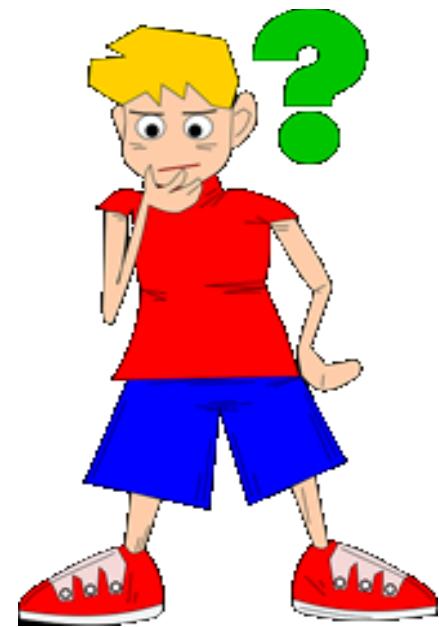
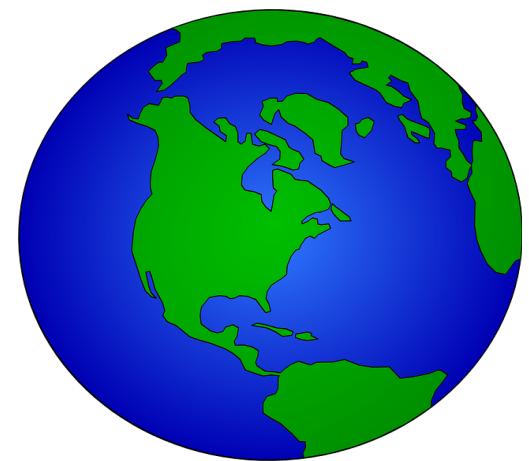


**What are basic principles of evolution,
and what is the evidence?**

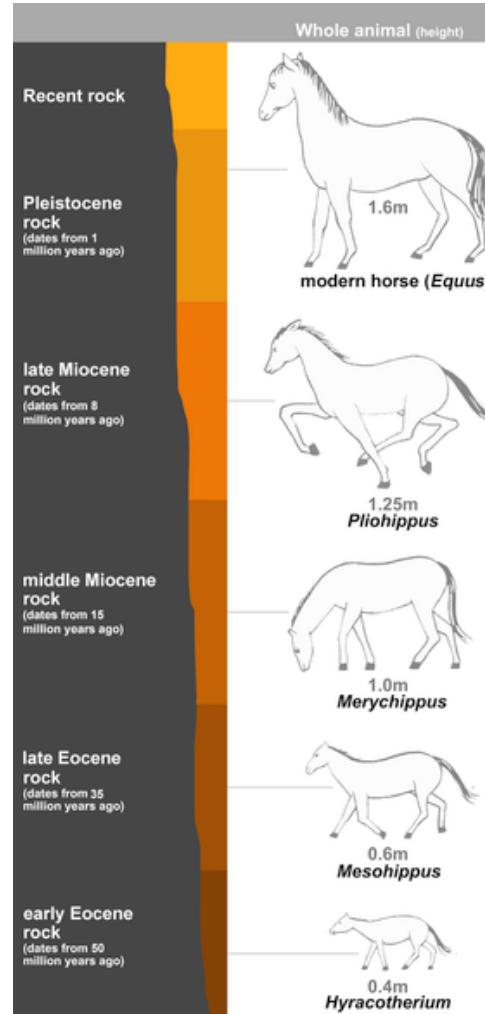


EVOLUTION has two fundamental processes

- Change within a lineage
- Formation of new lineages (split of existing lineage)

