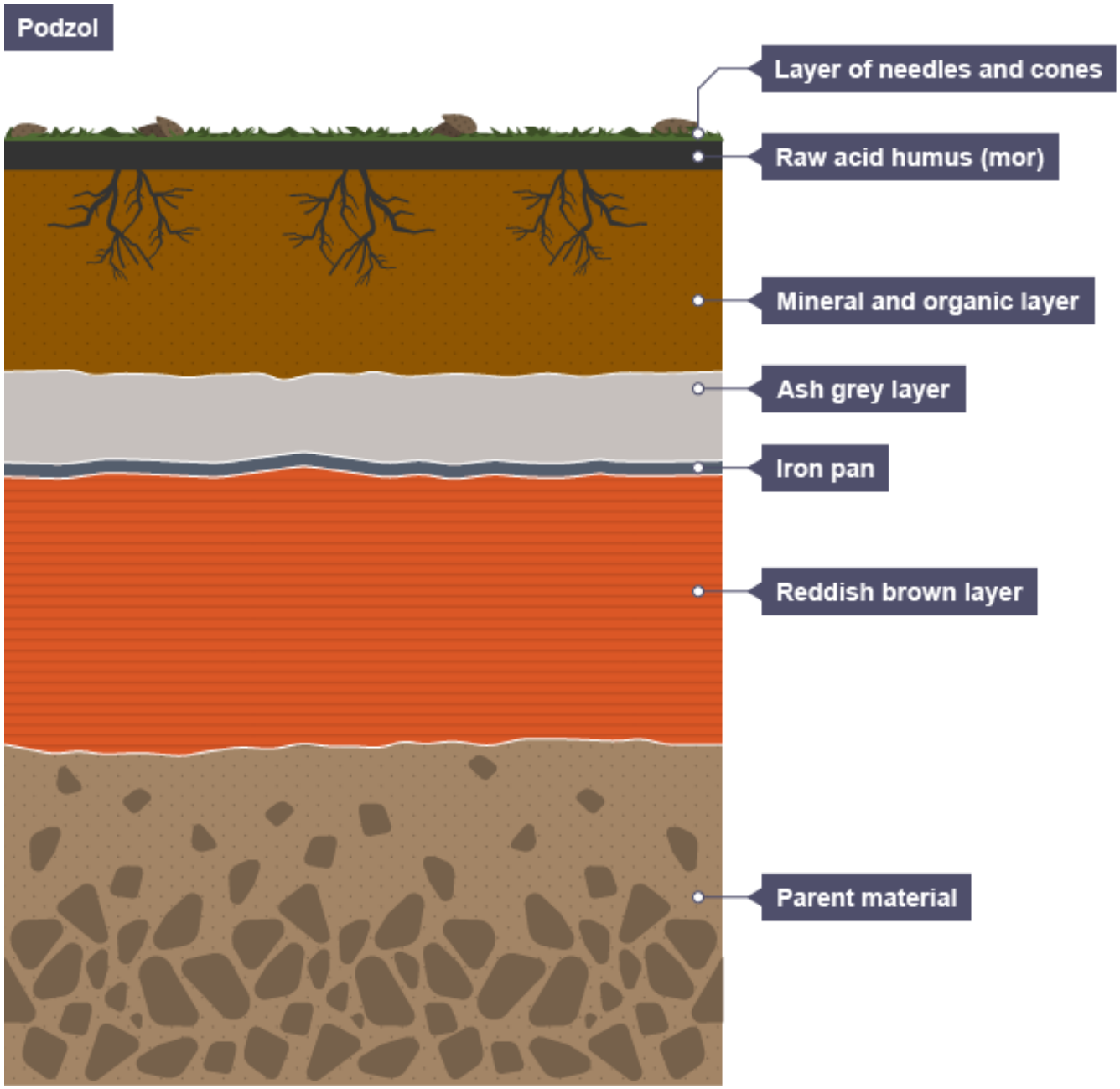
Geography Hons – SEM IV

Factors in Soil Formation

- The factors involved in soil formation are time, geology, relief, drainage, climate, vegetation and people.
- **Time**
- It takes about 1000 years for one centimetre of soil to form. In many parts of Britain we have had only 10,000 years since the last Ice Age stripped the original surface soils away.
- **Geology**
- Minerals from the parent material are added to the soil by physical and chemical weathering.
- **Relief**
- Different soils will form on different degrees of slope and aspect. Gravity and temperatures will affect the degree of slope movement and weathering.
- **Drainage**
- Whether water can or cannot move through the soil easily will affect the development of the soil profile.
- **Climate**
- How much water and air enter the soil - and their temperatures - will affect the organic life of the soil and evaporation rates on the surface.
- **Vegetation**
- The type and quantity of plant cover will affect the amount of organic material added to the soil. This is called humus.
- **People**
- When people change the angle of a slope through construction, or change the vegetation cover and/or drainage in an area, the soil will also change.

Soil Profile : Podzol

- Podzols are easily recognisable by their distinct layers or horizons. A grey or light-coloured 'E' horizon is the result of severe leaching, or ***eluviation***, which washes out everything but quartz grains. **Eluviation** is the removal of soil, clay, silt or fine organic matter in suspension from a soil horizon.
- The iron and aluminium oxides collect in the 'B' horizon where the iron oxides can accumulate to form a thin layer of hardpan, which impedes drainage through the soil.


Podzol
Layer of needles and cones
Raw acid humus (mor)
Mineral and organic layer
Ash grey layer
Iron pan
Reddish brown layer
Parent material

- ***Illuviation*** is the process of deposition of soil material removed from one horizon to another, usually from an upper to a lower horizon as material is washed down profile by percolating water. Some iron and aluminium oxides get through the iron hardpan, giving this 'B' horizon its dull orange colour.
