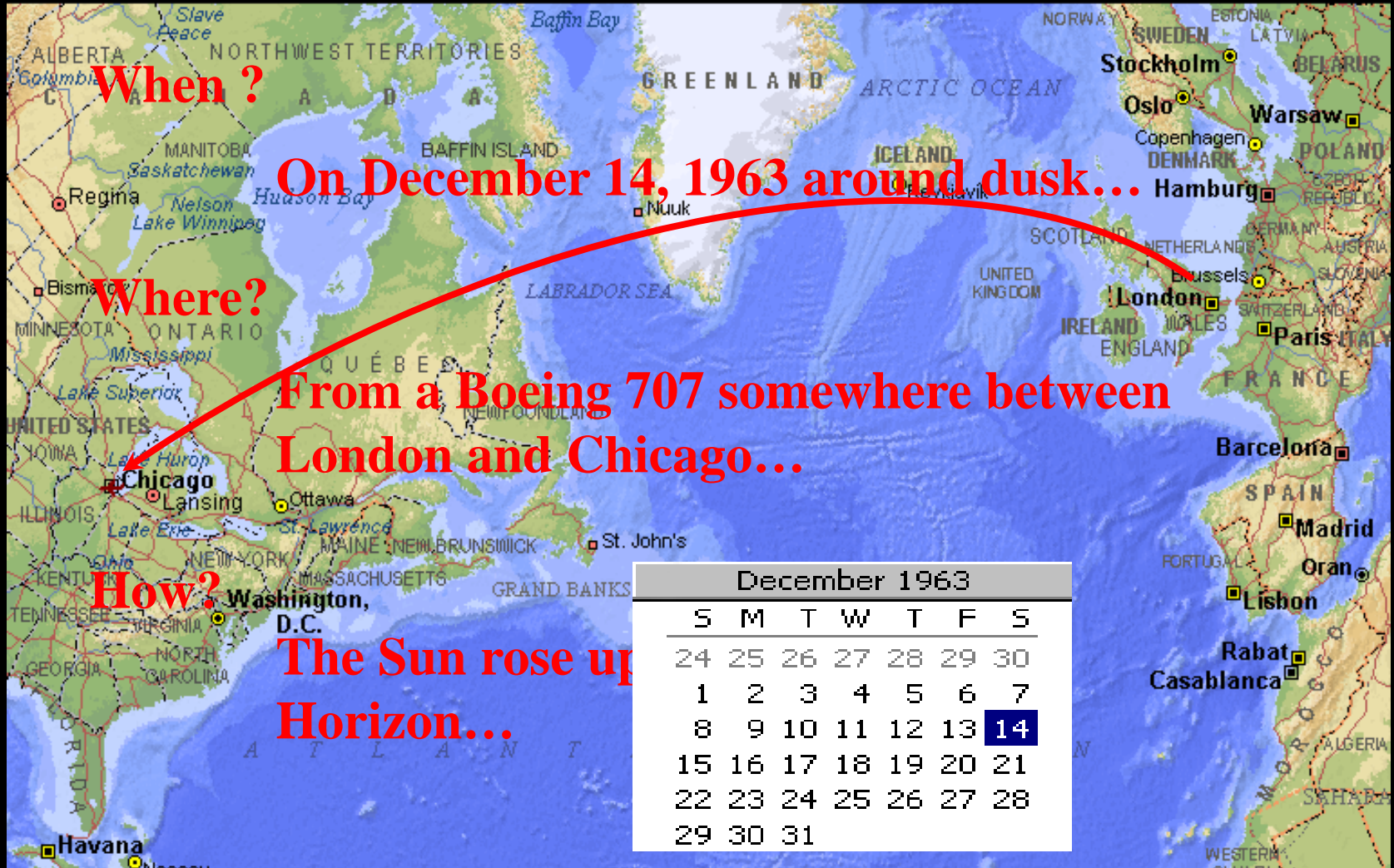




Strange Events in Our Solar System

The day I saw the Sun rise in the West...



Why did this happen?

Why do the Sun and the stars rise in the East and set in the West?

Because the Earth spins around its axis from the West to the East...



Can we reverse the trend?

Not by trying to reverse the Earth's spin...

But ...

by flying around it from the East to west fast enough!

