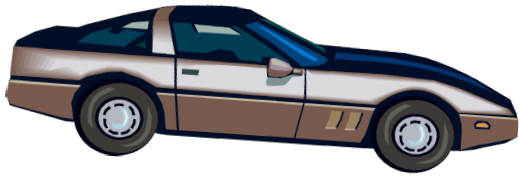
Sunlight

and space travel

Distances

- If you drive on a motorway at 70 miles per hour
  - in one hour you may get to Stafford.
  - Steady speed!
- If you keep on driving after 3 hours you would reach London.
  - Steady speed - no stops!

If we could keep on and on - -

- If you could drive to the Moon
  at 70 miles per hour,
  230,000 miles or about 400,000 km
- it would take you 3400 hours,
- or 140 days.

Light and heat comes from the Sun

- It is a long way away!

  146 million km or 93 million miles

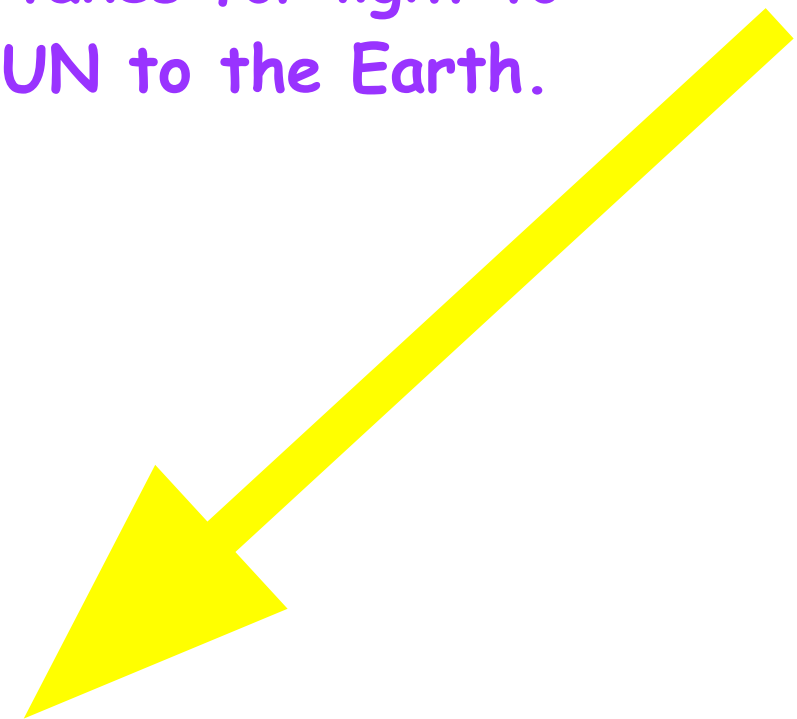
- If you could drive to the Sun at 70 miles per hour it would take over 50 000 days.

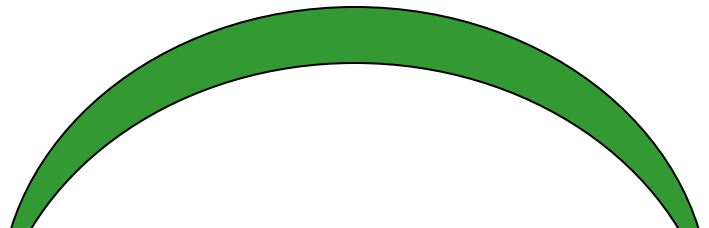
  = 150 years

  – *longer than we live!*

Light travels very, very fast!

- Guess how long it takes for light to come from the SUN to the Earth.
  - *8 years*
  - *8 days*
  - *8 hours*
  - *8 minutes*





It takes

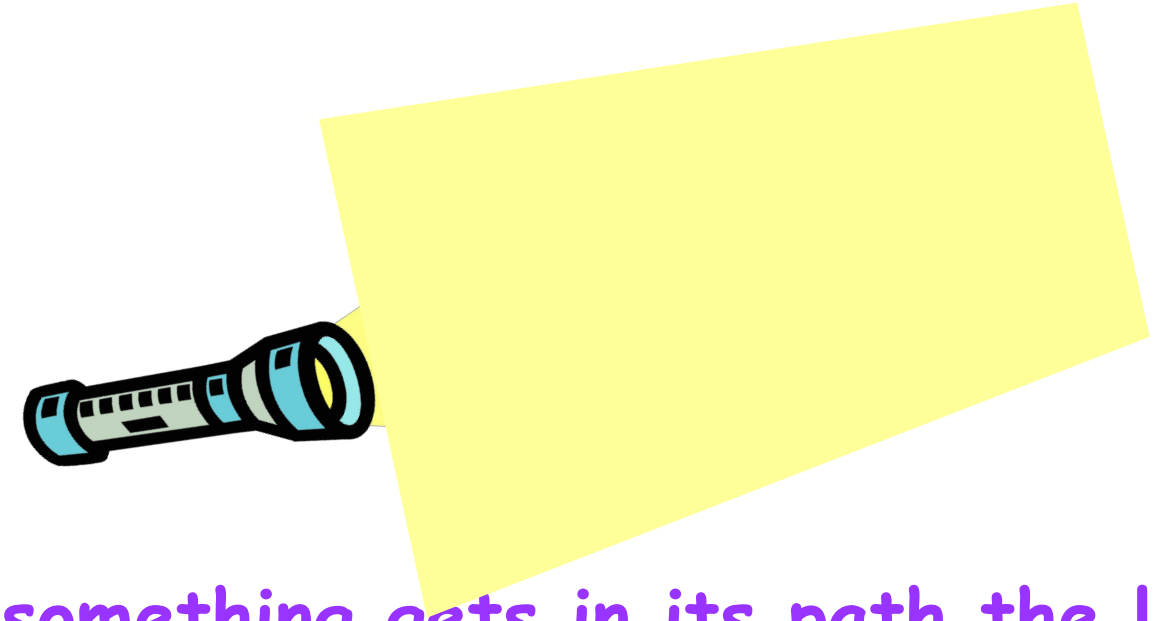
8 minutes

for light to reach us from the Sun!

Light travels 300 000 kilometres through space every second!

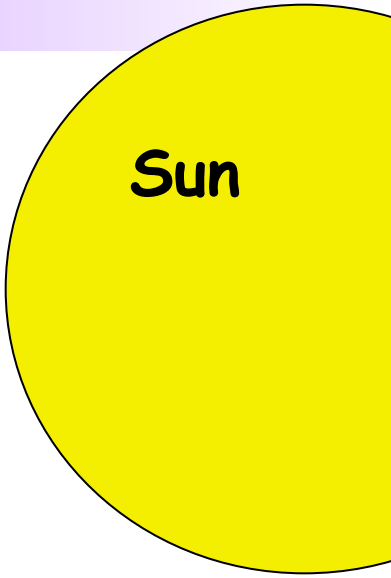
Shadows

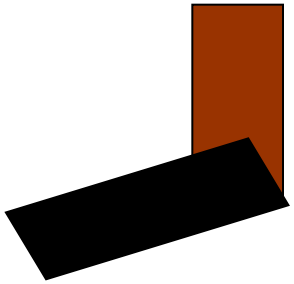
- Light travels in a straight line.



