

**Welcome to the Exciting
world of Earth Sciences**

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ES-1101

At IISER-Kolkata

Instructors:
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Grading pattern (Tentative)

5 Class tests, spaced throughout the semester, for which one week of advance notice will be given: 75%
End-Sem Examination: 25%

Suggested Readings

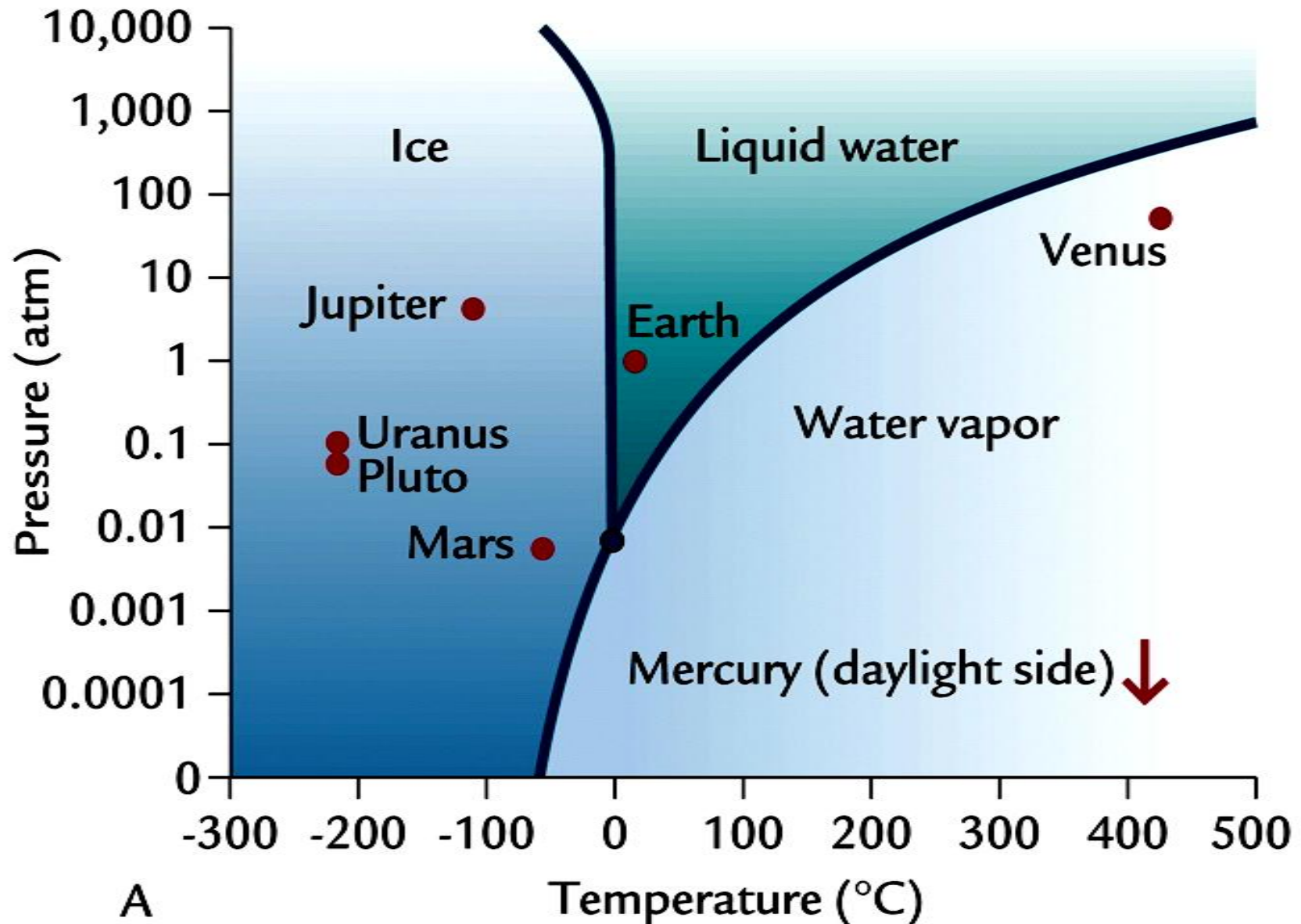
Text Books:

1. Press, F and Siever, R. *Understanding Earth (5th ed.)*, W.H. Freeman and company.
2. Fowler C.M.R. *The Solid Earth*, second edition, CUP.
3. Edward J. Tarbuck & Frederick K. Lutgens *Earth: An introduction to Physical Geology (9th ed.)*, Pearson Prentice Hall.
4. Stanley, S. M. *Earth System History (3rd ed)*, W.H. Freeman and company.
5. Cowen, R. *History of life (4th ed)*, Blackwell publishing.
6. Lunine J.I. *Earth: Evolution of a habitable world*. Cambridge University Press

- **Earth is a unique place,
home to millions of
organisms**

The Earth- a unique planet

Why unique?



Climates on three planets today



Venus

avg. temp. 460 °C

Earth

15 °C

Mars

-55 °C

What is Earth Science ?

