Class 4 – 02nd April 2025, 1pm

LS1201

Introduction to Biology II

Part B - Evolution

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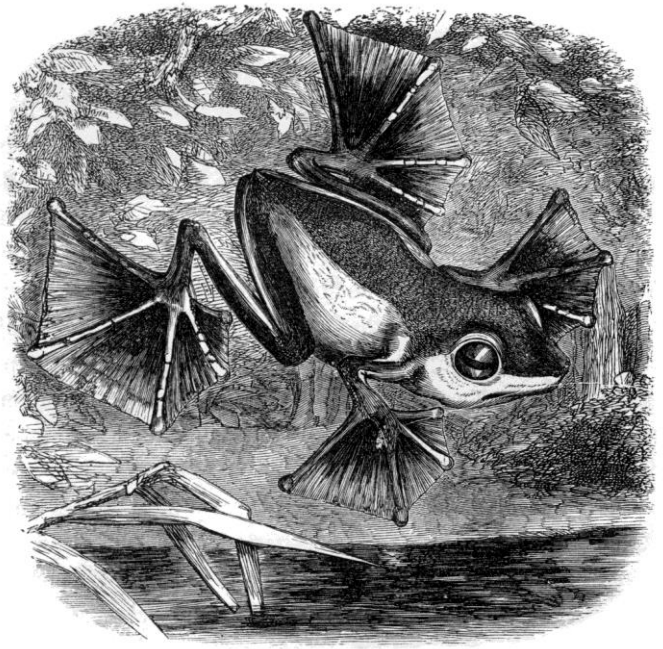
Wallace encountered a large number of organisms