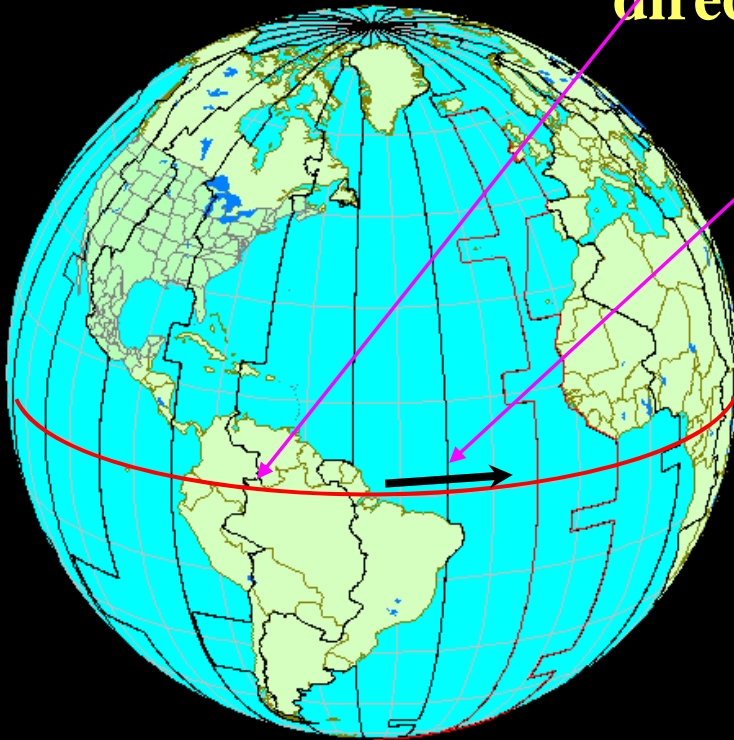


A short calculation...

Circumference of the Earth $\approx 40,000$ km.

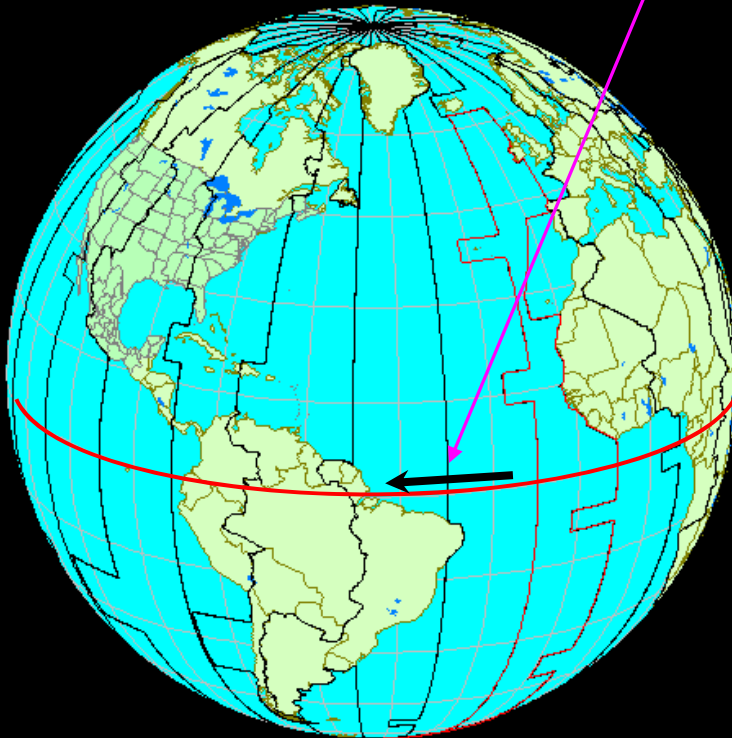
A point on the Equator moves this distance in 24 hours,

**$40,000 / 24 \approx 1,667$ kph
directed from West to East.**



A short calculation...

If we want to 'turn the spin around' at the equator, we have to fly *East to West* at a speed exceeding this value.



Subsonic jet aircraft normally flies at a speed not much exceeding around *half* this value, say with speeds up to 950 kph.

