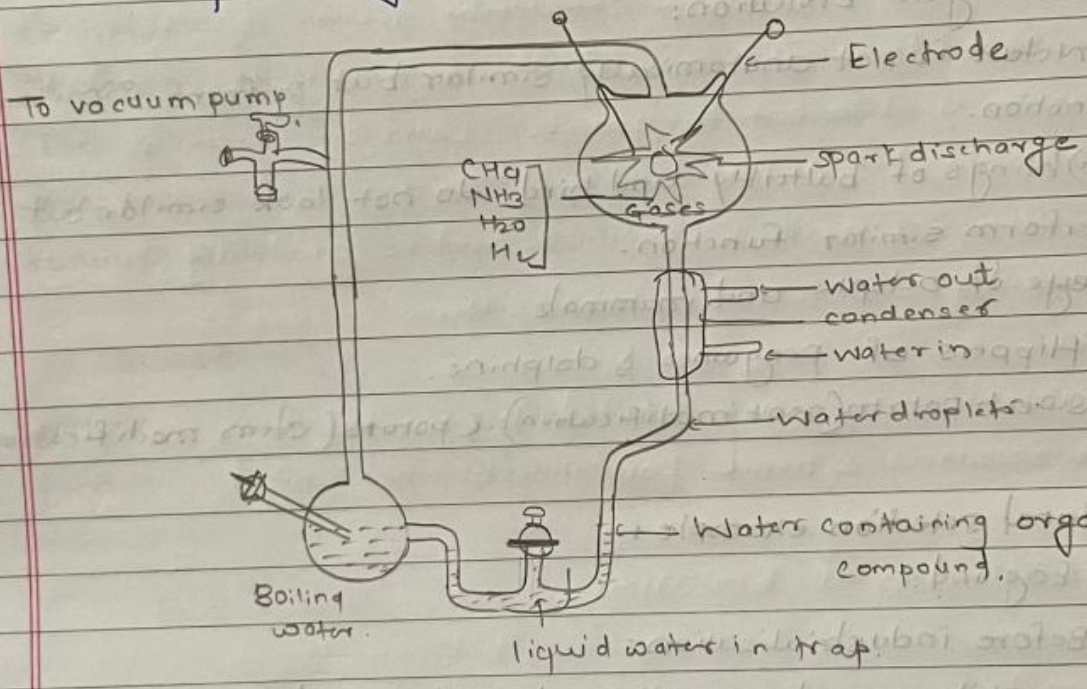
Chapter - 7
Evolution

- **origin of life :**
- Universe - 20 billion years old
- Galaxies contains stars, and clouds of gas and dust.
  clusters of galaxies comprises the universe.
- Big bank theory - explain origin of universe.
- Earth formed - 4.5 billion years back
  There was no atmosphere on early earth.
  Water vapour, methane, carbondioxide and ammonia released from molten mass covered the surface.
- Water $\xrightarrow{\text{UV rays}}$ Hydrogen + oxygen
- $O_2 + CH_4 + NH_3 \longrightarrow H_2O + CO_2 +$ other
- then ozone layer formed, as earth cool down waters vapour fell as rain & filled all depressions & formed ocean.
- life appeared 5 million years after formation of earth.
- panspermia theory - Early greek thinkers thought unit of life is spores which come from outside (seed comes from other planet and give life on earth.
- Spontaneous generation theory -
  life came out of decaying and rotting matter like straw, mud etc.
- biogenesis theory -
  Louise pasteure pasteure experiment demonstrated that life comes only from pre existing life.
  He showed that in pre-sterilised flasks, life did not come from killed yeast while in another flask open to air new living organisms arose from killed yeast.

Oparin and Haldane experiment; Urey millen experiment

- primitive earth condition - High temperature, volcanic storms, reducing atmosphere containing CH_4, NH_3 etc.

Miller created same conditions in laboratory scale
- He created electric charge in a closed flask containing CH_4, H_2, NH_3 and water vapour at 800°C.
- He observed formation of amino acid
- Hence chemical evolution was more accepted.
- first life form arises in water only.
- first cellular forms of life could have evolved into the complex biodiversity of today



Evolution of life forms:

- According to darwin those who are better fit in an environment leave more progeny than others and therefore will survive more and Hence selected by nature. He called it as a natural selection.
- Fossils - fossils are remains of hard part of life form found in rocks.
- A study of fossils in different sedimentary layers indicate the geological period in which they existed.

* divergent evolution:
- Same structural similarities but different function due to adaptation to different needs.
- These structure are homologous.
- Homology indicate common ancestry.

e.g: forelimb bone in whale bats, cheetah and human is same but have different function.

* Convergent Evolution:

Structure is not anatomically similar but perform similar function.

e.g.) Wings of butterfly and bird do not look similar but perform similar function.

2) eye of octopus and mammals

3) flippers of penguines & dolphins.

4) sweet potato (root modification) & porato (stem modification)

Natural selection example:

In England:

1) Before industrialisation:

more white winged moth than darked winged (melanised) on on tree bark.

Before industrialisation → No pollution → good lichen growth lichen covered tree bark → White barked tree → Hence predator can't catch white moth easily → white winged moth survive easily (chemoflauge mechanism) → dark colored moth picked by predator.

