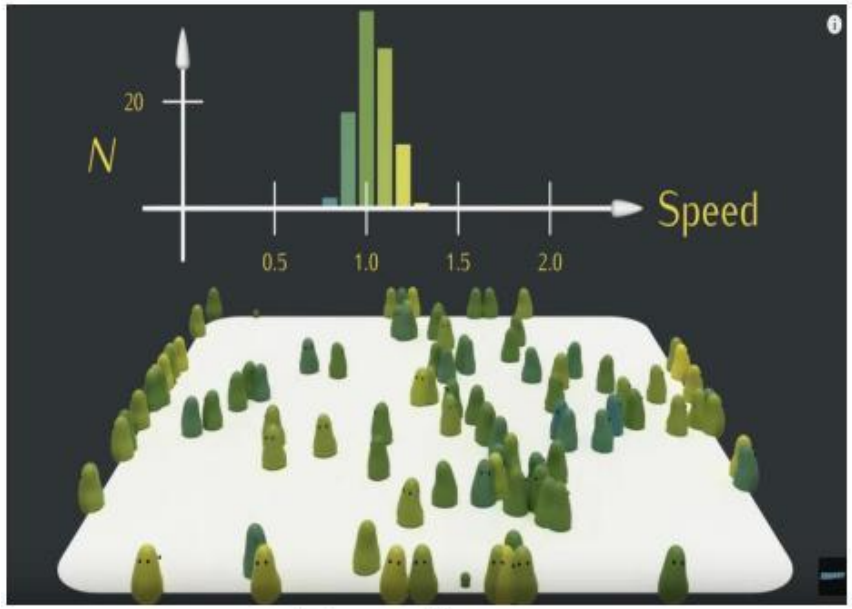
CHAPTER 5.1

Evidence for Evolution

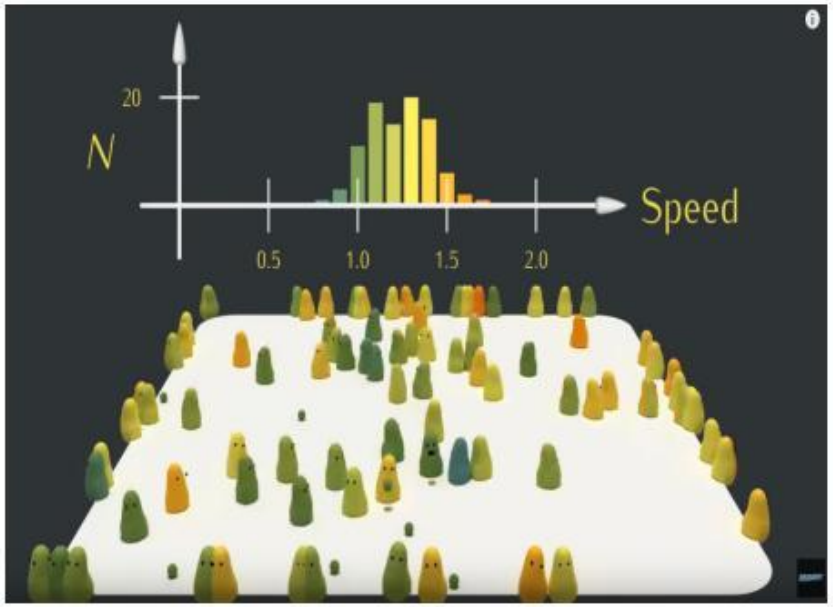
INTRODUCTION

A simulation of creatures looking for food - there is variation only in the characteristic of speed

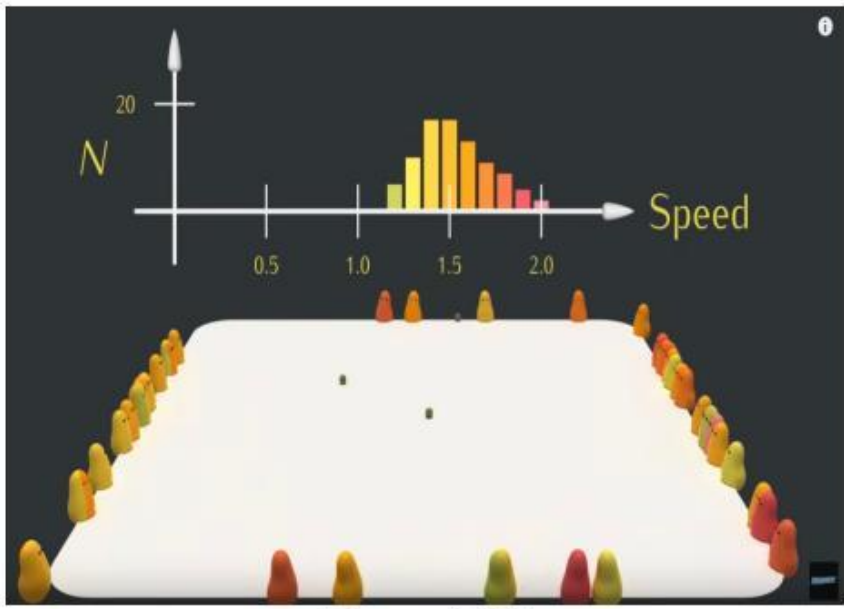
Blob creatures who find 2 peas survive and reproduce, 1 pea they survive, 0 peas and they die.



