NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

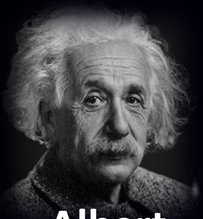
Satellite Research Centre
School of Electrical and Electronic Engineering

NTU Satellite Research Centre — Birthplace of Singapore Satellite

SPACE Science

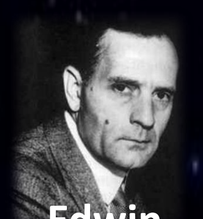
Stephen Hawking

Physicist and cosmologist Stephen Hawking (1942- 2018) dedicated his early career to understanding the gravitational laws governing black holes. In more recent years, he has developed cosmological theories that offer hope for unifying the theories of general relativity and quantum theory



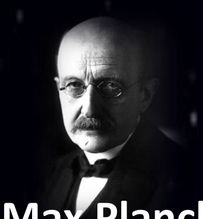
Albert Einstein

Physicist Albert Einstein (1879-1955) shaped 20th century physics more than any other. His special and general theories of relativity revealed the interchangeability of mass and energy and the true natures of space, time and gravity. He also played a major role in developing quantum theory.



Edwin Hubble

US astronomer Edwin Hubble (1889-1953) used Cepheld variable stars to measure the distance to remote galaxies and prove they lay far beyond the Milky Way. He also devised a scheme for galaxy classification, and showed that the universe as a whole is expanding, paving the way for the Big Bang theory.

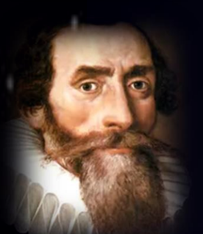


Max Planck

Physicist Max Planck (1858-1927) is widely recognized as the founder of quantum theory thanks to his suggestion that light and other forms of electromagnetic radiation might be found in discrete packets of energy, or quanta. He argued against the wider implications of quantum physics,

Isaac Newton

Mathematician and Physicist Isaac Newton (1643- 1727) devised the laws of motion and universal gravitation and the math of calculus. He also contributed to the study of optics, building the first practical reflecting telescope and showing that white light consisted of many colours.



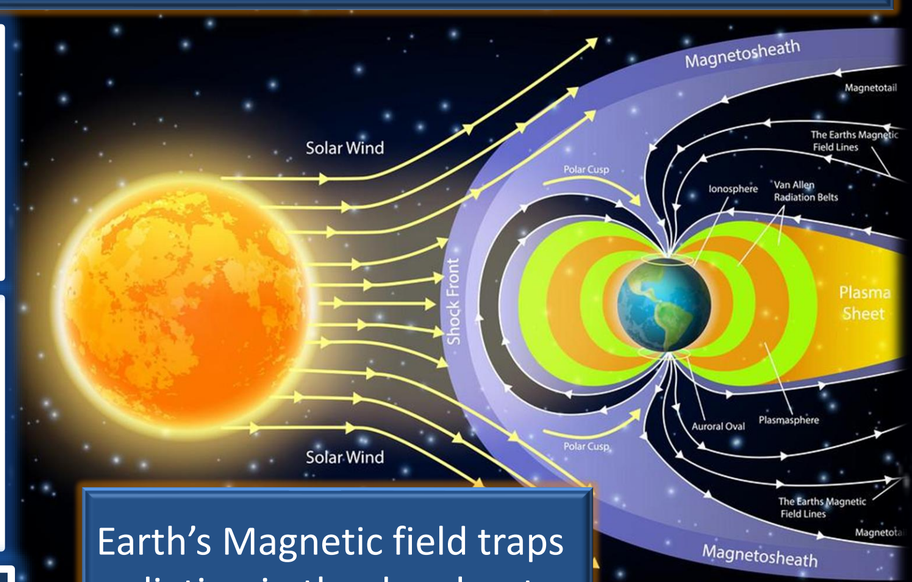
Johannes Kepler

Kepler (1571- 1630) was a student of the astronomer Tycho Brahe, and used his observations of planetary motions to form his revolutionary theory of elliptical planetary orbits. Despite being remembered as a scientific pioneer, he was also a keen astrologer.

Solar Flares, Sunspots, & Solar Cycle

A **solar flare** is a sudden increase in the Sun's brightness. The flare ejects ions, electrons, and atoms into space which reach the Earth and cause auroras and may disrupt communication. The massive amount energy released in a solar flare originally comes from nuclear fusion in the Sun's core but the mechanism of energy transfer is not fully understood.

Solar flares tend to emanate from dark areas on the Sun known as **sun spots**. Sun spot numbers cycle on an 11-year period known as the **solar cycle**



Earth's Magnetic field traps radiation in the doughnut like **Van Allen belts**

Cosmic rays are high-energy particles from outer space that constantly bombard Earth. They are primarily composed of protons (about 90%), with smaller amounts of heavier nuclei and electrons. These particles travel at nearly the speed of light and originate from various cosmic sources, including the Sun, supernovae (exploding stars), neutron stars, black holes, and possibly even distant galaxies.

	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
Radius (km)	2,440	6,052	6,371	3,389	69,911	58,232	25,362	24,622
Earth Mass	5.5 %	81.5 %	100 %	10.7 %	x317.8	x95.2	x14.5	x17.1
Gravity (g)	0.378 g	0.907 g	1.0 g	0.377 g	2.36 g	0.916 g	0.889 g	1.12 g
Orbit (Earth Time)	88 days	224.7 days	365.25 days	1.9yrs	11.9 yrs	29.5 yrs	84 yrs	164.8 yrs
Rotation (days)	58.6	-243.01	0.997	1.03	0.41	0.43	-0.72	0.67
From SUN (million km)	58	108	150	227	779	1,428	2,974	4,497

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