

Subject: Environmental Science (Hons.)

Semester/Year : 4th Semester/2nd year

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Name of Topic: Biogeography

Biogeography

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What is **Biogeography**?

- Bio-geography is the **study of the geographical distribution of plants and animals**. Most species of plants and animals of the world are essentially restricted in their distribution either by (natural) barriers of some description or because of the history of their origins and dispersal.

What is **Biogeography**?

- The **major units** of distribution are referred to as **bio-geographical regions**, which are largely defined by the past and **present relations of the continents to each other**.
- These major global units of bio-geography were first recognized by P.L. Sclater (1858, in J. Proc. of Linn. Soc.2), and later elaborated upon and described in modern terms as "**realms**" by P.J.Darlington (1957,in Zoogeography. John Wiley & Son. New York).

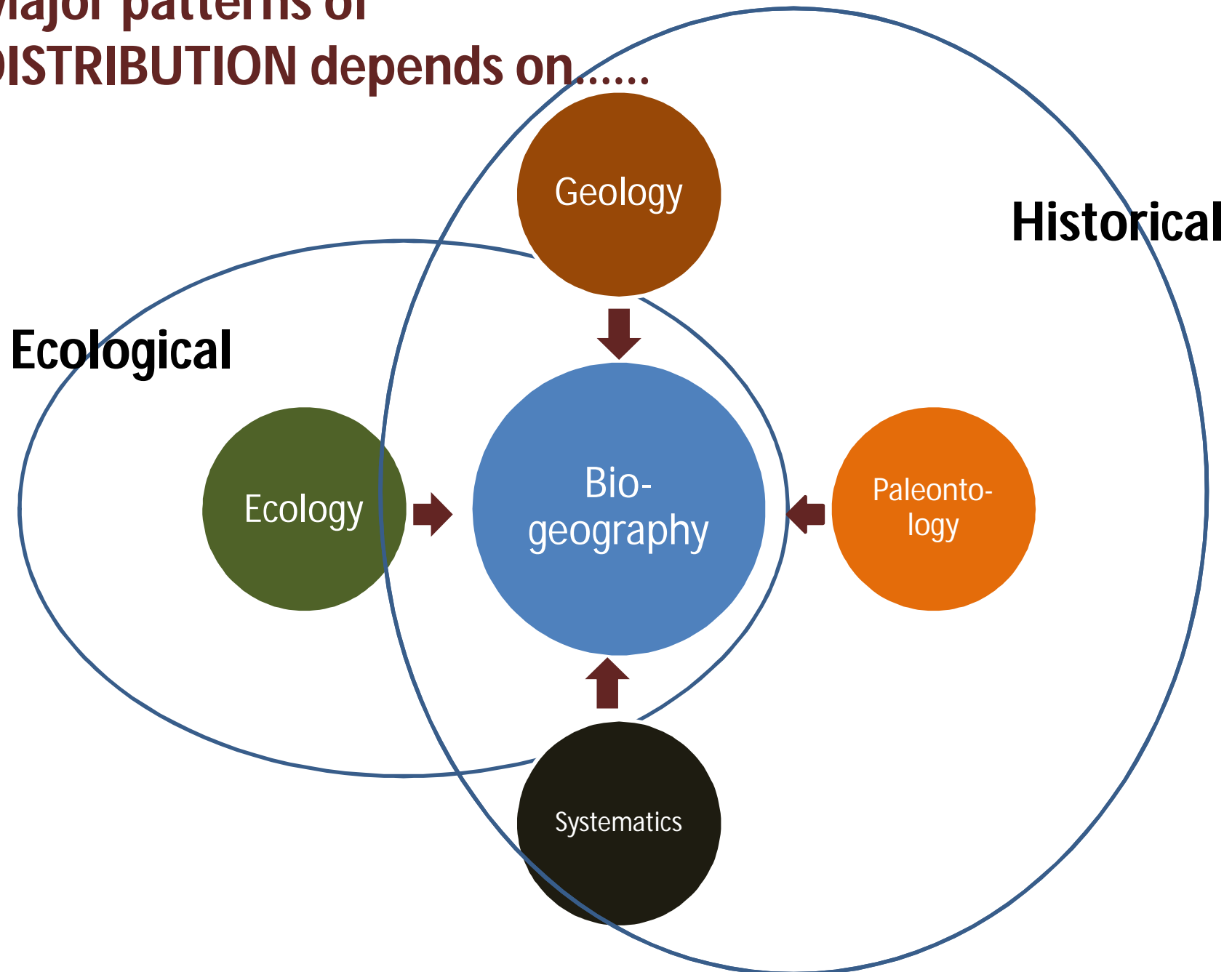
What is **Biogeography**?

