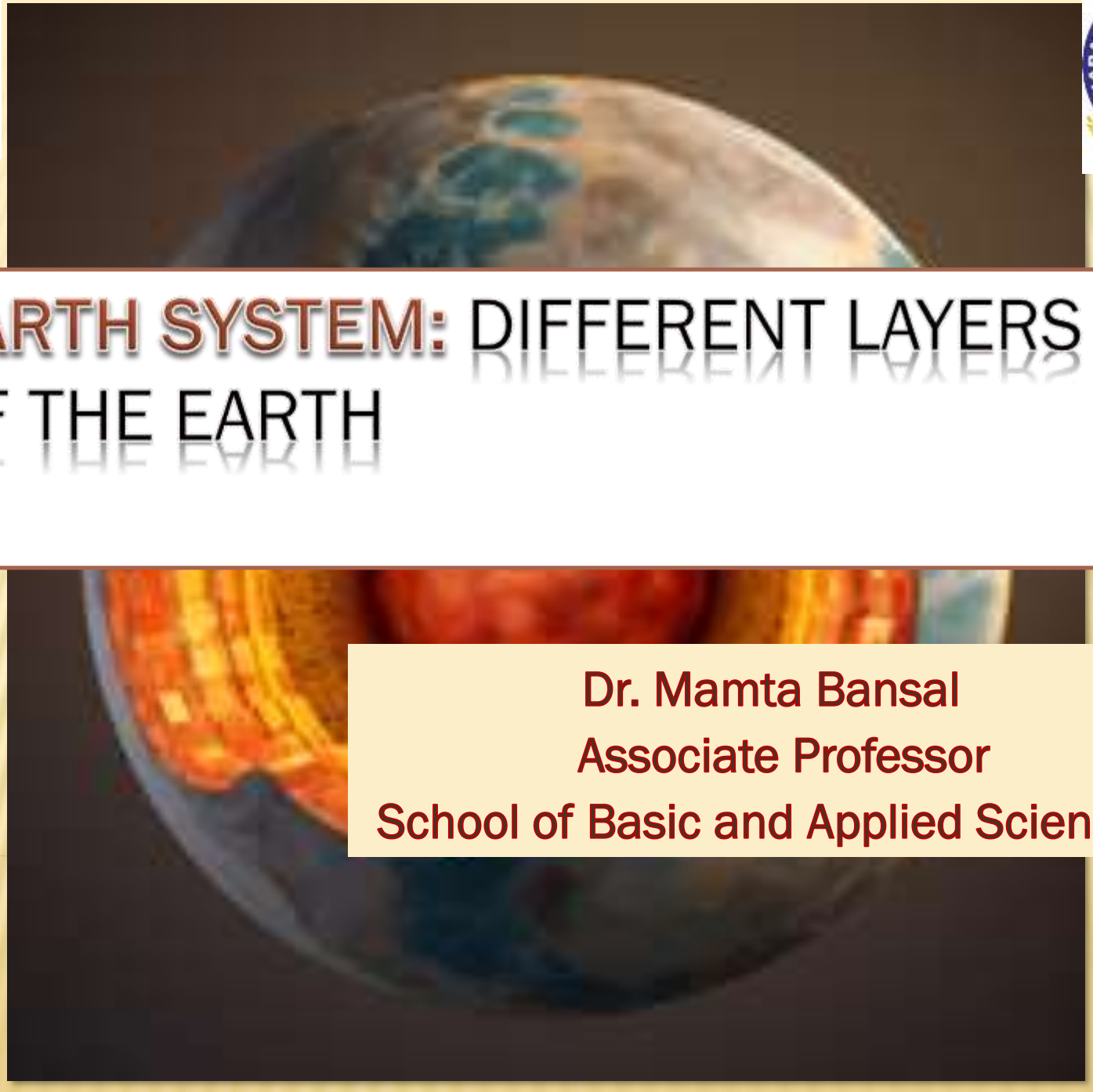


EARTH SYSTEM: DIFFERENT LAYERS OF THE EARTH

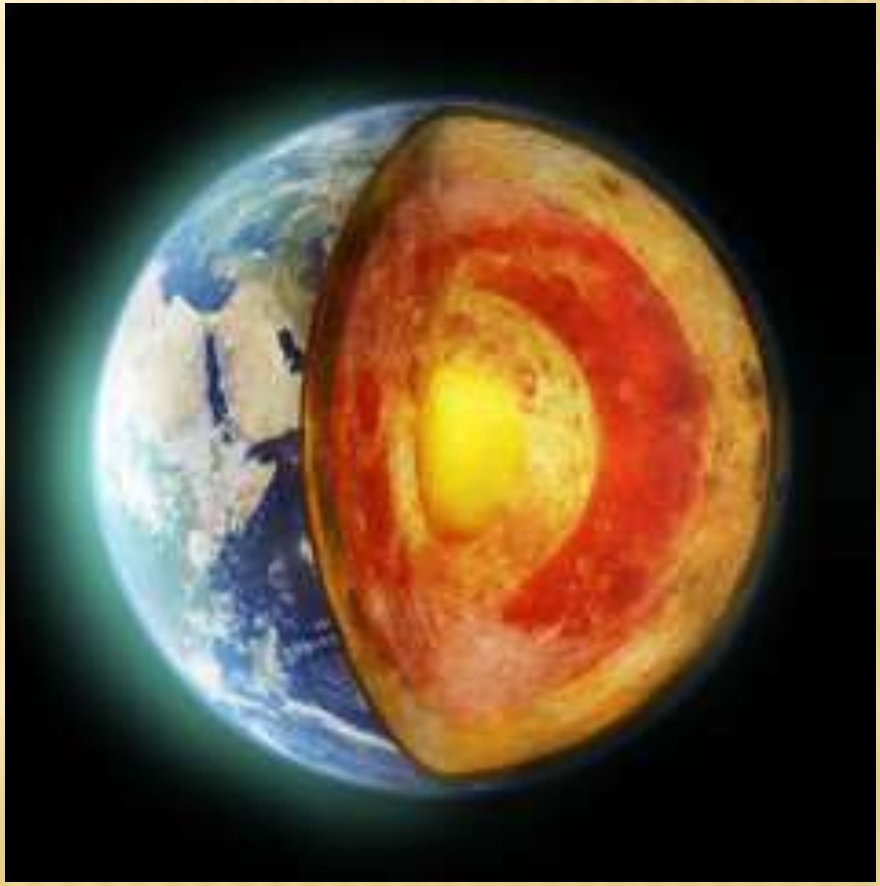
Dr. Mamta Bansal
Associate Professor
School of Basic and Applied Sciences

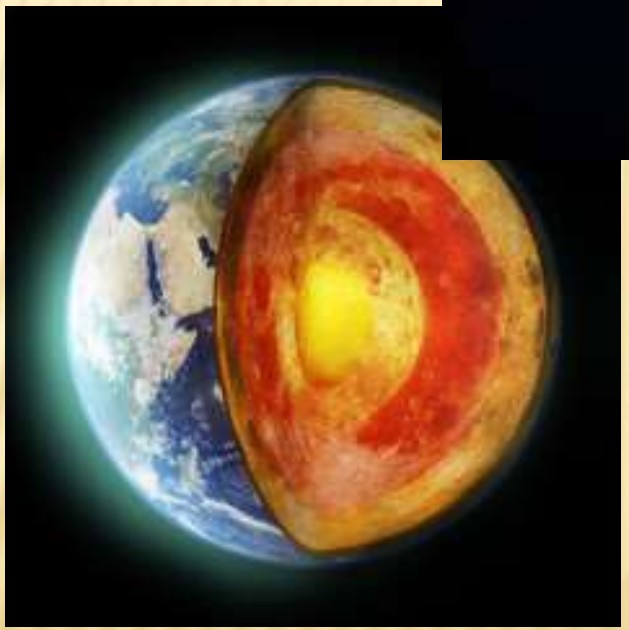
Introduction

- The Earth is composed of multiple layers, each with distinct characteristics.
- These layers play a crucial role in Earth's geological and environmental processes.
- This presentation explores the four main layers: Crust, Mantle, Outer Core, and Inner Core.