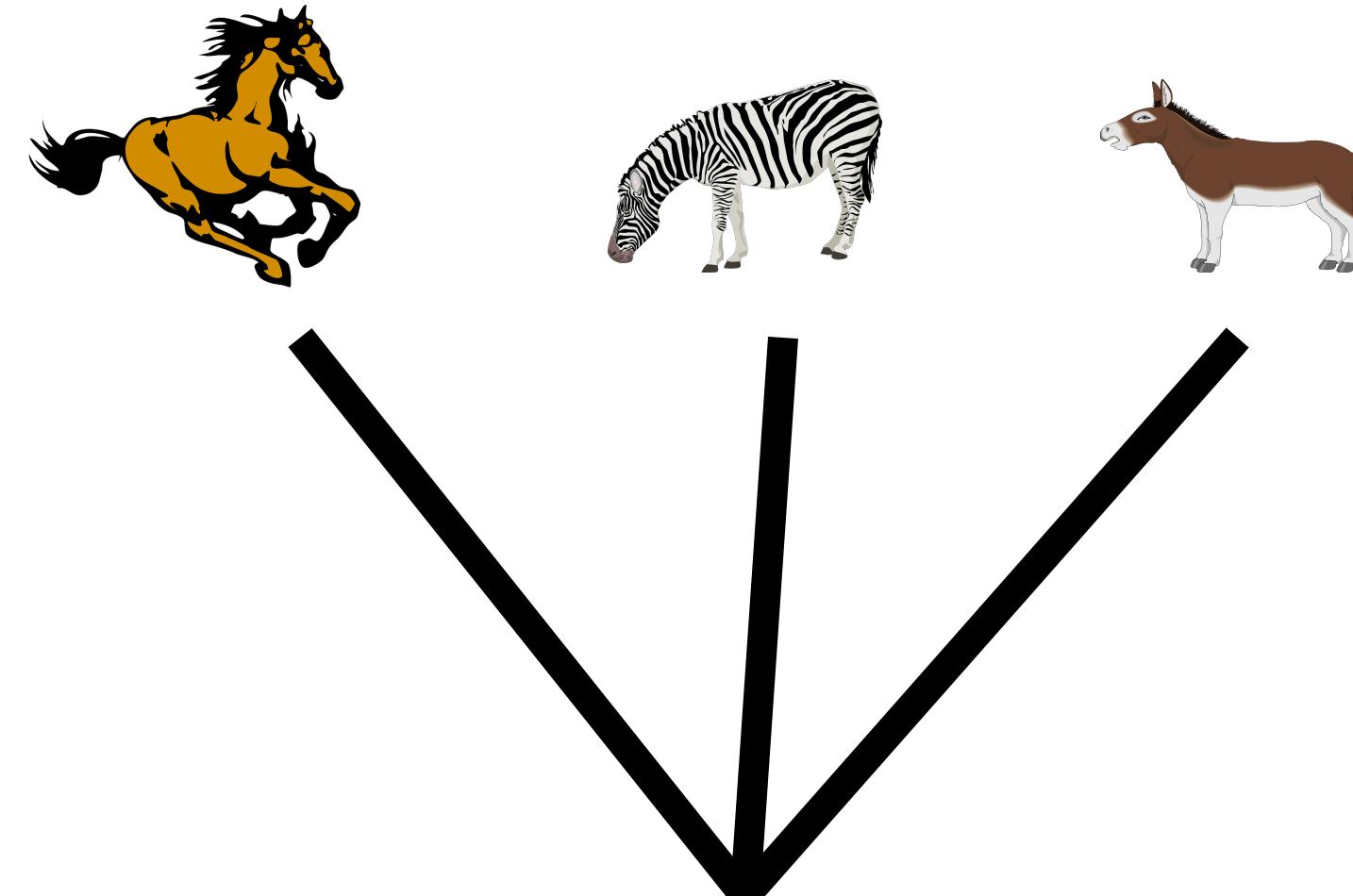
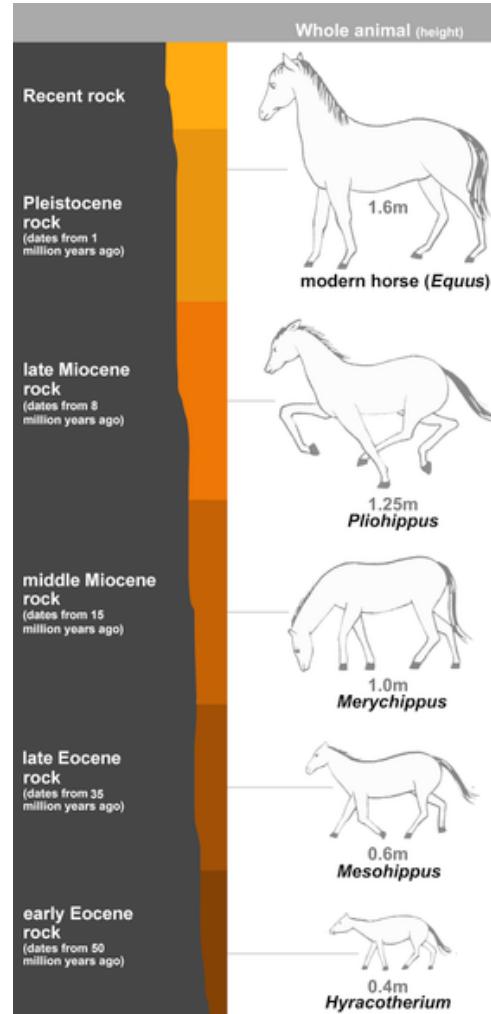
