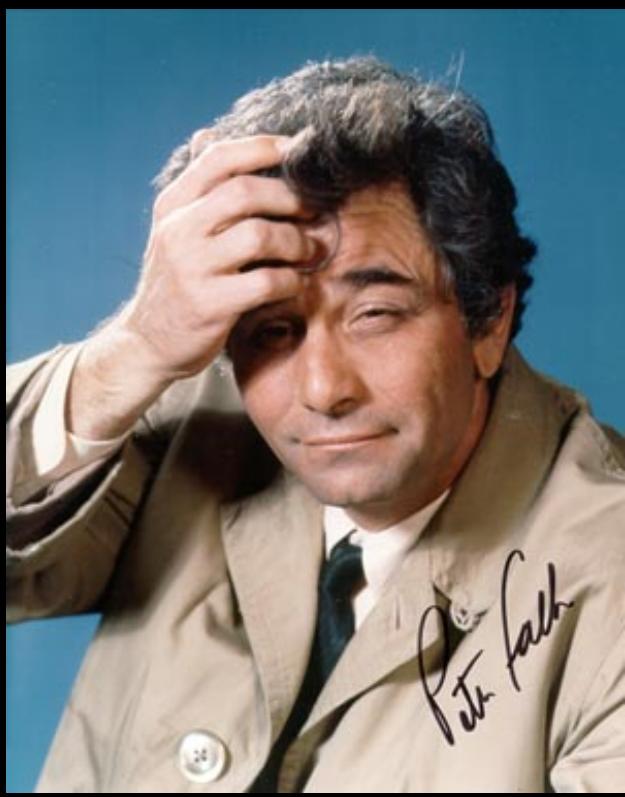


EVOLUTION & ADAPTATION (EEB214S) 2012

Lecture 6: Evidence for Evolution

Islands and biogeography

evidence from biogeography



Same environments but different plants and animals:



It seems the east and west slopes of the Andes have similar soils and environments but the plants and animals are different?



- On a large scale, S.America, Africa and Australia all contain some regions with very similar climate but there is little or no overlap in the organisms found in a deserts or tropical forest in Australia when compared to Africa or S. America.



Clearly, the global distribution of any particular species is not simply a matter of filling all the places that have a suitable environment.

But then there are other cases where similar looking but genetically different plants and animals living in similar environments.

How can we explain this?



- **Su** You could be mistaken and think these are all similar plants but they are very distinct: succulents come from Asia and Africa, while cacti from North and South America but all exist in deserts. Mmmm.



Transplantation seems to work







Why are nearly all of Australia's native mammals marsupials, while placental mammals dominate the rest of the world?

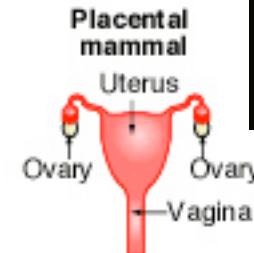
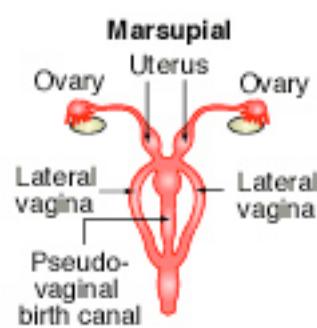


Here, a 2 week old red kangaroo joey in the pouch. Its tiny foetus compelled to make an unaided march from womb to pouch after only weeks of existence..



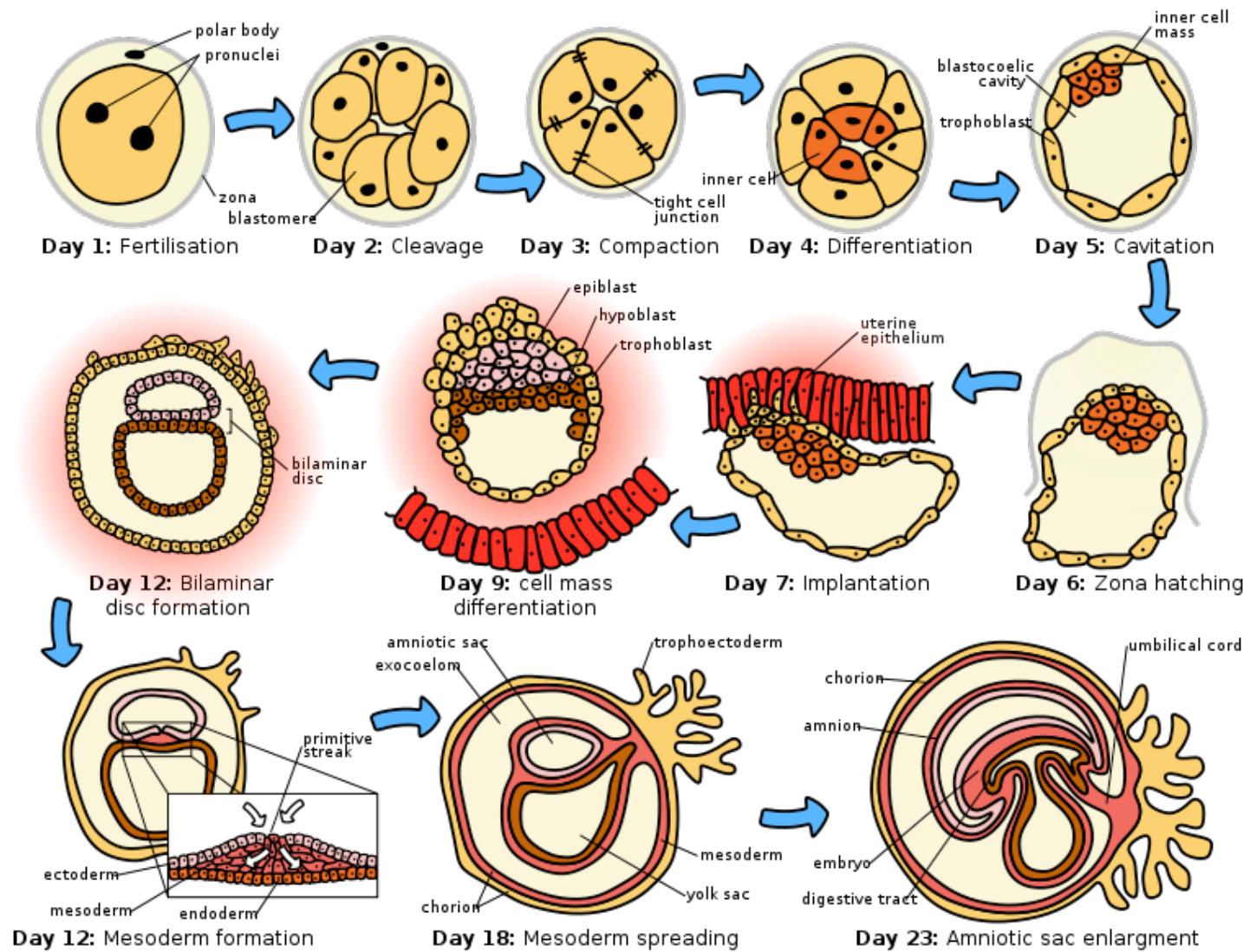
Baby bats usually nurse for three months.

