must never look directly at the Sun.

Eclipses don't happen every day, so why not make a cheap and simple model that demonstrates how eclipses occur when the Sun, Moon and Earth line up in a row?

SUN, EARTH AND MOON MODEL

Requirements

A plank of wood as long as your arm

Two square rods the same length as the plank's width

A square piece of polystyrene or foam board the size of the plank's width

Two polystyrene balls: one the size of a ping pong ball, one the size of a large orange

A piece of bendable but sturdy metal wire

Adhesive tape
Two toilet rolls
Glue
Hammer and nails
A lightweight hand torch
Pencil
Scissors
Cardboard cutter
Black, blue and yellow paint

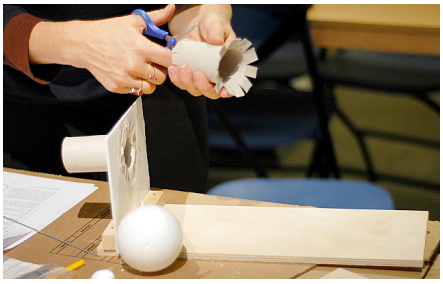
- Nail the two rods to one end of the plank so that the foam board can be fitted snugly between them.

- Place one of the toilet rolls just above the middle of the foam board and trace the circle it makes.

- Cut out the hole with the cardboard cutter and insert the toilet roll in the foam board so that it fits snugly.

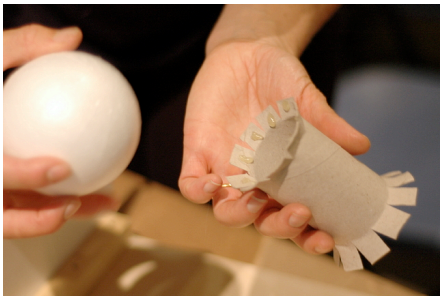
- Take the other toilet roll and make a series of small (~ 2cm) even, vertical cuts all the way around.

- Stand the toilet roll upright and bend each cut piece outwards. The cut end should fan out like a flower.



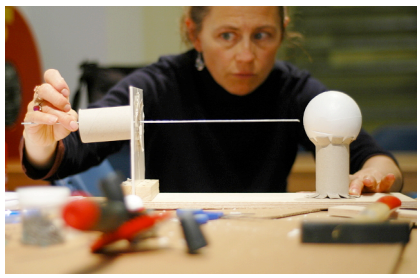
- Do the same to the other end.

- Place the bigger ball in the open flower of the toilet roll and glue/tape it in place. The cut fringe should make this easier. This is the Earth.



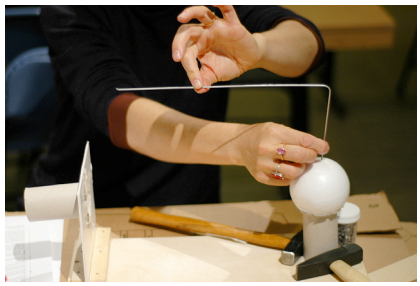
- Place the upright toilet roll, with the Earth in its top almost at the end of the plank.

- Look through the hole in the screen and make sure that the whole Earth is visible. The Earth should seem to fill up the entire space that you can see through the peephole. When you are sure that you can see the ball evenly, glue the toilet roll to the board. The cut fringe should make this easier. You can also use some tape to hold it fast.



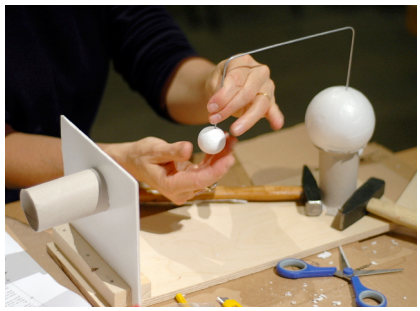
- Take your bendable but sturdy wire and insert one end into the top of the big ball.

- Measure a finger's length vertically along the wire and then bend the wire at a right angle so that it is horizontal.

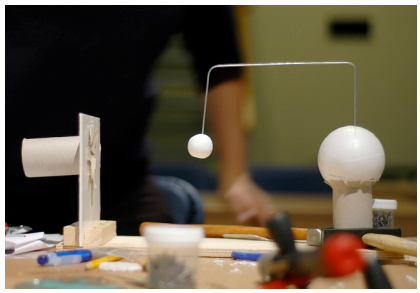


- Insert the other end of the wire into the smaller ball. This is the Moon.