- It attempts to explain **why species and higher taxa are distributed as they are,**
- and why the **taxonomic composition of biota vary from one region to other.**

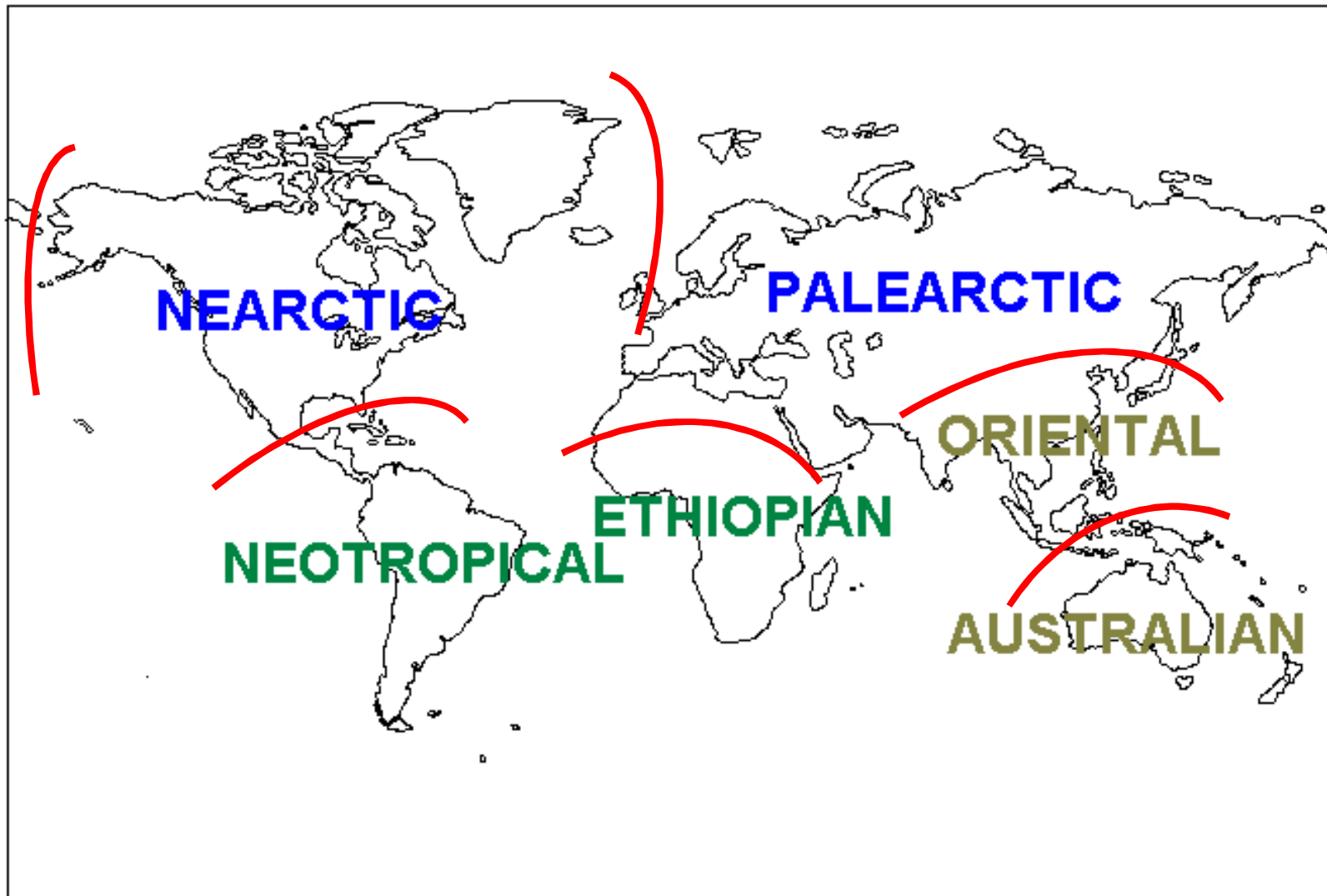
Major patterns of DISTRIBUTION

The geographic distribution of almost every species is limited to some extent, and many higher taxa are likewise restricted to a particular region. Here the concept of **Endemism** begins.

Major patterns of
DISTRIBUTION depends on.....



Large-scale Modern **Bio-geographic** Realms



Wallace, A.R. 1876. The Geographical Distribution of Animals. MacMillan, London

Nearctic and Palearctic

- Similar climate and environments
- Closely connected for the past 65 my
- 14mya Eurasia and new world NA joined
- Bears, cats, dogs, buffalo, moose, caribou, pronghorn to NA from Eurasia in Tertiary
- Camels evolved in NA ~50mya and dispersed to Eurasia in the Quaternary
- Endemic Palearctic species include monkeys, pandas, tigers, horses, camels
- Endemic Nearctic species include pronghorns, tulip tree, coast redwood, Douglas-fir

Neotropical

- 137 families of flowering plants (most diverse) and shares families with Australasian, Ethiopian and Nearctic regions (southern beeches and cushion plants)
- llamas, guinea pigs, chinchillas are endemic to the region and there are 3 families of marsupials (84 species)
- **Shares** rabbits, shrews, squirrels, cats, foxes, raccoons, mountain lions, and deer **with Nearctic**
- Shares camels and monkeys with Palearctic, Oriental and Ethiopian regions
- Large number of rodents (200 species)