Why are nearly all of Australia's native mammals marsupials, while placental mammals dominate the rest of the world?



BBC



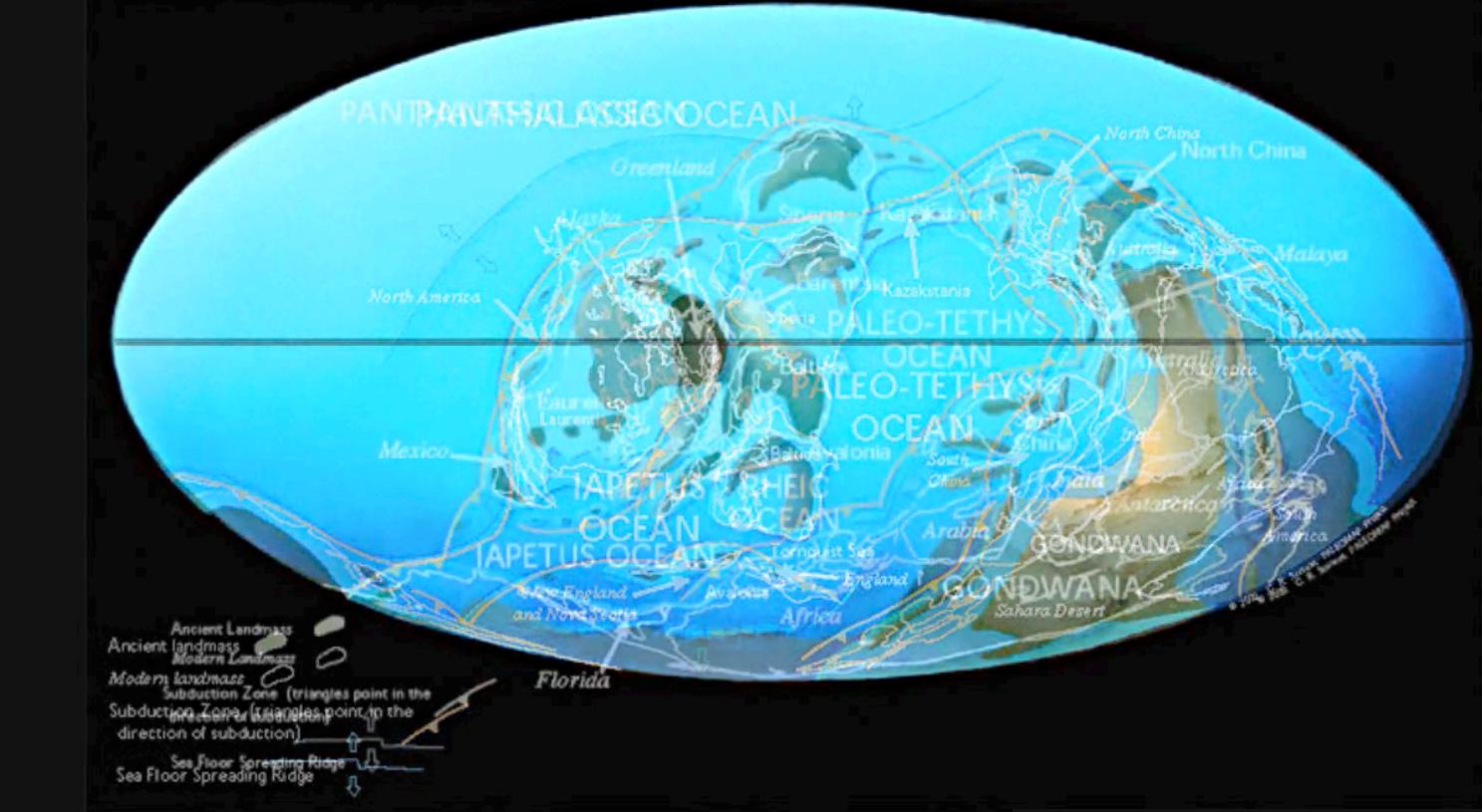




Why do placental mammals and
marsupials (and succulents and cacti) look
and act so much alike?

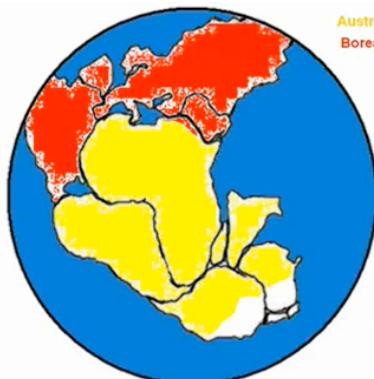
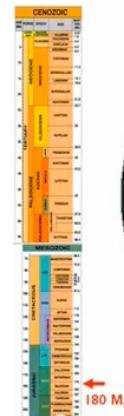


Middle Shropshire 425 Ma

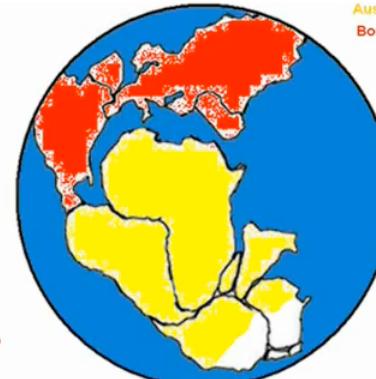
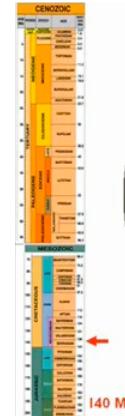


How did marsupials and placental mammals end up in different places?