Semioptera wallacii

Bird of Paradise



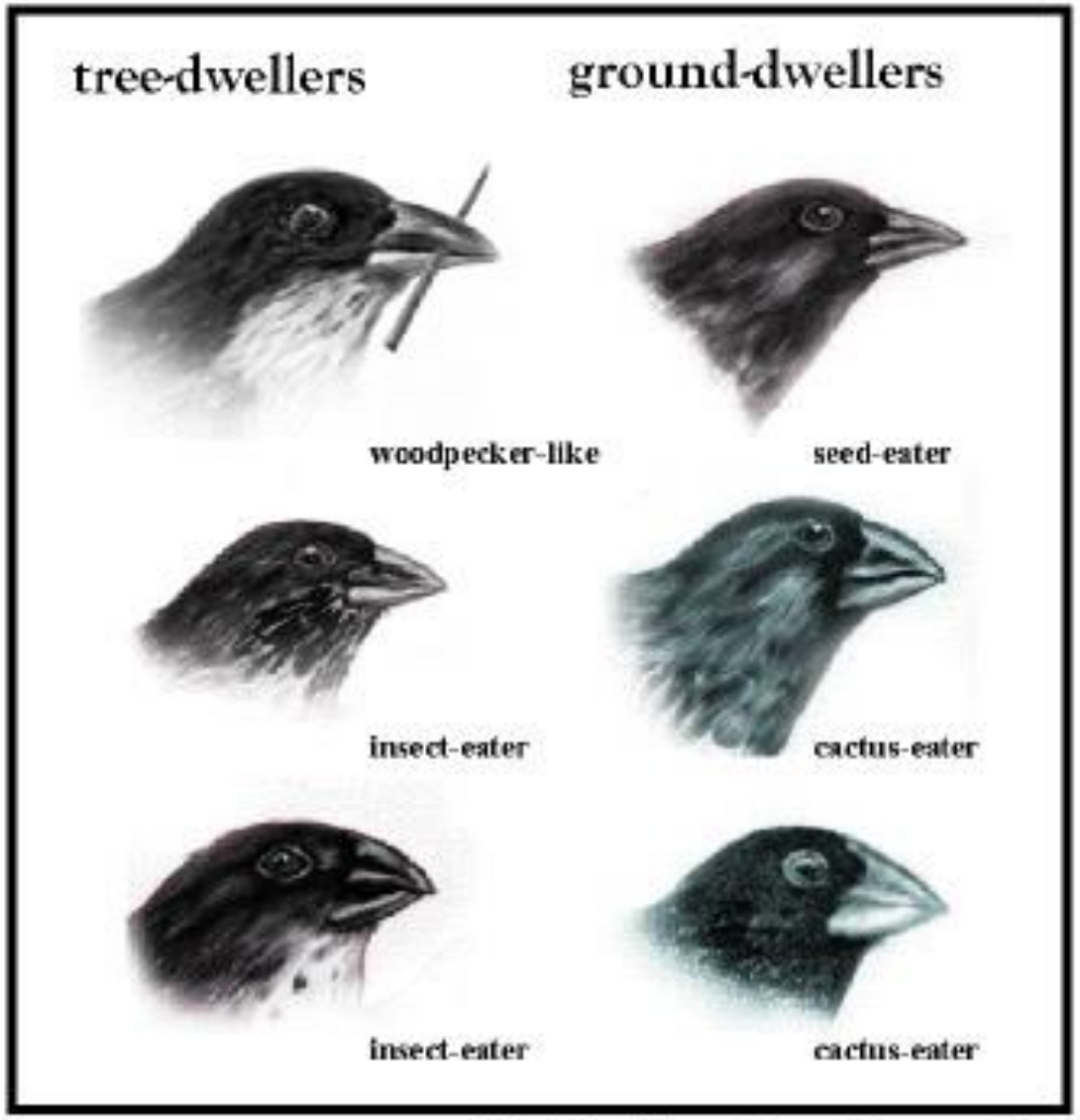
Rhacophorus nigropalmatus

Wallace's flying frog.

Darwin’s voyage

The giant tortoise is the largest living species of tortoise and 10th-heaviest living reptile, reaching weights of over 400 kg (880 lb) and lengths of over 1.8 meters (5.9 ft). With life spans in the wild of over 100 years, it is one of the longest-lived vertebrates. A captive individual lived at least 170 years.

Darwin's finches



variation in beak form of some Galapagos finches

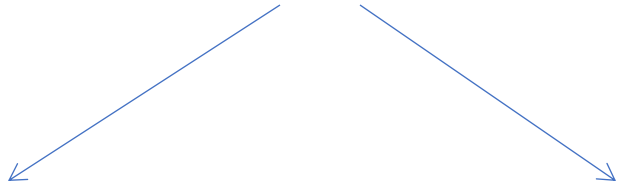
"Seeing this gradation and diversity of structure in one small, intimately related group of birds, one might really fancy that from an original paucity of birds in this archipelago, one species had been taken and modified for different ends" (The Voyage of the Beagle, 2nd Ed, 1845)