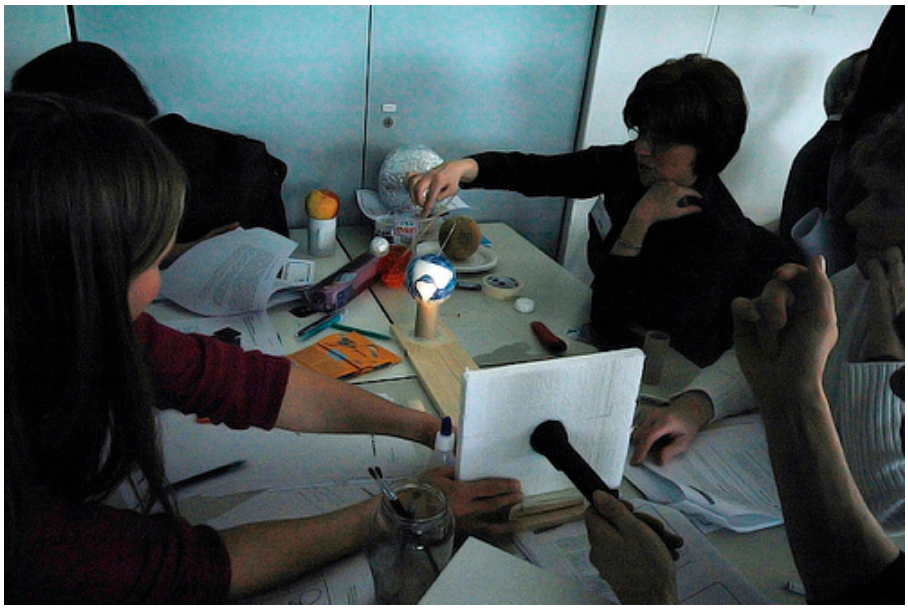
- A finger's length from the end of the wire, bend the wire vertically, downwards. The small ball will now be suspended next to the Earth.



- Insert your lightweight torch through the toilet roll in the screen. The toilet roll should give it some support so that the light shines in a horizontal beam.

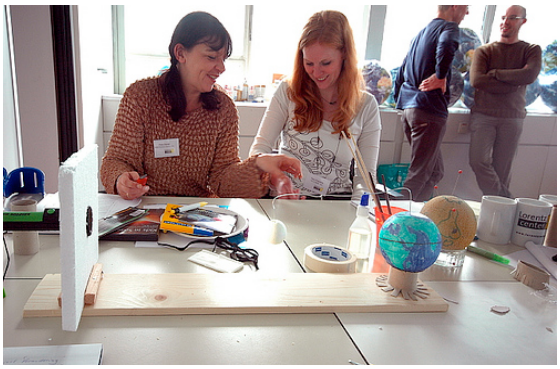


- For a solar eclipse, stand facing the torch and swing the wire backwards and forwards so that at a precise moment, the moon can block the sun. The sequence in a straight line will be Sun-Moon-Earth.



- For a lunar eclipse, face the other direction and place the Moon directly behind the earth. The sequence in a straight line will be Sun-Earth-Moon.

- Paint your model and add satellites, stars, astronauts, rockets, etc. but no dragons!



Source: 'Science Center op School', National Center for Science and Technology, Netherlands

The Four Seasons

Preparation: Vivaldi's *4 Seasons*.

- Play a piece of music from each of the movements to evoke the different moods of the seasons.

- Elicit from the children the different things they do in their daily life during each season.

  - Lead the discussion towards the question of sunshine.

  - Establish that the sun shines all year round.

  - Establish that we are warmer during the summer than in winter.

  - Introduce the idea that it is the amount of sunshine that makes the difference.

SPRING
There are lots of flowers everywhere.
You don't have to wear so many clothes.
It rains a lot

SUMMER
It is hot and you eat lots of ice cream.
You go to bed when the sun is still shining.
You wear sandals and bikinis and your skin turns brown when you go to the beach
Grownups wear sunglasses.

AUTUMN
The leaves fall off the trees.
It gets really cold.
Everything stops being green and becomes brown.

WINTER
It is dark when you get up to go to school and sometime it is dark on the way home
It is really cold and you need to put the heater on.
It is frosty in the morning and the air you breathe is like smoke.

The question is: Why is there more and less sunshine at certain times of the year?

Activity #1

WHAT IS A YEAR?