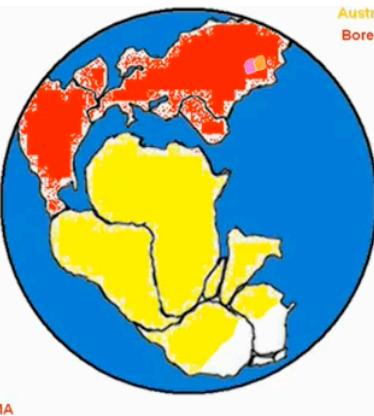
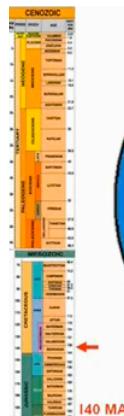
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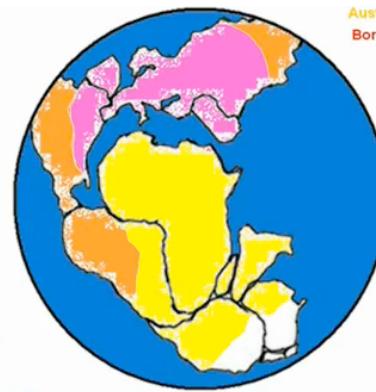
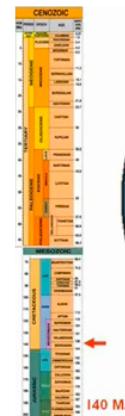
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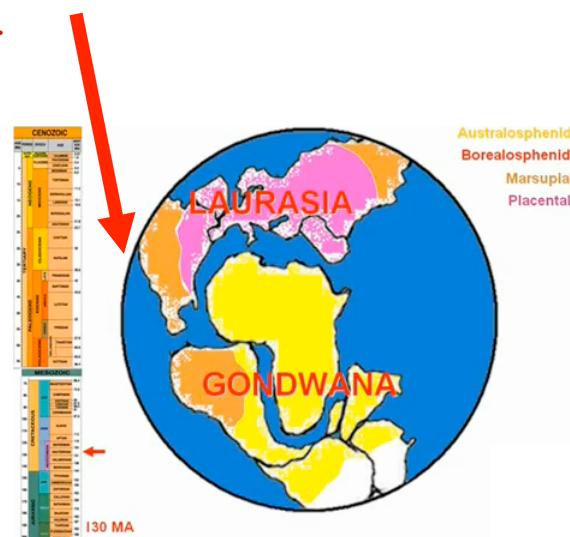


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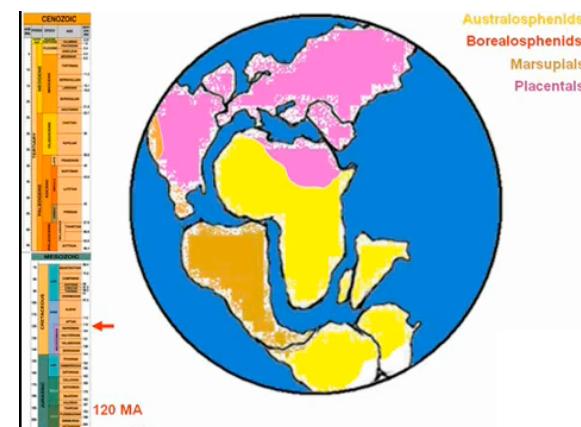


Earliest marsupial fossils
(from 8 million years ago)
were not found in
Australia but North
America.

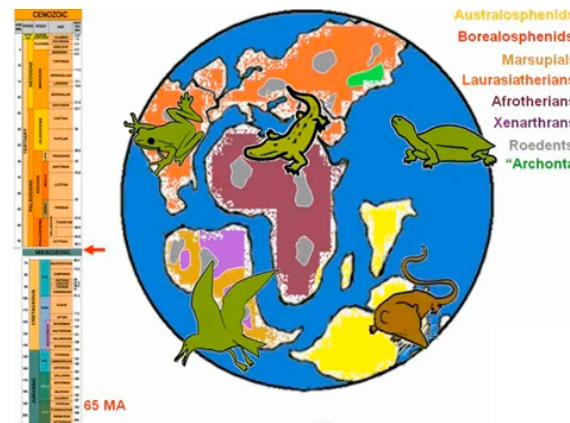
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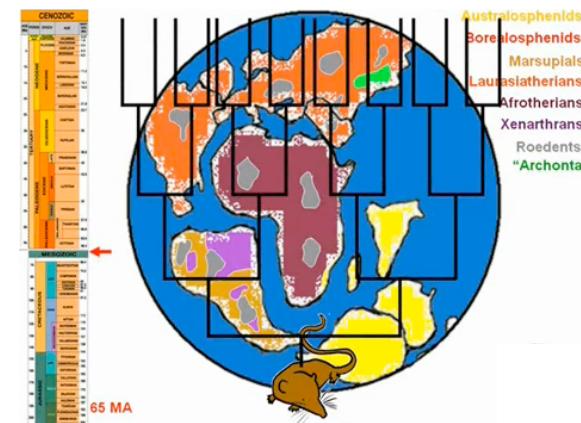
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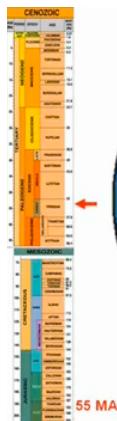
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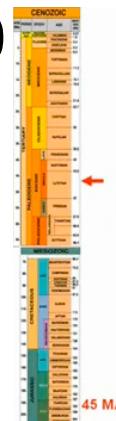
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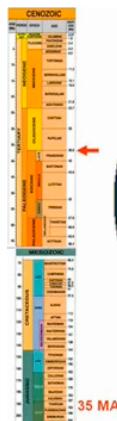
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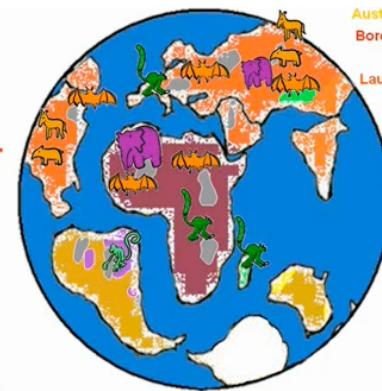
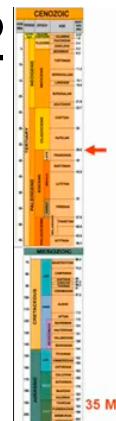
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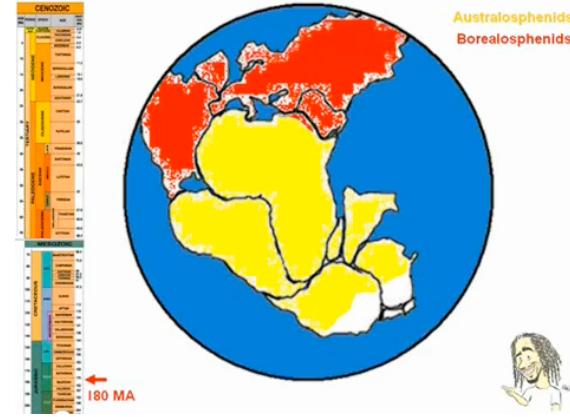


