

Experiment 1:- The Dark Trail

Matariki Unit Lesson 3

Learning Intention : To understand why a nebula has dark areas.

Procedure:

1. Punch 2 holes in the index card as shown.
2. Tear off a piece of tape about 1 inch (2.5cm) long and place over one of the holes.
3. Face an open window that does not have direct sunlight.
4. Close one eye, and hold the card in front of your open eye. Look through each hole and observe the amount of light that you can see through the holes.

CAUTION: Never look directly at the sun. It can damage your eyes.

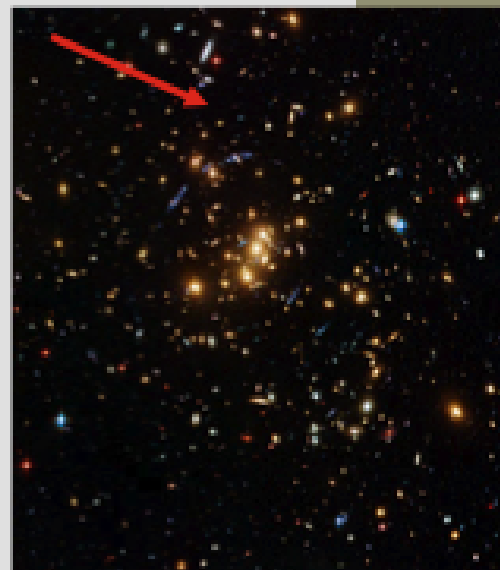
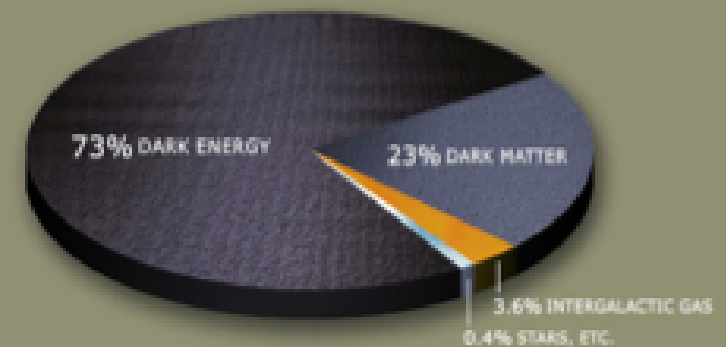
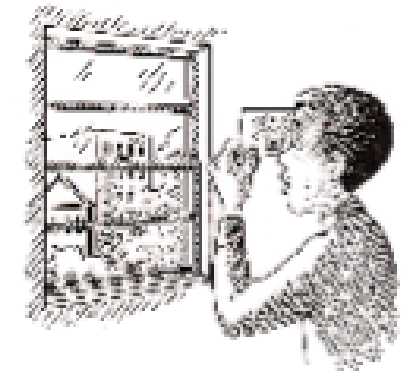
5. Tear off a second piece of tape about 1.5 inches (3.75 cm) long. Stick one end of the tape next to the covered hole. Loop the tape over the hole by supporting it with the point of the pencil and attaching the other end to the opposite side of the hole as shown. Remove the pencil.
6. Again, look through the holes in the card, observing the amount of light you can see through each hole.
7. Repeat steps 5 and 6 five times, increasing the length of tape by about half an inch (1.25 cm) each time and attaching each loop over the preceding one. The loops should not stick to each other.

Results:

The amount of light coming through the uncovered hole does not change, but the light coming through the covered hole decreases as each piece of tape is added, until little or no light can be seen.

Conclusion:

Interstellar dust is small particles of matter between celestial bodies. A nebula is a cloud of interstellar dust and gas spread across many millions of Kilometers in space. Like a nebula, the clear plastic tape in this experiment is



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Experiment 2:-

Daytime Stars

Learning Intention: To understand that the stars are always shining.

Procedure:

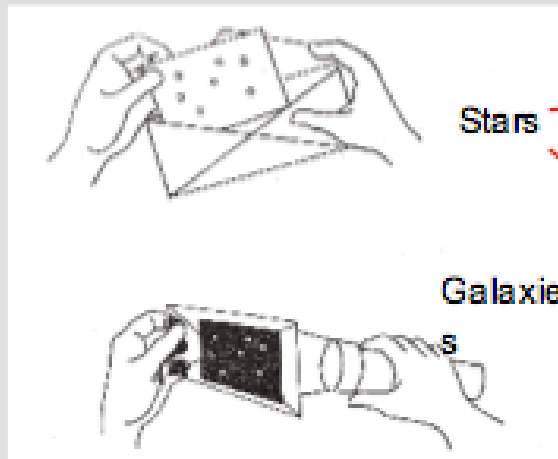
1. Cut 7 to 8 holes in an index sized card with a hole punch.
2. Inset the card into an envelope.
3. In a well-lighted room, hold the envelope up in front of you with a lit torch about 5cm from the front of the envelope and over the card.
4. Move the torch behind the envelope.
5. hold the lit torch about 5cm from the back of the envelope.

