On a clear starry night, haven't you ever desired to unravel the mysteries of space? Your desire is about to be fulfilled.

Welcome to SARAS-3D's ISRO-Registered Space Tutor Programme

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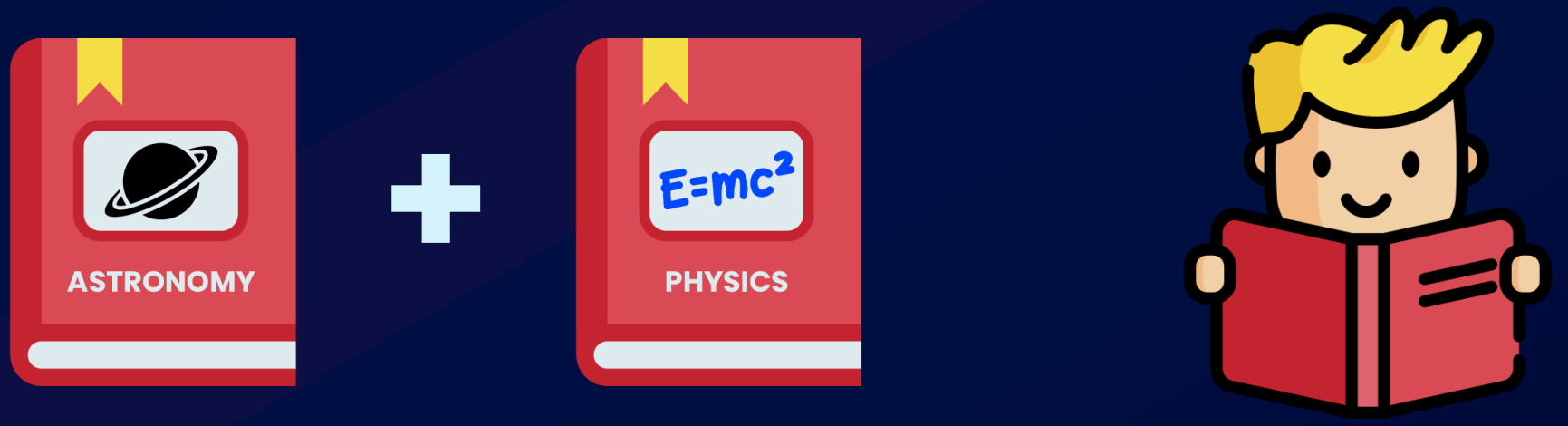
Do you feel awestruck with the vastness of our Universe?



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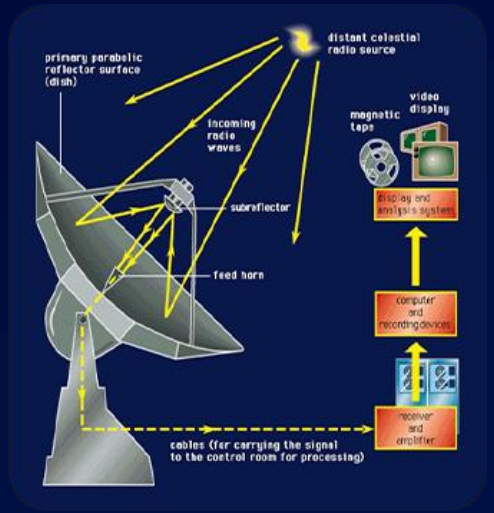
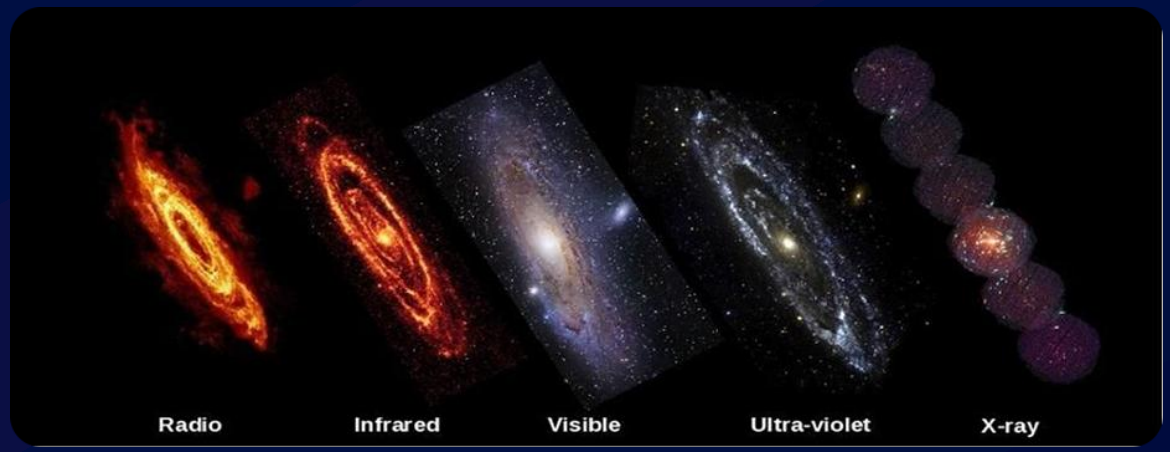
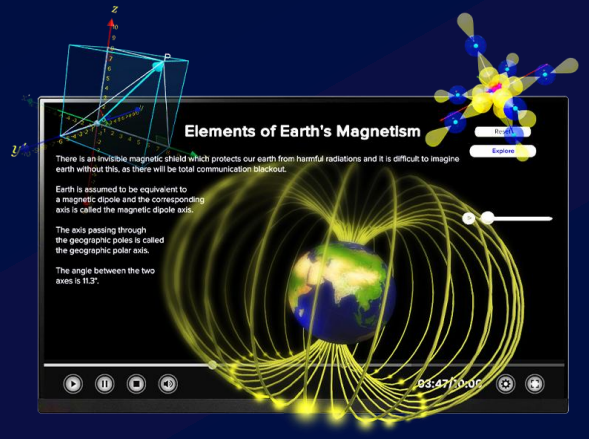
This programme intends to lay the foundations
for becoming a Space Technologist or a Space Scientist, or simply empower you
with more understanding about the world beyond our planet.