On the Origin of Species

1859

After Darwin returned from his journey in 1836

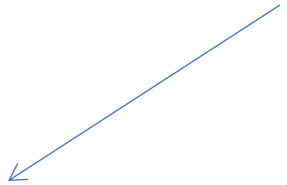
Origin of Species



Theory of Natural Selection

Descent with Modification

Origin of Species



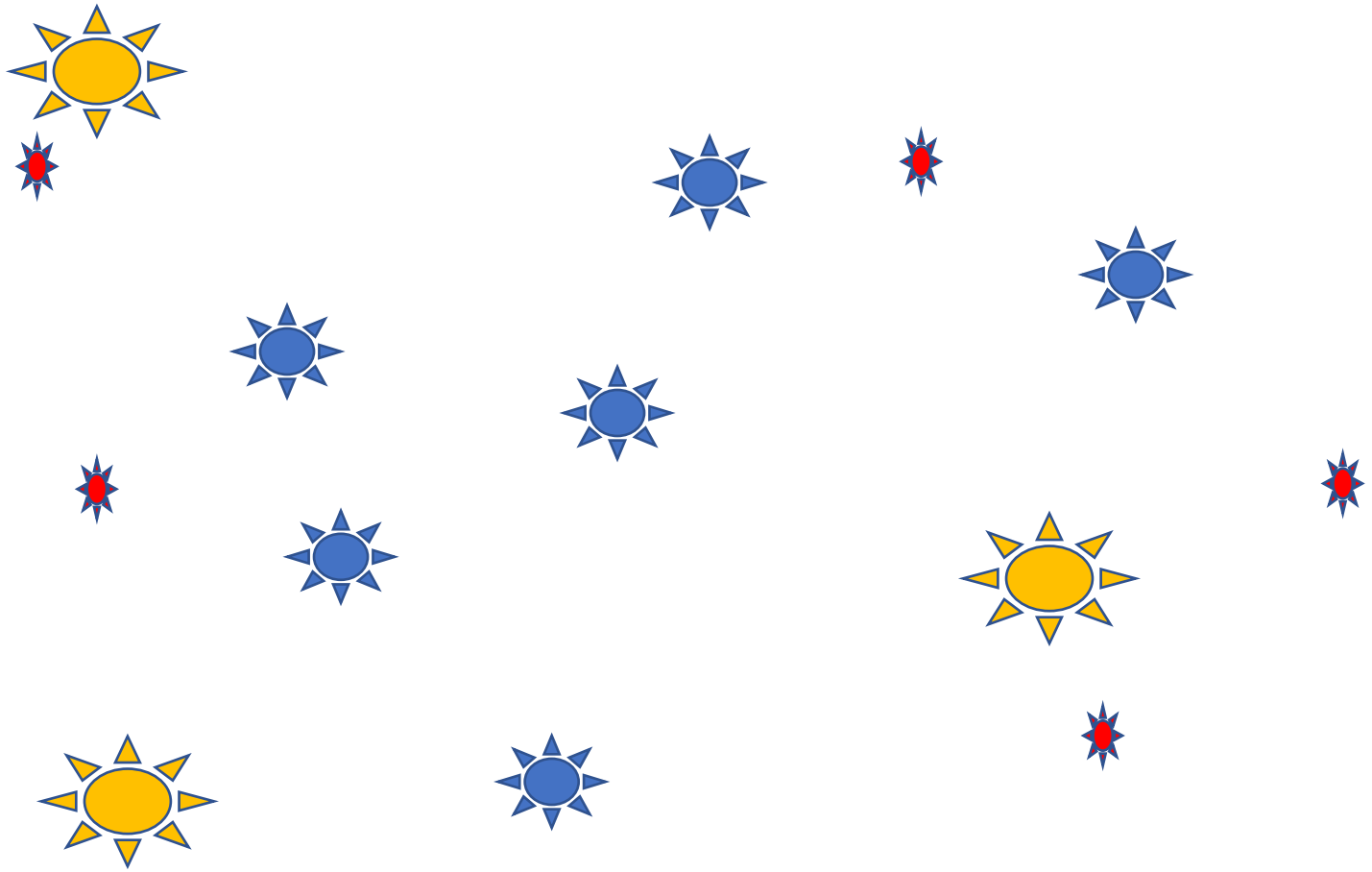
Theory of Natural Selection

- Organisms have the capacity to over reproduce
- Organisms are enormously variable in their traits
- Struggle for existence
- Environmental factors filter heritable variations
- Those best adapted will produce higher number of offspring

Theory of Natural Selection

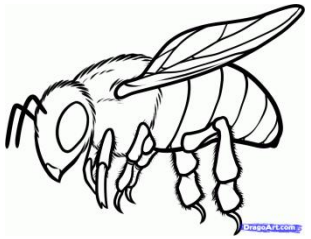
Consider one organism with the above phenotype

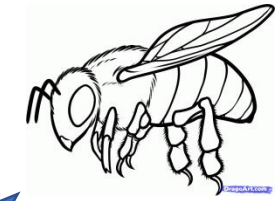
Theory of Natural Selection

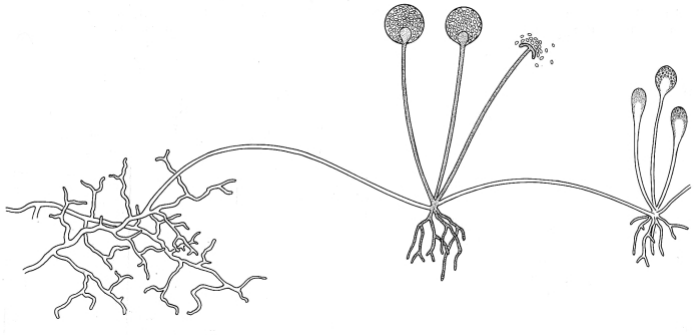


In nature there are a large number of these organisms and they show some variation in their phenotype