Results:

The holes in the card are not seen when the light shines on the front side of the envelope, but are easily seen when the light comes from behind the envelope and towards you.

Conclusion:

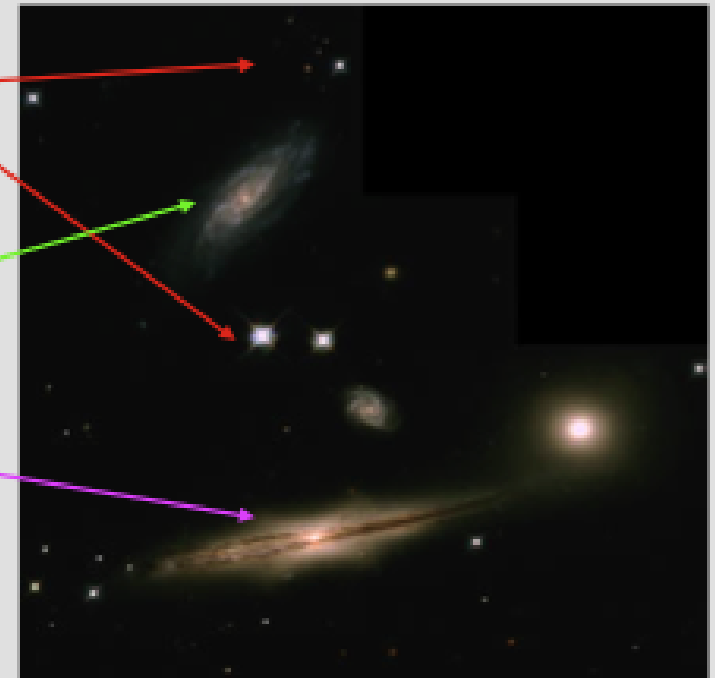
Light from the room passes through the holes regardless of the position of the torch but only when the surrounding area is darker than the light coming through the holes can they be seen. This is also true of stars. They shine during daylight hours but the sky is too bright from the Sun's light, that the starlight usually blends in. Stars are most visible on moonless nights in areas away from city lights. It is why observatories are often found in isolated places well away from street and car



Stars

Galaxie

Nebul
a



Stars and Moon seen during the day



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Experiment 3:- Darkness

Learning Intention : To understand why space is dark.

Procedure:

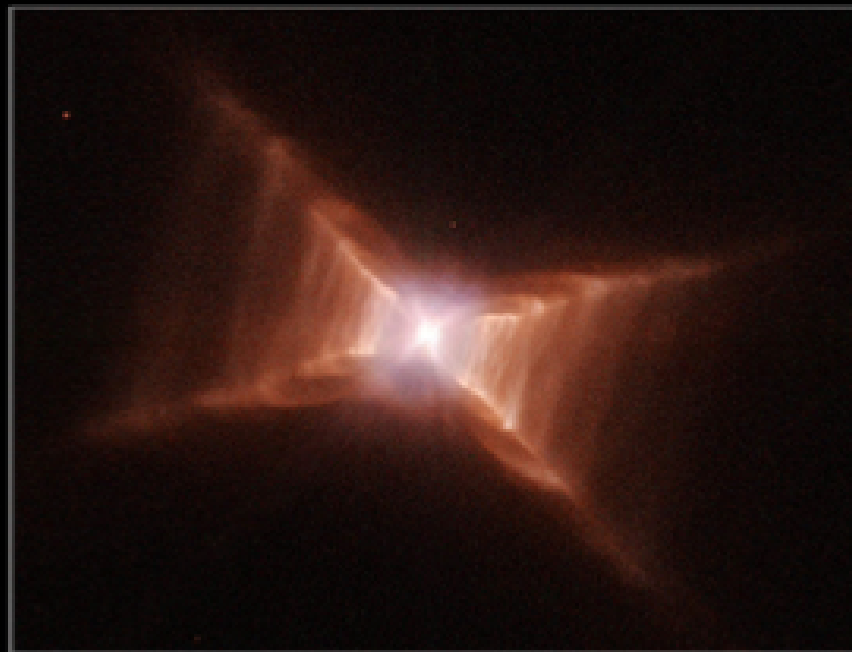
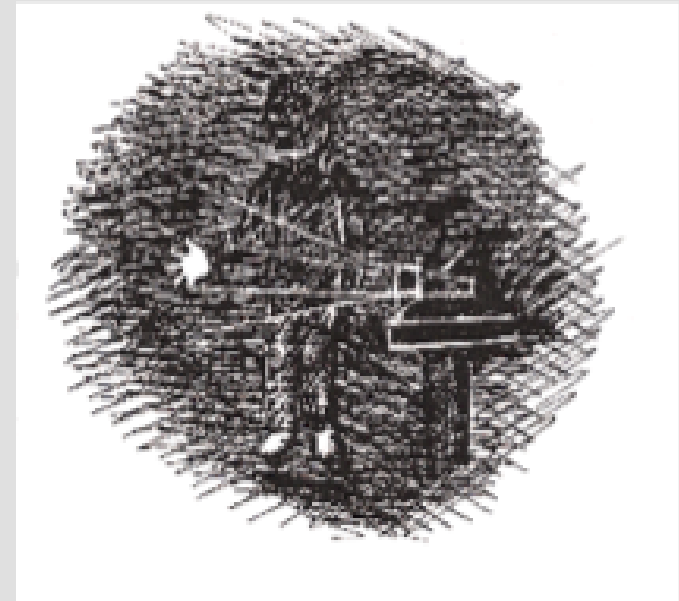
1. Place a torch on the edge of a table.
2. darken the room, leaving only the torch on.
3. Look at the beam of light leaving the torch and try to follow it across the room.
4. Hold your hand about 30cm from the end of the torch.