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Want to know more about Space?

Awesome! As a student, you have come to the right place.

The world in general, and India in particular, needs scientists and engineers with innovative ideas and problem-solving ability.

BUT...

As per reports, only 15 to 30% of fresh engineers in India are 'directly' employable[1].

This of course is improving[2].

We, at SARAS-3D, want you to be in that 15% bracket through our unique interactive 3D learning material. Do not forget to check out the most suitable package for you or your institution at: www.saras-3d.com

1: https://www.businesstoday.in/current/corporate/indian-engineers-tech-jobs-survey-80-per-cent-of-indian-engineers-not-fit-for-jobs-says-survey/story/330869.html

2: https://www.thehindubusinessline.com/news/education/india-skills-report-finds-4621-of-students-employable/article30269722.ece

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Is Space Technology a “Rocket Science”?

The term ‘Rocket Science’ indicates that a topic is Very Hard.

But is Space Tech really so? The answer is a resounding ‘NO’. Provided, of course, the fundamentals, on which the castle is built, are strong.

The multi-crore rupees question is, how to make our fundamental understanding of the subject strong? There may be multiple answers to this, but the one which fits all students is, ‘Learning by doing’.

In this SARAS-3D Space Tutor course, we will learn the very basics to much advanced physics concepts related to the Space Science and Technology in a “DIY- Do It Yourself” way. We have given a very apt name to this technic: “Play With the Objects- PWO”.

Let us explore how the seemingly complicated tasks like launching a satellite or satellite orbits or design of a space born camera can be understood with the concepts learned in Grade 9 to 12 Physics– if learned in a right way.

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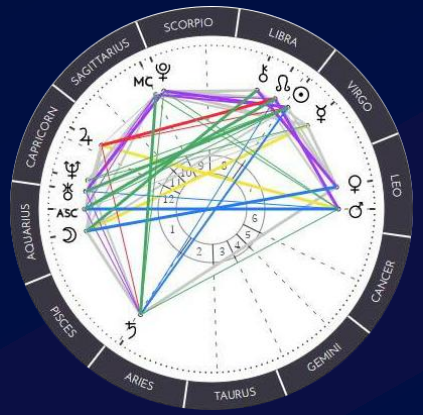
“I’m a radio astronomer!”

+



AS-TRO-NO-MER, I’m an Astronomer, NOT an Astrologer!

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Let’s start by simplifying some terminologies first…

Space Science, Astrophysics, Astronomy, Space Technology …these are terms used interchangeably, albeit inadvertently. But are they same? Let’s define them properly.

1. Space Science: Focuses on the formation and evolution of the Earth and solar system, and our place in the universe. Space scientists explore the Earth and other planets from space, and use powerful telescopes to observe distant celestial objects.

2. Astronomy: Once one goes beyond our solar system, Astronomy takes over. It is a natural science that studies celestial objects and the phenomena that occur in the cosmos. It uses mathematics, physics, and chemistry in order to explain their origin and their overall evolution. Objects of interest include stars, nebulae, galaxies, meteoroids, asteroids, and comets etc.

3. Astrophysics: Astrophysics is a science that employs the methods and principles of physics and chemistry in the compositional study of astronomical objects and phenomena.

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Space terminologies simplified (Cont'd)

4. Space Technology:

a) Involves the development of systems and tools for use in space, such as space vehicles, instrumentation, and mission components. Space technology is used for space exploration, Earth observation, and other activities beyond Earth's atmosphere. Development, launching and use of our GSLVs, PSLVs, various satellites, Chandrayaan, Mars Orbiter Mission, Aditya L1 etc. come under this category.

b) At a higher level, Space technology and space science are both part of aerospace engineering, which also includes atmospheric flight. Space technology has many applications in our daily lives, including communications, navigation, weather forecasting, and security.

c) In our 'Space Science & Technology' course, points # 1, 2 & 3 are combined under 'Space Science' while #4 under Space Technology. But this division is not watertight because, our aim is to understand the underlying science, that is, Physics.