Day 1



Day 50



Day 100

In pairs explain to each other what you think is happening in the population of blob creatures.
Use terms like: variation, competition, struggle, survive, die, adaptation, reproduce, inherit.

EVIDENCE FOR EVOLUTION

VIDEO: WHAT IS THE EVIDENCE FOR EVOLUTION?

https://www.youtube.com/watch?v=llEoO5KdPvg

- Worksheet

EVOLUTION DEFINITION

Simple definition:

- Evolution = change over time

Definition:

- Biological evolution describes cumulative changes that occur within a population between one generation and the next

What Mr.Prantner would prefer:

- A change in the allele frequency of a population's gene pool over successive generations

Mr. Prantner's students

Evolution is the change in the allele frequency of a population's gene pool over successive generations.

Ordinary Biology students

'Evolution is change over time'

EVIDENCE FROM FOSSILS

Plaeontology = science that deals with fossils

Radioisotope dating revealed ages of the rock strate and the fossils

DID FOSSILS MATCH EXPECTATIONS?

1. bacteria and simple algae in deeper layers (older = appeared first)
2. fungi and worms
3. land vertebrates
   - 3a) bony fish
   - 3b) amphibians
   - 3c) reptiles
   - 3d) birds
   - 3e) placental mammals

DID FOSSILS MATCH EXPECTATIONS?

- plant fossils before animal fossils
- plants on land before animals on land
- plants suitable for insect pollination before insect pollinators

EXAMPLE:

Fossil sequences are often known (link existing organisms with their likely ancestors).

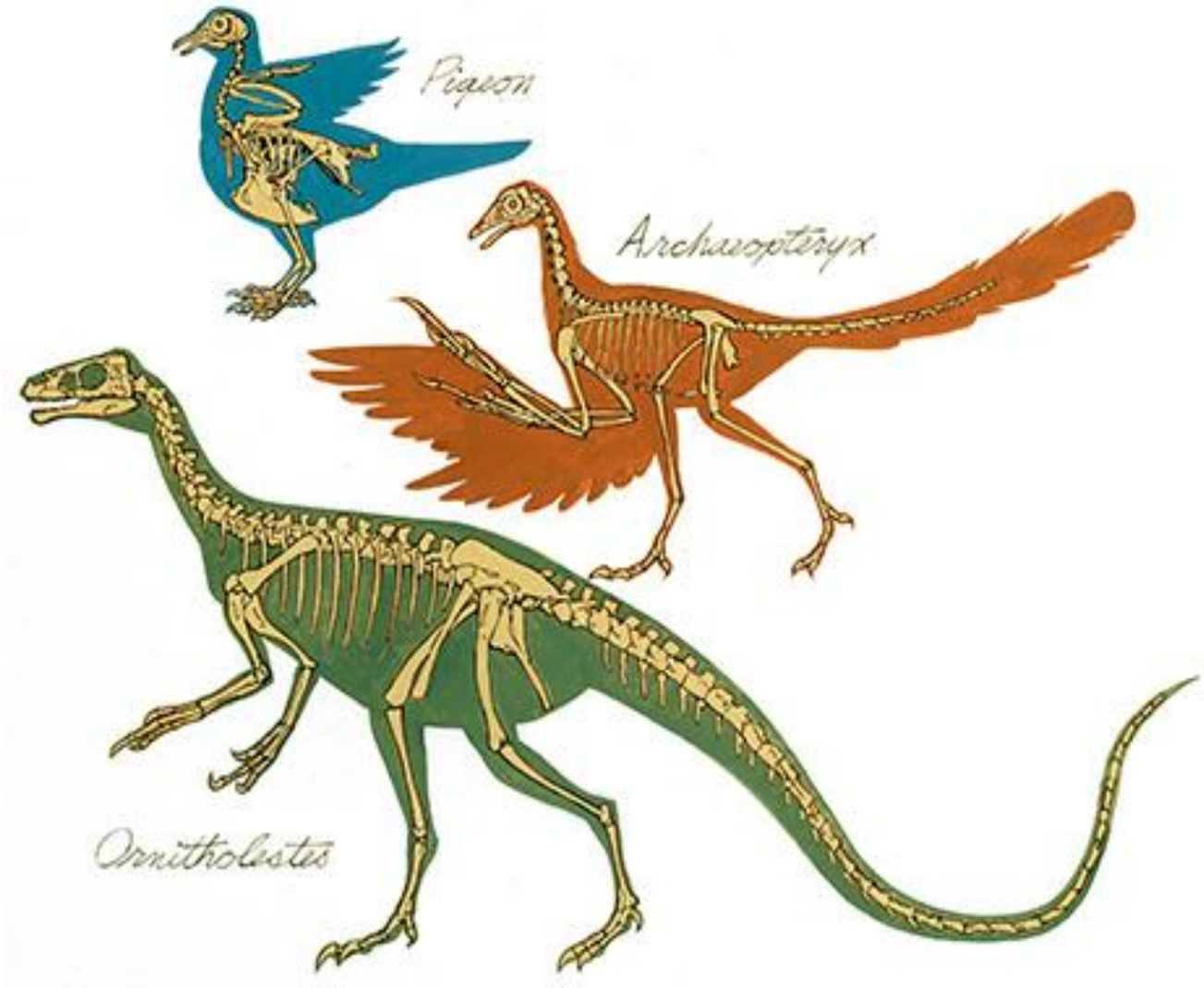
Horses, asses, and zebras (members of the genus *Equus*)

