- Experience, Common Sense, observation – basis of all our activities, thinking, expecting, theorizing, ...
- Einstein: "The whole of science is nothing more than a refinement of everyday thinking"
- The word "space" – means differently for different people and in different contexts.
- This lecture is to highlight these differences – show how they converge ultimately to a profound characteristic – the very basis of the universe – of matter, radiation, force, ... all activities – in the past, in the present and in the future.
- For the Space Technologist:

~~Everything~~ "Space" extends from the ~~Surface~~ of the earth to the farthest corners of the universe. –

Transparency

the atmosphere – MST – Mesosphere, Stratosphere, Troposphere –
Ionosphere –
Interplanetary Space.
Inter-stellar Space.
Inter-galactic Space.
upto the horizon of the visible universe.
Beyond the visible universe – but for (the finiteness of the velocity of light – EM waves.

Balloons, Rockets, Satellites, Deep Space Probes, ...

One way information that we are receiving is the form of EM Radiation, Neutrinos and particles - Cosmic Rays

This information has a time tag associated with it - that we see to-day corresponds to different times in the past - how far depends on the distance. - we are thus able to see what was happening in the Universe at different times in the past. - almost to the beginning of the Universe.

Man landed on the Moon in and brought samples from there.
Instruments have been landed on Mars.
Deep space probes have carried out the grand tours of several planets and made direct observations by instruments orbiting in their neighbourhood.
These have been projects like Soho. Which have orbited the Sun. and provided lots of info information about the Sun.

Can we go to the nearest star? - Compared to distances the time taken for the light to come from the nearest star is 4·3 years. - light travels at the speed of 186,000 miles/sec. The fastest space probes can travel almost 1/10th the speed of light per second.

∴ that we can sample directly is a negligible part of the total Universe.
Space Travel will remain a dream for ever - not because of technological incapability, but limited by

by Nature - the maximum Speed - and the VASTNESS of the UNIVERSE. -

Contents of the UNIVERSE:

For a long time, we treated Space as just the Container for Matter and Radiation - as just <u>emptiness</u> (vacuum) without any physical properties.

Maxwell: "Vacuum is that which is left in a vessel after having removed everything we can remove from it."

- Newton and the Problem of Action at a distance
How is the Gravitational Force transmitted through SPACE?
"God only knows." - NEWTON'S ANSWER.
- Faraday and the Magnetic Field.
- Coulomb and the Electric Field
What are fields? Are they material? What is the relation between empty Space and these fields?
- Maxwell and the Electromagnetic Field. -
the Ether - Mechanized Models of Maxwell failed.
- Photon - Particle of Light - of EM. Radiation.
- Dimensions of Space - 3 dimensions + time.

Euclidean Space. - (Euclid (300 BC))
- the three angles of a triangle add up to 180°.
- Straight line is the shortest distance between two points

* With the advent of Relativity, the field became the primary reality, rather than the consequence of some other reality
* It is not that the elasticity of the ether that provides the basis for electromagnetism, but electromagnetism serves as the basis of elasticity in general.
* Space is a continuum provided with physical properties. In a sense space could be called the old ether.