Requirements
Calendar
Oranges
Chopsticks
Torch
Marker pens
International Flags

- Begin by asking the question
  "Who in this room has a birthday? Everyone?"

- Mark them on a calendar.

- Find the child whose birthday is closest to the actual day and tell them that we are going to make them a year older. Call them Birthday boy/girl.

- Give them an orange. This is the Earth.

- Insert a chopstick through the orange. What do we call the place at the top of the world? The top is the North Pole. Mark it with an N.

- What do we call the place at the very bottom of the world? The bottom is the South Pole. Mark it with an S.

- Using a marking pen, draw a line around the orange halfway between the poles. What is it called? The equator.

- Referring to an Earth globe, find your country i.e. Ireland. Find what is on the opposite side? New Zealand! Mark both with a little flag.

- Turn the orange. What is the line it spins on? The axis.

- Choose a volunteer whose name begins with S or who is wearing yellow/orange. S is the Sun and holds the torch.

NB* The Sun is a great ball of energy and light. It shines in every direction all the time. As we only have a little torch, everyone will have to imagine that S is covered in lights shining in every direction.

- We are going to make the Earth a year older! Birthday boy/girl takes the orange and goes for a walk around the Sun. S stands in the centre and makes sure that the light is always shining on the Earth

- The teacher narrates as the Earth walks a quarter circle to the left:
  "In March we have St Patrick's day, then Easter. April showers bring May flowers. The weather is getting warmer, you can play outside without your hats and gloves on now."

- Earth walks another quarter circle to the left:
  "June: the summer is here and the Sun shines. We can lie in the green grass and go swimming in July. It is summer vacation. We don't go to school all of August"

- And another quarter circle:
  "September: we go back to school, and it starts to get colder. The leaves fall off the trees and it starts getting darker again. By November it is dark when we get up in the mornings."

- Earth finally comes back to where they started.
  "December brings Christmas and sometimes in January it snows. It is dark in the morning and dark when we come home from school. February comes and then March and Hooray! "Happy - the Earth just went right around the Sun – day"

In this experiment, wherever the Earth went as it circled the Sun, the orange was lit from pole to pole. But if that were the way that the Earth turns, then there would be only one season on earth. It would never get any colder or warmer and the days and nights would not get longer or shorter.
We know that doesn't happen.

Source: UNAWE International

Activity #2

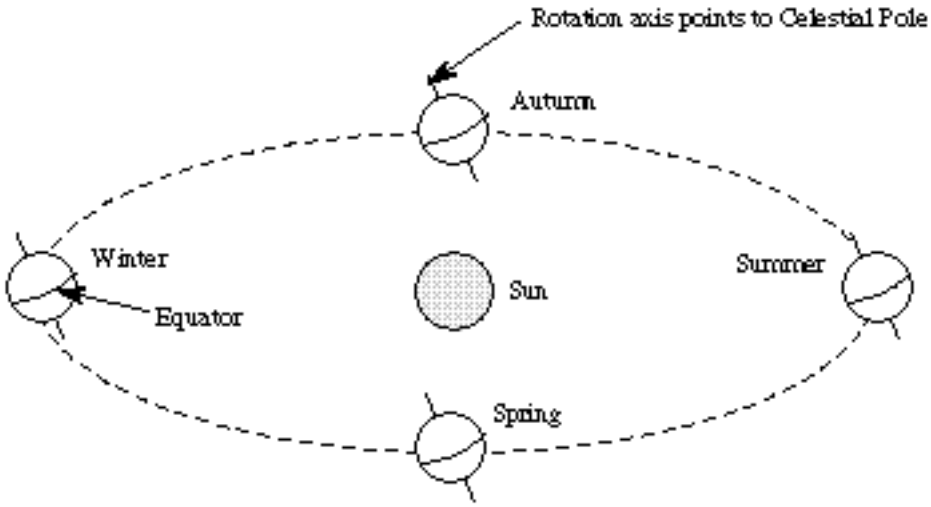
THE EARTH HAS A TILT

- Collect suggestions from the group. Is it something to do with the equator, the North Pole, the South Pole, the axis?

- Introduce the orange again but show that the axis of the Earth is not up and down. It is tilted.

- Suggest that the experiment is repeated. Invite new volunteers. And invite predictions as to what is going to happen.