Most closely related to rhinoceroses and tapirs

Fossil records → links them to *Hyracotherium* (similar to rhinoceros)

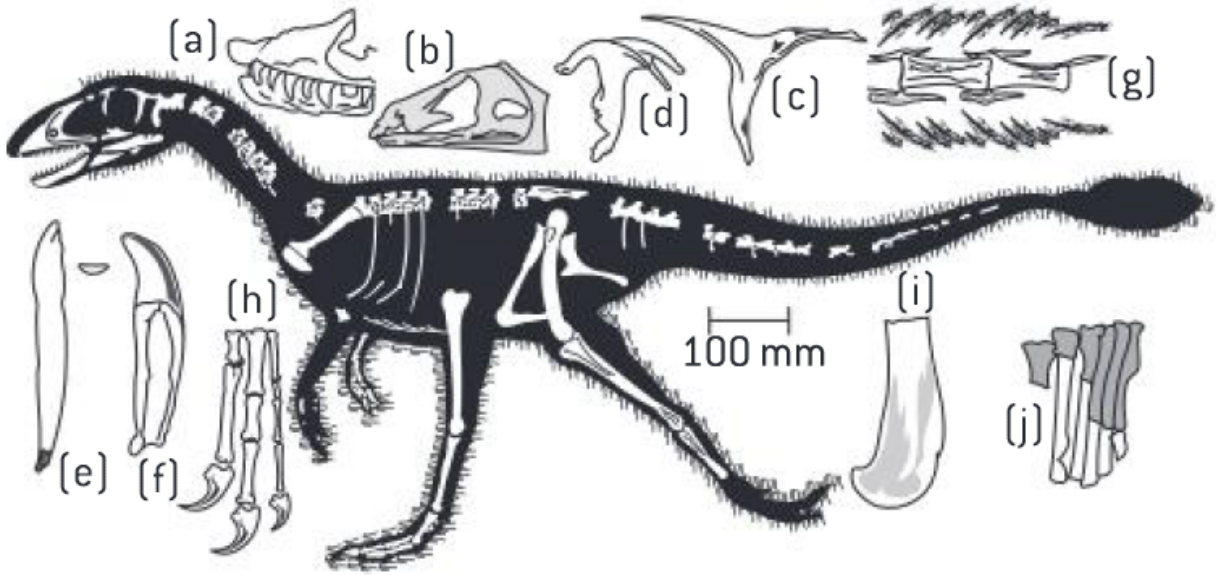
WHAT IS A MISSING LINK?

ARCHAEOPTERYX – THE MISSING LINK



Data-based questions: Missing links

An objection to fossil evidence for evolution has been gaps in the record, called missing links, for example a link between reptiles and birds.