To know about the origin of the Earth, how it formed, how it evolved, how it works, and **how to sustain it for the generations to come**

- **Requires broad knowledge of
Physics, Chemistry, Biology
and Maths**

**Geology + Physics=
Geophysics**

**Geology + Chemistry=
Geochemistry**

**Geology + Biology=
Geobiology....**

- **Observational, Theoretical,
Experimental & Applied
Science**
- **Basic requirement of an Earth
Scientist: Must be a Nature
Lover; Must be Adventurous;
Must be intrigued with natural
phenomena and so seek
answers**

Earth System Science

We look at the Earth as a System

It has several components that
Interact with each other:

Geosphere: Hard part, rocks, soil

Hydrosphere: oceans, rivers

Atmosphere

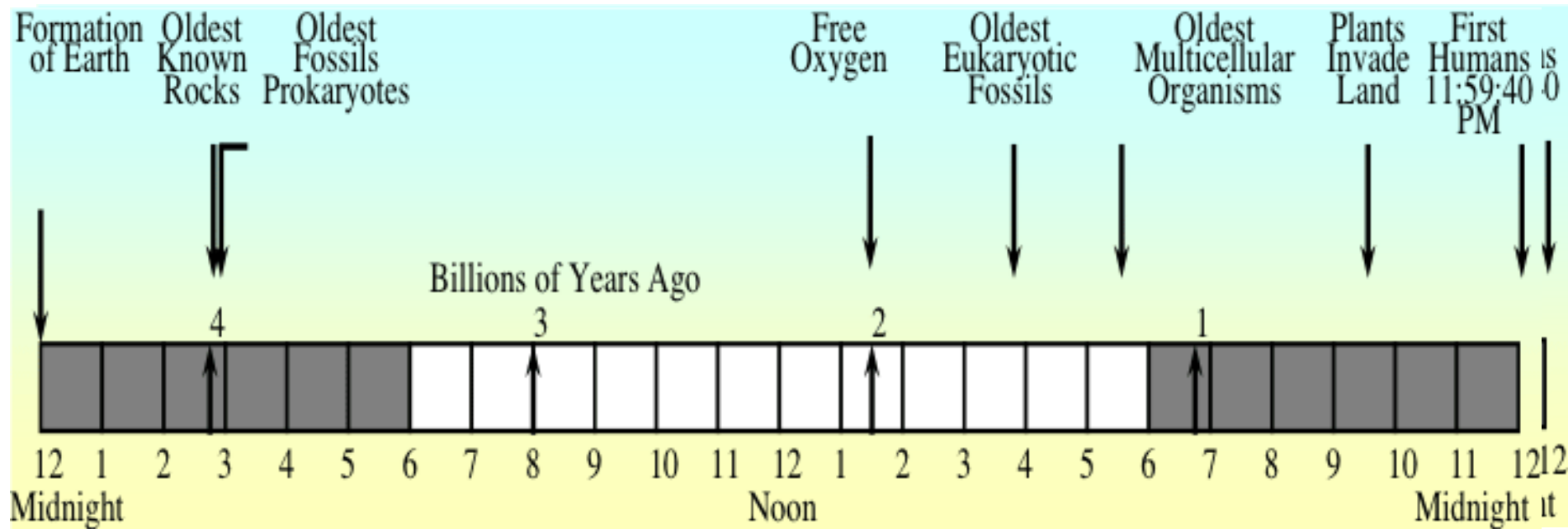
Biosphere

Cryosphere: Ice cover

Geologic Time

- **human perspective**
 - **seconds, hours, days, years**
- **ancient human history**
 - **hundreds or even thousands of years**
- **geologic history**
 - **millions, hundreds of millions, billions of years**

The Concept of geological time is quite distinct !



Why is it necessary to study

1. Earth Science is critically relevant to human existence

The 21st century is defined by grand challenges, such as climate change and the availability of water, energy and mineral resources. Understanding the ideas and concepts of Earth Science is critical for the ability of human society to respond successfully to these challenges and thrive in the decades to come.

2. The process of Earth Science takes many different forms

Earth Scientists use multiple lines of evidence taken from field, analytical, theoretical, experimental and modeling studies to interpret observations about Earth and forecast Earth's future

3. Earth Science research studies an enormous range of complex processes

Earth Science examines processes that occur over spatial scales ranging from subatomic to planetary and over time scales ranging from nearly instantaneous to gradual over billions of years.

4. Most of Earth's interior is inaccessible to direct observation

Earth Scientists must use complex remote methods to examine the structure, Composition and dynamics of Earth's interior. These investigations include data from Seismic waves, gravitational and magnetic fields, radar, sonar and laboratory Experiments on the behavior of materials at high pressures.

5. Earth Scientists use multiple methods to reconstruct Earth's incomplete historical records

Earth Scientists determine the history of rocks by examining their structures, fabrics, textures, compositions and mineral grain sizes.

6. Earth Scientists reconstruct the history of life and of the planet from fossil evidence

7. Earth Scientists devise methods to locate mineral deposits that produce metals/non-metals, locate coal, petroleum and nuclear fuels crucial for sustenance of human civilization

8. Earth Scientists explore the space to know about planetary evolution

Before They Go to Space, Astronauts Go to Geology Camp

By [Meghan Bartels](#) March 07, 2019

<https://www.space.com/astronaut-training-geology-field-work.html>