- These soils are found where there is good drainage and soil water is strongly acidic. They tend to be found on the upper slopes of upland areas where precipitation is heavy or where the vegetation is coniferous forest, producing an acid humus.
- The acidic conditions are not liked by soil organisms which would normally merge the boundaries of the horizons.

Soil Profile : Chernozem

- Chernozem is a type of fertile black soil containing a very high percentage of humus. The humus percentage ranges from the 4% to 16% of its total content. It also contains high quantities of ammonia and phosphoric acids. It is considered to be the most fertile black on the Earth due to its high mineral content

- **Characteristics of Chernozem**

  As we know that chernozem is a type of fertile black soil then just like black soil. It has also high amounts of lime, iron, magnesium and generally low quantities of phosphorus, nitrogen and organic matter. Apart from the all the characteristics of normal black soil, it has large quantities of humus, high quantities of carbonates in the subsoil and large concentration of metal ions specially calcium ions

Theories of Chernozem formation

- **First Theory:** It was given by the Swedish mineralogist **Johan Wallerius** in 1761. He opines that the chernozem is formed by the decomposition of plants.
- **Second Theory:** It was given by the Russian scientist **Mikhail Vasilyevich** in 1763. He expanded the first theory and said that the chernozem is formed by the decomposition of plants and animals.
- **Third Theory:** It was given by the Botanist **Peter Pallas**. He said that chernozem was formed by the reed marshes.
- **Fourth Theory:** It was propounded by the British geologist **Roderick Murchison.** He postulates that the chernozem was formed from the remains of Jurassic marine shales.
- **Fifth Theory:** It was given by the **Vasily Dokuchaev** in the late 19th century. He believes that chernozem was formed by the interaction of various factors such as a region's climate, its vegetation, and topography.