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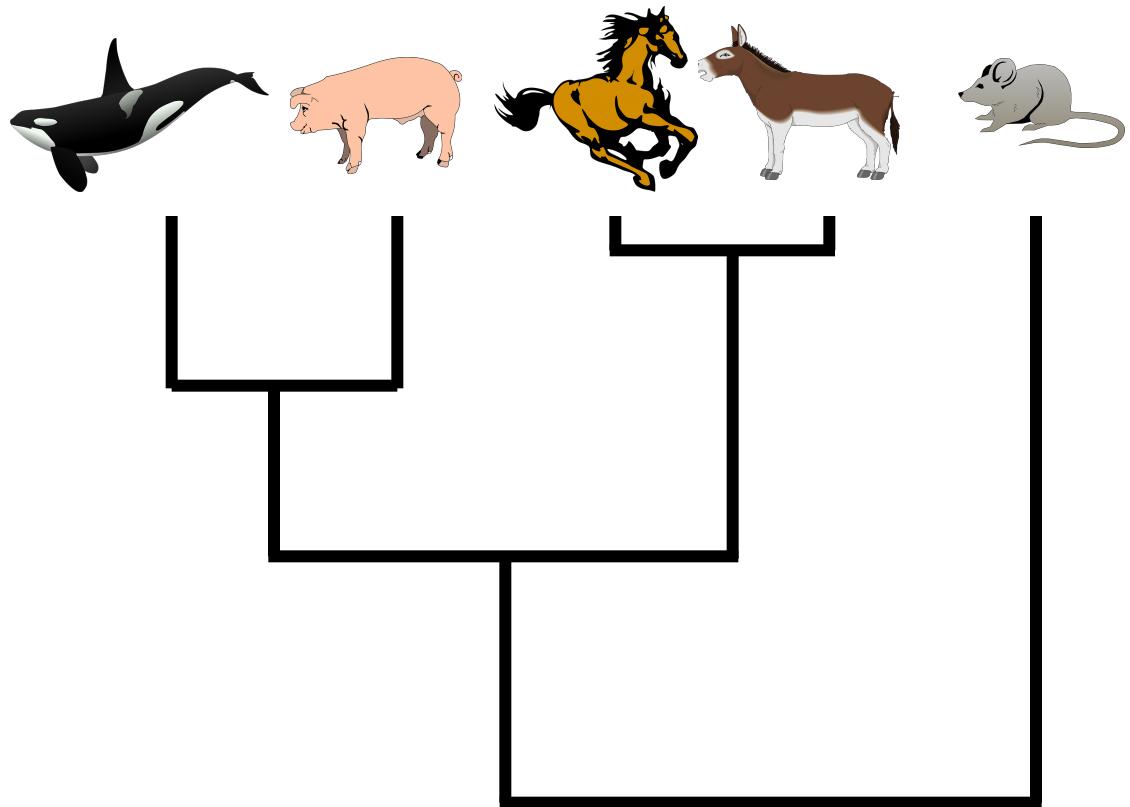
EVOLUTION has two fundamental processes

