Tuesday, September 17, 2019

Biology

Lecture 3

- While being the ship's naturalist at 22, Darwin spent most of his time in South America. While being there, he observed fossils and geographical distribution of animals, flora and fauna of oceanic island.
- While studying there, he concluded that what we see today, is not as it has always been; He found transitional fossils that used to be similar to the recent species but they were not identical.
- Fishapod: A fossil found that it's not quite fish, but it has some features and also it's not really a land animal; they only had a rough idea that the animal used to live nearly 400M years ago and that there's a common ancestor for it.
- Birds: Their wings are the evolved form of dinosaurs' legs (Skeletal features) so they're basically dinosaurs that have not gone extinct. The fossils have some features identical as those in modern birds. The only difference is. in how the bones are oriented, shaped or their size.
- Whales: Their ancestors used to live on land based on their vestigial features such as Rudimentary pelvis and hind legs. Based on the fossils, whales and their ancestors share the same bones (Modification and adaptation to suit the environment) in arms and are only different in size, orientation and shape of those bones.

Darwin collected his evidences from Geology, Homology, Biogeography and domestication.

- *Geological evidences prove three points to Darwin :*
  - The earth was old; since he found fossils of sea animals on mountains.
  - There was common ancestry based on the intermediate forms(transitional fossils).
  - Fossils in younger strata were more similar to younger ones and those in old strata had a big difference with the fossils.
- *Homological evidences show that:*
  - There are 500 genes shared between different species which means that if a sequence was useful for them, they'd kept it. These genes are involved in basic cellular functions such as Transcription and Translation. The genes are either not

conserved, which means they were not as useful or something else could do the same function giving room for more modifications, or they have conserved which means that they were actually useful.

- There are characters that are common in different species. (We all have hand bones but in a different position and size and shape-Modified to make it suit the environment which also shows that each animal was not optimally designed)

- *Biogeographical evidences are found in the islands :*
  - There were 15 main islands most of which were volcanic.
  - The flora and fauna were capable of long-distance dispersal such as Cacti or Succulents.
  - Cacti seeds have probably reached there by birds eating them since they have bright red fruits, or have travelled there by sea.
  - Distinct species on different islands provide evidence for early stages of speciation.
  - This is the place where Darwin found evidence to support his theory of evolution.
  - In Australia flora and fauna have high levels of endemism and there are many unique adaptations. This is a result of a long history of isolation (Caused unusual organisms) from other parts of the world; it has island characteristics plus Adaptive radiation, endemism and adaptions.
  - Geographically close organisms resemble each other. They adapt to similar environments in different parts of the world.
  - There were tortoises in those islands that had different shells, this made us conclude that they had a common ancestor.
  - There were also Finches in the island. There, finches had different shapes of beaks which were also modifications to get them useful for the type of seeds they eat. Over the time, based on the place these finches were living, they had different size of beaks. Small ones for light seed and big ones for large and hard seeds. The difference in the food they could eat changed the vegetation of the island. Phenotypical diversification means their beaks being different from how they used to be and the change in vegetations was Ecological diversification.

- *Domestication:*
  - Just like the example of the pigeon that has turned into many other styles of pigeons, there are vast amounts of heritable variations found in species, and these variations, if selected on, will lead to dramatic change over generations. Artificial selection, so that humans choose something that it's the best for them so that it'd be beneficial to them. Such as having wolves as dogs to help them.
- Among all of these, there are Vestigial Characteristics to many of the organisms:
  - Cave Fish: it lives in an absolutely dark environment so eyes are basically useless. And if something is useless, natural selection either deletes it or changes the way it functions. This is the reason why these fish have no eyes are are mostly pale or white. These fish have descended from species that used to live above the ground.
  - Birds: Many birds have lost the functionality their wings, or their functionality has changed from flying to different purposes. Such as ostrich that uses them as a balancing limb or such as Australian kiwi that mostly has lost its wings.
  - Animals also have vestigial traits such as:
  - Appendix: over time it has lost its ability to function and even causes infections sometimes, so many people are born without it.
  - Ear muscles: These were functional in out ancestors that used to move them to hear different voices on their habitats.
  - Goosebumps: were there to help the animal look bigger and trapping a warm layer of air since that trait is not useful in humans, many of us don't have it. Also humans are hairless animals so we don't need it.
  - Wisdom teeth: It doesn't serve to chew anymore.
- Olfactory genes are also wither dead or non functional in any of us since we don't really need to rely on our sense of smell.