Theory of Natural Selection





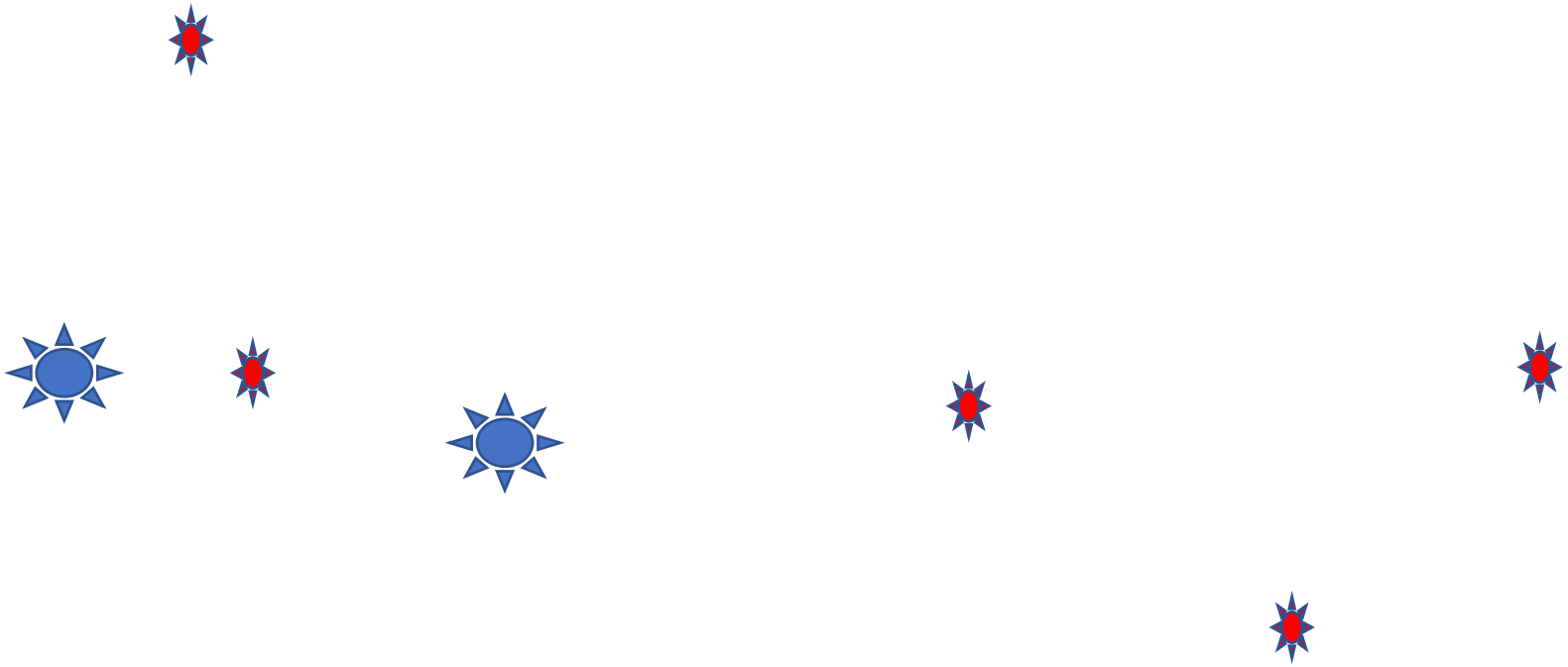


Interact with the environment

Abiotic factors like soil, water, wind