- Change within a lineage
- Formation of new lineages (split of existing lineage)



Two important principles of evolution

1. Much of evolutionary change was caused by **natural selection**, which produces the appearance of design.
2. All species share **common ancestry**-- result of splitting of lineages from one ancestral life form.



Prediction

If life originated on Earth in the distant past and then evolved, we should see:

That the first detectable traces of life on Earth would be simple forms

. . . and only later would more complex and more “modern” forms appear

Prediction

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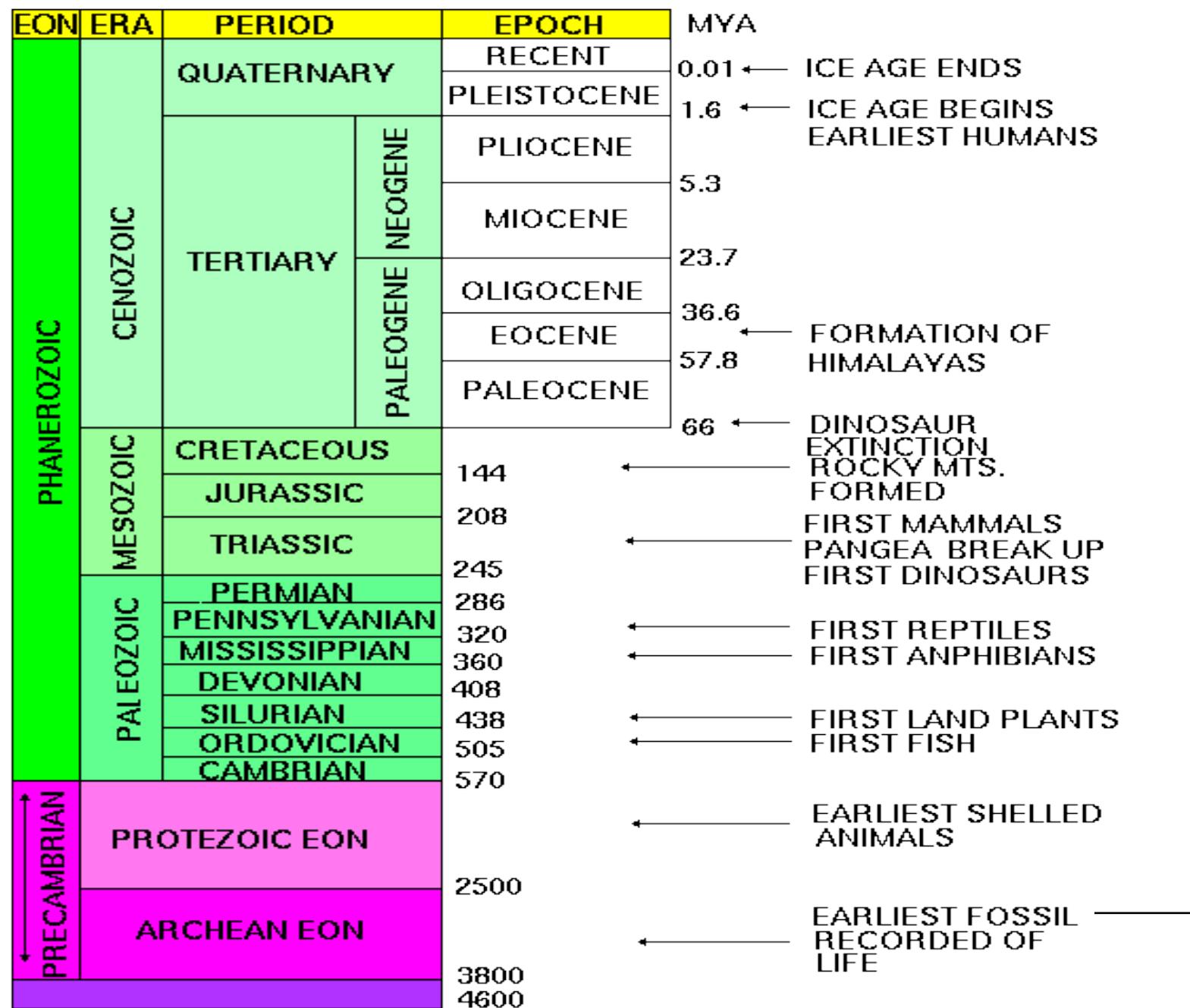
That the first detectable traces of life on Earth would be simple forms

. . . and only later would more complex and more “modern” forms appear

No “fossil rabbits in the Precambrian era”...



Fossil evidence: early life simplest



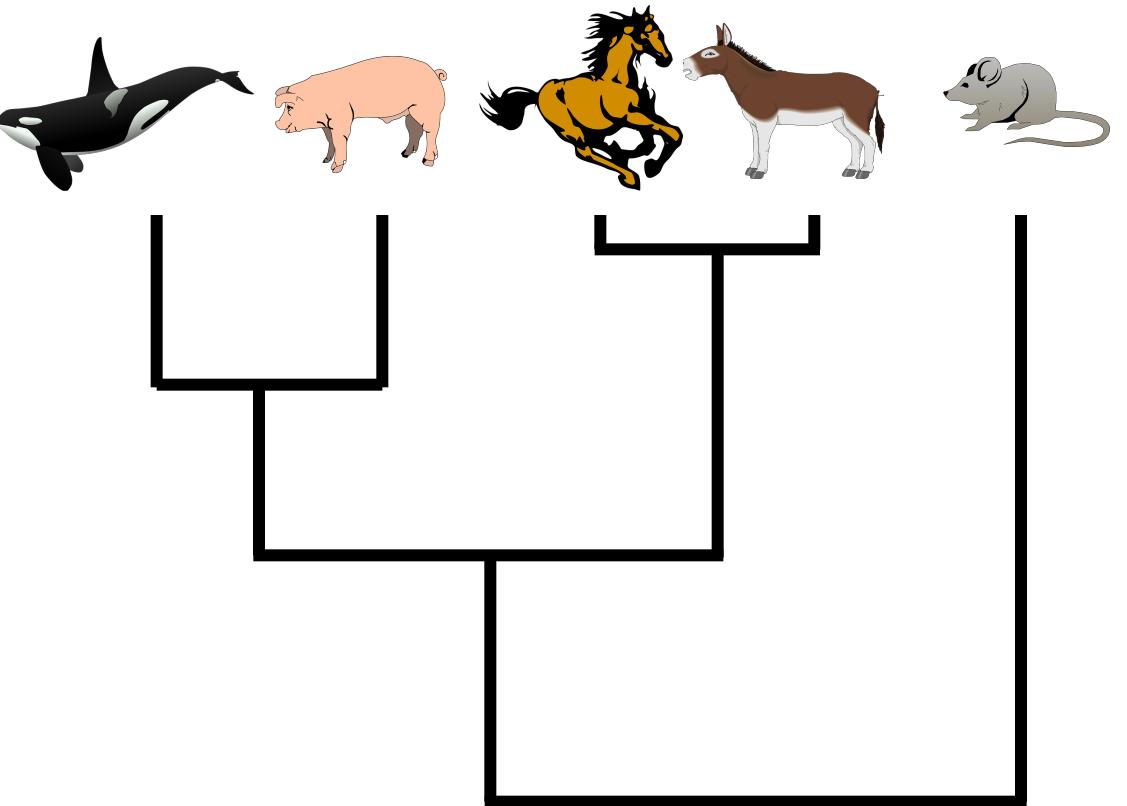
CONFIRMED!

