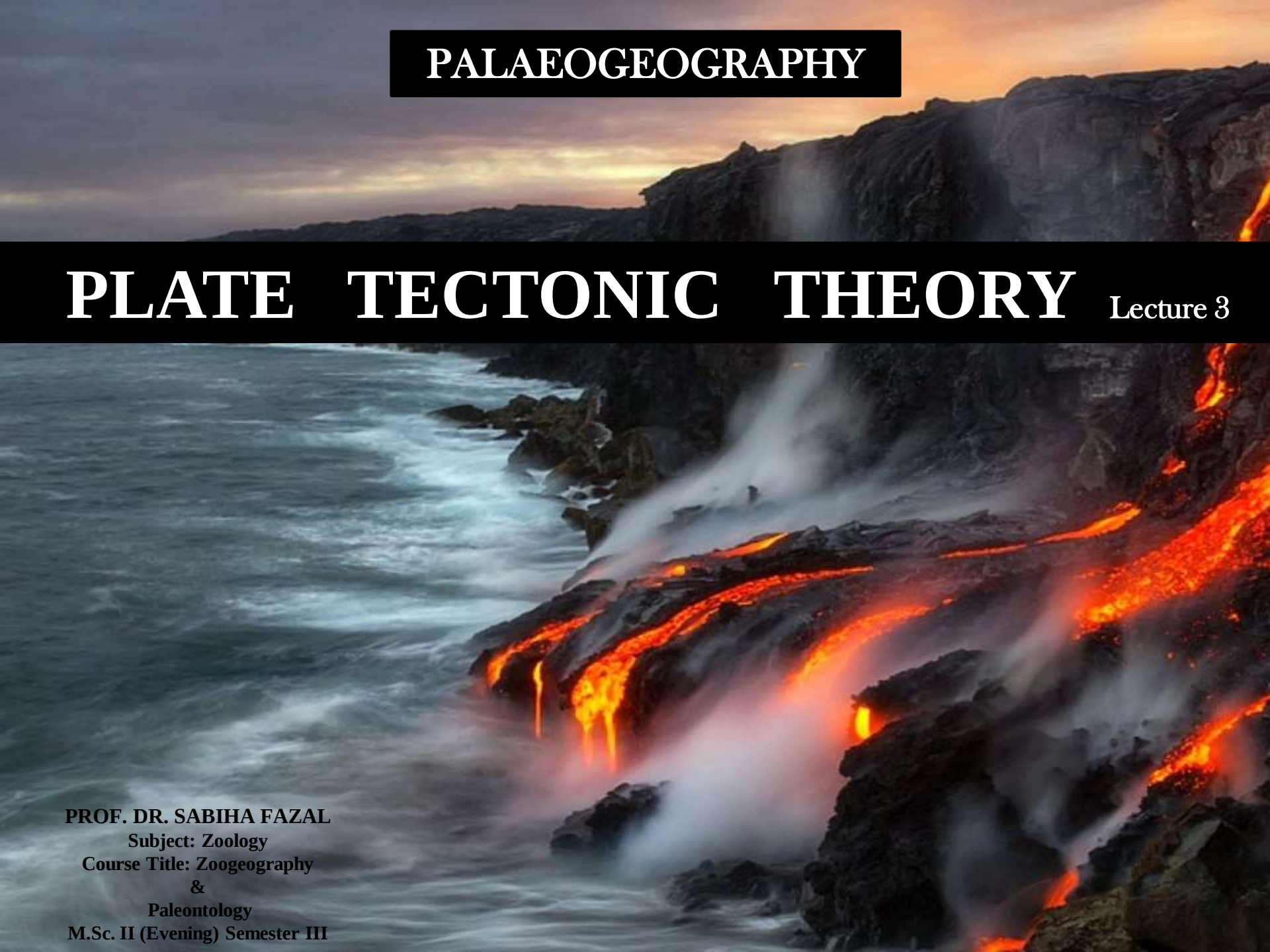

PALAEOGEOGRAPHY

PLATE TECTONIC THEORY

Lecture 3

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Subject: Zoology
Course Title: Zoogeography
&
Paleontology
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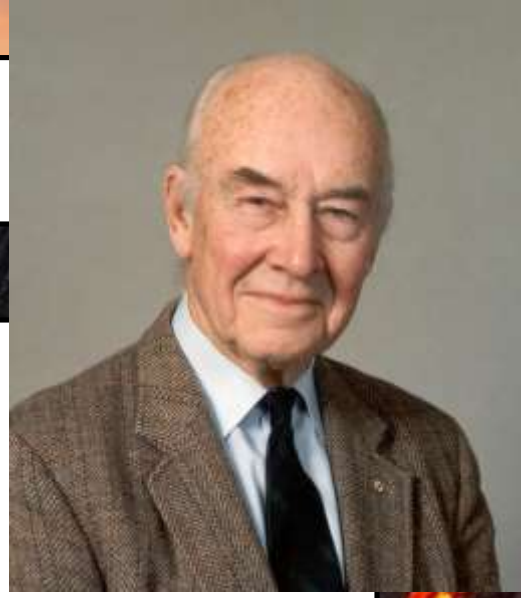