*NB Throughout the activity, make sure that the torchlight is always shining on the Earth. Birthday boy/girl must make sure that the tilt of the axis never changes orientation:



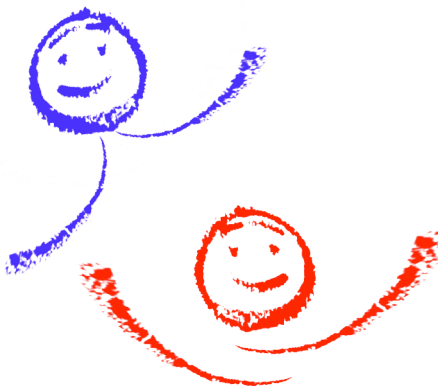
- Repeat the experiment and this time observe the flag.

- S shines the torch on the tilted orange.

- Turn the orange all the way around. Notice how the flag is in the light only for a short period of time? That is why the northern part of the world has short days and long nights. This is the winter in the North.

- Keep the axis of the orange tilted in the same direction and go a quarter turn to the left around the torch. See how the light now falls on both poles. It is spring in the North. Days are getting longer. Do you notice how it is not so dark anymore when you go to school?

- Without changing the tilt of the axis, go another quarter turn to the left around the torch. Now you are halfway around the circle. See how the North Pole is tilted towards the light. This is summer time in the Northern hemisphere.



- Keep moving another quarter turn to the left. Again, light is falling on both the North Pole and the South Pole. It is autumn in the North. The days are getting shorter again and cooler.

- Move back to where you started. There is less light in the North again. We are back in the winter.

Extension

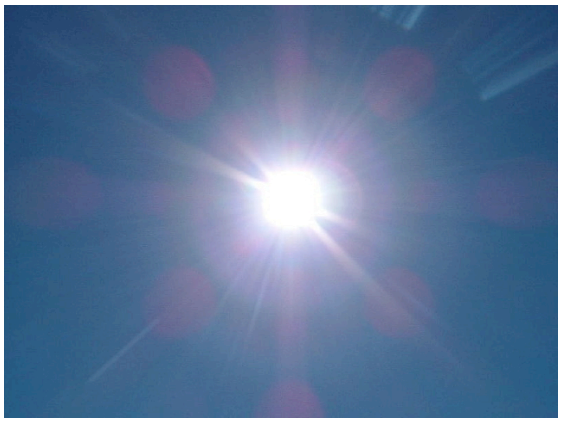
Imagine what it would be like living on the equator, in Congo for example.

Put a pin on the equator and repeat the year revolution. The pin gets the same amount of light in summer, winter, spring and autumn. Does the temperature stay the same all year round?

Source: UNAWE International

Activity #3

SUNLIGHT = HEAT



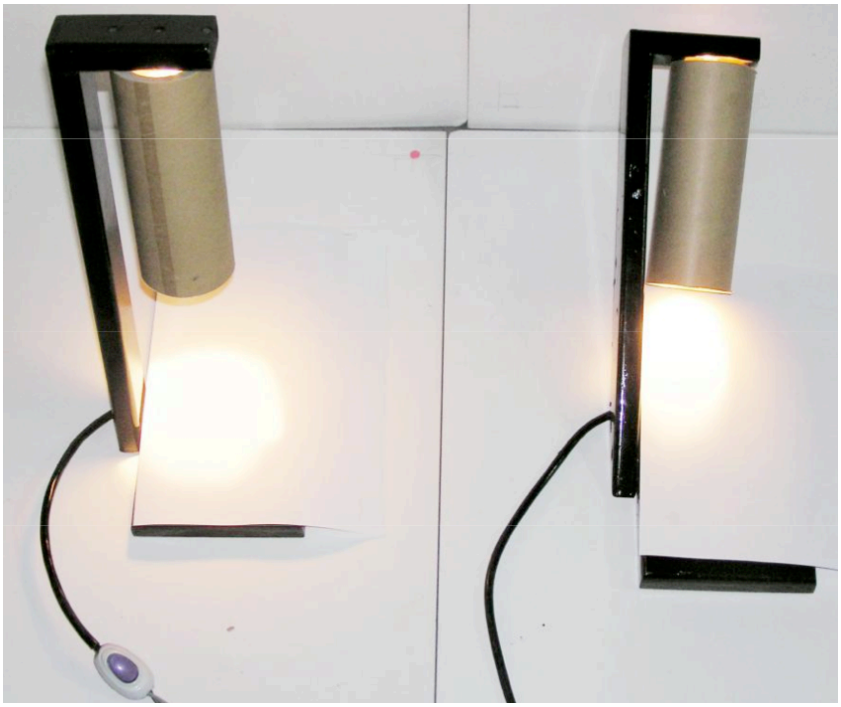
To demonstrate the heat of the sun and the way it changes its intensity, we will demonstrate the light shining on the equator and the light shining at an angle.