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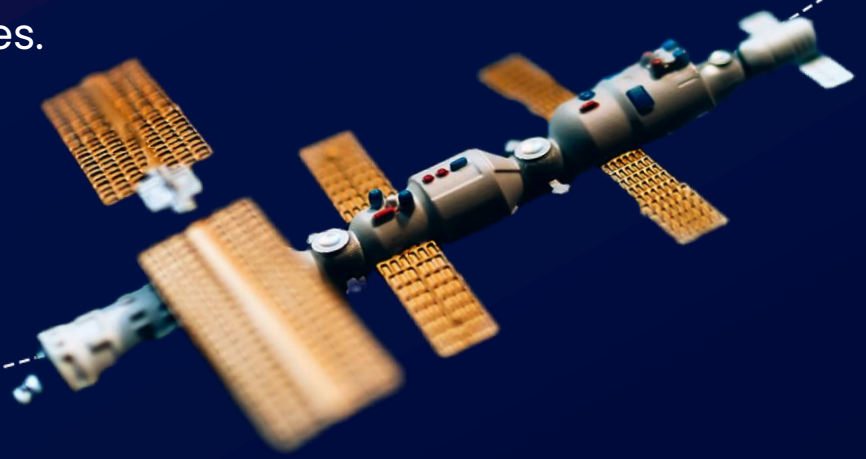
Satellites and Orbits

- Satellites are launched in various orbits depending upon the applications.
- Low Earth Orbit, Polar satellite orbits. Satellites are launched for Earth observation in this orbit. Their altitude is from 500 to 1000 KM
- Geosynchronous orbit is at 36000 KM above equator and a satellite here points to one location on earth and used for communications
- Molinia orbits are highly elliptical and used for several uses.

Let us study these orbits.



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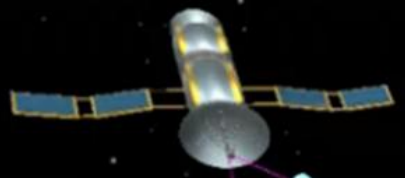
Main Menu

A Low Earth Orbit Satellite

Reset

A natural satellite is a heavenly body revolving around a planet in a stable orbit. Moon is the only natural satellite of the Earth.



Man made satellites which are launched into the orbit using rockets are called artificial satellites. Artificial satellites are used to study the Earth and other planets, to help us communicate, and also to observe the distant Universe.
In a low-Earth orbit, a satellite is only a few 100 kilometers above the planet. The satellite is outside the Earth's atmosphere, but still close enough to image the Earth's surface from space. Artificial satellites can have a range of missions, including scientific research, Earth imaging, navigation and weather observation.

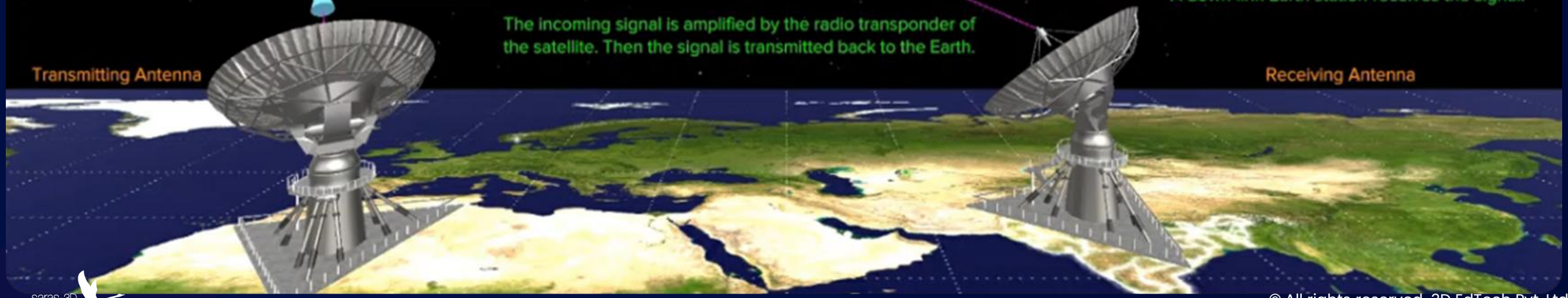
An up-link Earth station transmits the desired signal to the satellite.

The incoming signal is amplified by the radio transponder of the satellite. Then the signal is transmitted back to the Earth.

A down-link Earth station receives the signal.