PLATE TECTONIC THEORY



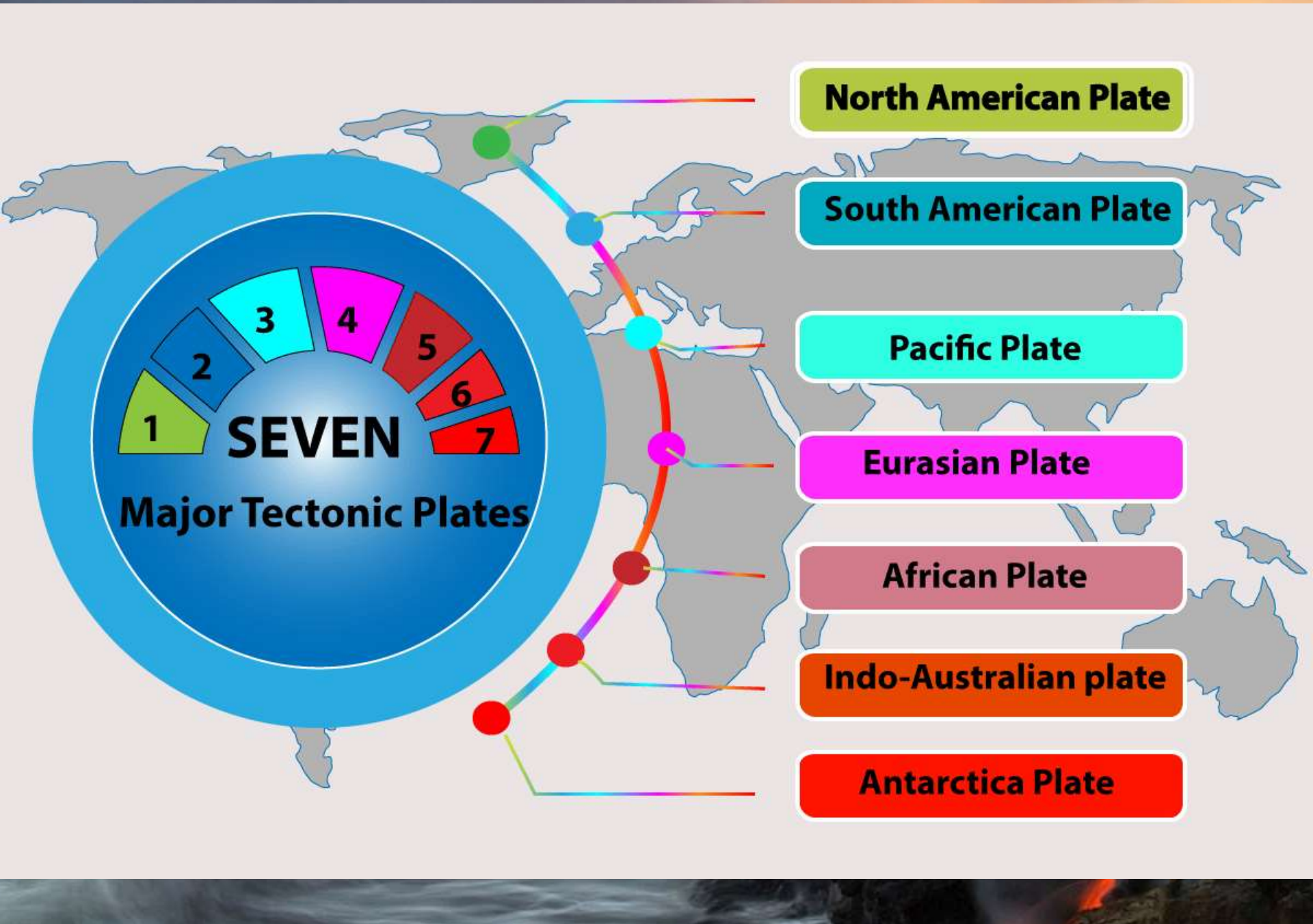
- In the recent decades due to the combined efforts of geologists, paleontologists and biologists, enough information and evidences have been gathered to support Wagner's theory of continental drift.