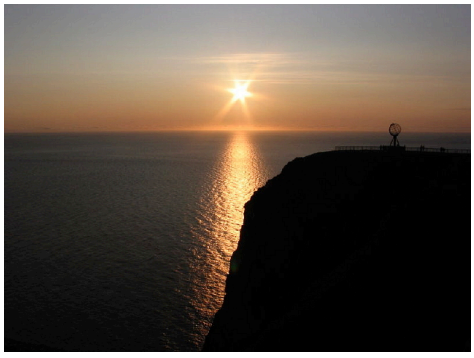
Requirements
2 desk lights with flexible arms
Two identical saucers
Some butter
Tubular shades so that the light can be focused

- Place the 2 lights above the saucers. One light should be pointed directly down. This is the angle at which the Sun hits the equator.

- Place the other light with the beam hitting the other saucer at a tilt of about 25 degrees. This is the way the Sun hits the Northern hemisphere.

- Place a dab of butter in both saucers and watch. The butter at the 'equator' melts quickest because the sunlight is more intensely directed there. The sunlight that reaches the butter in the 'Northern hemisphere' is spread over a wider area and is less intense.





Source: UNAWE Tunisia

The Structure of the Universe

In most primary schools there are places where kids can dress up or build things, places on windowsills where they can watch things grow, boards to exhibit artwork, corners to read or draw in. Why not make a Universe Corner?

The Universe Corner introduces children to the fact that the universe is full of amazing and mysterious things: other planets, other moons, millions of stars, meteors, comets, black holes, even other galaxies beside our own Milky Way. Don't just take the word of the scientists. Images from deep space now show us the astonishing beauty of the universe.

Introduce your students to these images and create versions of your own.

Emphasize to children that nobody has ever travelled beyond the moon to the other planets and thus the information we have about the universe is incomplete.

We are used to seeing the world in visible light. But there are many other types of light. If the doctor wants to see if you have a broken bone you have an X-ray taken: a picture taken using only that type of light. The X-rays can pass straight through your skin but they cannot pass through your bones, so they make a picture of your bones.

There are also other types of light: gamma rays, ultraviolet, infrared, microwaves and radio waves, which we cannot see with our eyes. Telescopes use this invisible light to take pictures of things far away; much further than we can see. Imagine that! These pictures are very beautiful but they don't tell the whole story.

The Elephant in the Dark

Tell children the story of the 5 blind men feeling an elephant and trying to describe what they feel.

The first blind man grabbed the elephant's trunk. He said, "Aha! So an elephant is like a snake." The second blind man, holding one of the elephant's legs said, "Oh, no, it's like a tree trunk." The third grabbed the elephant's ear and said, "How can you say that? An elephant is clearly like a fan." The fourth, clutching the animal's tail, said, "No, no, no! The elephant is a like a rope." The fifth, climbing up the side of the elephant, said, "You're all wrong! The elephant resembles a small hill.

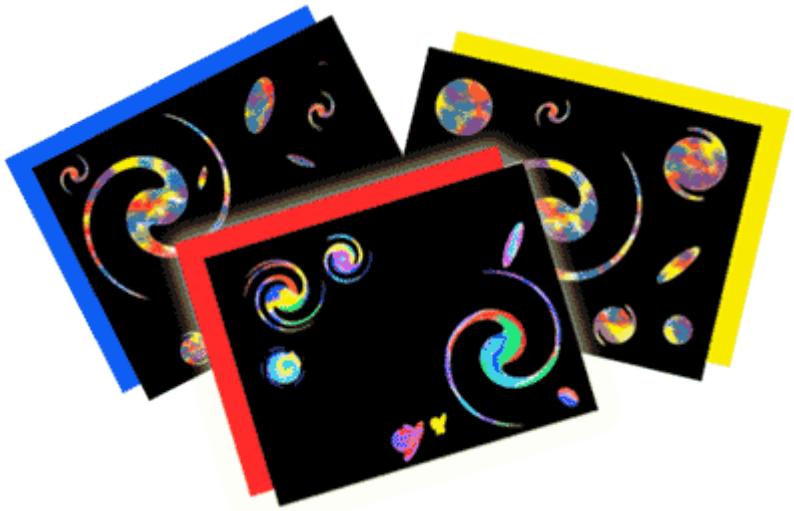
That is what space is like.