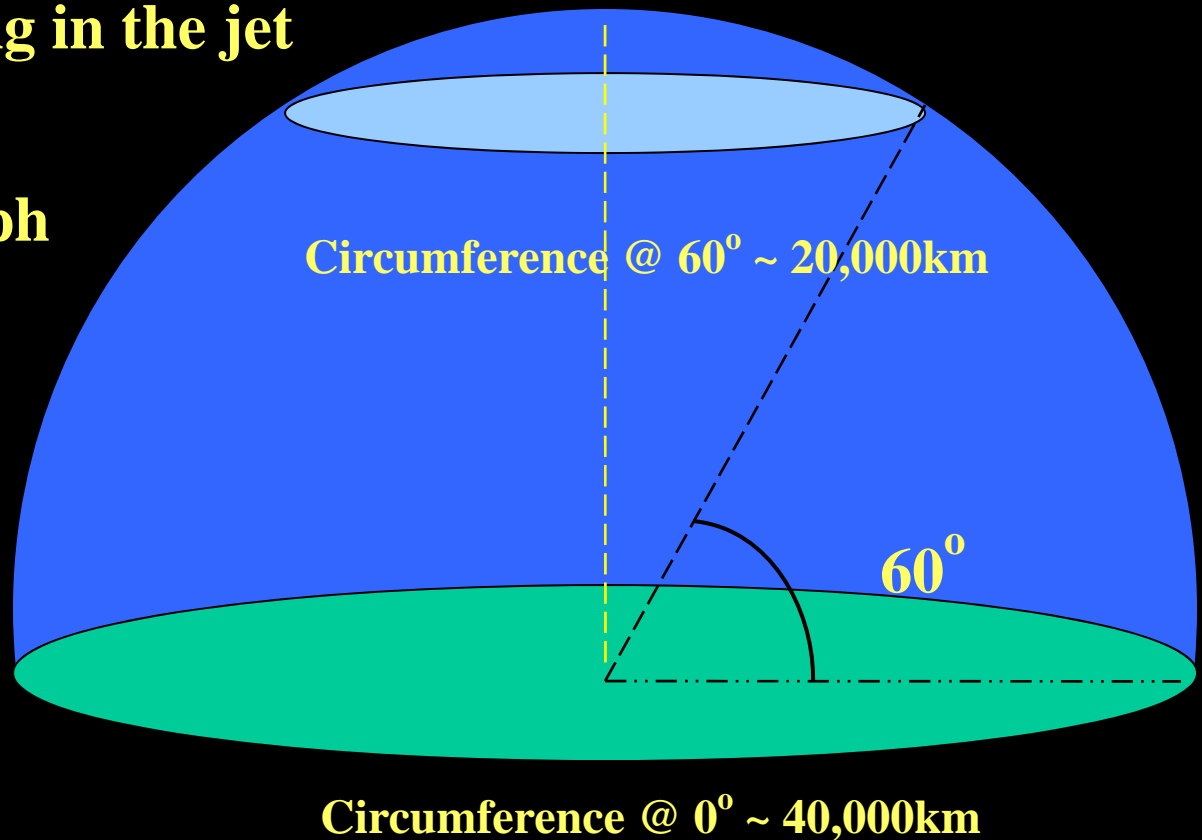
**However, at a latitude of 60 degrees,
the circumference of the Earth is half that at the equator.**

**So a point on the latitude circle at 60 degrees will move
West to East at half the speed of a point on the Equator.**

**So a person travelling in the jet
at a speed exceeding**

$$1667 \times \frac{1}{2} = 833.5 \text{ kph}$$

**will see the Sun
moving from West
to East.**



The jet plane on which I was travelling did touch high latitudes above 60 degrees, on its path from London to

Chicago. At this stage the Sun appeared to rise over the Western horizon.



Problem to think about :

A supersonic jet can leave London at lunchtime and arrive in New York at breakfast time...

Why ?