Transmitting Antenna

Receiving Antenna



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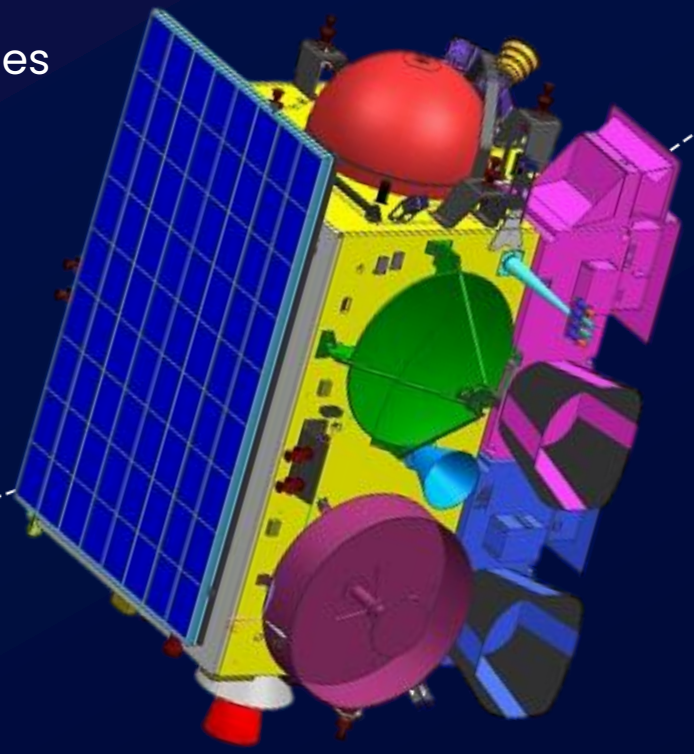
Optics Design

A satellite is launched for a specific purpose. Say for Earth observation. A rocket (Satellite Launch Vehicle) puts the satellite in a particular orbit with some velocity as we have seen.

Now, the satellite needs to have a ‘Camera’ to take pictures of earth. This digital camera is attached to a telescope because