Ethiopian

- Many endemics including zebras, giraffes, gazelles, wildebeests, African elephants, baboons, chimps, gorillias
- Shares a number of families with Palearctic and Oriental but few with Neotropical and none with Australian regions .
- 20 mya Africa collided with Eurasia and camels and zebras migrated in from Nearctic and Palearctic
 - Northward migration of elephants (mammoth) out of Africa ~2mya
- Floras are similar to Neotropical and Australian region suggesting that they were close enough to exchange floras >130 mya.
- Sahara desert is a significant barrier to species migration

Oriental

- Endemics include gibbons, orangutans, flying lemurs
- Indian rhino and elephant are from Ethiopian region
- Bengal tiger is closely related to Siberian tiger(Palearctic)
- Endemic teak tree
- No mammals from Australian region
- Flora from Ethiopian, Palearctic and Australian regions
- Transport of southern species to Asia = termed an **ark**(India)
- Tibetan plateau acts as a barrier to migration for many species in the Palearctic
- Australia and southern Asia were never connected; deep trenches in the Malaysian Archipelago

Australian

- All mammals are marsupials (except bats, dingo, and rat introduced by humans)
- Endemic species include kangaroo, wallabies, koala bears, and monotremes
- Flora closely related to Oriental, Ethiopian, and Neotropical regions
- Eucalyptus is endemic and accounts for 95% of tree biomass
- Ravens, crows, magpies first evolved in Australian region and migrated north via Malaysian Archipelago in the Miocene and became cosmopolitan.