- If something gets in its path the light is blocked.
- A shadow is formed.

Shadows





- How do they form?

We can make shadows!

- by blocking out the light.

Changing positions varies the size of the shadow.

If you are close to the lamp,
the shadow is large.

If you are close to the screen,
the shadow is smaller.

Day and Night

A day + a night = 24 hours

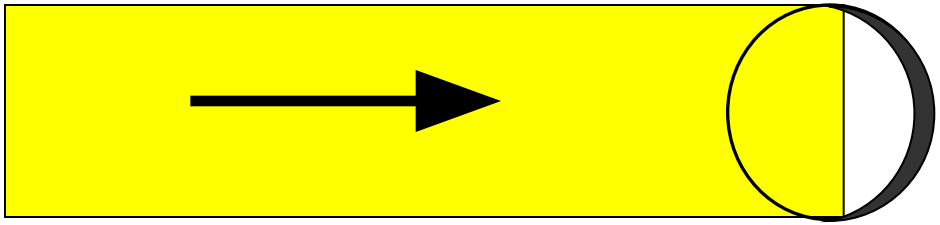
365 of these makes 1 year.

The Earth takes 1 year to orbit the Sun.

(What does 'orbit' mean?)

The Earth is a ball (or sphere)

The Sun cannot shine on both sides of the Earth at the same time



- Some of the Earth is bright - day
- Some is dark – night
- The Earth spins so each part has day and night.