of the distances involved. The distance can range from 300 KM to 36000 KM.

How this telescope is designed? An optical schematic of INSAT 3D Imager camera is shown here. It may well be similar to Orbiter High Resolution Camera (OHRC) of Candrayaan-2.

Have a look.



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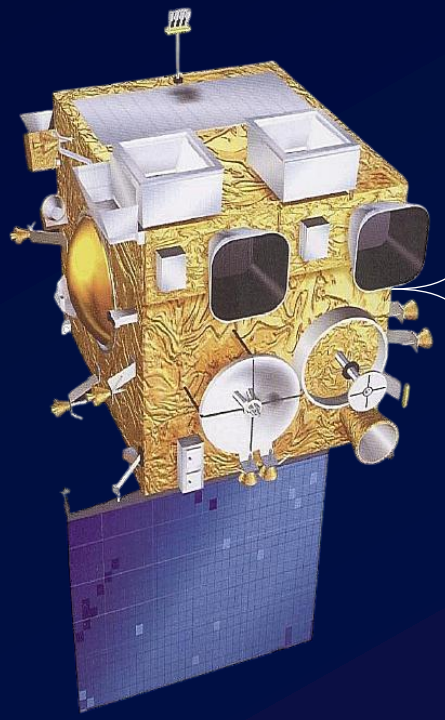
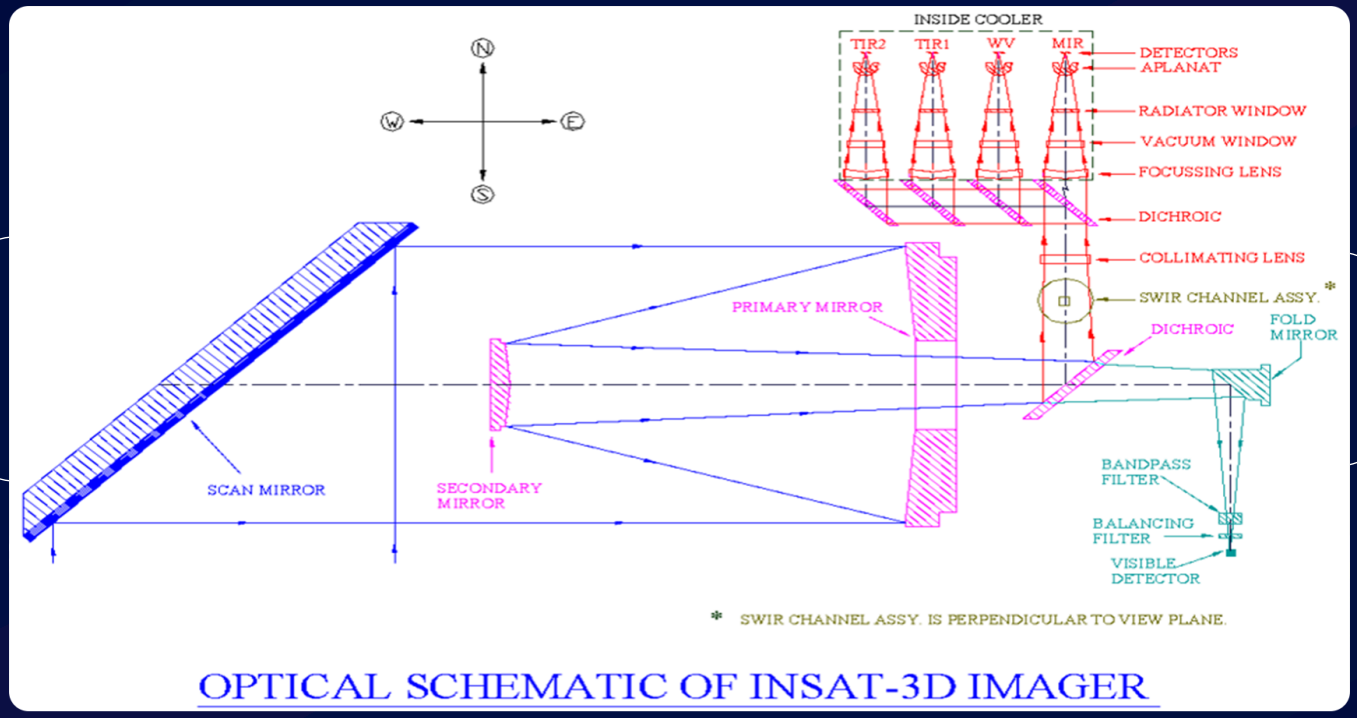
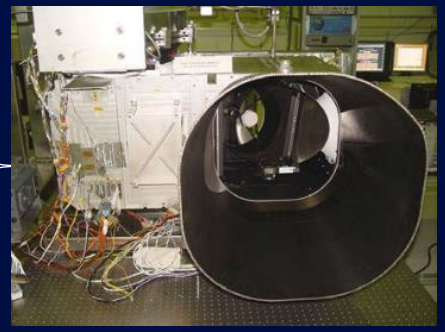
INSAT-3D Imager