Factors affecting geographic distribution

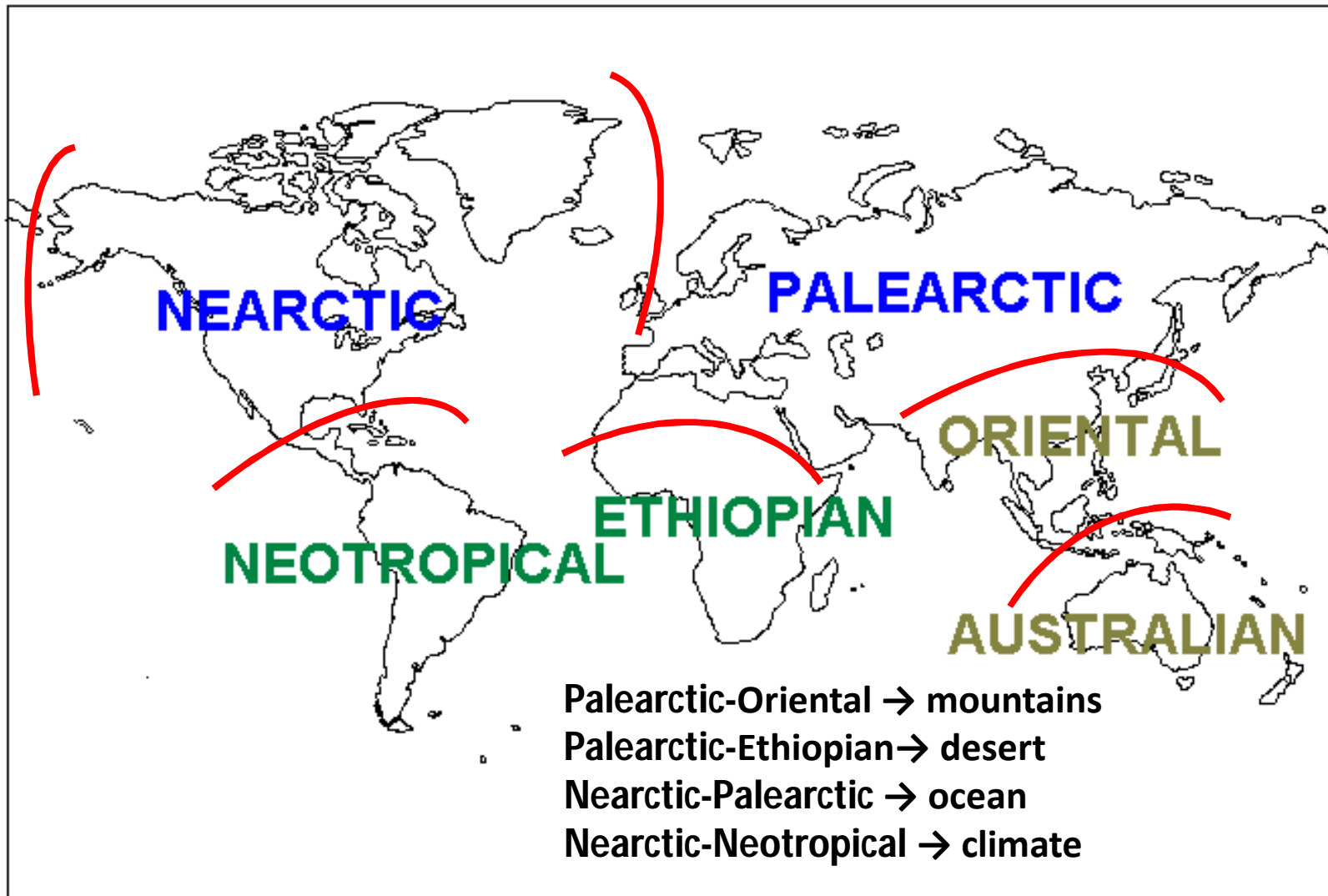
Biological

- Adaptation to Condition
- Range expansion
- Jump dispersal

Abiotic

- Climate
- Eustatic
- Tectonic

Barriers



Wallace, A.R. 1876. The Geographical Distribution of Animals. MacMillan, London

Traits of easily dispersed r-selected organisms

1. Short life
 2. Rapid growth
 3. Early maturity
 4. Many small offspring
 5. Little parental care or protection
 6. Little investment in individual offspring
 7. Adapted to unstable environments
 8. "pioneer" species
 9. Niche generalists
 10. Occupy low trophic level
 11. Often self fertilize - Autogamous
 12. Have large seeds, winged seeds, etc.
- These tend to result in more cosmopolitan species**

Traits of poorly dispersed k-selected organisms

1. Long life
 2. Slow growth
 3. Long maturity
 4. Few offspring
 5. Parental care and protection
 6. Intolerant of unstable environments
 7. Niche specialists
 8. Occupy higher trophic levels
- These tend to result in more endemics**