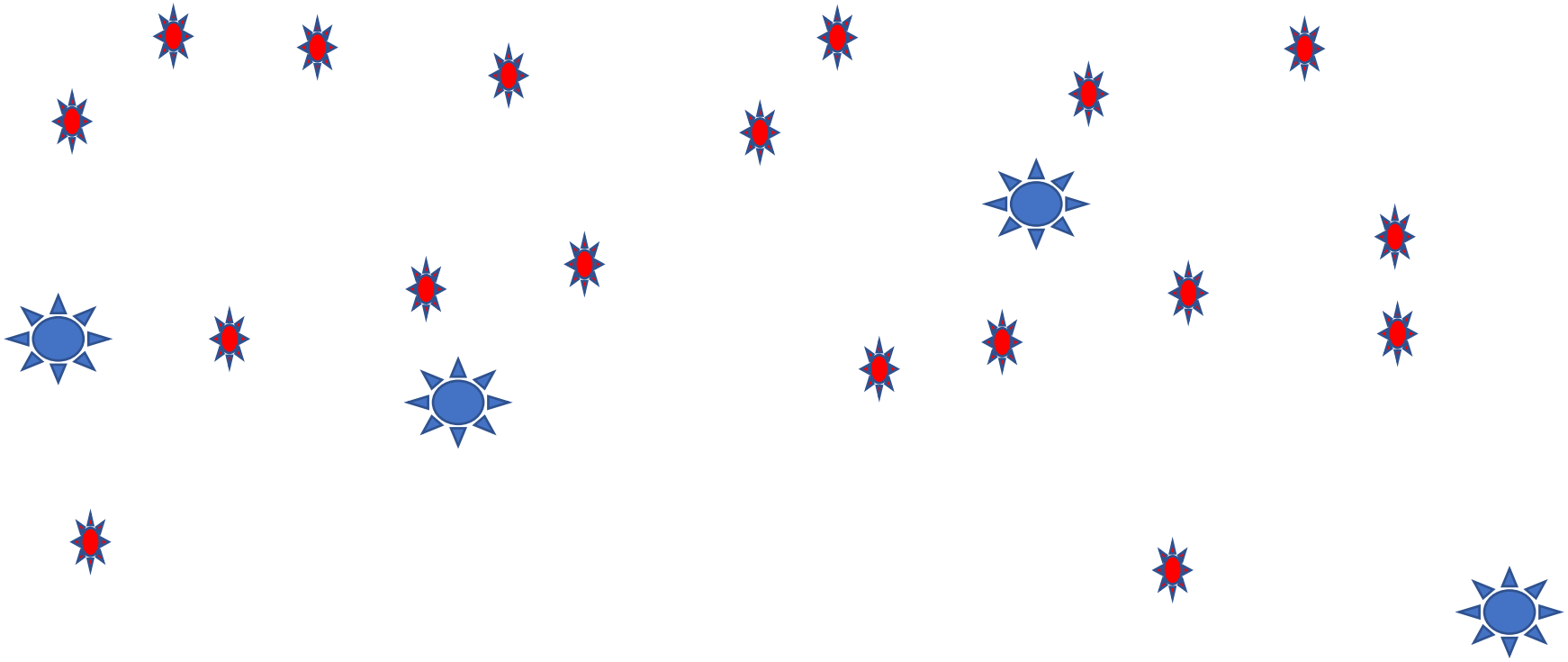
Biotic factors like other organisms of the same species and other species which are its predators, disease causing agents, pollinators etc.