Insat 3D





Imager Camera



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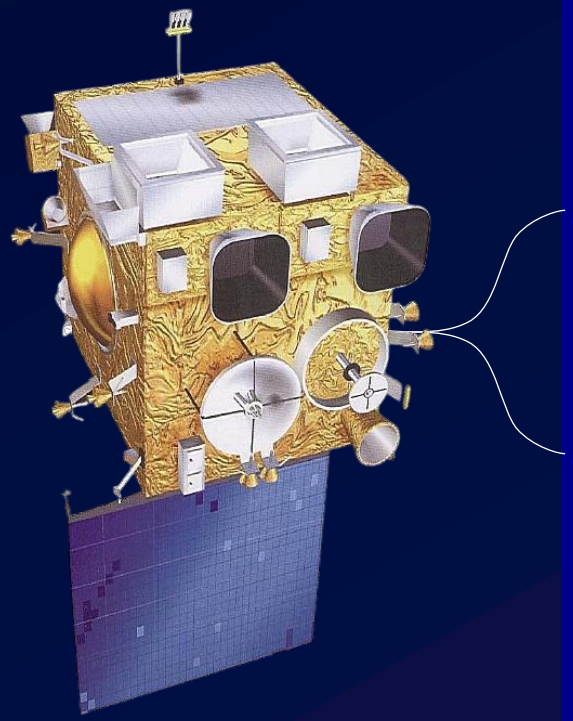
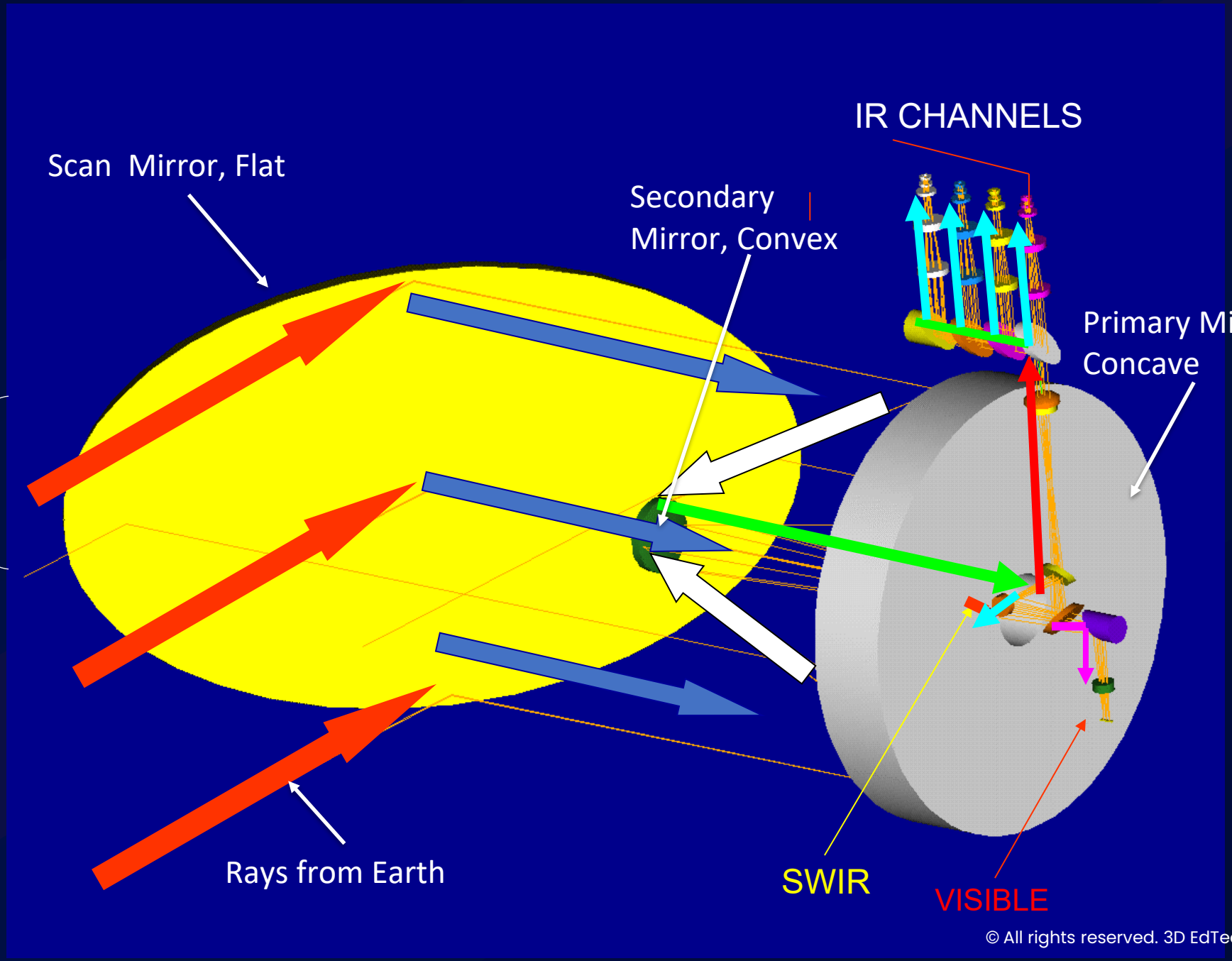
IMAGER Ray Diagram