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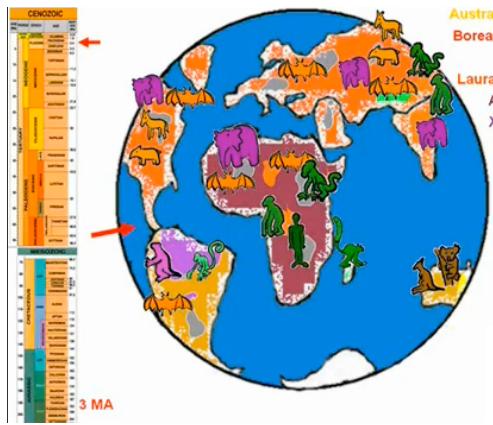


Fossils of Marsupials have
been found in Antarctica 21

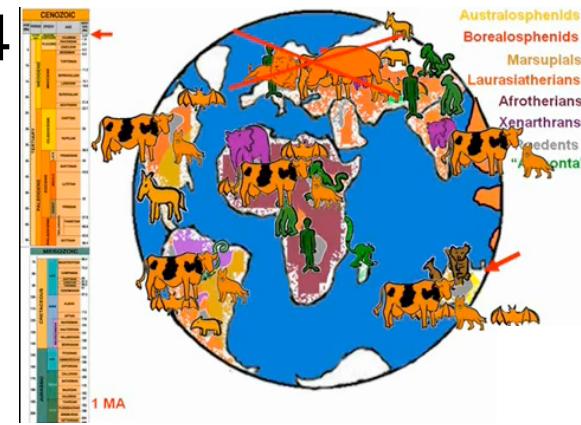
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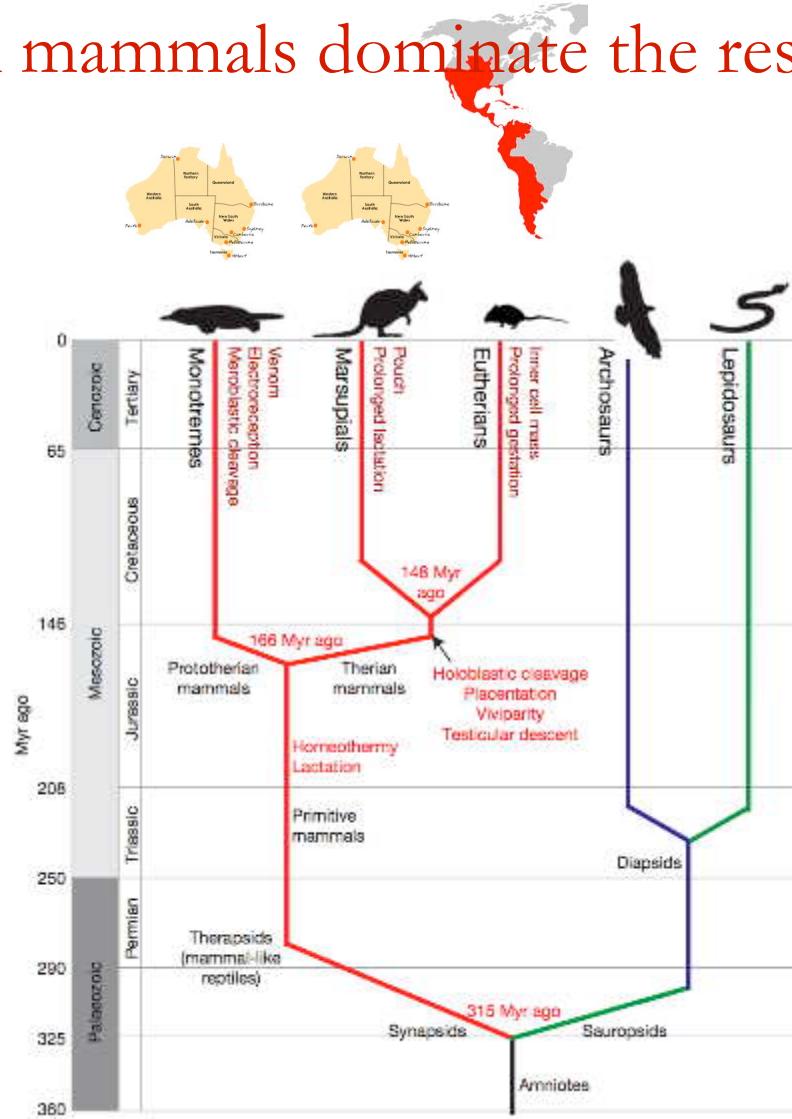


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22

Why are nearly all of Australia's native mammals marsupials, while placental mammals dominate the rest



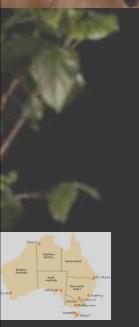


Why do placental mammals and marsupials look and act so much alike?





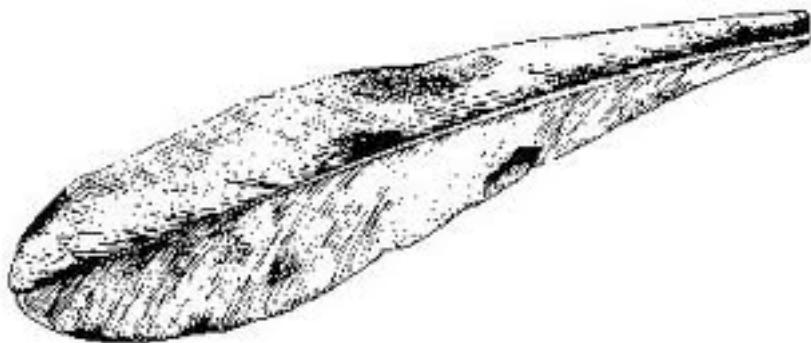
CONVERGENT EVOLUTION: Species that live in similar environments will experience similar selection pressures, so they *may* evolve similar adaptations.



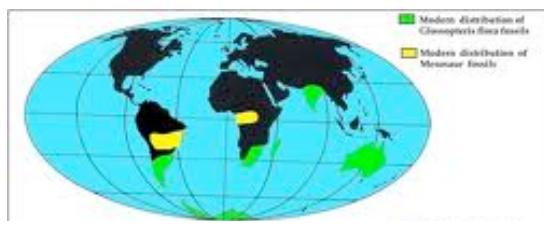
Think about coat colour in cold environments.