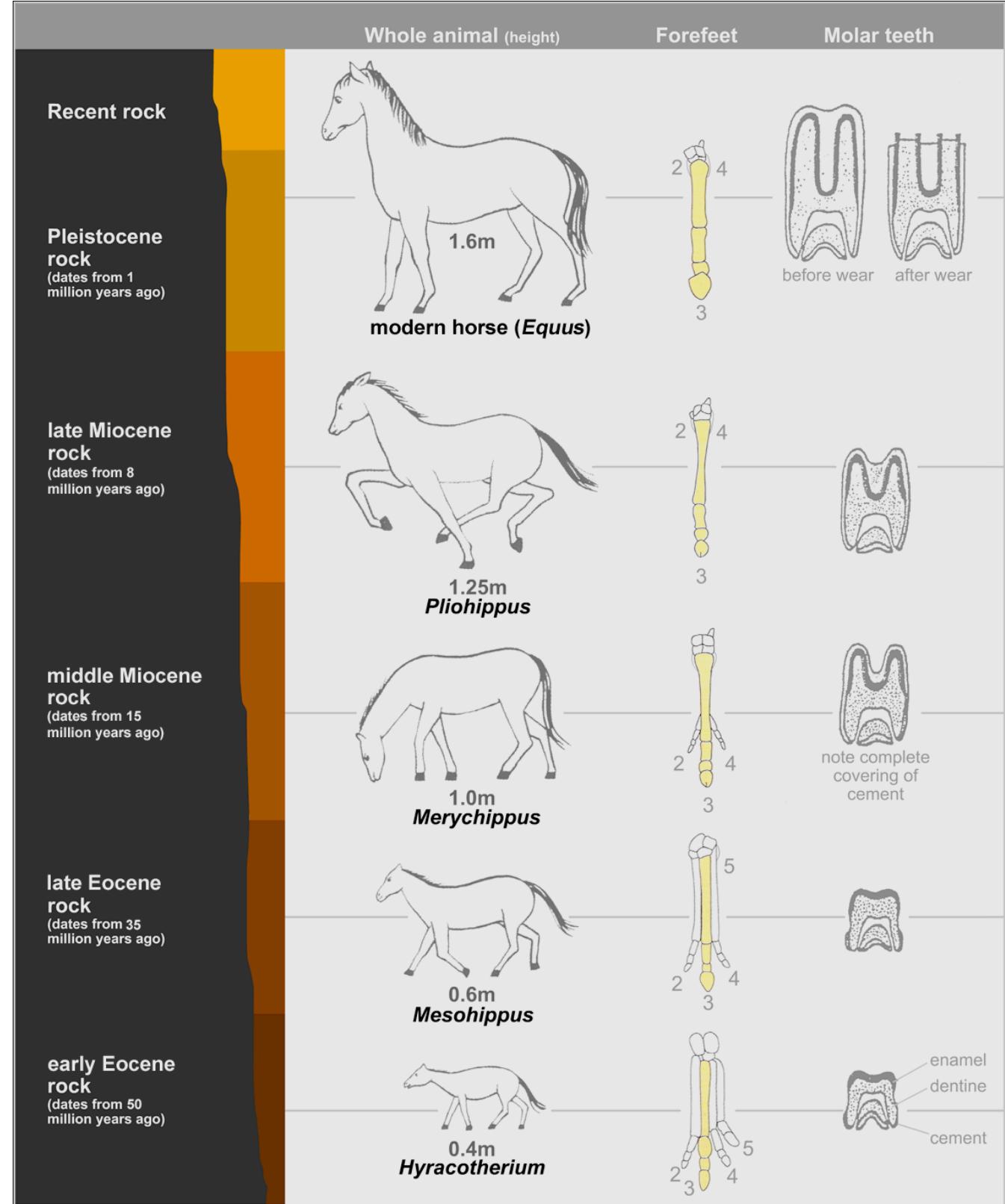


Prediction

If evolution occurred within lineages,
and those lineages sometimes split:

Then we should be able to find
examples of species gradually
changing in the fossil record into
new species/ forms