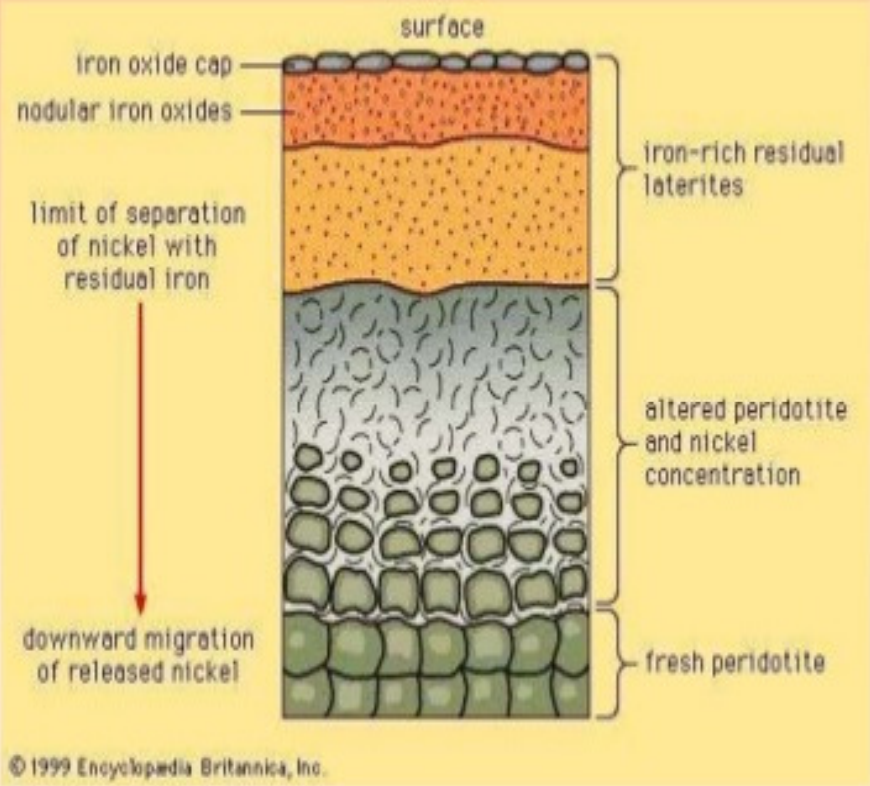
There are **two belts** on the Earth have large concentration of chernozem are given below:

- **First Belt:** Eurasian Steppe and encompasses territory in several countries such as Croatia, Romania, Ukraine, Russia, and Bulgaria. In Russia, the highest chernozem concentration is called as the Central Black Earth Region.
- **Second Belt:** Manitoba, Canada to Kansas, United States of America (North America)

Soil Profile : Laterite

- **Laterite** is a **soil** and rock type rich in iron and aluminium and is commonly considered to have formed in hot and wet tropical areas. Nearly all **laterites** are of rusty-red coloration, because of high iron oxide content. They develop by intensive and prolonged weathering of the underlying parent rock

Lateritic Soils



- Highly ferruginous
- Vesicular
- Unstratified deposits
- Highly weathered
- Qualify for *Ultisols* and *Alfisols* with *Kandic* properties