Other patterns that need explaining:



Glossopteris



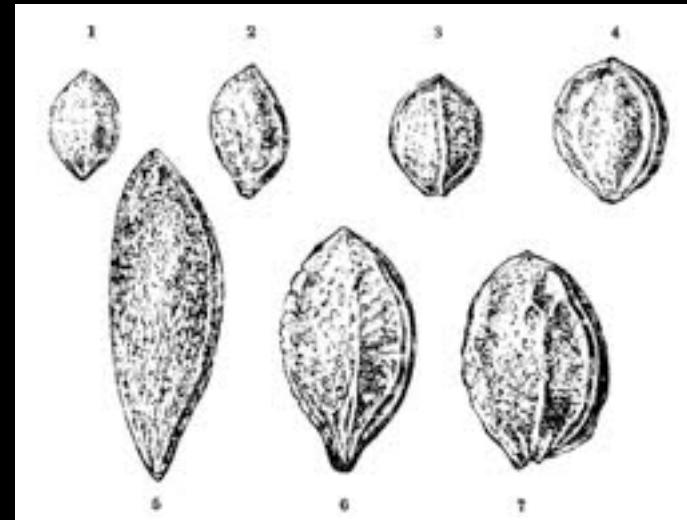
Why are some plant fossils found on all continents, how did they get?



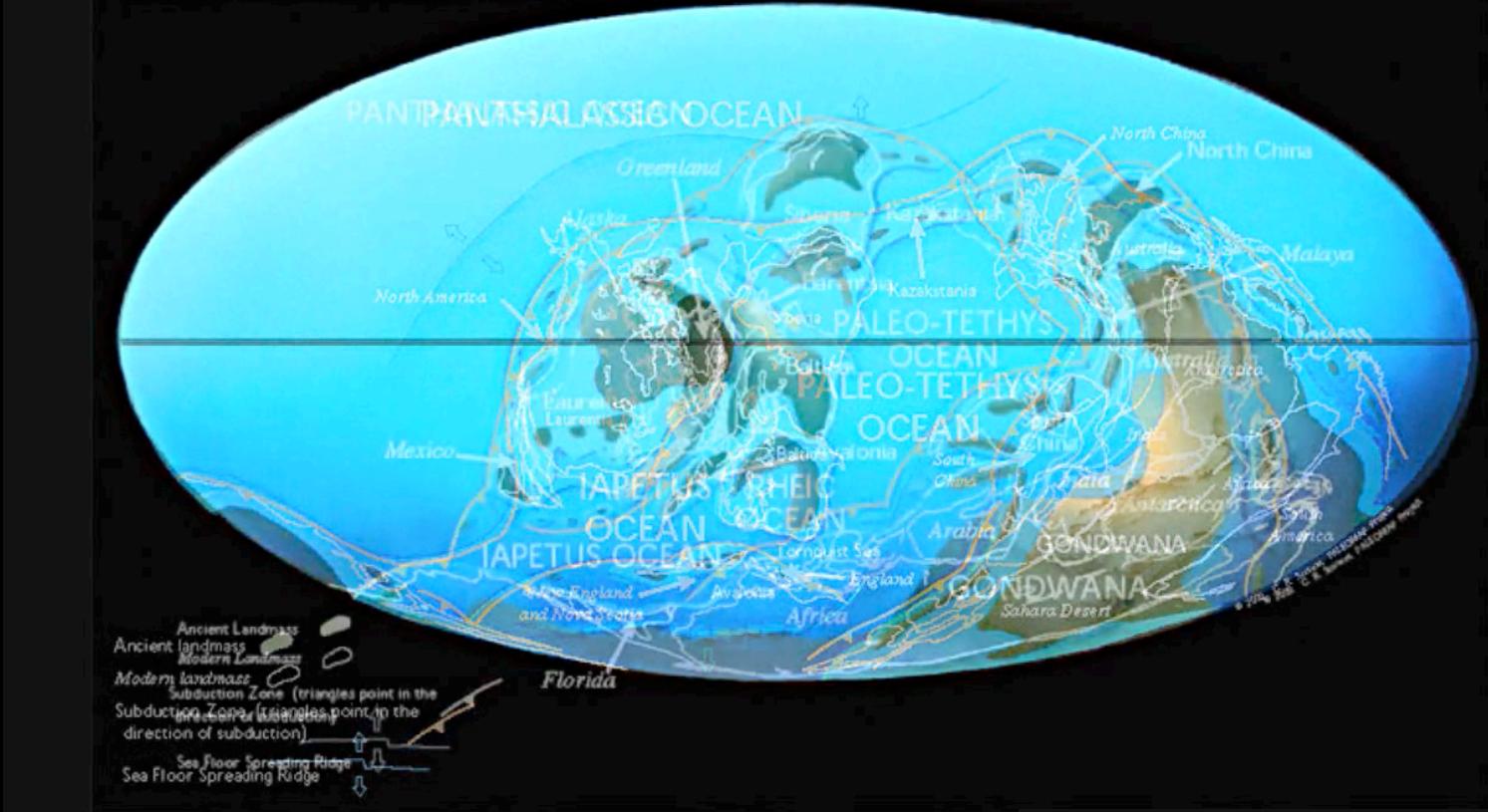


Darwin showed that seeds can still germinate after being immersed in water, nematode worms have been found on the feet of birds, and caged birds retain seeds in gut for a week. Lindburgh exposed glass slides on flights to show microorganisms in the skies.