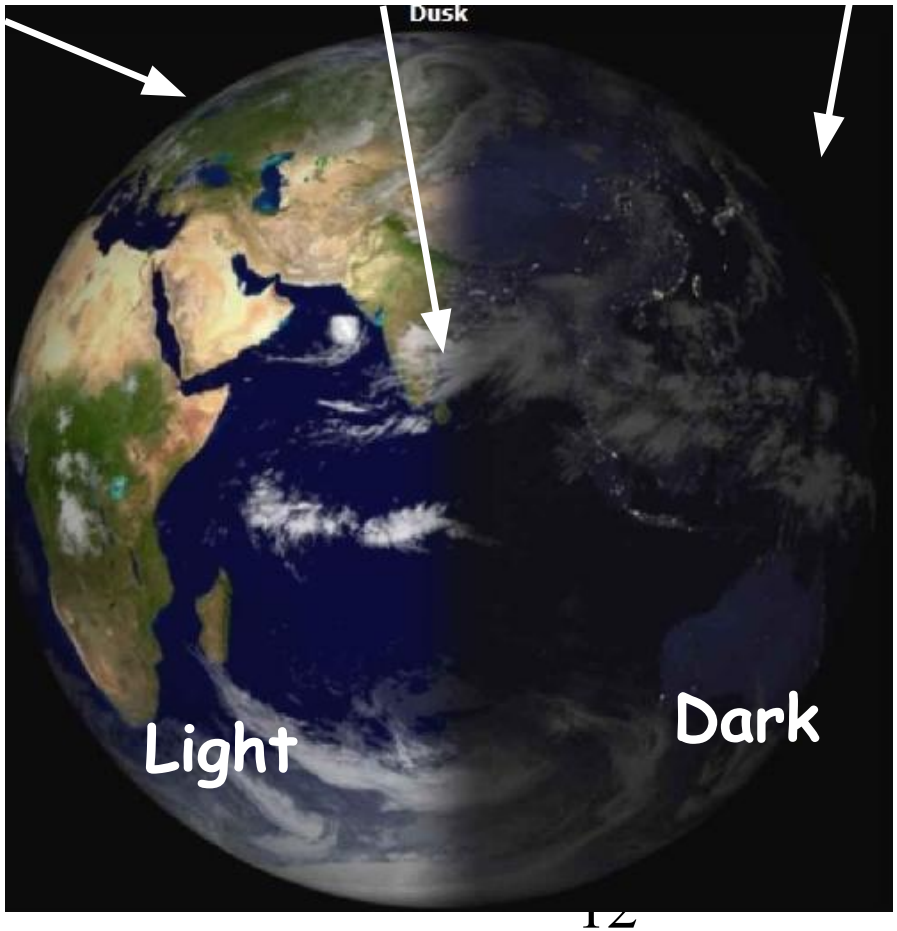
Day and night

Daylight in the UK

Light from the Sun

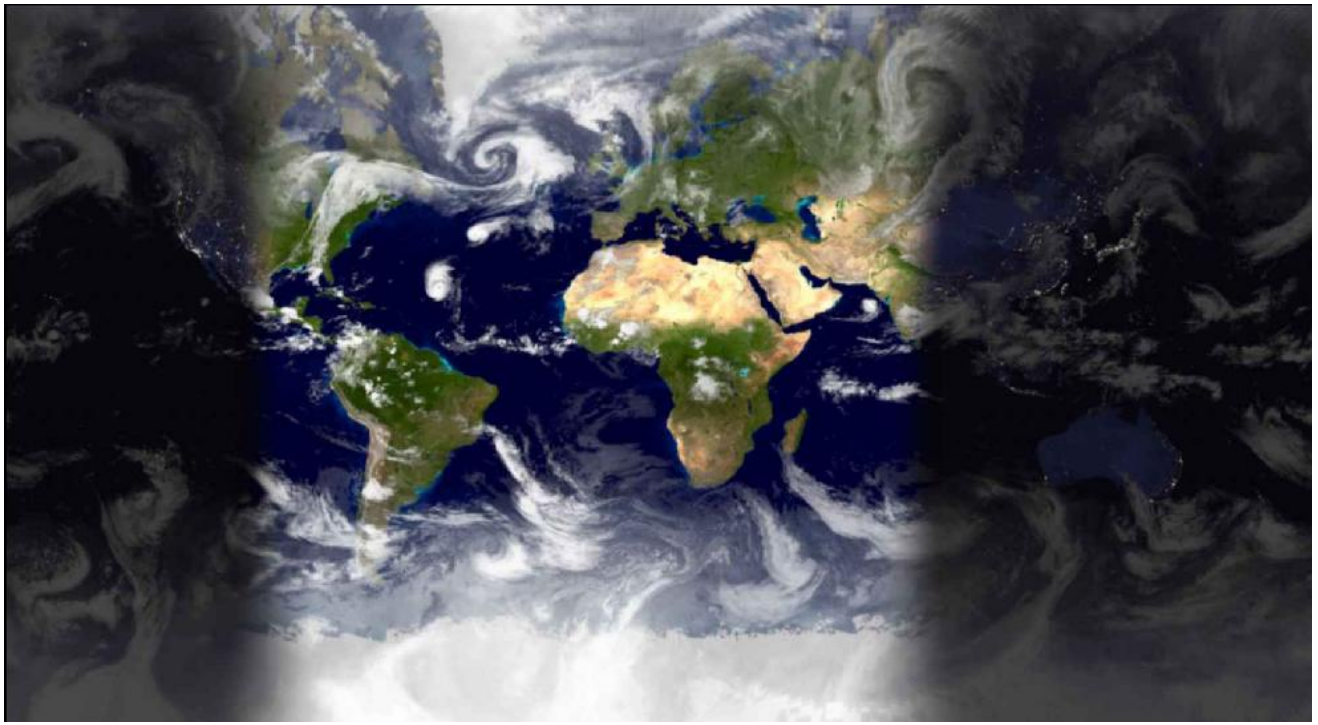
Dusk in India

Dark in China



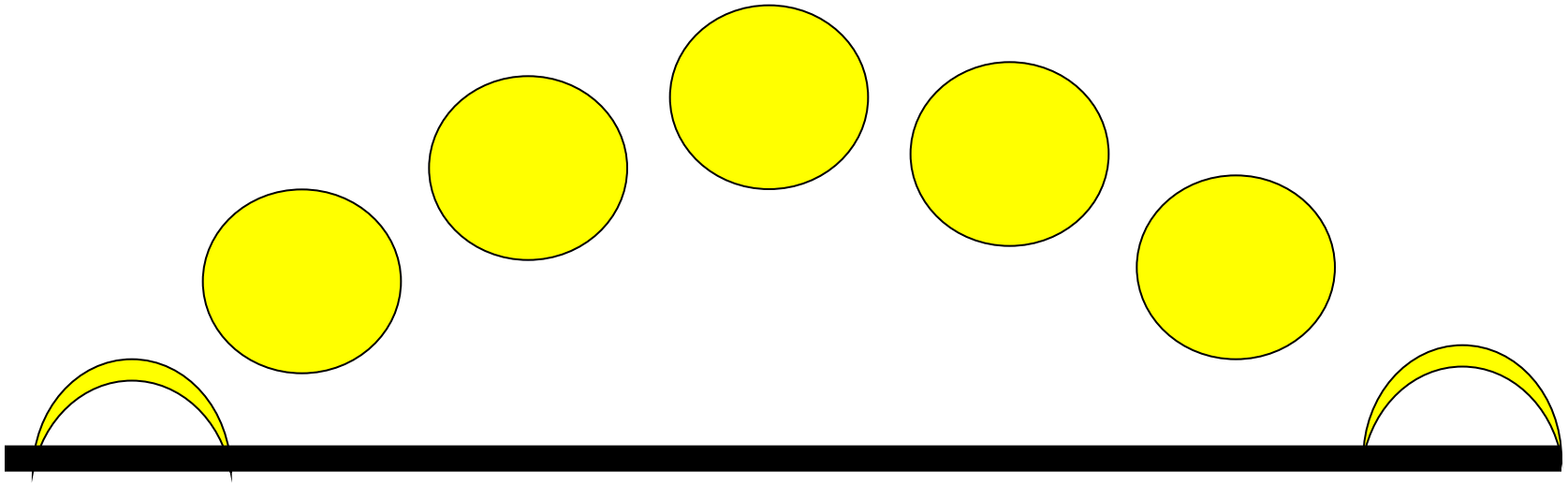
At midday here

- It is dawn in the USA
- It is dusk in India



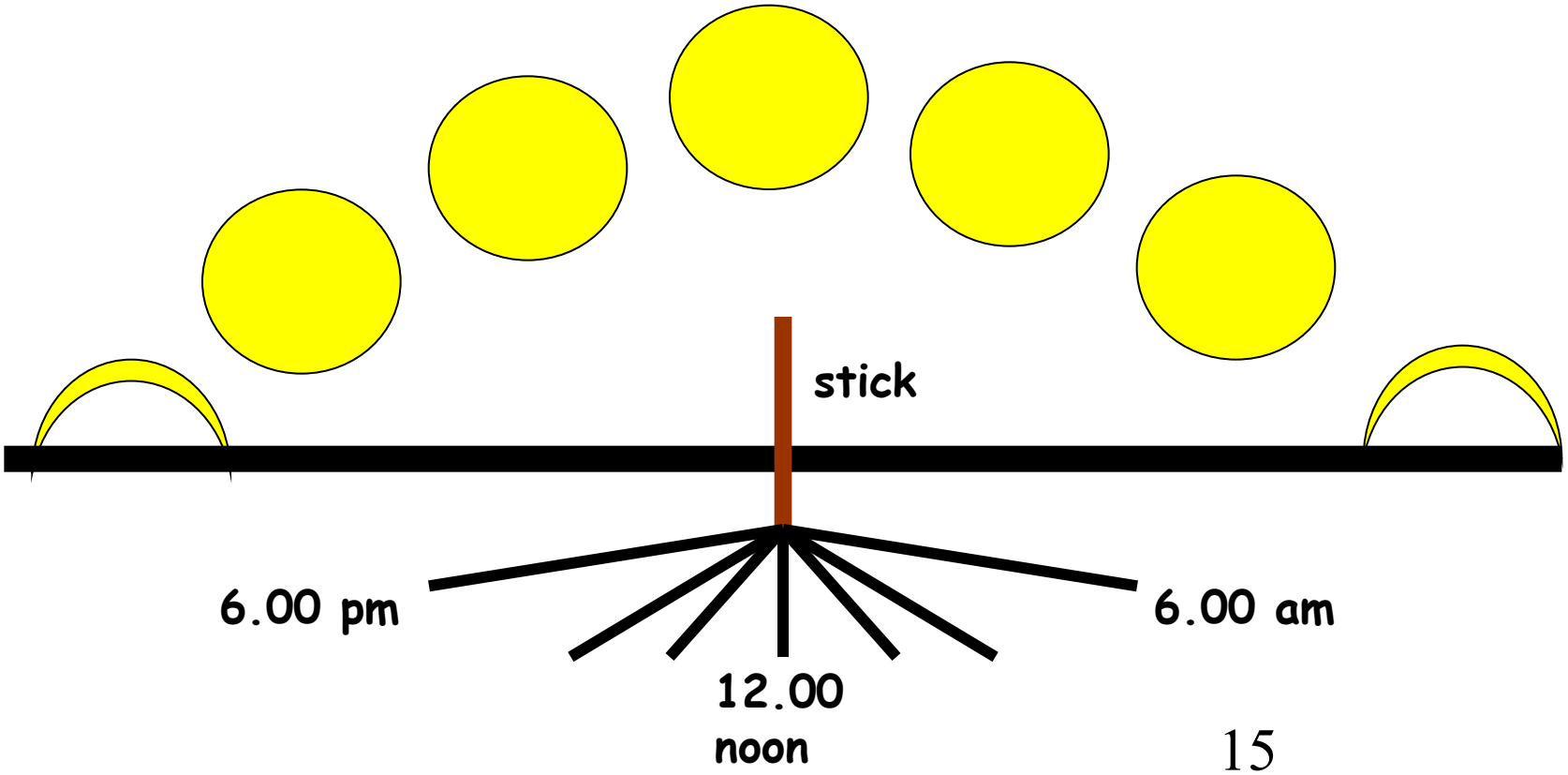
As the Earth spins the position of the Sun varies.

- Morning – the sun rises - it is light.
- The Sun gets higher in the sky.
- Then the Sun sinks and sets.



Shadows move during the day

- Watch the shadow of the stick
  - to tell the time
  - like a sundial.