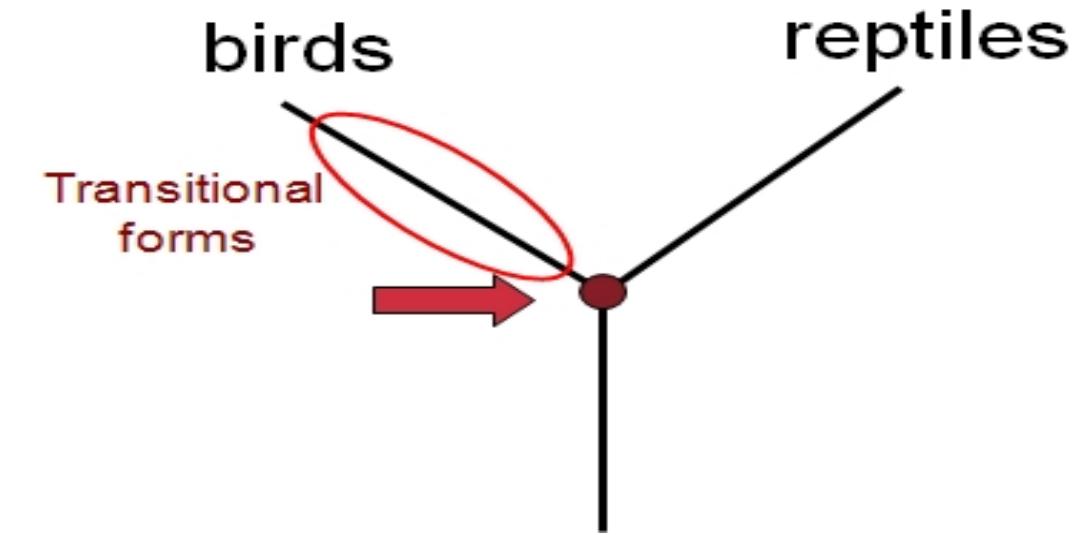


CONFIRMED!

Prediction

If all creatures share a common ancestor:

We should find transitional fossils that connect modern groups to their common ancestor



FEATHERED DINOSAUR!



*Sinornithosaurus
millenni*

CONFIRMED!

FEATHERED DINOSAUR!



*Sinornithosaurus
millenni*

Also appears
at the right
time in the
fossil record

FEATHERED DINOSAUR!