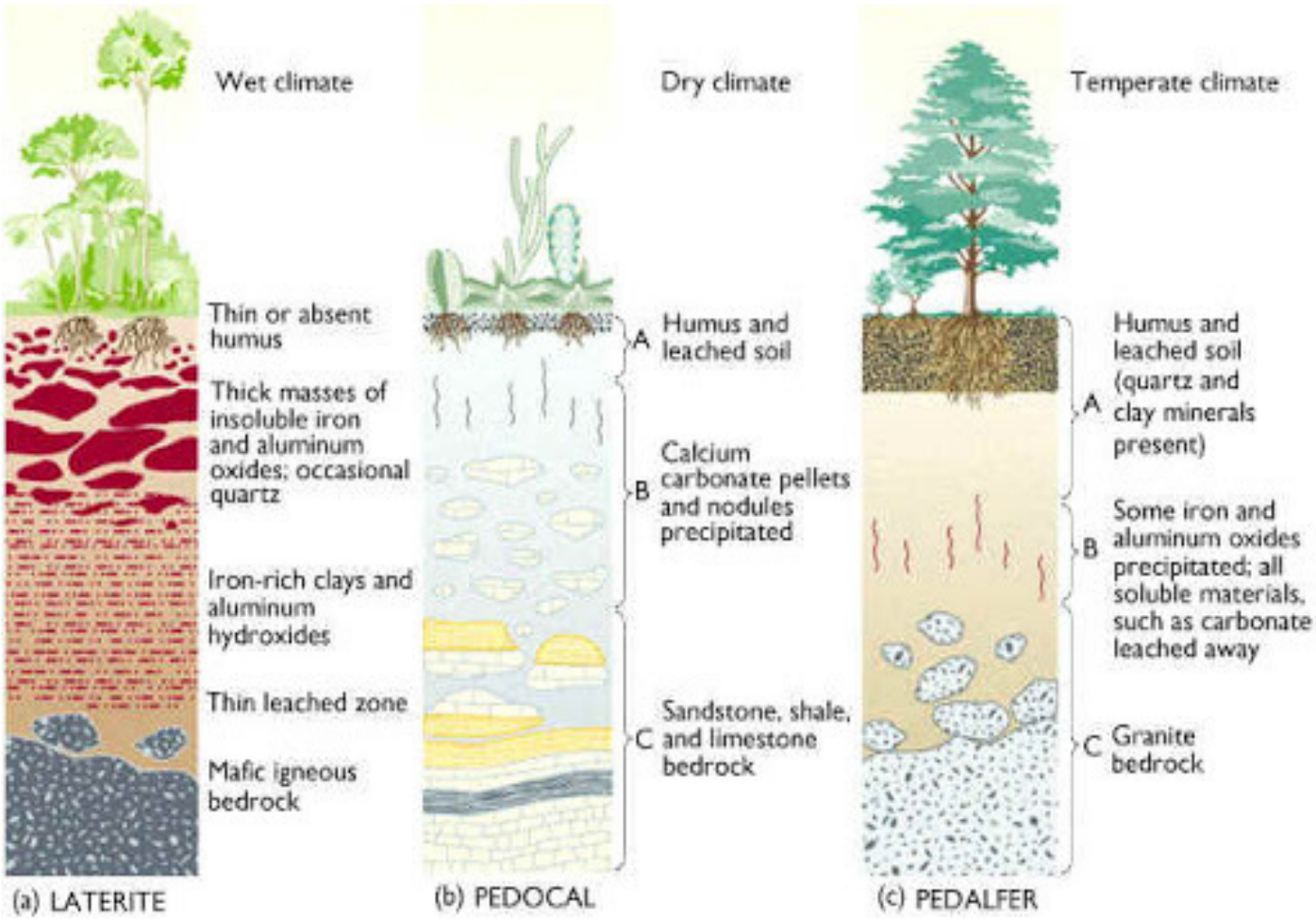
- In Subtropical and Tropical regions between 25 degrees North and South latitudes.
- Deposits are thick upto 20m.

- *Crops for higher topography*:

1. Cocoa
2. Cashew
3. Tea
4. Coffee
5. Rubber

- *Crops for lower topography:*

1. Rice
2. Banana
3. Coconut
4. Arecanut


Wet climate
Thin or absent humus
Thick masses of insoluble iron and aluminum oxides; occasional quartz
Iron-rich clays and aluminum hydroxides
Thin leached zone
Mafic igneous bedrock
(a) LATERITE
Dry climate
A
Humus and leached soil
B
Calcium carbonate pellets and nodules precipitated
C
Sandstone, shale, and limestone bedrock
(b) PEDOCAL
Temperate climate
A
Humus and leached soil (quartz and clay minerals present)
B
Some iron and aluminum oxides precipitated; all soluble materials, such as carbonate leached away
C
Granite bedrock
(c) PEDALFER

Thank you

Madhumita Chakrabarti Goswami