▲ Figure 3 Drawings of fossils recently found in Western China. They show *Dilong paradoxus*, a 130-million-year-old tyrannosauroid dinosaur with protofeathers. a–d: bones of skull; e–f: teeth; g: tail vertebrae with protofeathers; h–j: limb bones

The discovery of fossils that fill in these gaps is particularly exciting for biologists.

1 Calculate the length of *Dilong paradoxus*, from its head to the tip of its tail. [2]

2 Deduce three similarities between *Dilong paradoxus* and reptiles that live on Earth today. [3]

3 Suggest a function for the protofeathers of *Dilong paradoxus*. [1]

4 Suggest two features which *Dilong paradoxus* would have had to evolve to become capable of flight. [2]

5 Explain why it is not possible to be certain whether the protofeathers of *Dilong paradoxus* are homologous with the feathers of birds. [2]

SELECTIVE BREEDING

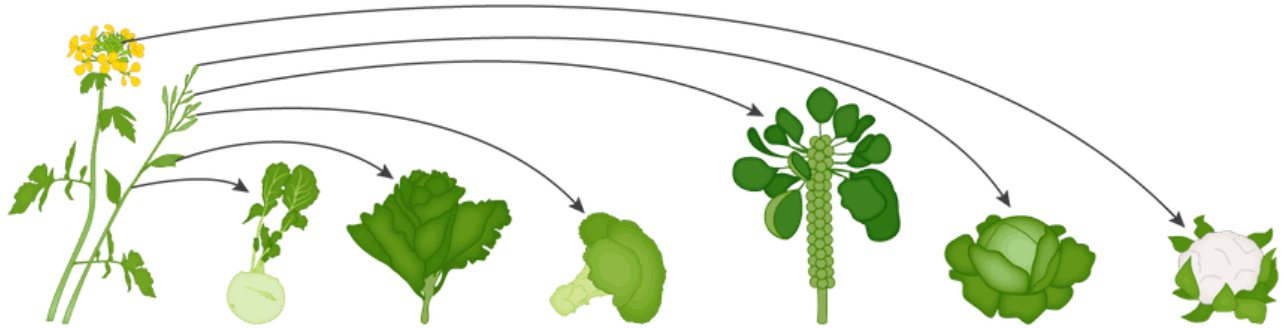
natural selection vs artificial selection / selective breeding