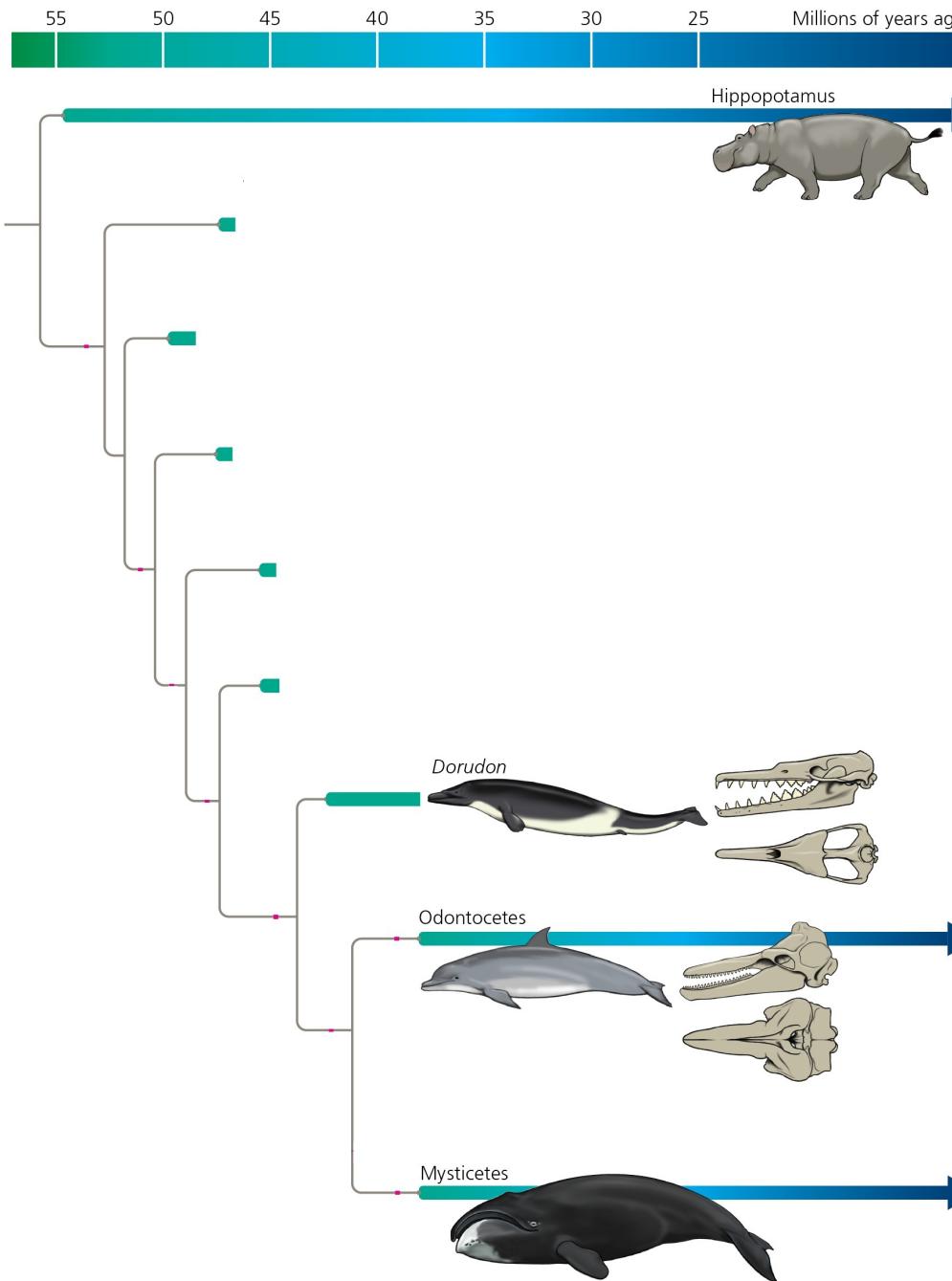
*Sinornithosaurus
millenni*

Also appears
at the right
time in the
fossil record

Missing Links?