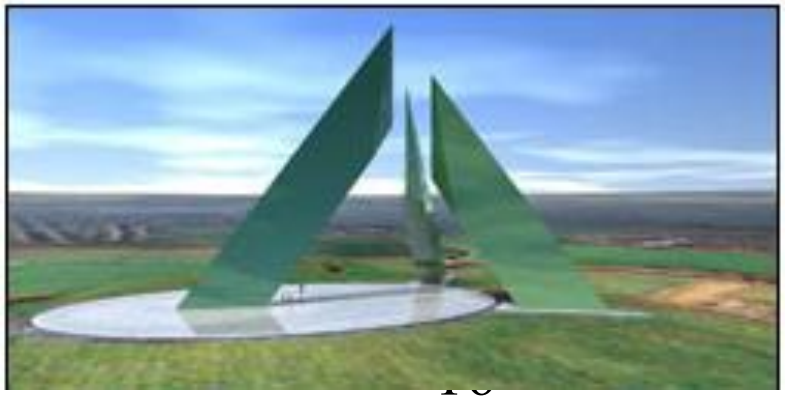


The Sun appears to move across the sky

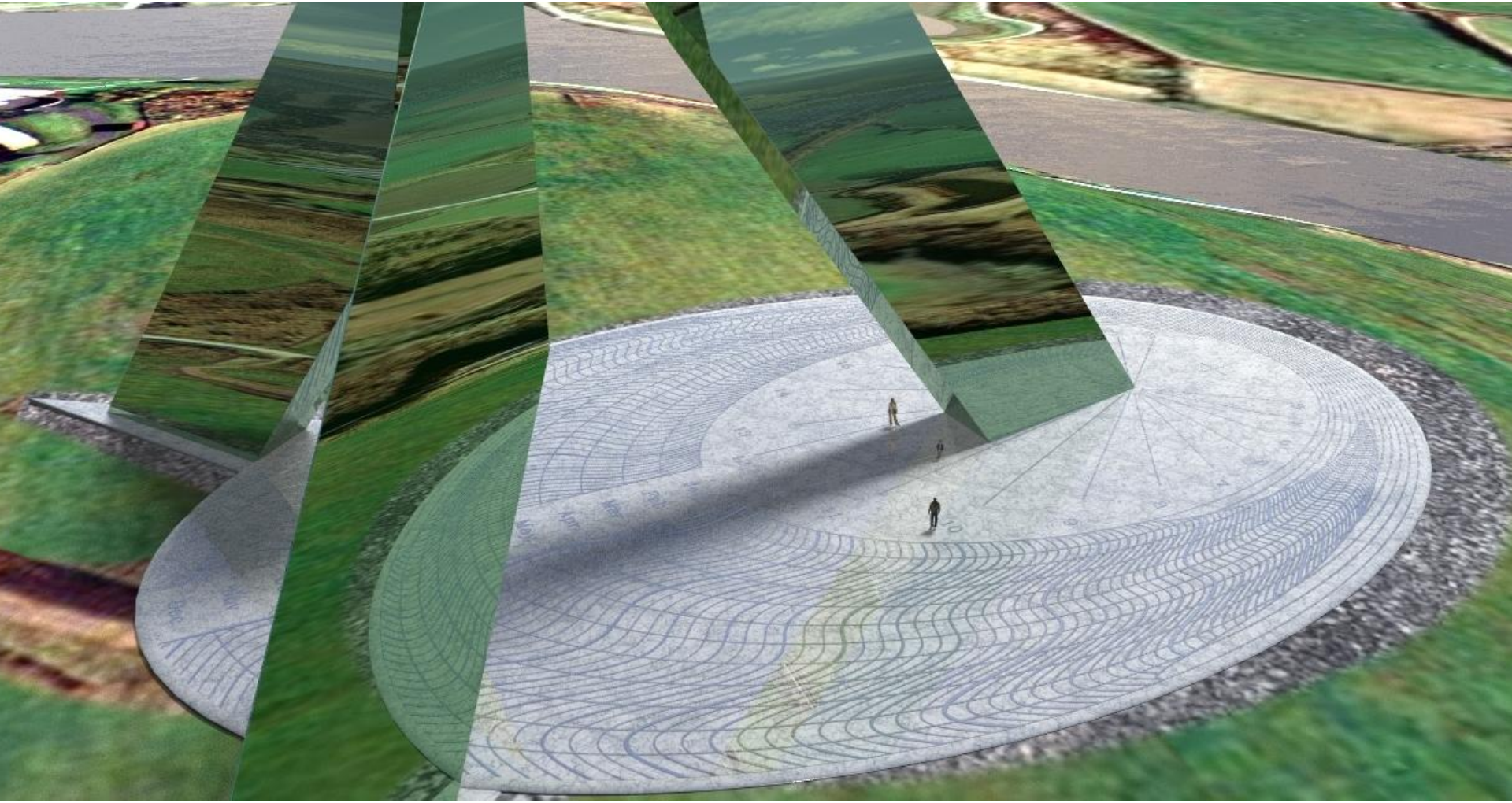
as it moves shadows move.

- A stick in the ground has a shadow.
- A sun dial uses this.

- The solar pyramid is like a huge stick.
- Its shadow moves to show the time.



The Solar Pyramid will act as a sundial

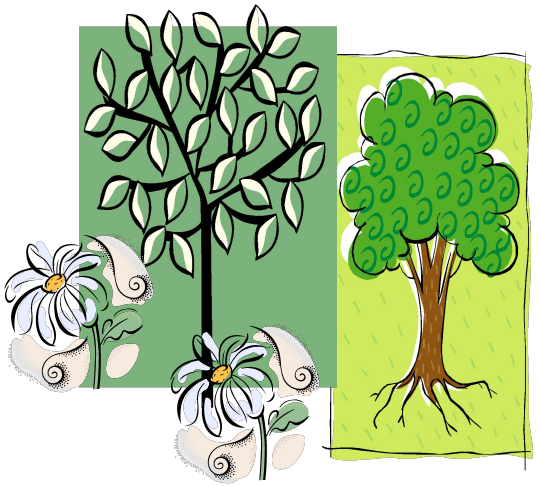


The seasons:

the Sun provides light and heat but -

- winter is cold

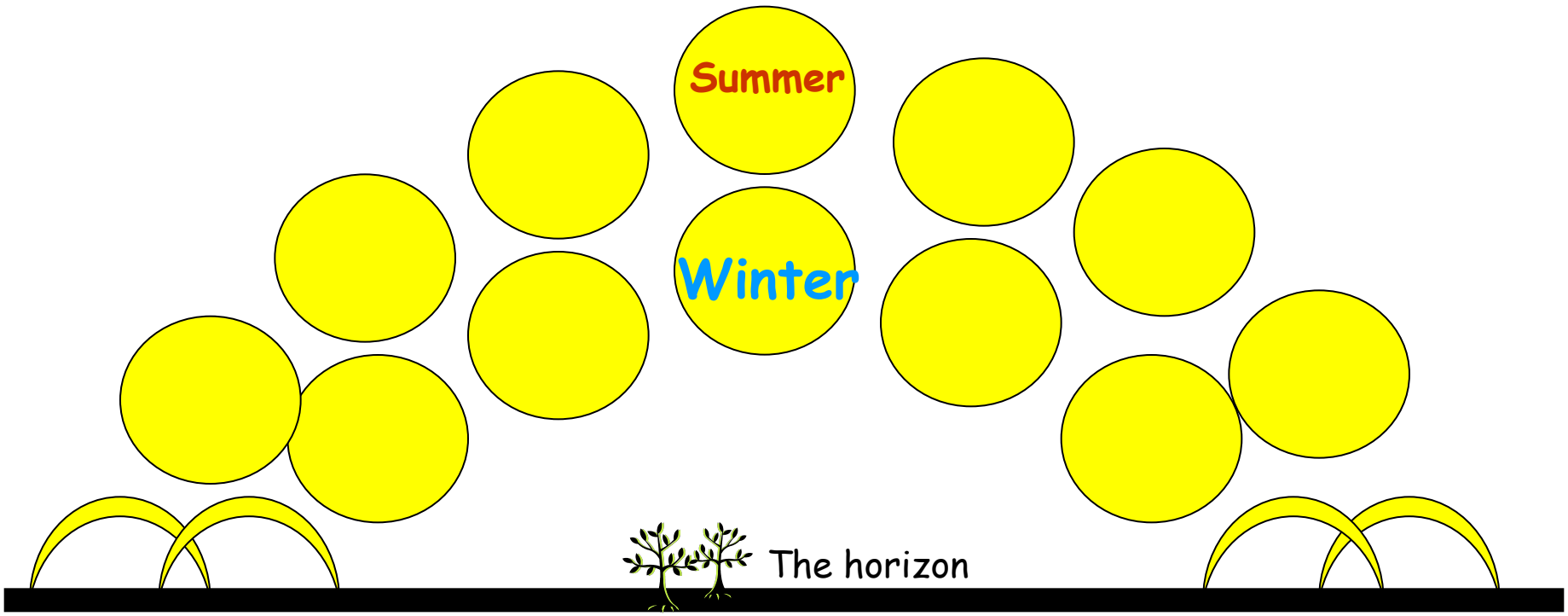
- summer is warmer



- **What causes this?**

Summer and winter

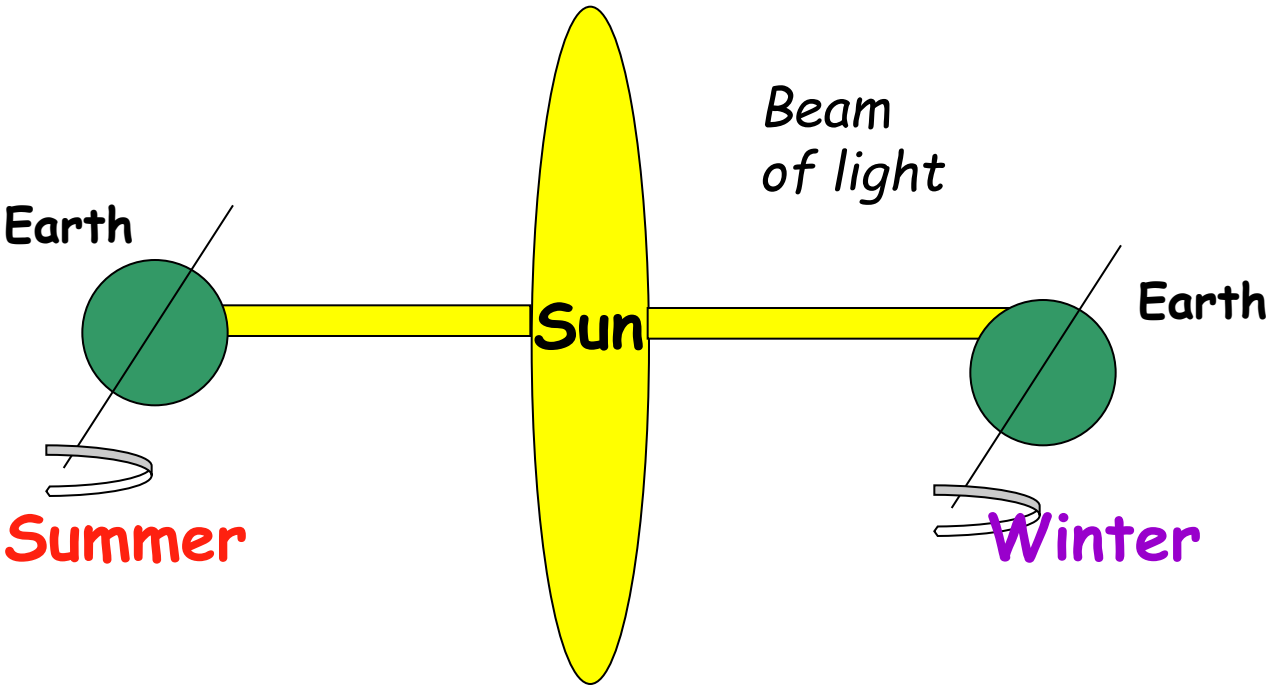
- In winter the Sun stays low in the sky.
- In summer the Sun rises higher in the sky.

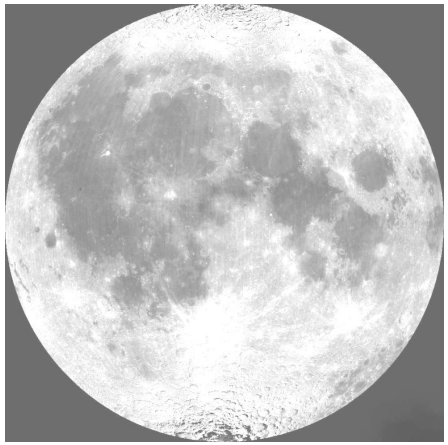


Summer and winter

- The earth is tipped as it spins
- Light and heat reach the Earth at different angles in summer and winter
- In winter the light and heat from the Sun is more spread out than during the Summer.
  - It feels colder

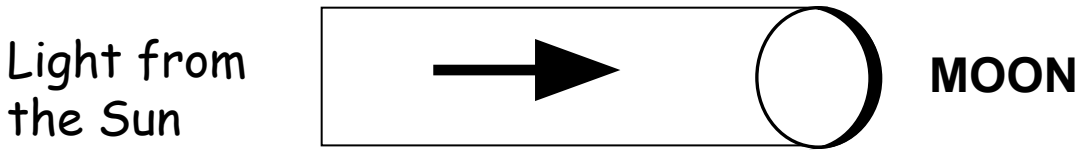
We can try an experiment.