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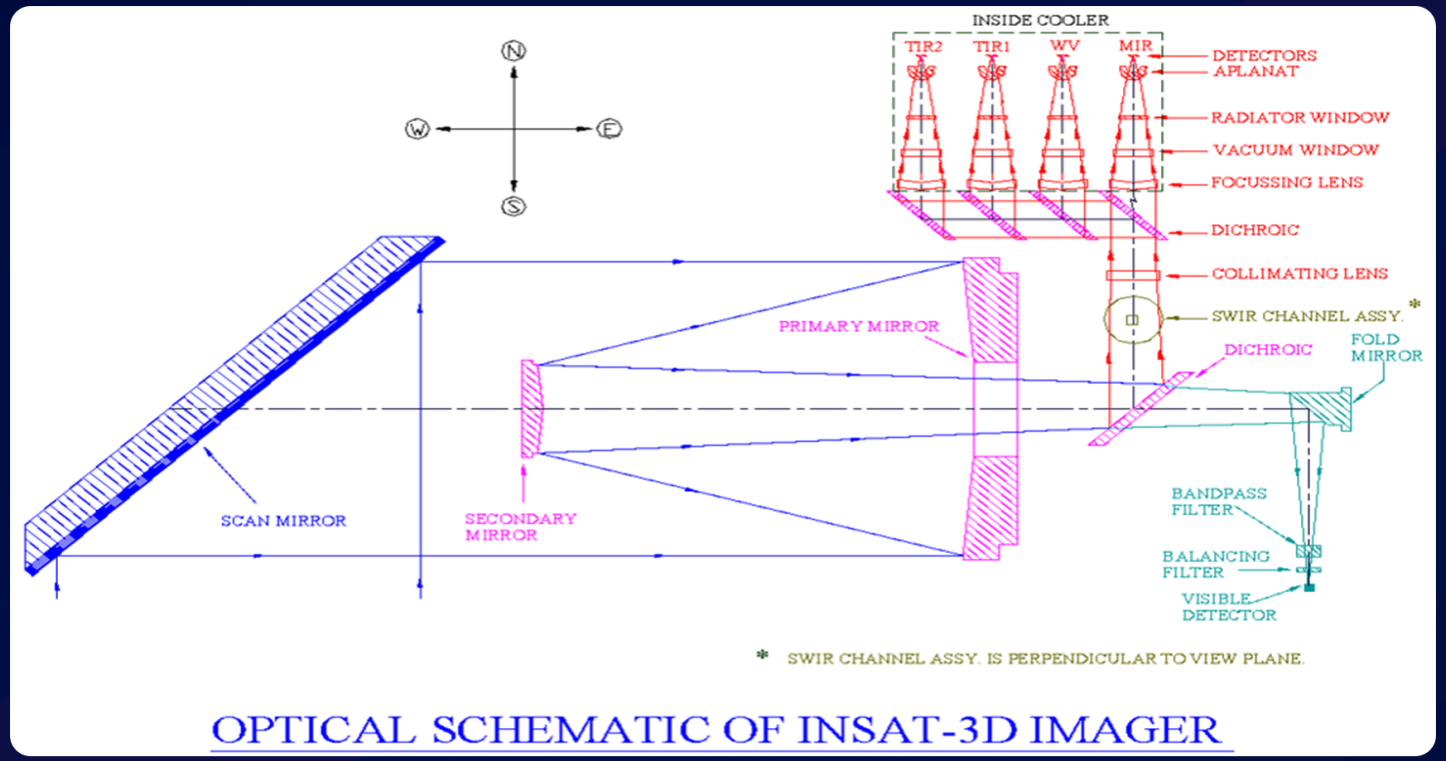
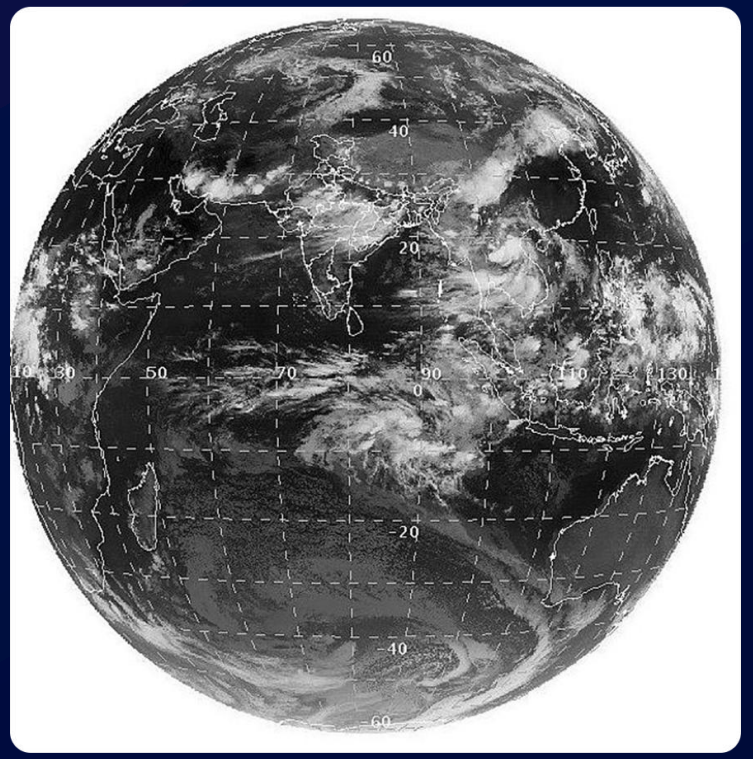
CBSE Grade 12 Ray Optics Chapter