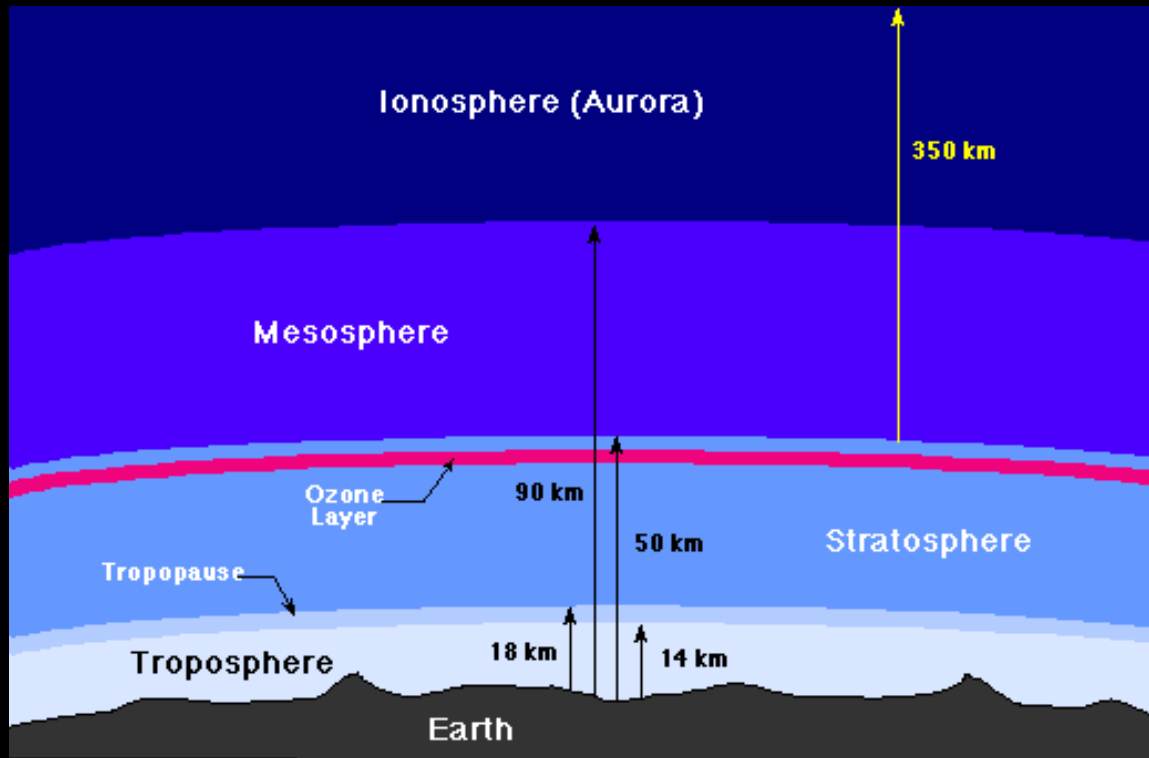
What are night and day like on the Moon?

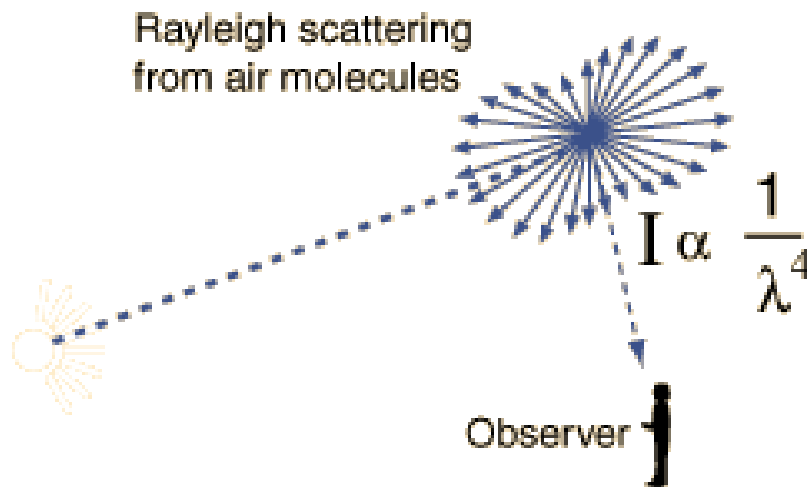
On the Earth, on a bright sunny day we have blue skies while the sky is dark at night.



Why is the sky blue?

The Earth is surrounded by a layer of atmosphere containing particles of gases and dust. These scatter sunlight falling on them.





The strong wavelength dependence of Rayleigh scattering enhances the short wavelengths, giving us the blue sky.

The scattering at 400 nm is 9.4 times as great as that at 700 nm for equal incident intensity.



So not all of the light from the Sun travels straight to the ground level...part of it is scattered by the atmospheric particles and spread around.