Theory of Natural Selection



Only a few can survive and those that have the variation that can be inherited

Theory of Natural Selection



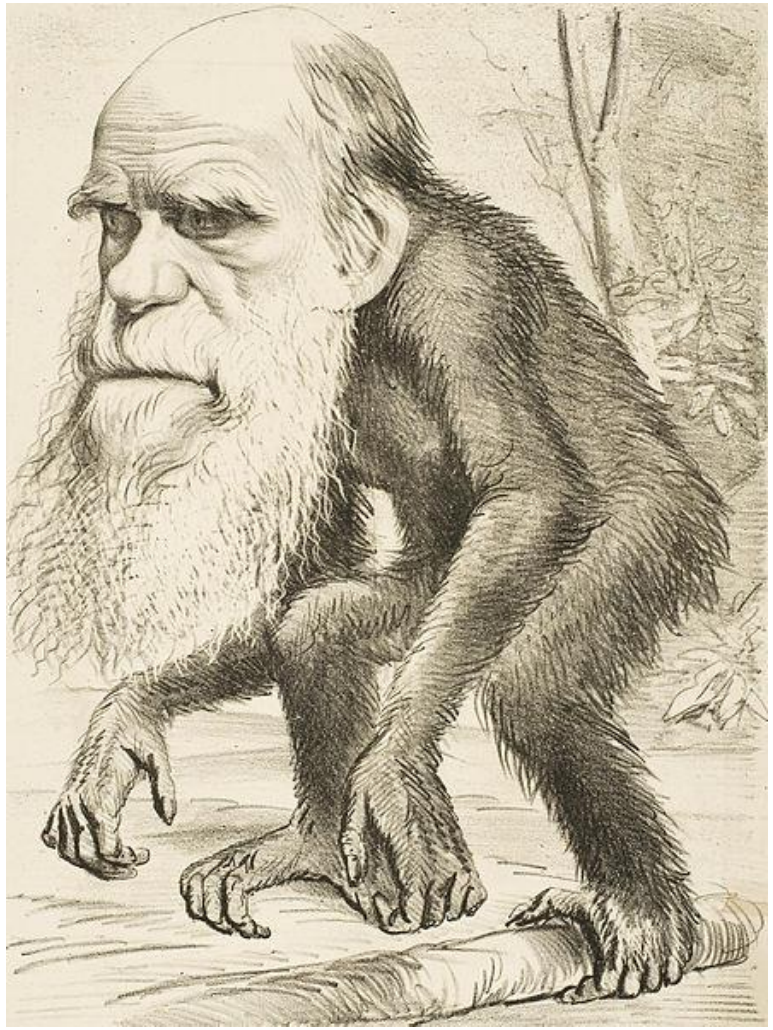
will reproduce in large numbers
and produce the next generation

Origin of Species

Descent with Modification

- All species have descended from one or a few original forms of life

- Ancestors accumulated differences gradually to produce radically different species



Reaction of the society

Mutation

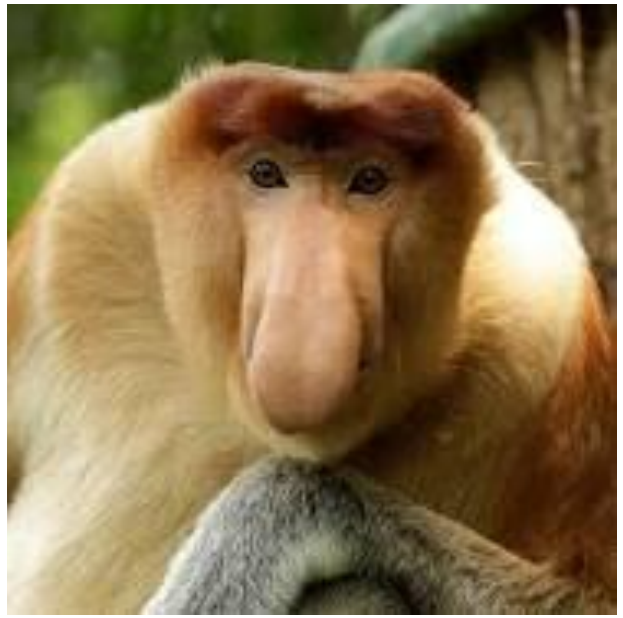
Variation

Implications of variation

- Variation in individual organism will cause changes in the ability of organisms to live
- Variation in individual organism will cause changes in the ability of that organisms to reproduce.
- Variation in individual organism can lead to large scaled differences at the level of the population, species, communities, ecosystems.

Operational Pathway

Spontaneous mutation → Variation = Elongated nose + Additional olfactory ability → Has an advantage → One individual survives better and reproduces better → Population currently has only individuals of this variety



Proboscis Monkey

Next step –
More individuals with this phenotype and eventually they outcompete other phenotypes and the entire population has this kind of elongated nose.