- Some of Darwin's ideas:
 - transport by bird
 - floating seeds
 - land bridges

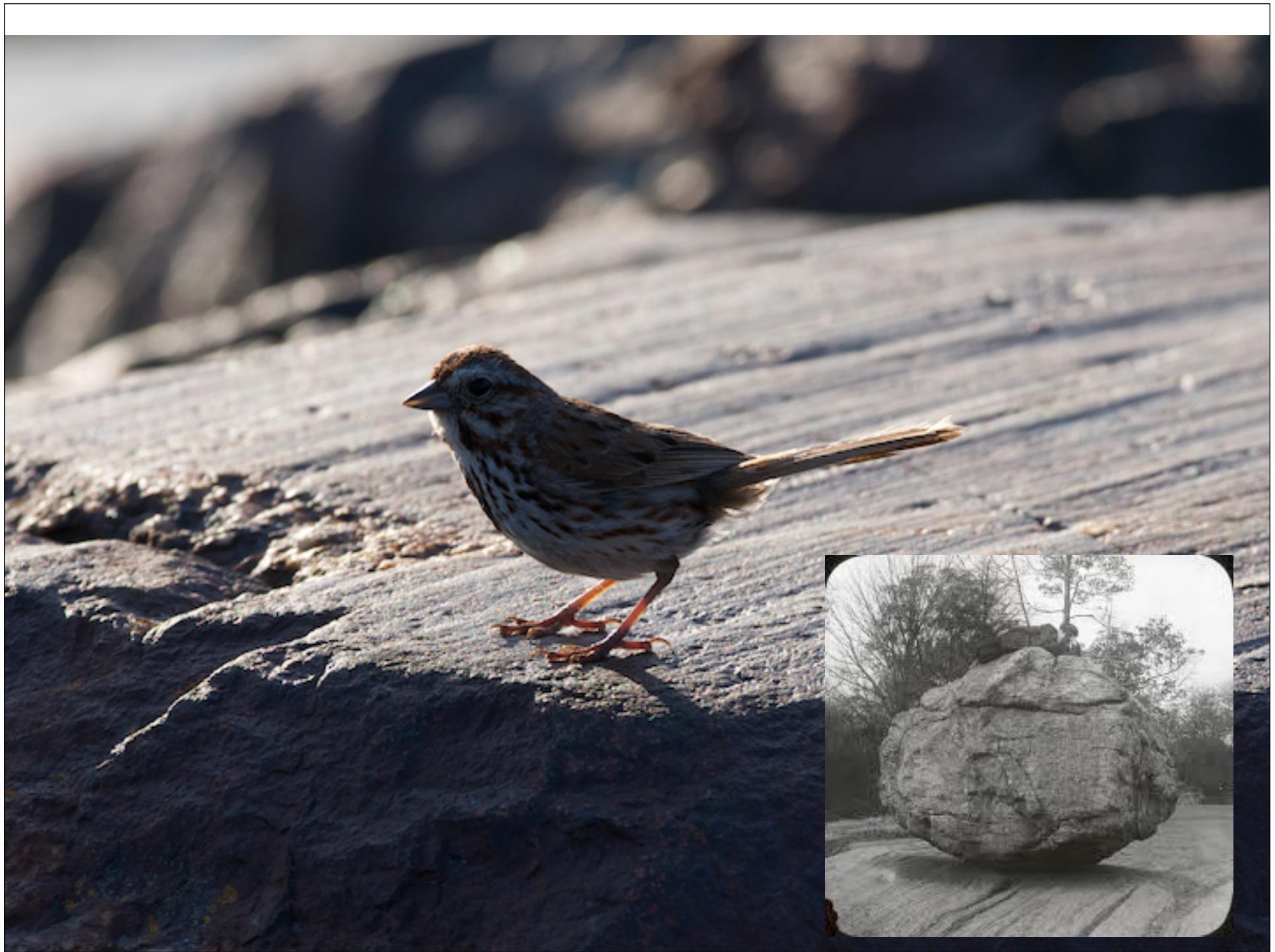


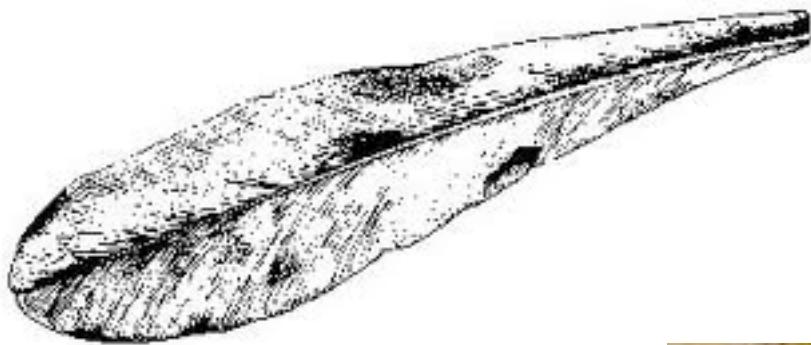
Middle Ordovician 425 Ma - 458 Ma



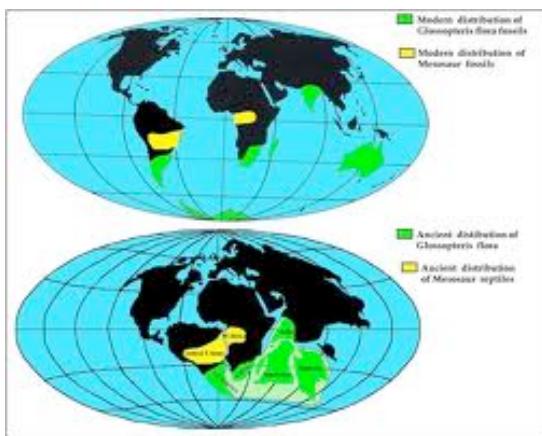
What Darwin was missing:





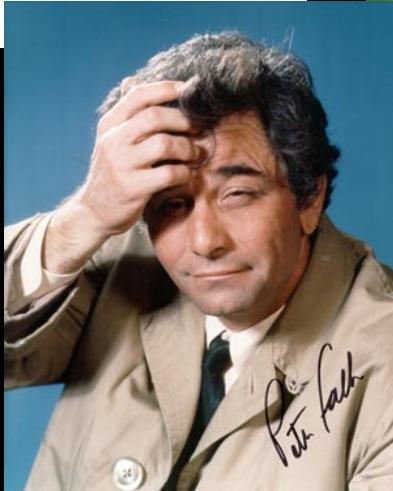


Glossopteris



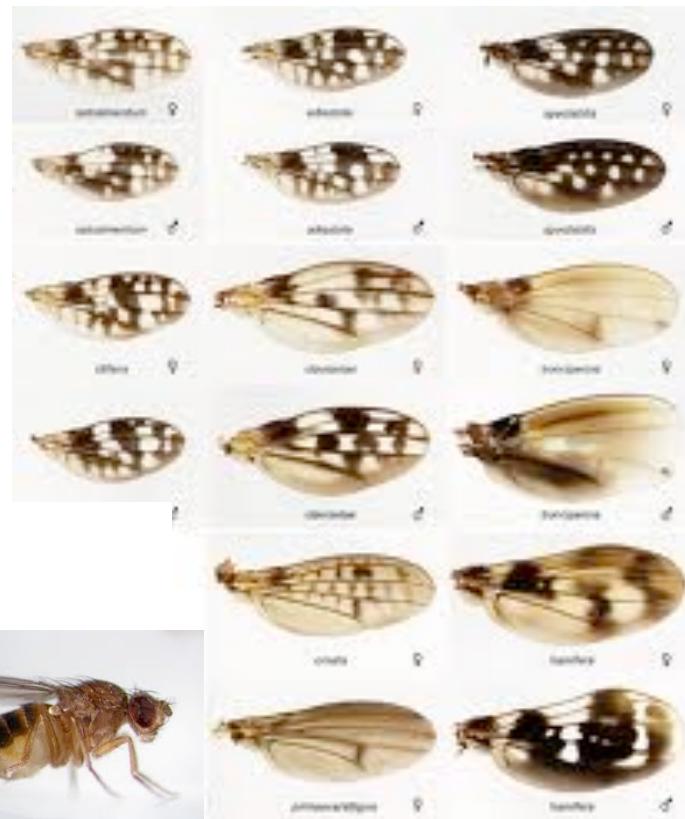
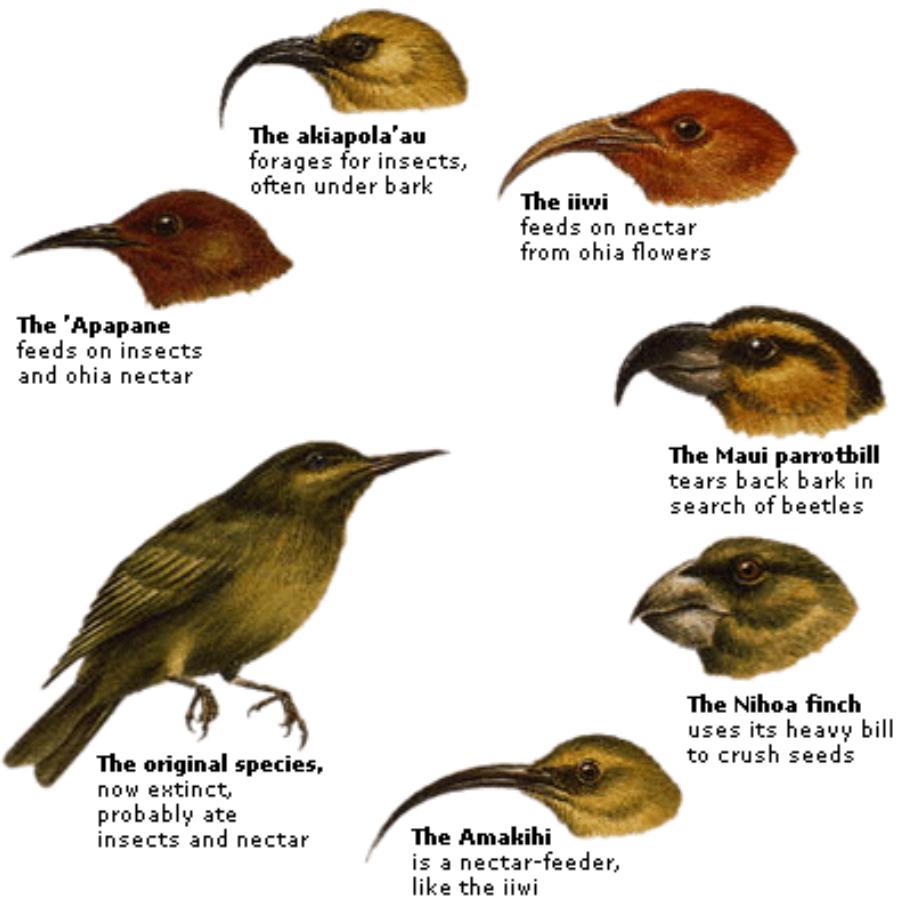
evidence from islands

“Now you see, although oceanic islands miss many animals, the ones they do have tend to be comprised of many similar species, and these species seem to fulfil very diverse ecologically niches.



The same is true of
Hawaiian
Honeycreepers

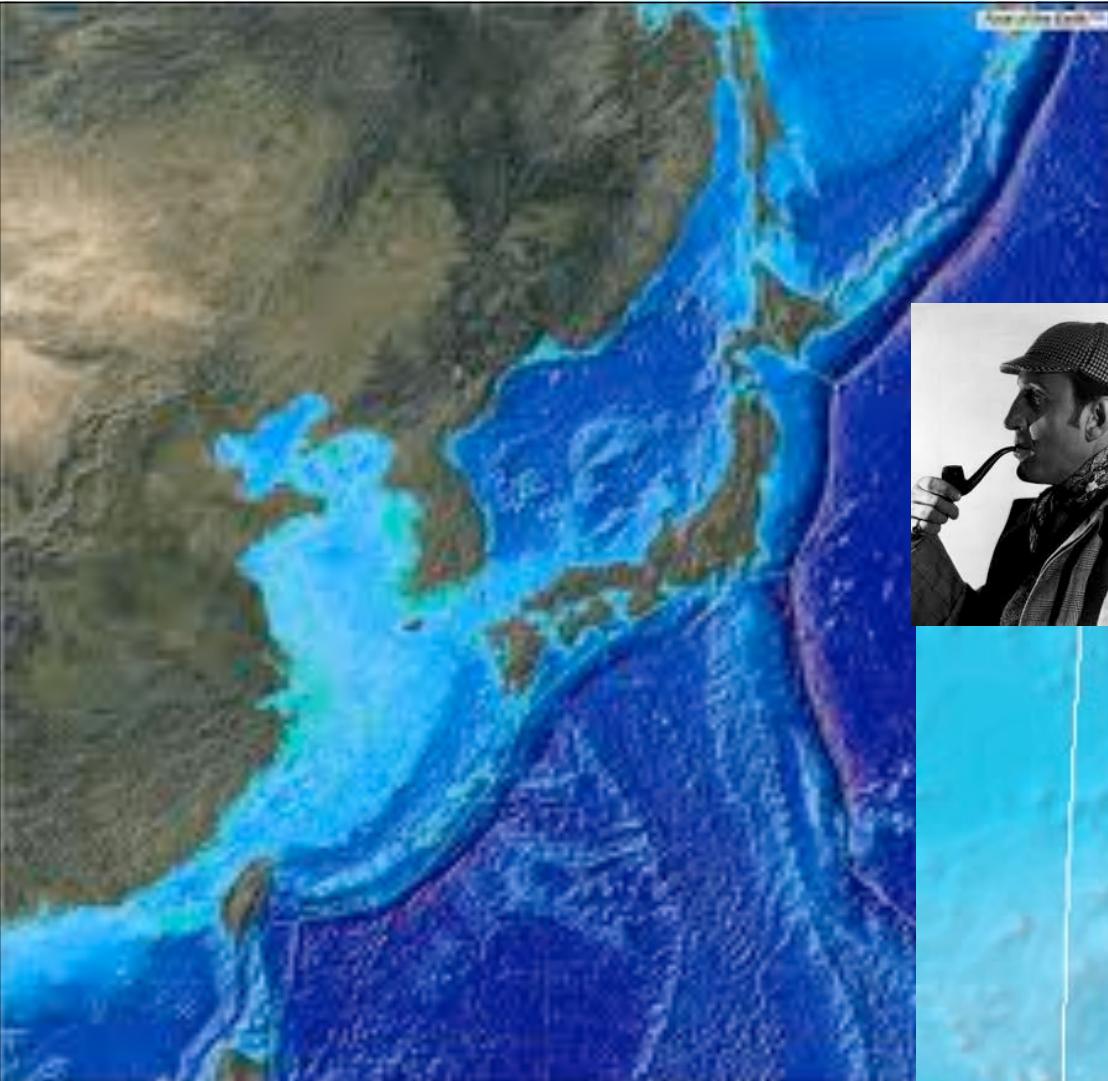
Hawaiian islands make up 0.004%
of the Earth's surface but
contain over half the species
of fruitfly