We don't really know what the universe looks like. Even the cleverest scientists have to take the bits of information they know and then use their imaginations to make a complete picture.

Let your kids interpret the universe. The following techniques introduce children to the beautiful shapes and objects we know exist in the universe. Make them, experiment with colours and textures and then add them to your Universe Corner.

Activity # 1

MAKE A GALEX GALAXY MONTAGE



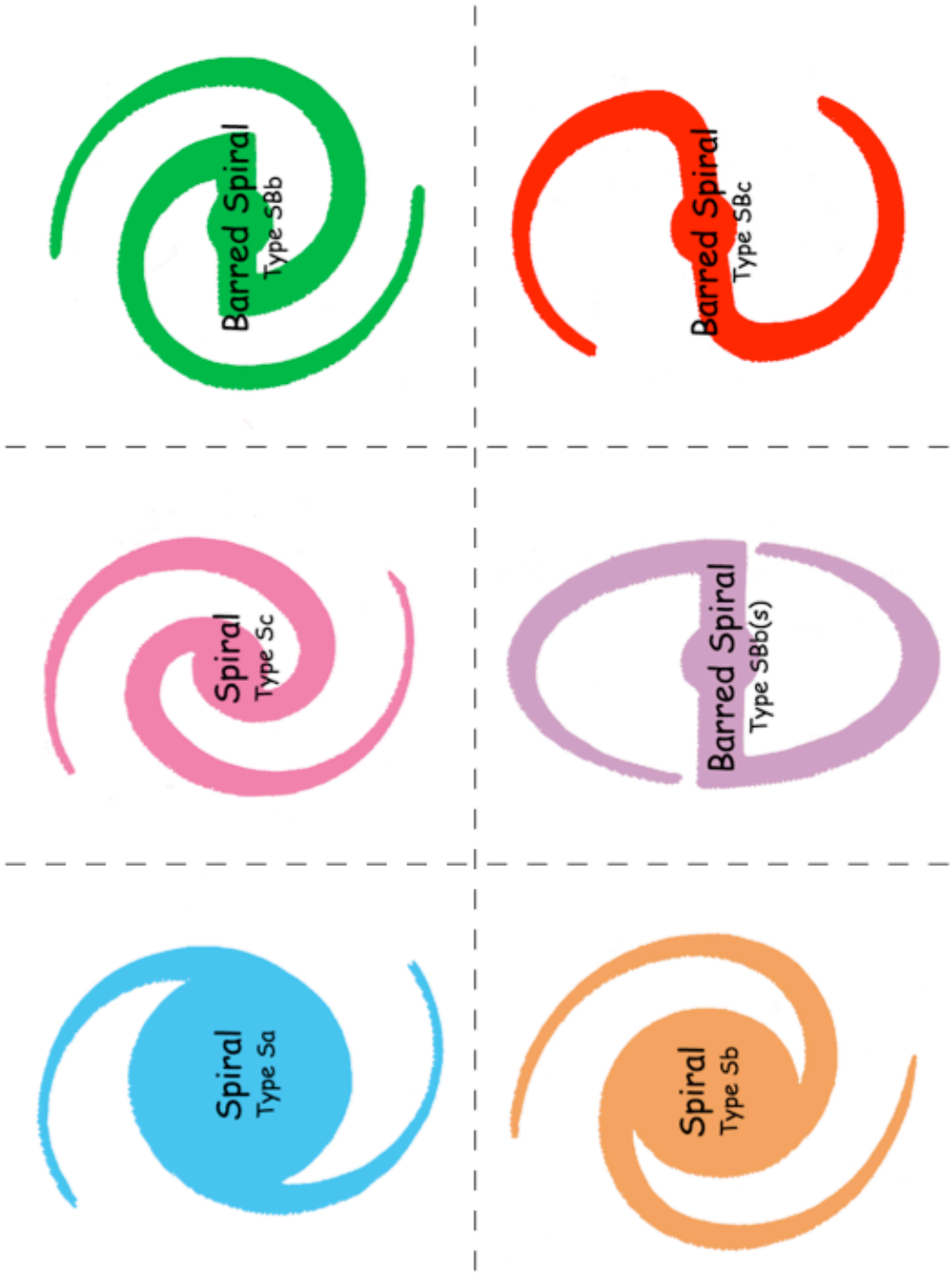
Make a colorful work of galactic art using coffee filters, markers, and construction paper. It will remind you of the

beauty of the night sky and the great variety of shapes the galaxies take.