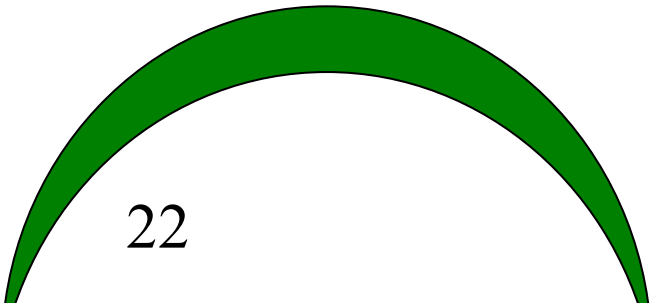


The Moon

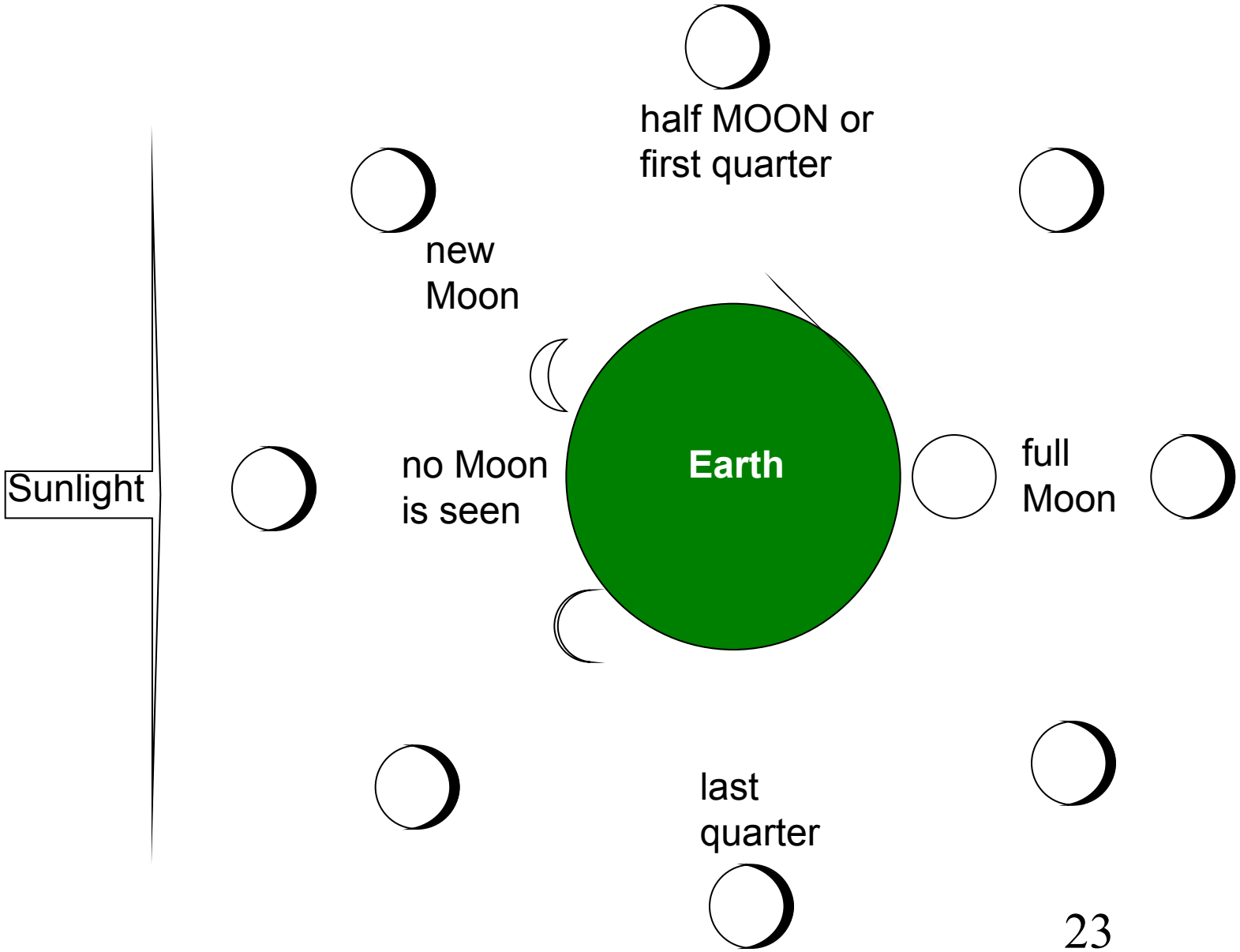
- The Moon is not a source of light.
- Light from the Sun shines on the Moon. Some light is scattered so we see it on Earth.



- The Moon takes about 28 days to move round the Earth.
- It always shows Earth the same side.
- The shape we see changes during the 28 days- a lunar month.



The Moon travels round the Earth



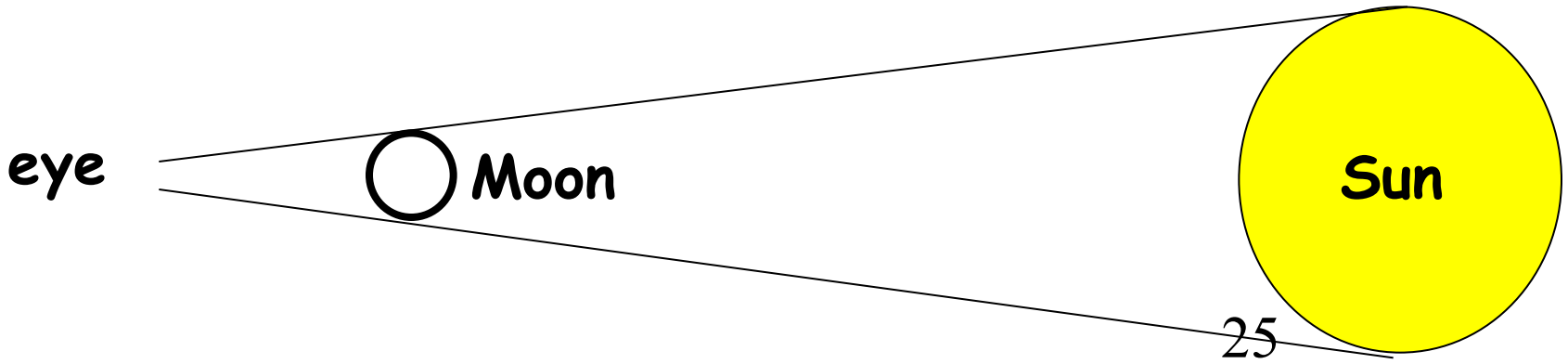
Bad astronomy in films

What is wrong with –

- the Moon looking the same for 3 or 4 nights?
- lots of stars visible at full Moon?
- showing lots of stars out of the window of a brightly lit room?
- the shadow line at Sun-rise looking sharp?

The Moon

- The Moon is very much smaller than the Sun.
- But the Moon is very much closer than the Sun.
- They both look the same size in the sky.

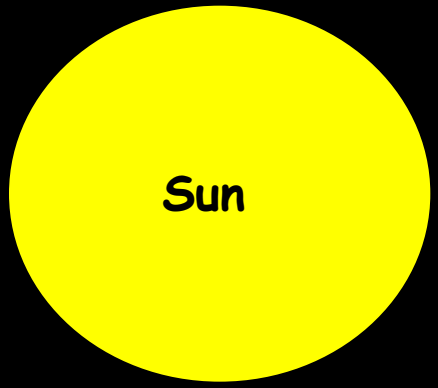


Sometimes the Sun does not shine during the day.

- Even when it is not cloudy!