SELECTIVE BREEDING EXAMPLE

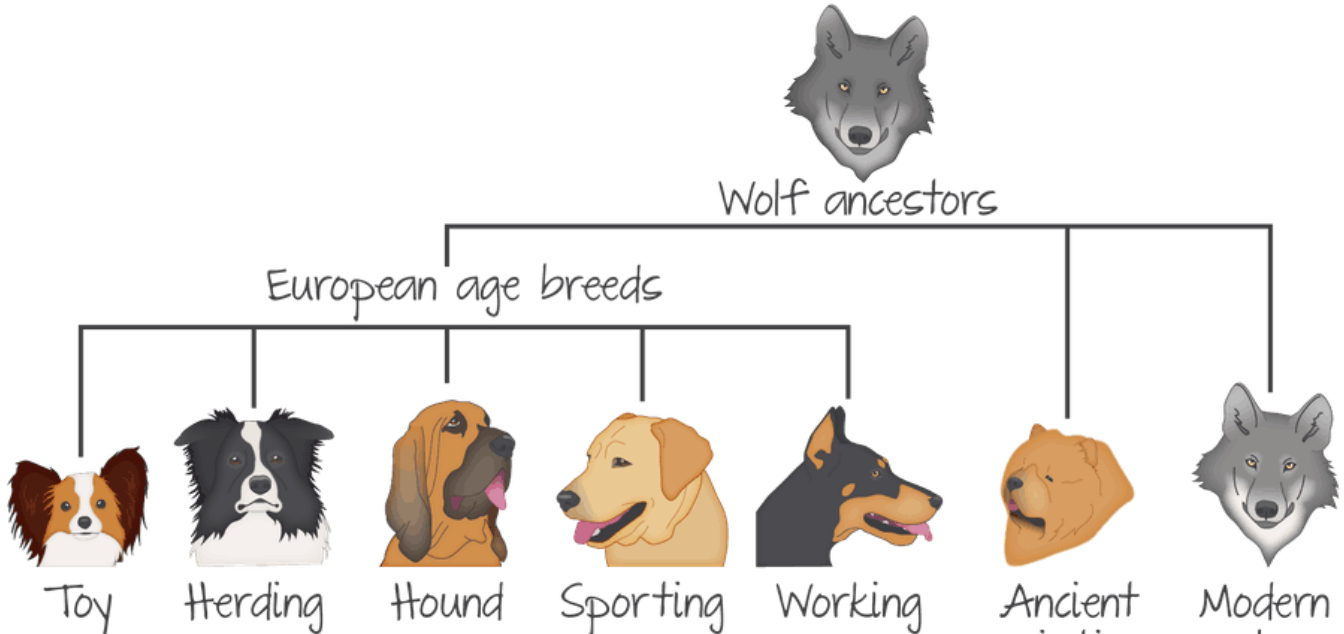
Normal Cow

Belgian Blue

Wild mustard plant
(*Brassica oleracea*)



Strain	Kohlrabi	Kale	Broccoli	Brussels sprouts	Cabbage	Cauliflower
Modified trait	Stem	Leaves	Flower buds and stem	Lateral leaf buds	Terminal leaf bud	Flower buds




I'm cold and hungry.
I see humans around a
bonfire. Maybe I can ask
for food. What could possibly
go wrong?


30000 YEARS LATER

PENTADACTYL LIMB

Homologous structures:

similar in position, structure, and evolutionary origin, but not necessarily function

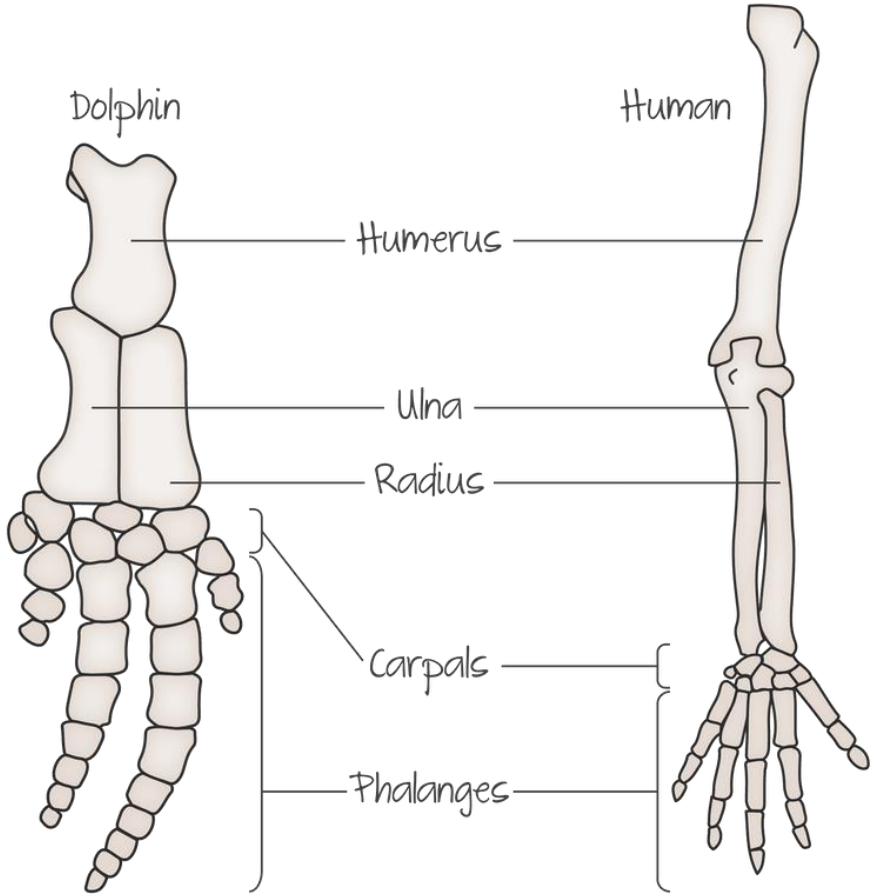
Divergent evolution:

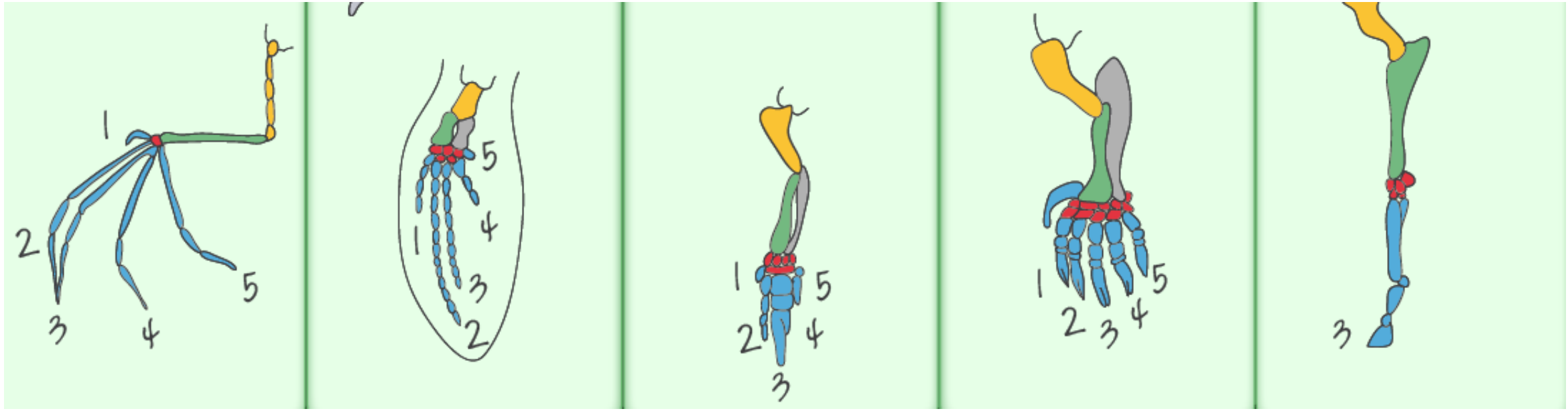
two separate species → a similar structure, but use it in different ways because of environment.

Adaptive radiation

organisms rapidly diverge from original species into several new forms specialized to make use of different environmental niches

→ divergent evolution and the development of a new species.