“And the animals and plants that are on oceanic islands have some common features, d'accord?





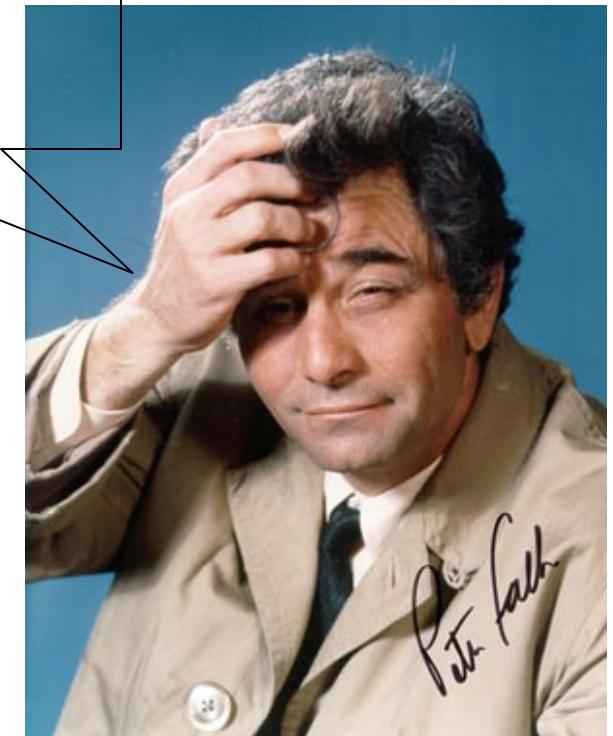
Oceanic and continental islands
- know the difference.



“Many oceanic islands are missing freshwater fish, amphibians, reptiles and land mammals, dear Watson, while continents and their islands are not.



“Just one more thing...
animals and plants on
oceanic islands are
most similar to those
on the nearest
mainland. For example,
those on Galapagos
looked like those from
S.America.



Why are some animals missing off islands?

Why do islands have lots of ecologically diverse forms of animals?

Why do island animals and plants resemble those of close mainland?

Why are some animals missing off islands?

Why do islands have lots of ecologically diverse forms of animals?

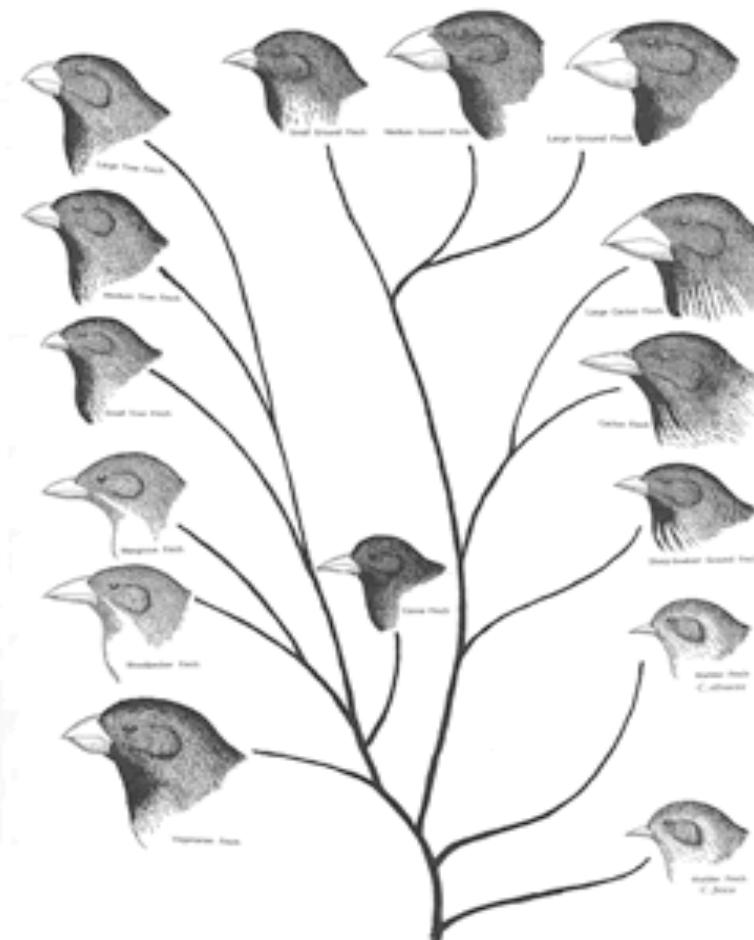
Why do island animals and plants resemble those of close mainland?

It is elementary..



The inhabitants of oceanic islands descended from earlier species that colonised the islands, usually from nearby continents, in rare events of long-distance dispersal. Open niches, and a lack of predators on islands lead to ‘adaptive radiations’, like we see in the finches.

The inhabitants of oceanic islands descended from earlier species that colonised the islands , usually from nearby continents, in rare events of long-distance dispersal. Open niches, and a lack of predators on islands lead to ‘adaptive radiations’, like we see in the finches.



- Adaptive radiations: begin with a recent single ancestor, that splits into different morphological and physiological traits with which they can exploit a range of divergent environments.
- These finches descended from one type of ancestor and then, due to isolation and through chance, different climates and natural forces such as food availability and type, they evolved into many different types of finches.
- Robinson Crusoe Effect - time and chance determine what might get marooned.
- [Evolution by Natural Selection from Common Ancestor + chance = speciation]