2) After industrialisation -

More dark winged moth than white winged

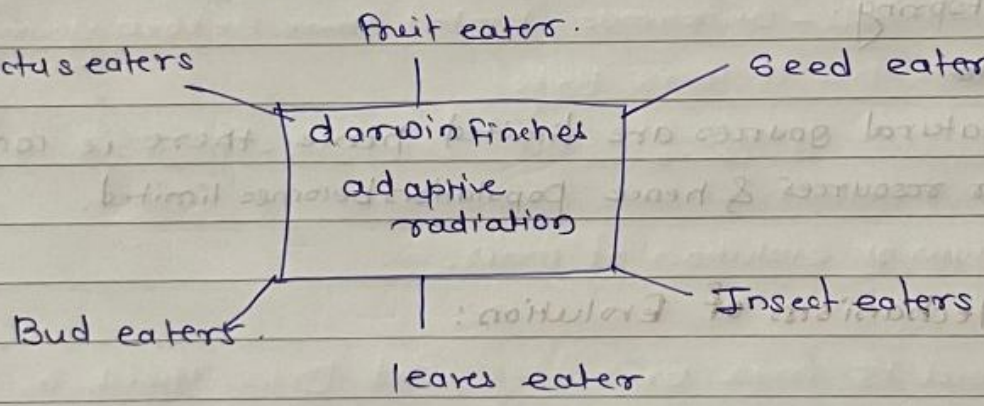
After industrialisation → High pollution → dark colored trunk due to smoke & sooth → Dark winged moth survive in dark bark

→ White moths picked by predator.

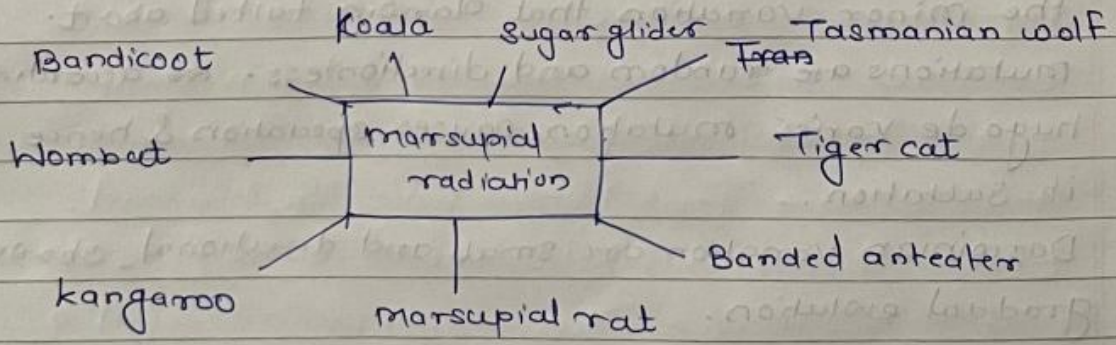
- another example:
  excess used of herbicide/pesticide result in selection of resistant varieties in much lesser time scale.

Adaptive radiation:

- during research on galapagos island darwin observed varitie of finches in the same island.
- seed eater finches, insectivorous finches, vegetarian finches.
- This process of evolution of different species in a given geographical area starting from a point and literally radiatin to other areas of geography is called ~~adt~~ adaptive radiation.



another example - Australia (marsupial radiation)



Biological Evolution:

- Fitness is based on characteristics which are inherited.
- Branching descent and natural selection are two key concept of Darwinian theory of evolution.

Lamark theory –

- Theory of use and disuse of organs. he gave example of giraff.

Evolution of long necked giraffe took place from short necked giraffe due to continuos stretching of neck muscles in order to find food from tall tree. In the beginning the short necked giraffe used to eat the grasses, Later on source of grass on land reduced & it forced to eat the leaves of tall trees Stretching of neck is continuos and is gradually transmitted to offspring.

- ~~Na~~
- Natural sources are limited hence there is compitition for resources & hence population becomes limited.

Mechanism of Evolution:

- Hugo de varies - put forth the idea of mutation.
  He believed mutation causes ~~variation~~ evolution & not the minor variation that darwin talked about.
- mutations are random and directionless. ~~for~~ according to hugo de varies mutation causes speciation & hence called it saltation.
- Darwinian variation are small and directional. shows gradual evolution.

A Brief account of evolution:

- Firstly single celled organism formed on earth from non cellular aggregate molecules.
- slowly single celled organism become multicellular life forms.
- Then invertebrates formed.
- seed weeds & few plants.
- amphibians.
- reptiles
- reptiles goes back into water and evolve into fish like reptiles.
- & then mammals formed on earth.

- Mammals - viviparous, protect their unborn young once inside the mothers body.
Whales, dolphine, seals, sea cows - mammal in water.

Origin of evolution of man:

- About 15 mya primates called Dryopithecus and Ramapithecus were existing. hairy and walked like gorillas & chimpanzees.
Ramapithecus - man like
dryopithecus - Ape like.
- Evidence showed that they hunted with stone weapons but essentially ate fruit.
Homo habilis - first human being the hominid, brain capacity were between 650-800cc (did not ate meat)
- next stage - Homo erectus - large brain around 900cc. ate meat. next - Neanderthal (brain size 1400cc) next - Homo sapiens
- Ape → Homo habilis → Homo erectus — Neanderthig → Homo sapiens → Homo sapiens sapiens.