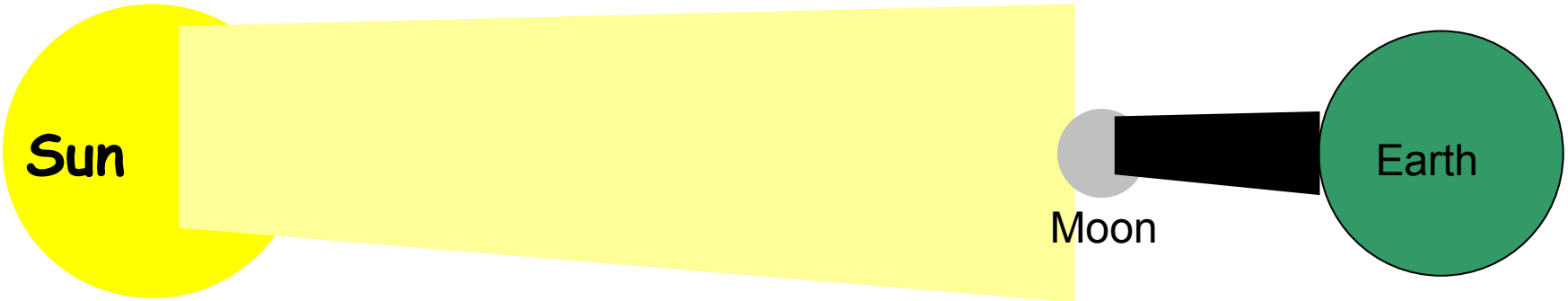
NASA

- Let us play a game.
  - Shut one eye
  - Hold the Moon card so that you cannot see the Sun.

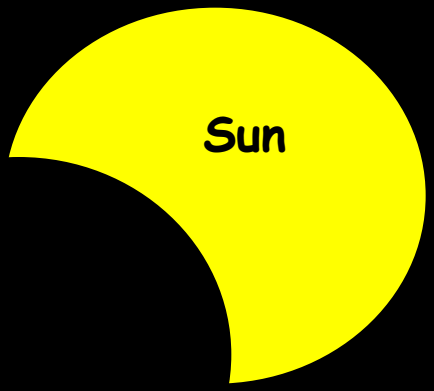

Sun

An eclipse of the Sun

- When the Moon stops the light from the Sun reaching the Earth
- We call it an eclipse.
- During an eclipse, it goes dark in the middle of the day.
- An eclipse of the Sun is rare and happens at a new Moon.



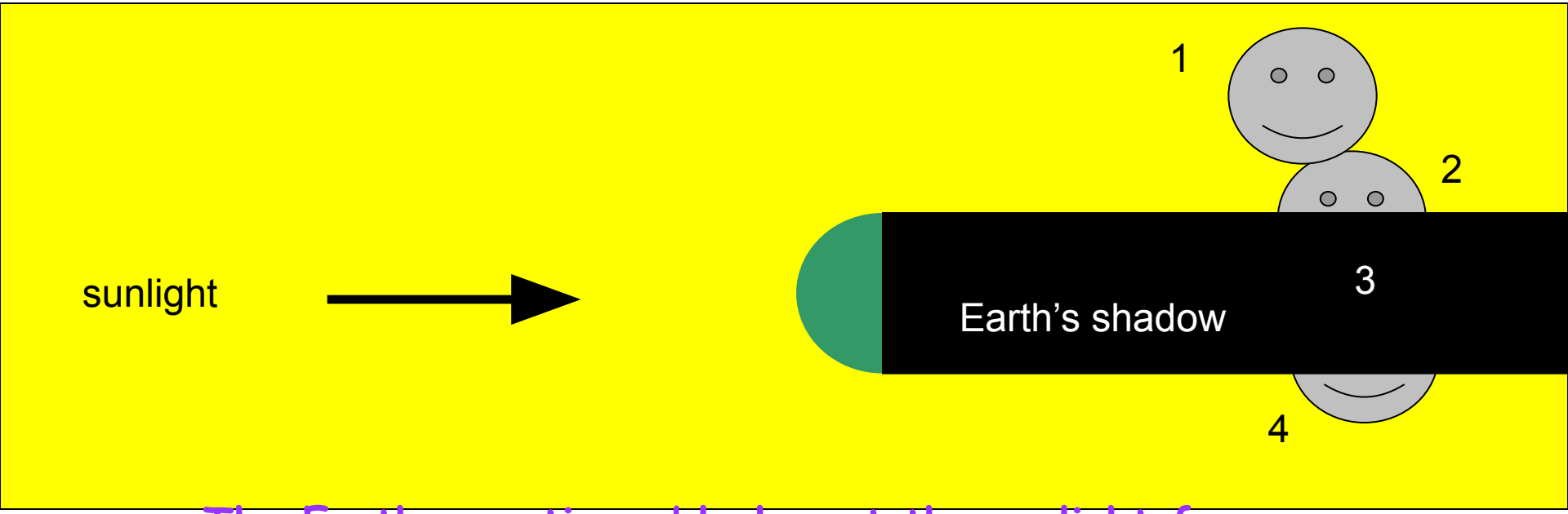
A partial eclipse is when the Moon does not cover all of the Sun.



This happens much more often than a total eclipse.

An Eclipse of the Moon

- **Full Moon:** the Earth is between the Moon and the Sun.
- Light gets to the Moon because they are not in line.



- The Earth sometimes blocks out the sunlight from reaching the Moon.
- Then we cannot see the Moon (in position 3).
- **This is an eclipse of the Moon.**

What have we learned?

(Sunlight takes 8 minutes to reach the Earth.)

- Shadows form when light is blocked out.
- Night is when no sunlight reaches us.
- We can tell the time by shadows.
- In winter the Sun is low in the sky.
- The moon reflects light to the Earth.
- Its shape changes because of shadows.
- Eclipses happen when light is blocked out.