Play with the Object
to understand the Optics fundamentals





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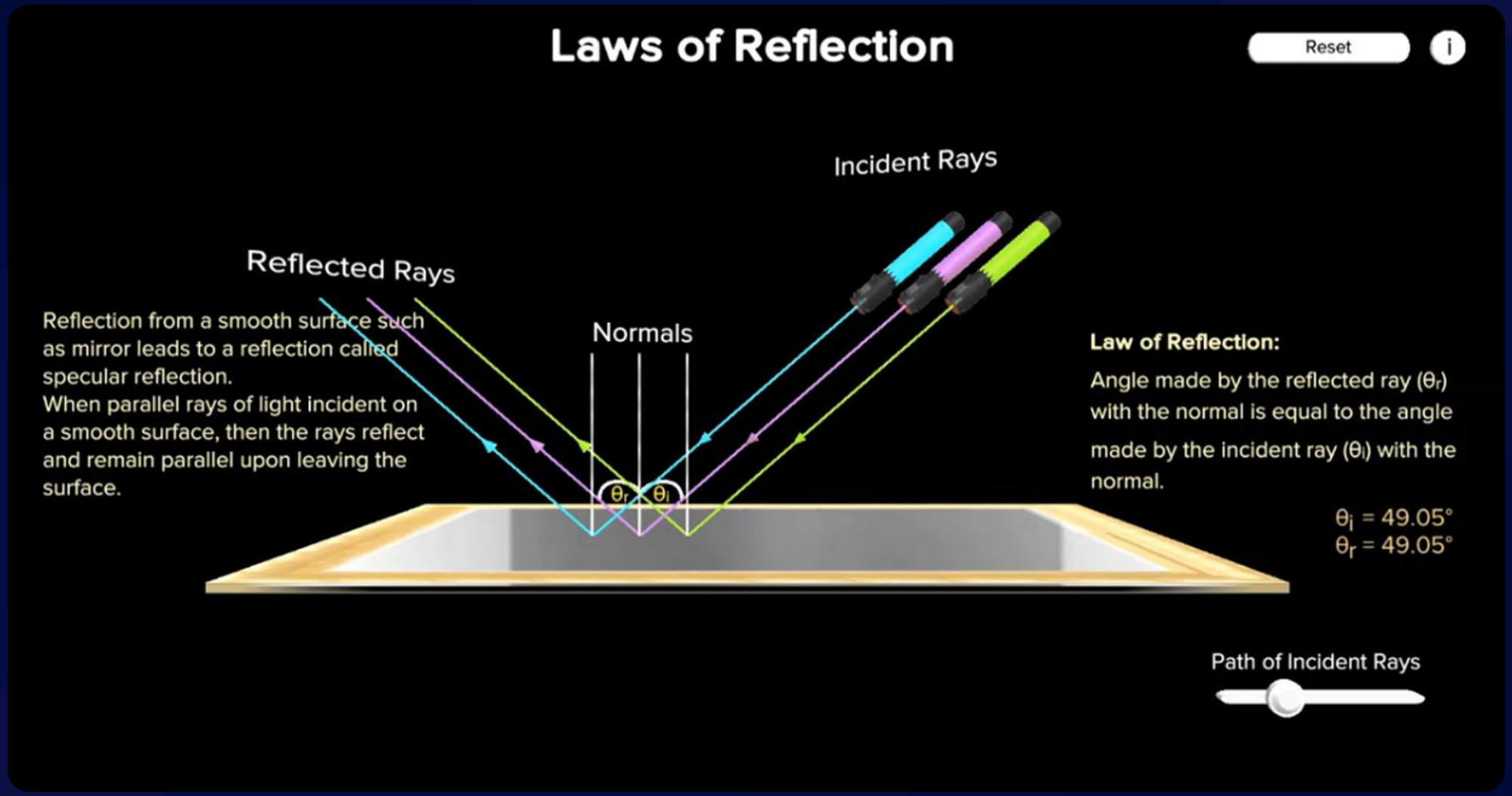

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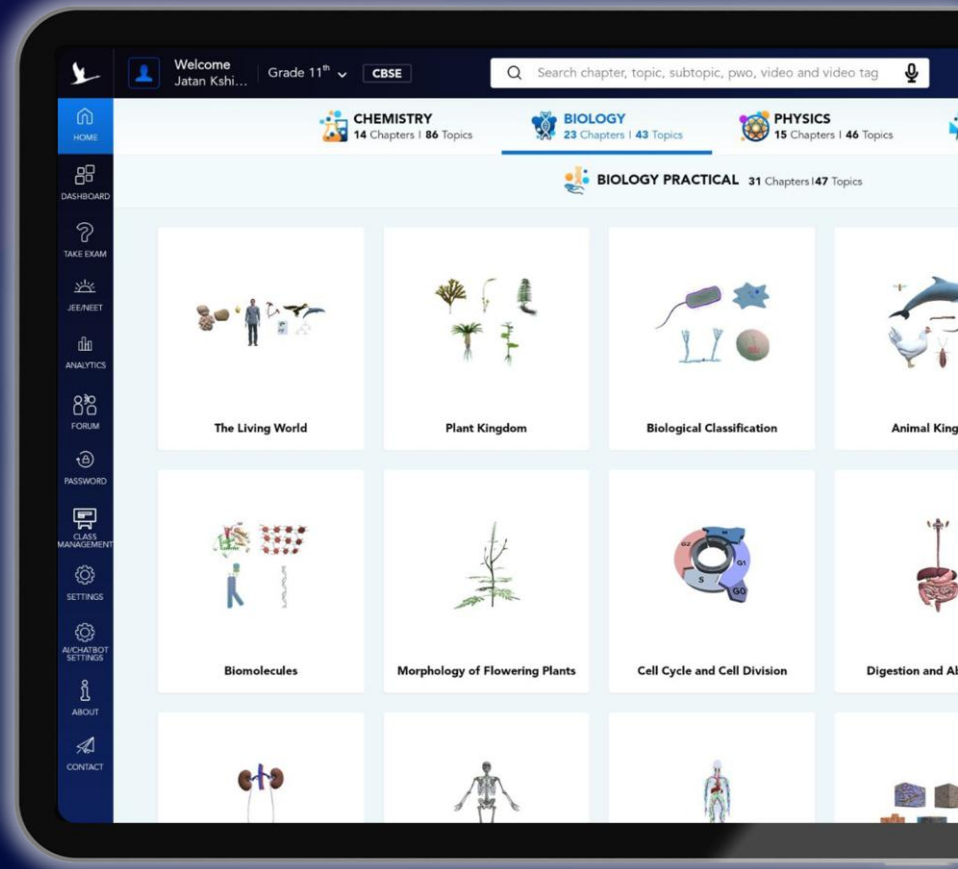

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