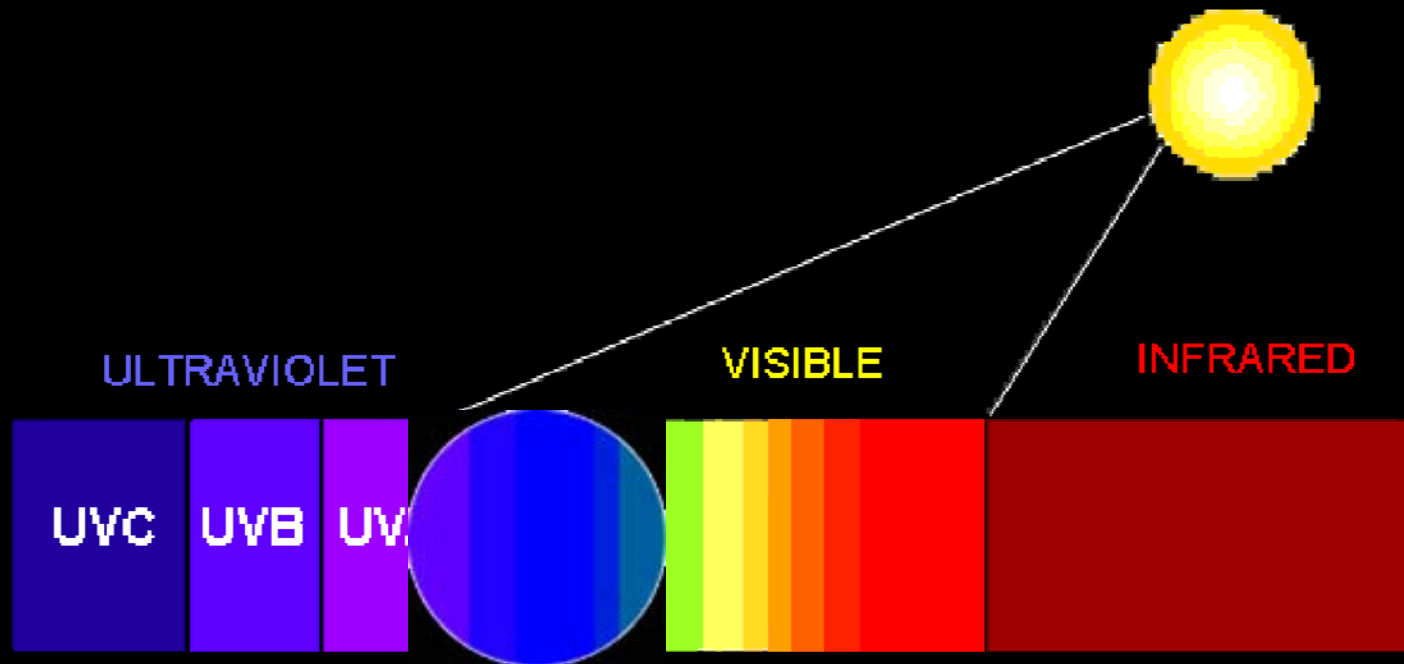
Normally we should have expected the sky to be lit by sunlight so spread, and with the same colour as the Sun.

However, when light is scattered, it is predominantly bluish... Why?

Sunlight is made of several colours, normally identified with the seven colours of the rainbow: Violet, Indigo, Blue, Green, Yellow, Orange, Red (VIBGYOR).



The properties of light tell us that the VIB colours are scattered far more than the YOR colours. As blue predominates in the VIB part of the sunlight, the sky looks mainly bluish.



An astronaut travelling well above the Earth's atmosphere will not see this effect. He will get all the sunlight heading towards him, with no scattering en-route. So the sky will remain dark for him except for the neighbourhood of the Sun.





The lunar landscape will, however, shine wherever light falls.

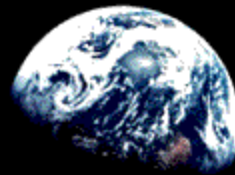
The day and night on the Moon

Night:

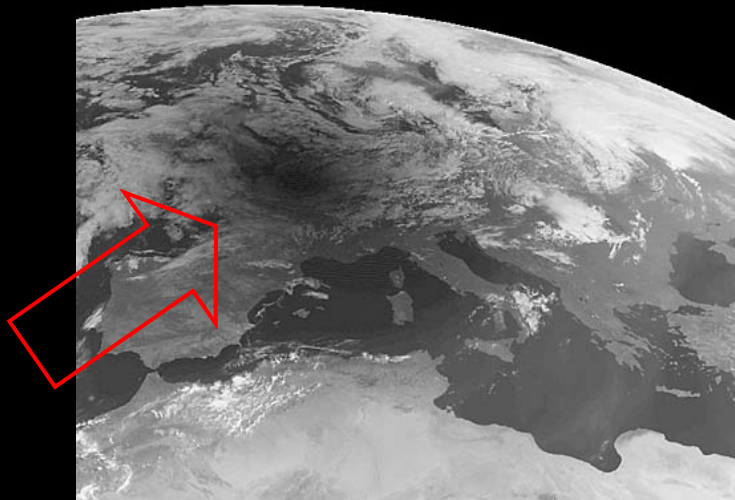
The sky will continue to be dark, except of course that there will be no Sun.

Problems to think about :

a) Like the Sun, does the Earth also rise and set on the Moon?



b) Will there be solar and terrestrial eclipses visible from the Moon?



What is the likelihood of the Earth being hit by another body in the solar system?

The Solar System has

- a) The Sun**
- b) The Planets**
- c) Satellites**
- d) Asteroids**
- e) Meteorites**
- f) Comets...**



Can two bodies in the Solar System Collide?

In particular, can the Earth be hit by any of them?

(a) – (c) pose no problem in this context.

a) The Sun b) The Planets c) Satellites

However, (d) – (f) do pose threats.

d) Asteroids e) Meteoroids f) Comets

The comet Shoemaker- Levy crashed into Jupiter in July, 1994.

A comet
years.
Jupiter
gravitatic

It has bee
comets pu
period...



© 1993 Michael Carroll

ousand
because
strong

es of

But the Earth is not so strong an attractor (fortunately!) and a comet may strike the Earth once in a million years...

Impact of a comet may have killed life on the Earth, wiping out dinosaurs...



What about future collisions?

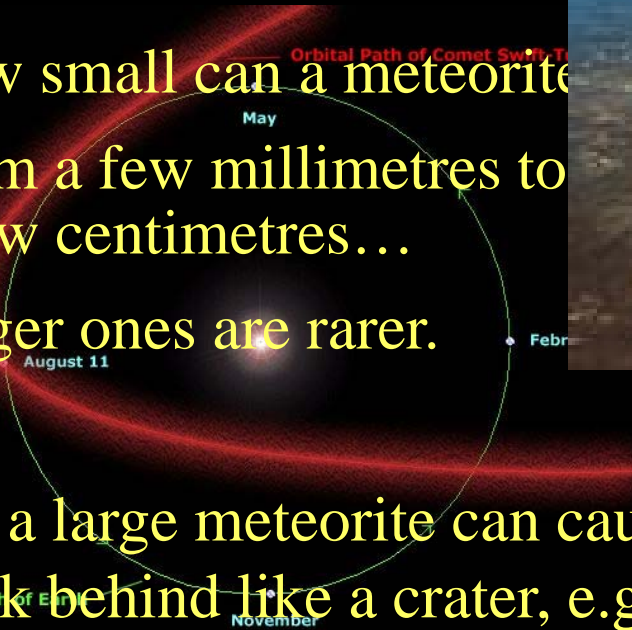
Recall the Comet Swift-Tuttle on its next approach in the

How small can a meteorite

From a few millimetres to a few centimetres...

larger ones are rarer.

But a large meteorite can cause heavy damage and leave a mark behind like a crater, e.g., the Arizona Crater...



**Or,
the Lonar Crater Lake in India.**

This crater lake is believed to have formed from the impact of a meteorite weighing some 20 million tons, about 50,000 years ago.



An impact of this order can destroy local life, but also jeopardize other parts of the Earth as a lot of oxygen is consumed in the combustion process and the eco-balance is drastically upset.

What about asteroids, which can vary in sizes ranging from 1 – 1000 km or even larger? A one-kilometre object would generate impact energy of the order of a million Hiroshimas.

Spacewatch project looks for major asteroid trajectories and provides details on a possible collision.



**Can suitable preventive action be taken
in time?**

**(Sci-Fi story “The Comet” by JVN details a
possible course of action.)**

To conclude...

**One should be prepared for strange sights,
unexpected phenomena and activity on a far
greater scale than on the Earth, when one leaves
the *terra firma* and takes a leap into space...**