Requirements
Coffee filters, any size.
One large sheet of black construction paper
Water colour marker pens (not permanent markers)
Water in a cup
Plastic sheet to protect table (a garbage bag works fine)
Straw
Scissors
Glue
Glitter
Patterns for galaxies

- Using the water-color markers, draw on the filters colorful planets, moons, stars and comets; all objects that make up galaxies.
- Spread out the plastic sheet to protect table or floor, and lay the coffee filters on it
- Use the straw to dribble a few drops of water on your pictures. The water will make the colors run together in lovely ways.
- When the filters are dry, cut them into galaxy shapes. (See Below).
- Arrange your galaxies on the sheet of black construction paper and glue them down
- Add some blue glitter highlights to your galaxies. The glitter represents thousands of new-born stars.

Source: NASA Space Place
http://spaceplace.nasa.gov/en/kids/galex/art.shtml


Barred Spiral
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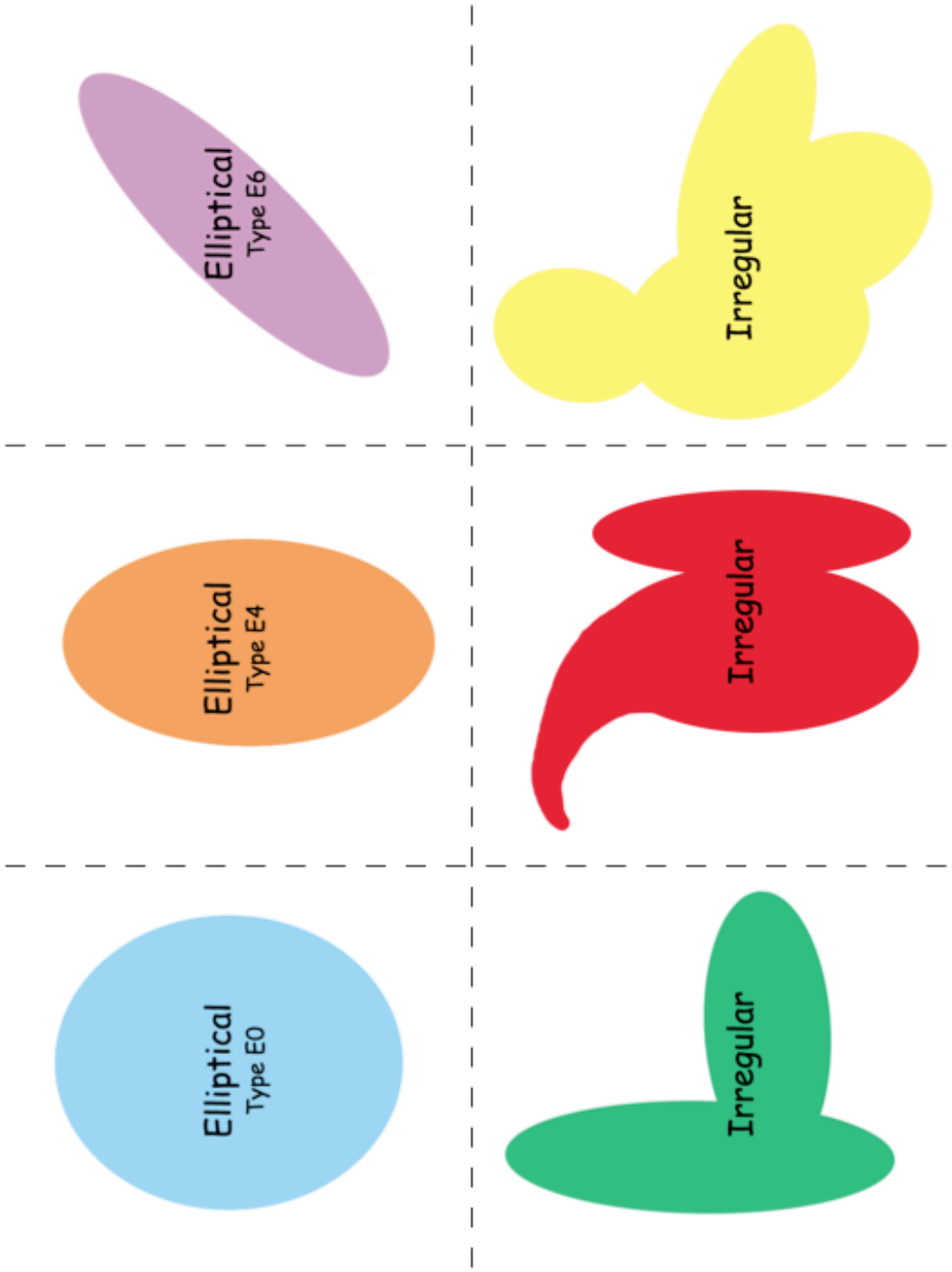