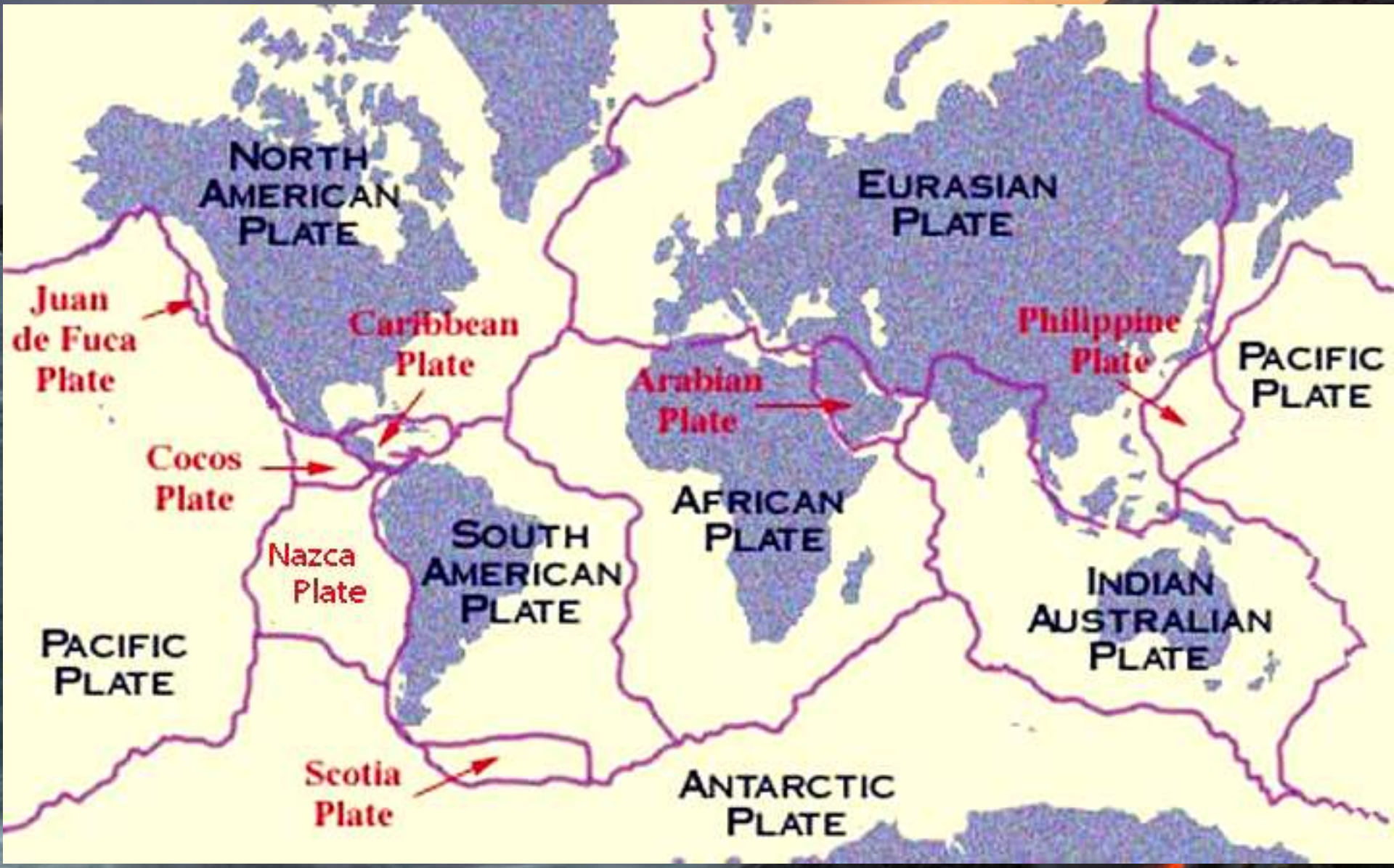
- In 1966, the concept of plate tectonic was introduced by a Canadian geophysicist J. Tuzo Wilson. It may be regarded as a scientific mechanism for the theory presented by Wegner in 1915.