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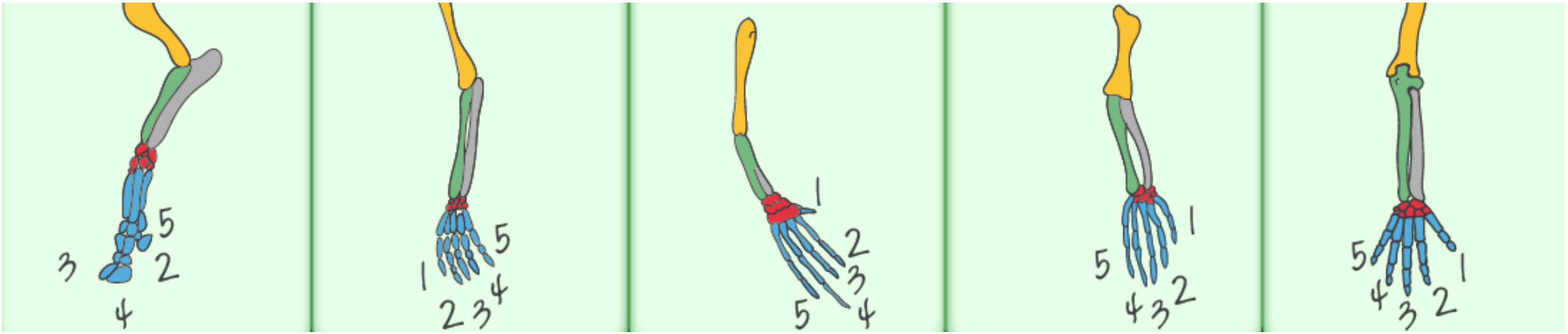
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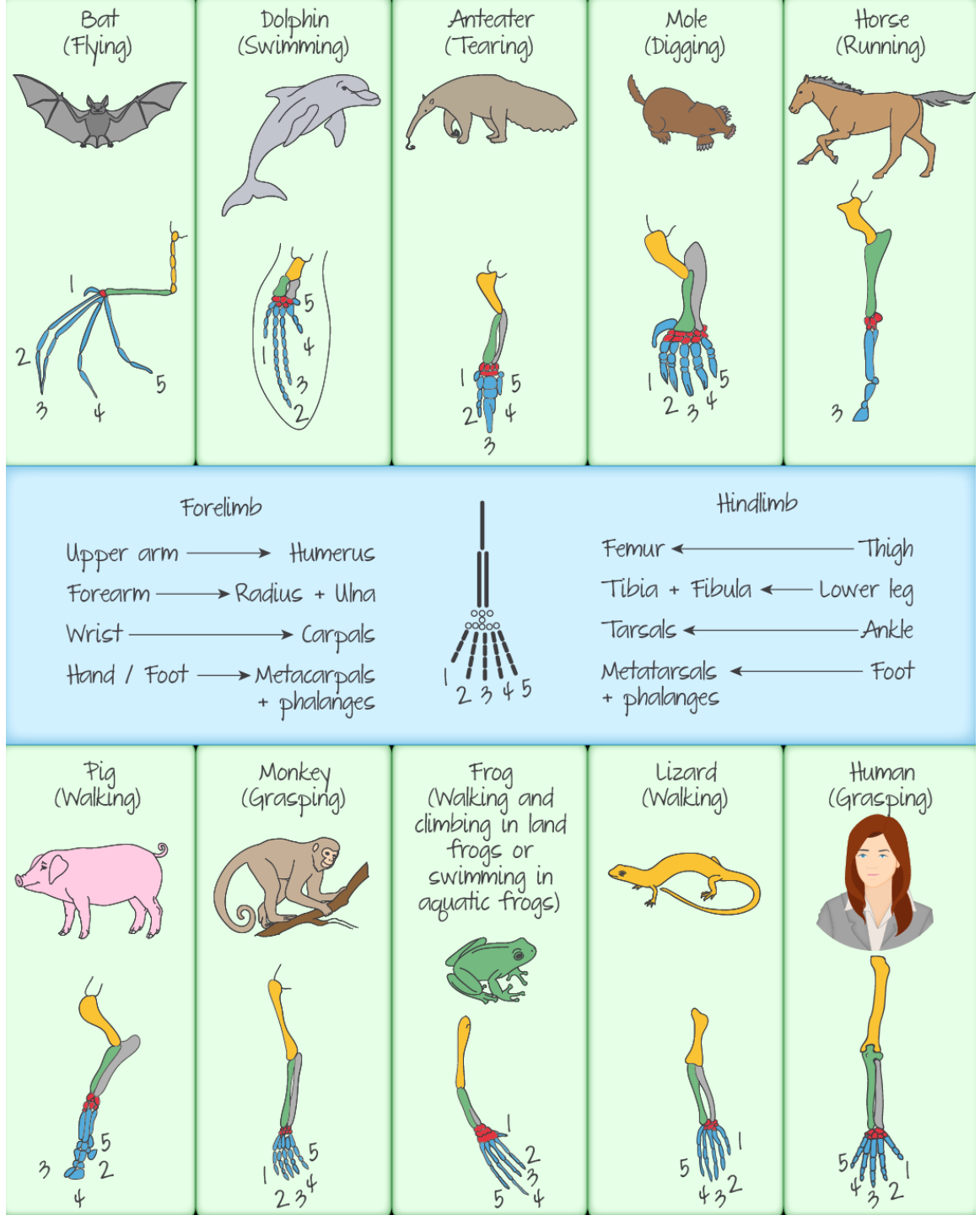

Bat
(Flying)
Dolphin
(Swimming)
Anteater
(Tearing)
Mole
(Digging)
Horse
(Running)
Forelimb
Upper arm → Humerus
Forearm → Radius + Ulna
Wrist → Carpals
Hand / Foot → Metacarpals + phalanges
Hindlimb
Femur ← Thigh
Tibia + Fibula ← Lower leg
Tarsals ← Ankle
Metatarsals + phalanges ← Foot
Pig
(Walking)
Monkey
(Grasping)
Frog
(Walking and climbing in land frogs or swimming in aquatic frogs)
Lizard
(Walking)
Human
(Grasping)

CONVERGENT EVOLUTION, ANALGOUS STRUCTURES

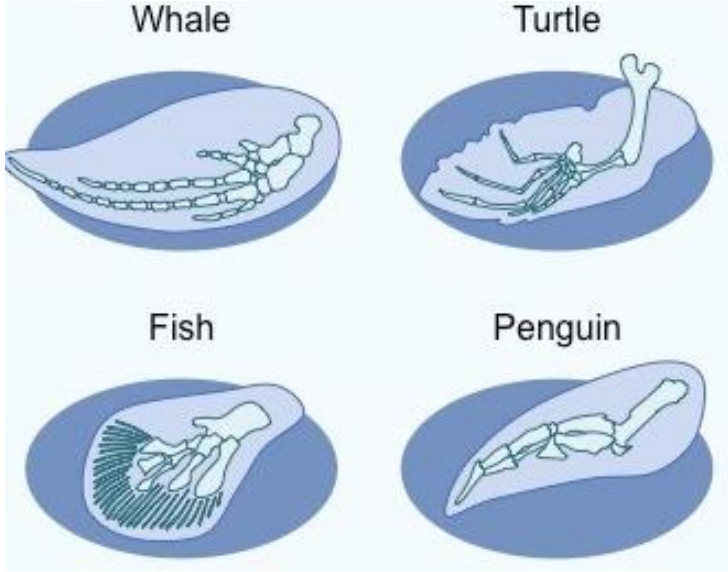
Analogous:

similar function but different evolutionary origin

e.g. bird and insect wings

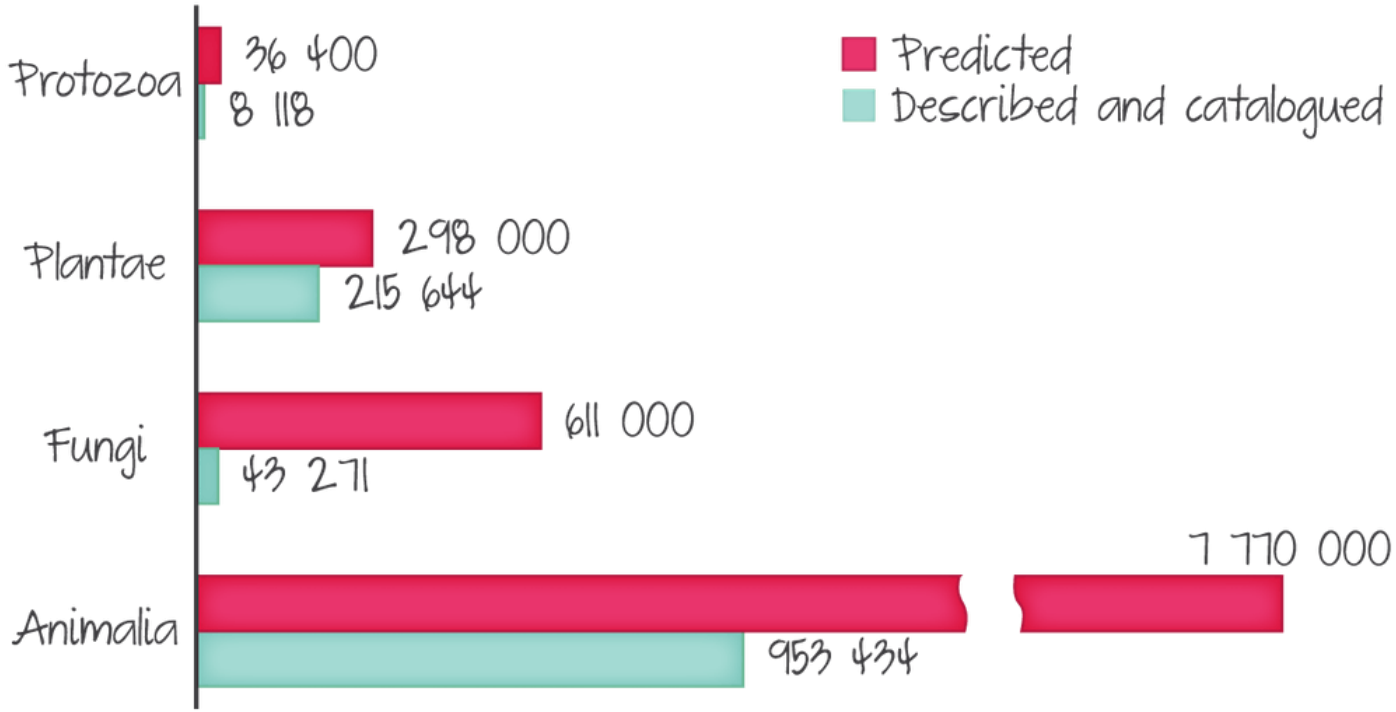
Convergent evolution:

Different ancestor, but structures develop to resemble each other and have the same function.



SPECIATION

Speciation = process by which new species form



number of species by kingdom

CONTINUOUS VS DISCONTINUOUS VARIATION

CONTINUOUS VS DISCONTINUOUS VARIATION

Discontinuous variation

is a type of variation that is influenced by a gene or a few genes, can be put into categories, and is not influenced by the environment.

Continuous variation

is a type of variation that is controlled by many genes, has a wide range of variability, and is easily influenced by the environment.

GALAPAGOS FINCHES

https://www.youtube.com/watch?v=mcM23M-CCog