OVERVIEW OF EARTH'S LAYERS

- The Earth is divided into four main layers:
  - Crust
  - Mantle
  - Outer Core
  - Inner Core
- Each layer varies in composition, state and temperature.





THE CRUST - INTRODUCTION

- The Crust - Introduction
- The outermost layer of the Earth.
- Composed of solid rock, mostly basalt and granite.
- Divided into oceanic and continental crust.

THE CRUST - FEATURES

- Thickness: 5-70 km.
- Temperature: Varies from surface temperature to around 870°C.
- Lithosphere: Includes the crust and upper part of the mantle.
- Home to all known life forms.

OCEANIC VS CONTINENTAL CRUST

- **Oceanic Crust:**
  - Mostly basalt, denser, thinner (~5-10 km thick).
- **Continental Crust:**
  - Mostly granite, less dense, thicker (~30-70 km thick).

THE MANTLE - INTRODUCTION

- The layer beneath the crust.
- Makes up about 84% of Earth's volume.
- Composed mostly of silicate rocks rich in iron and magnesium.

THE MANTLE - FEATURES

- Thickness: About 2,900 km.
- Temperature: Ranges from 870°C to 3,700°C.
- Semi-solid, with slow-moving convection currents that drive plate tectonics.

LAYERS OF THE MANTLE

- **Upper Mantle:** Includes the lithosphere and asthenosphere.
- **Lower Mantle:** Denser and hotter, extending to the outer core.

THE ASTHENOSPHERE

- A semi-fluid layer within the upper mantle.
- Allows tectonic plates to move.
- Plays a crucial role in plate tectonics and volcanic activity.

THE OUTER CORE - INTRODUCTION

- A liquid layer beneath the mantle.
- Composed mainly of iron and nickel.
- Responsible for generating Earth's magnetic field.

THE OUTER CORE - FEATURES

- Thickness: About 2,300 km.
- Temperature: 4,000°C to 6,000°C.
- Movement of liquid iron creates the Earth's magnetism.

THE INNER CORE - INTRODUCTION

- The Earth's innermost layer.
- Composed primarily of solid iron and nickel.
- Despite extreme heat, it remains solid due to immense pressure.

THE INNER CORE - FEATURES

- Thickness: About 1,220 km.
- Temperature: Up to 6,000°C.
- Generates heat that drives mantle convection.

INTERACTION BETWEEN LAYERS

- The heat from the core drives convection currents in the mantle.
- These currents cause the movement of tectonic plates.
- Interaction between layers leads to earthquakes, volcanic activity, and mountain formation.

PLATE TECTONICS AND EARTH'S LAYERS

- Tectonic plates float on the asthenosphere.
- Their movement causes earthquakes and volcanic eruptions.
- Continental drift shapes the planet's surface over time.

THE ROLE OF EARTH'S LAYERS IN NATURAL PHENOMENA

- Earthquakes: Caused by stress between moving plates.
- Volcanoes: Magma from the mantle reaches the surface.
- Magnetic Field: Created by the outer core's liquid iron movement.

IMPORTANCE OF STUDYING EARTH'S LAYERS

- Helps understand natural disasters and predict earthquakes.
- Aids in resource exploration (minerals, oil, geothermal energy).
- Enhances knowledge about planetary formation and evolution.

FUN FACTS ABOUT EARTH'S LAYERS

- The inner core is as hot as the surface of the Sun.
- The crust is thinner than an apple's skin compared to Earth's size.
- The mantle makes up most of Earth's mass

SUMMARY

- The Earth has four main layers: Crust, Mantle, Outer Core, and Inner Core.
- Each layer has unique characteristics and functions.
- Understanding these layers helps us learn more about Earth’s processes and history.


THANK YOU