Results:

A circular light pattern forms on your hand but little or no light is seen between the torch and your hand.

Conclusion:

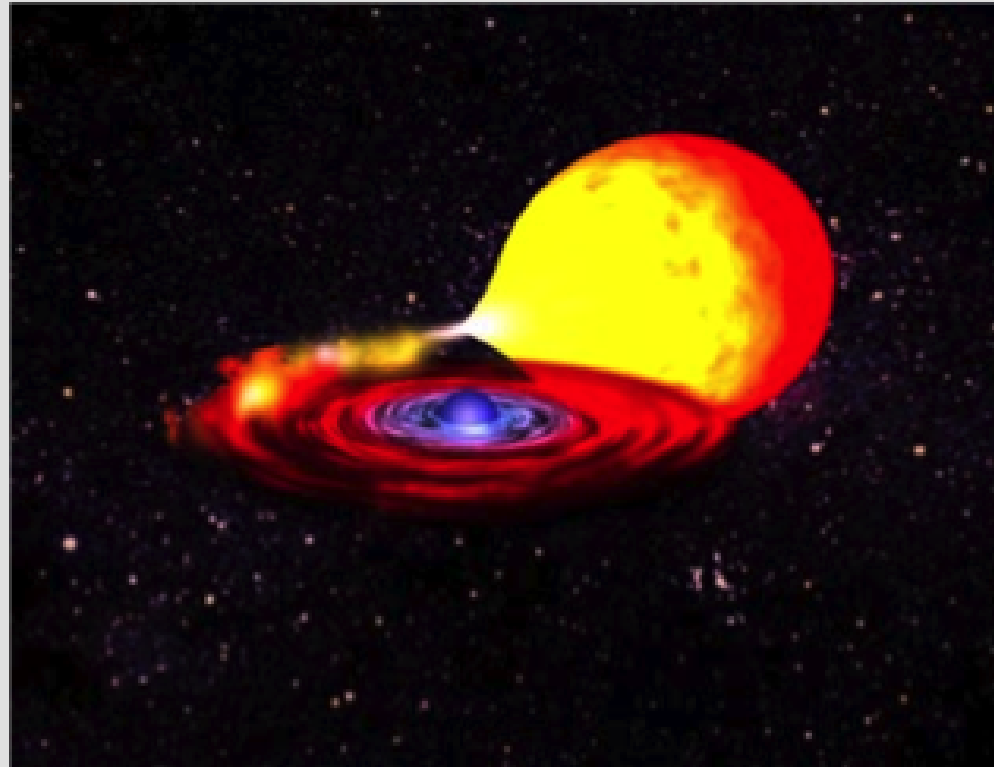
Your hand reflected the light to your eyes making the beam visible. Space is dark because there is nothing to reflect the light. Light is only visible when it is reflected.



Proto-Planetary Nebula - Red Rectangle - HD 44179
Hubble Space Telescope - WFPC2



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Neutron star (blue) draws nuclear fuel
from its companion star (yellow)

With ESA's space telescope XMM-Newton,

Neutron stars are among the densest objects in the Universe. They pack the mass of the sun inside a sphere 10 kilometres across. A sugar cube-sized piece of neutron star weighs over a billion tonnes. Neutron stars are the remnants of exploding stars up to eight times more massive than our Sun. They end their life in a supernova explosion and then collapse under their own gravity. Their interiors may therefore contain a very exotic form