BASIC PRINCIPLES OF PLATE TECTONIC THEORY

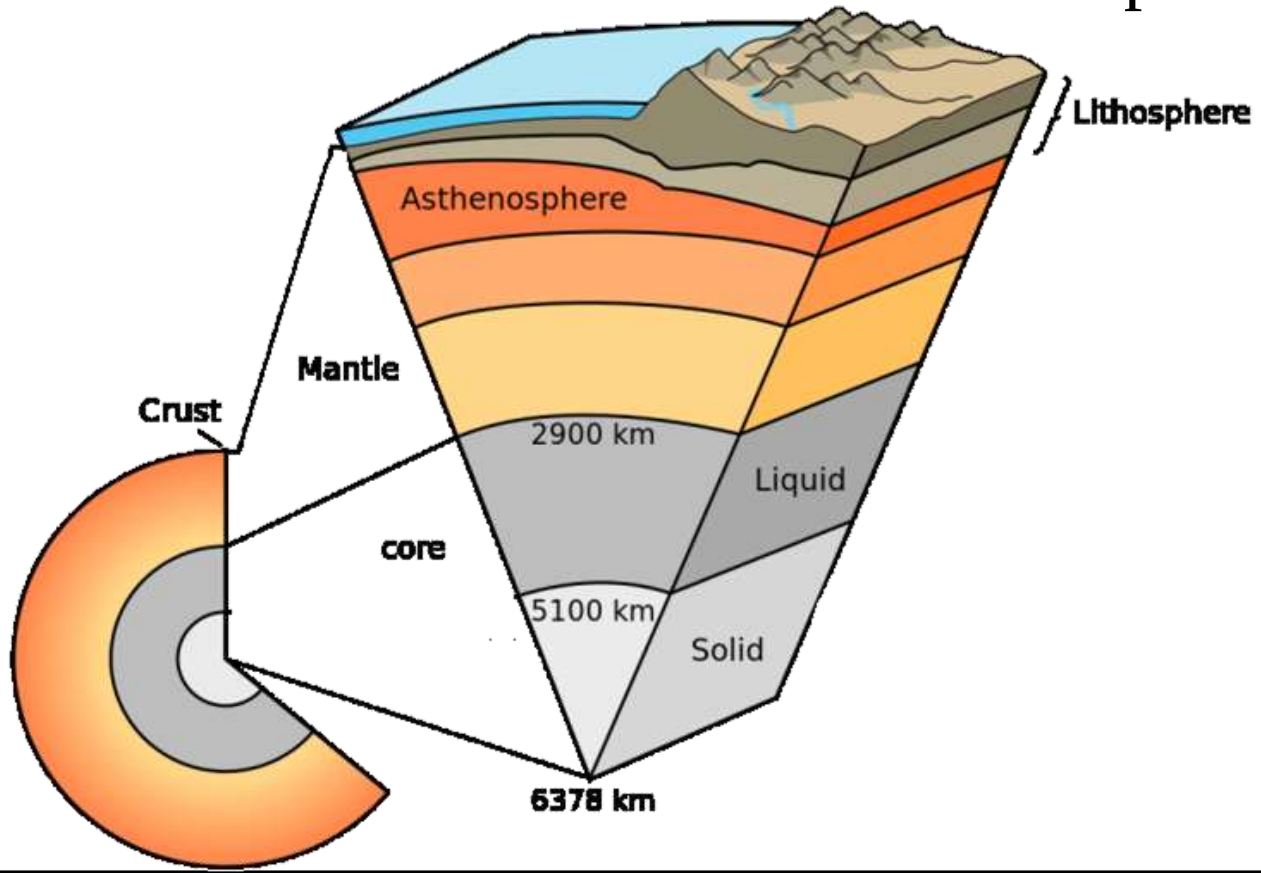
1. The lithosphere (the outer 100 km of earth crust) is divided into giant, irregularly shaped plates called **Tectonic Plates**. There are **seven** such major plates and several smaller ones.

2. A plate may carry continental and oceanic crust as well as the upper mantle termed as **Continental tectonic plate** (e.g., North America plate), or it may consist of only the oceanic crust and thin upper mantle material, the **Oceanic tectonic plate** (e.g., the pacific plate). Plates are thin in the oceans (50-100 km), where as the continental plates are 100-150 km thick.