Images from http://spaceplace.nasa.gov/en/kids/galaxies.pdf)

Activity # 2
RECIPE FOR A GALACTIC MOBILE

Requirements
A large cardboard disk
4 large sheets of thick black paper
Glitter
Glue
Paintbrush
Scissors
Thread (black is best) or fine nylon fishing line
A small, 4-holed button
A large, sturdy sewing needle
16 sequins or very small beads, black is best (optional)
Patterns for galaxies

- Cut the galaxy patterns out.
- Trace the galaxies onto pieces of thick black paper.
- Cut out the thick galaxies.
- Now decorate the galaxies with glitter. Imagine each speck of glitter is a star!

NB* Galaxies are brighter in the centre, becoming fainter at the edges or on the spiral arms.

- When you have decorated one side of each galaxy, let the glue dry.

- Turn them over and decorate the other side. Be sure to leave them lying flat until the glue is completely dry. Otherwise, the spiral arms will droop. (If they do, when they are dry you can set a heavy book on them for a while.)

- While you are waiting for the glue to dry, make the frame. Mark 12 points in the cardboard disk.

- Cut a length of thread and thread the needle. Tie a knot, sequin, or bead to the end. Draw the needle through the centre of the galaxy. Now poke the needle through one of the marks on the circle. Adjust the length of the thread so the galaxy hangs nicely, then cut the thread and tie a knot, sequin, or bead in the end.

- Make the galaxies hang at different levels, so they can turn freely without hitting each other.

- Gather three of the galaxies' threads and thread through one hole of the button. Do this for the other three holes.

- When all the threads have been gathered and threaded through the button you will be able to hang your Galactic Mobile from the ceiling.

Source: http://spaceplace.nasa.gov/en/kids/galex_make2.shtml

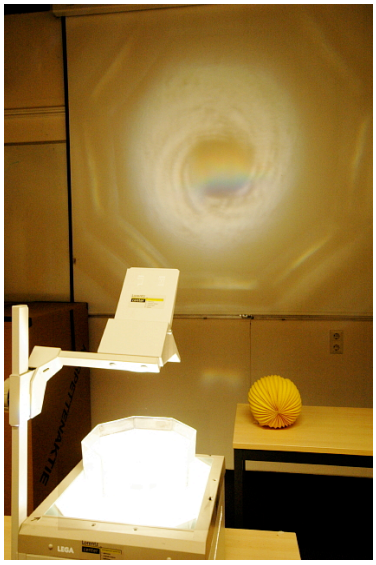
Activity #2
BUILDING SPIRAL GALAXIES

Requirements
A big flat-bottomed glass bowl
An old stocking
A spoon
Earth
Water
Projector

Stars group together, making galaxies of different shapes. Among the most beautiful ones are the spiral galaxies.
Have you ever poked at a sea anemone and seen it pull

itself in? The anemone is contracting.
Spiral galaxies are formed when gravity forces an enormous rotating cloud of gas and dust to contract.
What happens then? Millions of stars start to form.

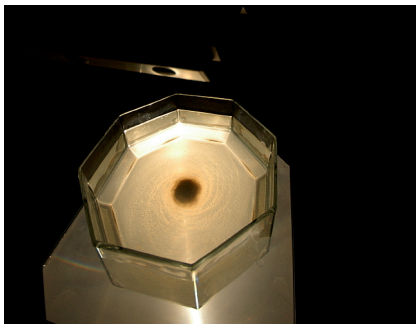
- Fill the bowl with water until it is almost full and put it on top of the projector so that the light is shining through it onto a screen.



- Put a dessertspoon of very dry earth into the stocking.

- Sprinkle the dry earth on top of the water using the stocking as a sieve. Make sure the earth falls in a fine shower.

- Stir the water in a circular fashion and then wait for it to settle.



Extensions

Try stirring the water in different ways and see what shapes are formed.
Try adding some pebbles and see what is the result.
Compare the shapes with images of real galaxies.

Source: UNAWE Venezuela