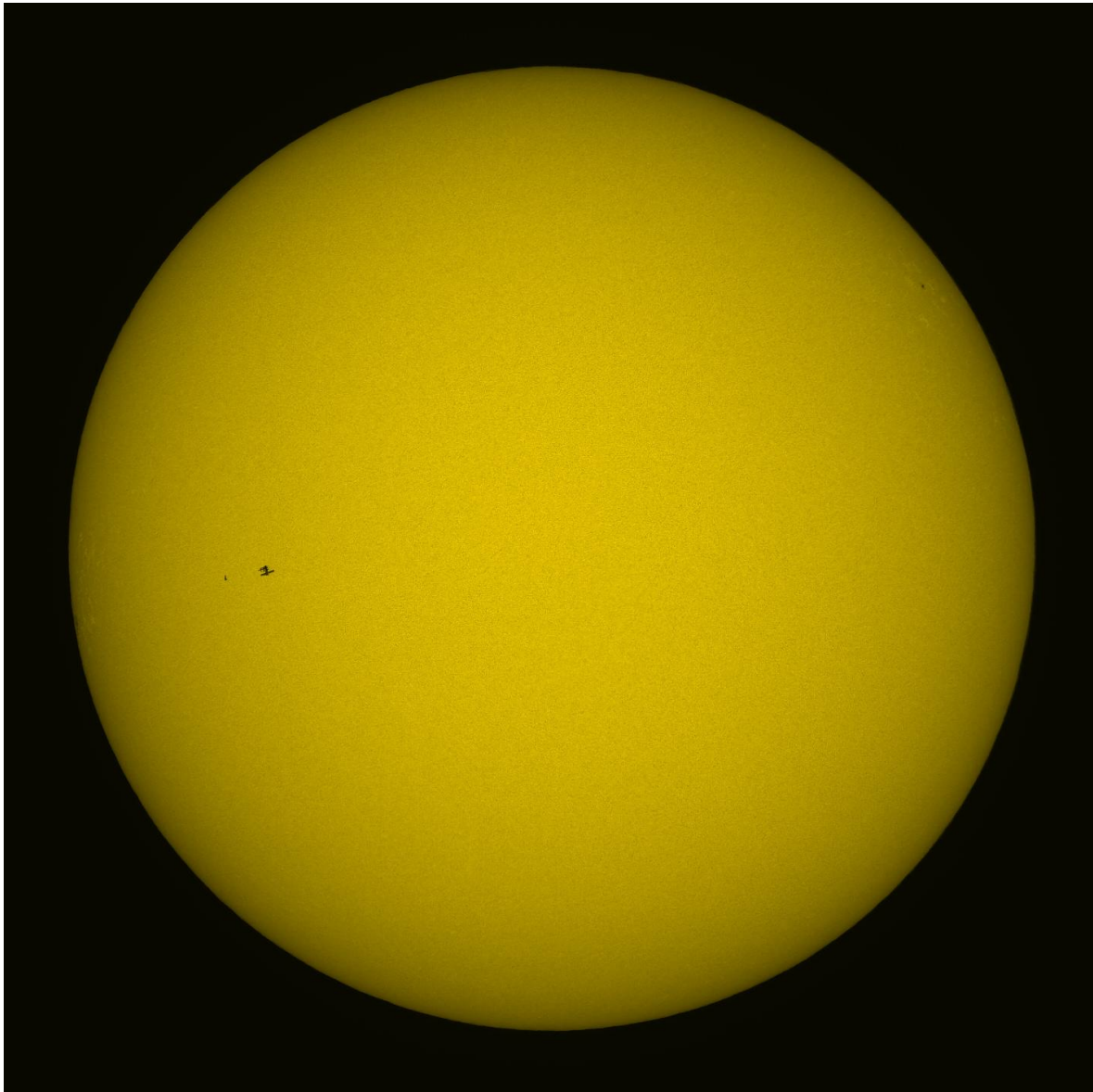
- all shadows!

Space exploration

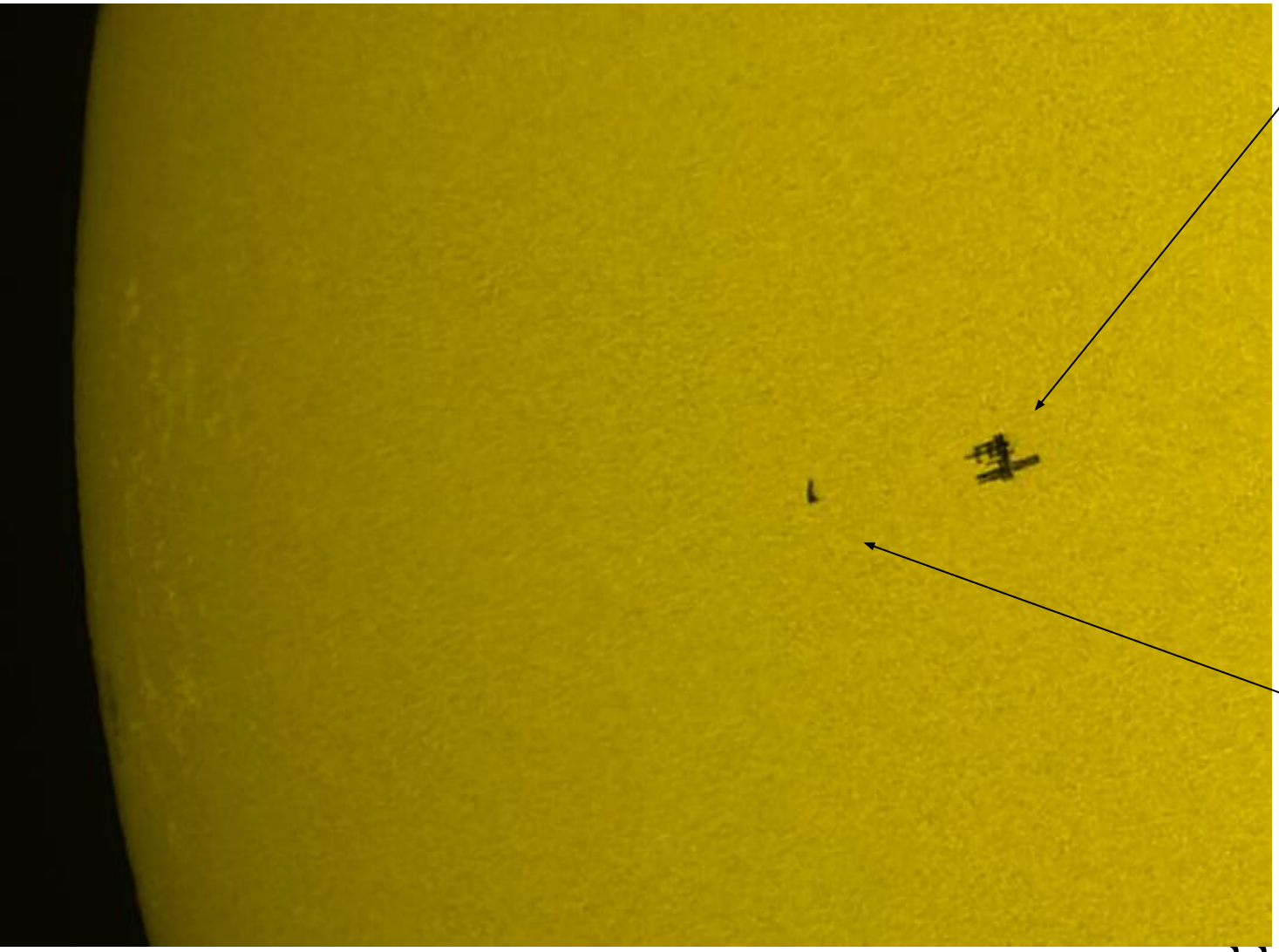
Solar transit

of the International Space Station and Space Shuttle Atlantis

(50 minutes after undocking from the ISS, before return to Earth)



Larger!



The girl who named Pluto

- In 1930, Pluto was discovered.
- **Venetia Burney, aged 11, named it Pluto.**
- She was born in 1919 and, is the only person in the World who named a planet- although it is not classified as a planet now.
- On 17 January 2006, NASA launched *New Horizons*, the first space mission to Pluto.
- It will reach Pluto in July 2015

NASA

New Horizons at Pluto (simulation)

It travels past Jupiter at a speed of 21 km each second

NASA


Keep asking questions!
There is lots to find out!