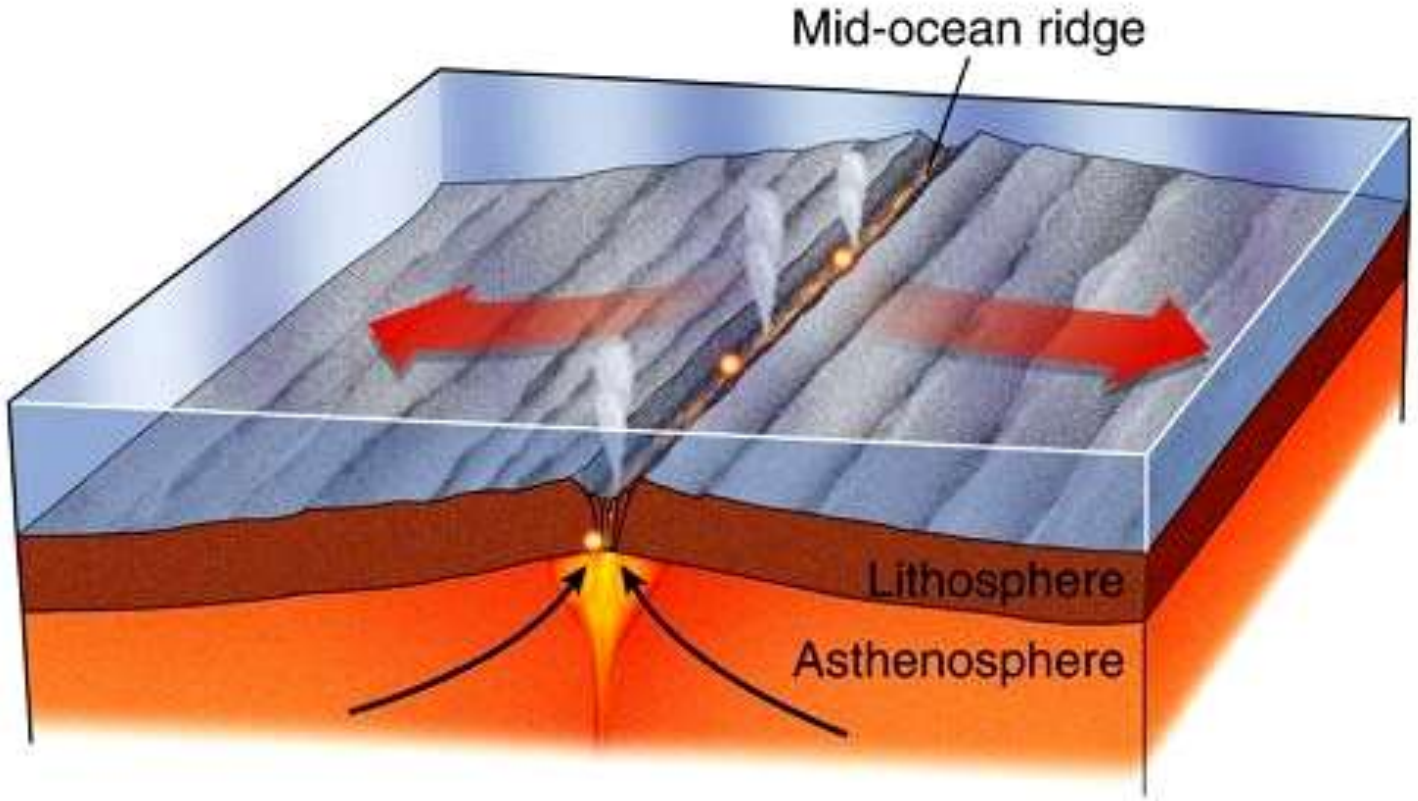

1
2
3
4
5
6
7
SEVEN
Major Tectonic Plates
North American Plate
South American Plate
Pacific Plate
Eurasian Plate
African Plate
Indo-Australian plate
Antarctica Plate


NORTH AMERICAN PLATE
EURASIAN PLATE
Juan de Fuca Plate
Caribbean Plate
Philippine Plate
PACIFIC PLATE
Arabian Plate
Cocos Plate
AFRICAN PLATE
SOUTH AMERICAN PLATE
Nazca Plate
INDIAN AUSTRALIAN PLATE
PACIFIC PLATE
Scotia Plate
ANTARCTIC PLATE

3. Below the lithosphere lies a semi-molten heavier & hot material called **Asthenosphere**. Thus the rigid , lighter and outer lithosphere shell is supported below by the more plastic and heavier material of Asthenosphere.



4. The crustal **plates move about slowly but constantly**, they literally float on underlying mantle. The plastic nature of mantle facilitate this motion, while the push is provided by the accretion of material to the plates at the **mid-ocean ridges.**



Mid-ocean Ridges.

5. Another basic principle is that **each plate moves as a single independent unit in relation to other plates**. Hence, as a plate moves, the distance between the two cities on the same plate (e.g., New York and San Francisco) remains constant (because both cities are located on the North American plate).

   while the difference between New York and London, which are located on different plates, is constantly changing, though at almost imperceptible rate (i.e., 2.5 cm per year).

6. **As a result of plate movements, world geography changes constantly.** Throughout geological time, continental movements have greatly influenced the distribution of fauna and flora around the world.

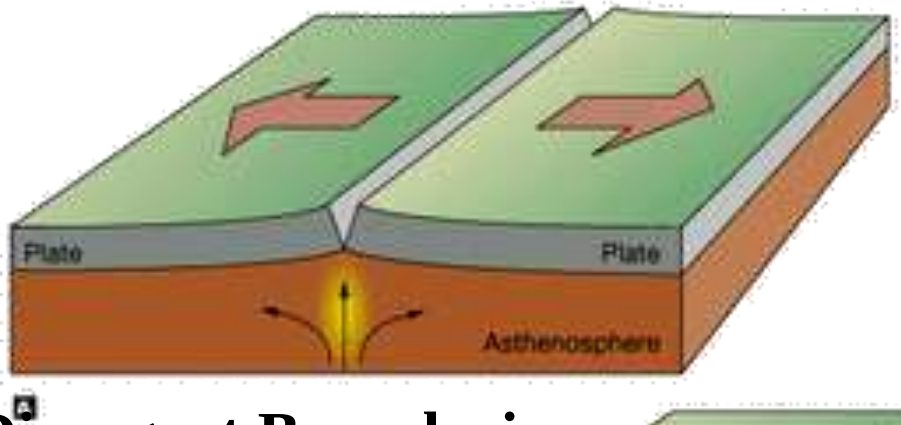
- Since each plate moves as a distinct unit, all major interactions between plates occur along plate boundaries. All plate margins are frequently the areas of considerable earthquake activity and volcanism.

- The large scale features of earth, such as, continents, ocean basins, island arcs, oceanic trenches, mountain belts, high plateaus, etc., all are produced as a result of interactions between plates along these dynamic margins.

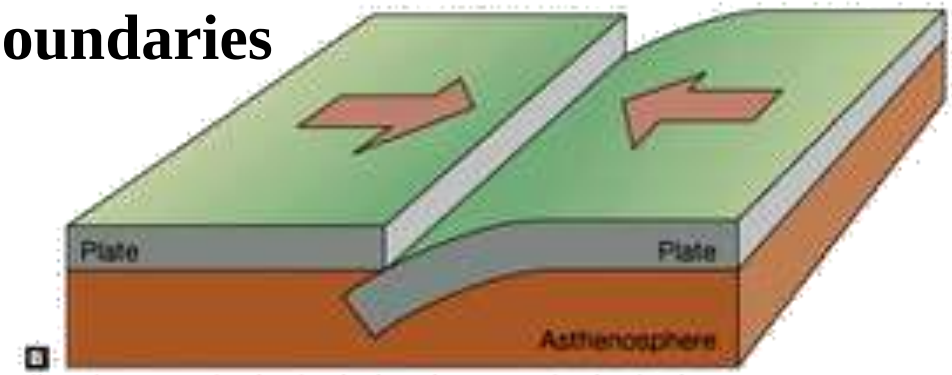
DISTINCT TYPES OF PLATE BOUNDARY MOVEMENTS

- There are **three** distinct types of plate boundaries, each differentiated by the movement it exhibits.

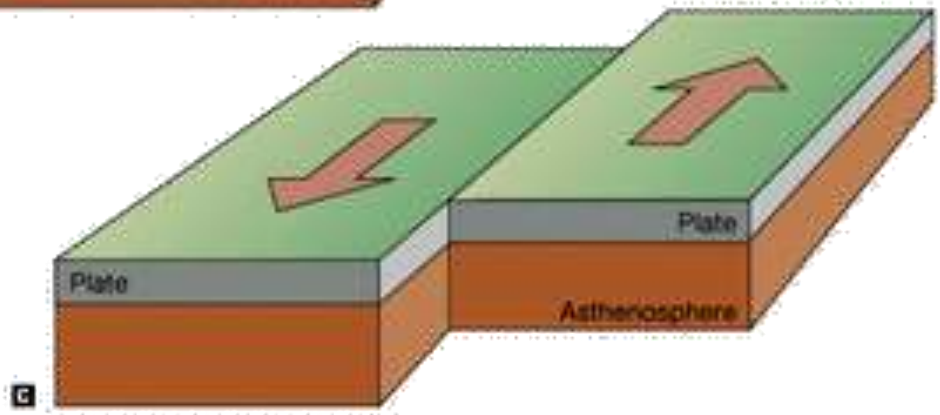
1. **Divergent Boundaries**
2. **Convergent Boundaries**
3. **Transform Boundaries**



1. **Divergent Boundaries**



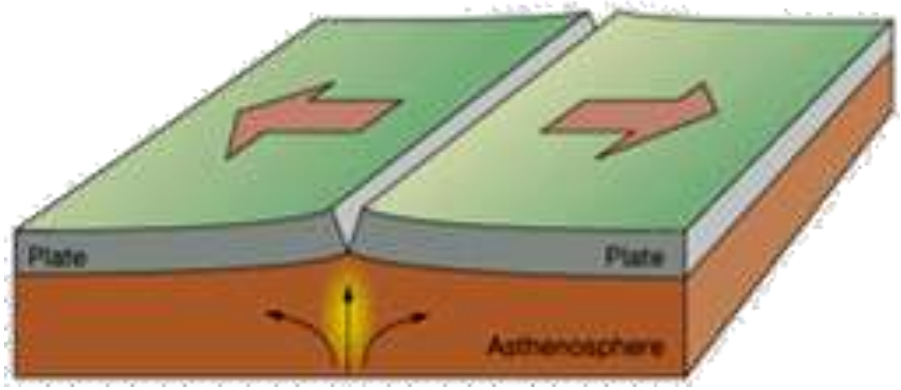
2. **Convergent Boundaries**



3. **Transform Boundaries**

DIVERGENT BOUNDARIES

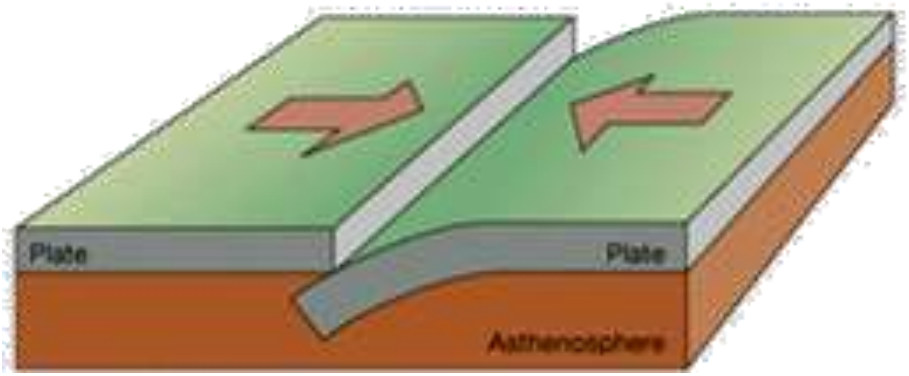
- At the mid-ocean ridges in Pacific, Atlantic and Indian oceans, plates **move apart** as a result of upwelling of materials from the mantle to create new ocean crust.



- A material is added to plate margin. It is also known as "**Accretion boundary**". This accretion causes the plates to be pushed apart giving rise to sea floor spreading. This movement of plates in the opposite directions is known as **Divergent boundaries**.

CONVERGENT BOUNDARIES

- When two plates moving in the opposite direction collide along the margin, i.e., they converge, one plate subducts under the other and in this process the lower plate may be absorbed in the mantle.



- The boundary where the plates are being destroyed is distinguished as a **Convergent boundary**. Oceanic trenches (some as deep as 11 km) develop along these convergent boundaries.

TRANSFORM BOUNDARIES

- Very deep faults generally develop within the plates, most prominently across the ridge axis. They are recognized as **Transform boundaries**. The faulted portion may slide past each other without loosing their motion.