1970

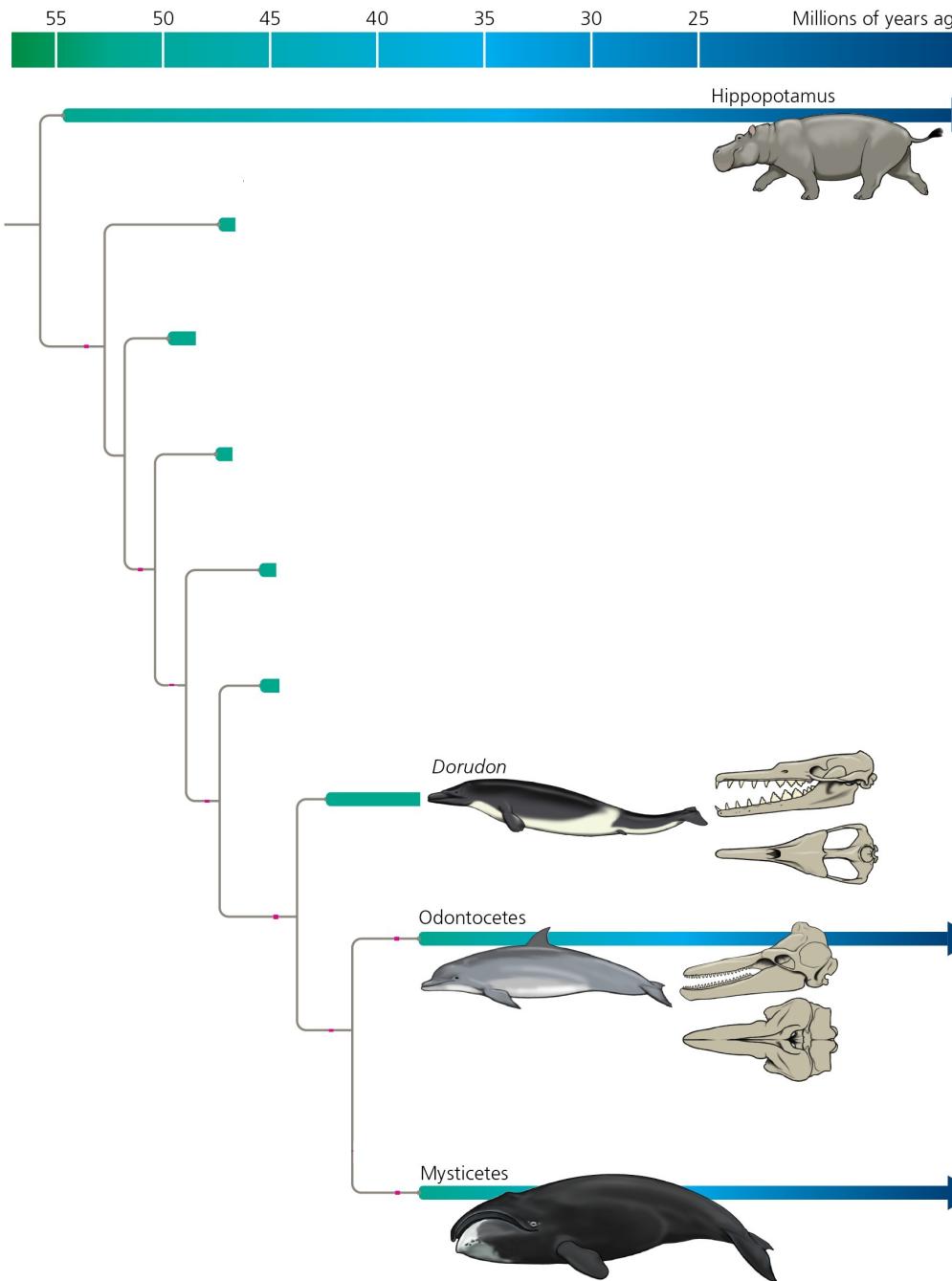


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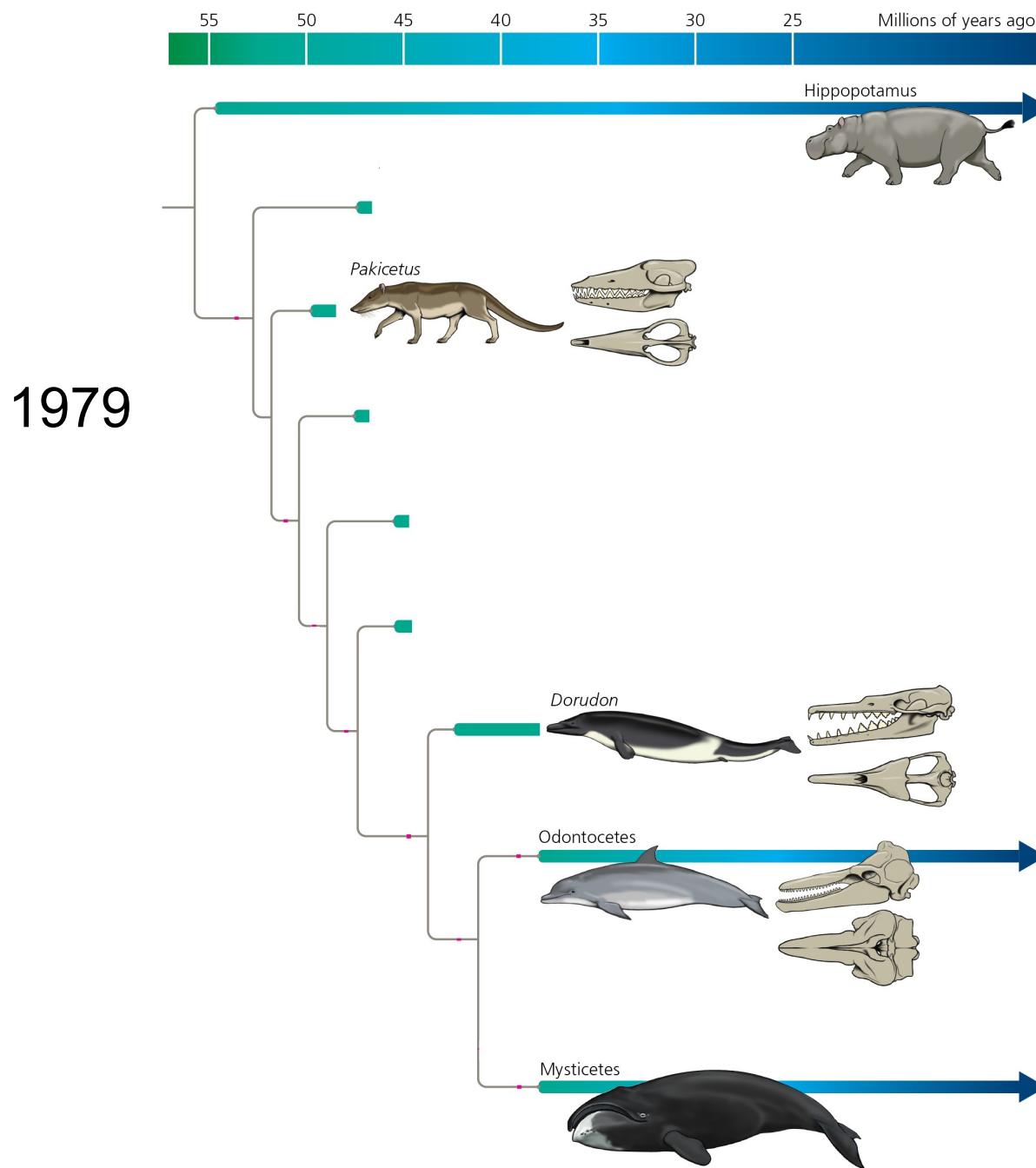


1970

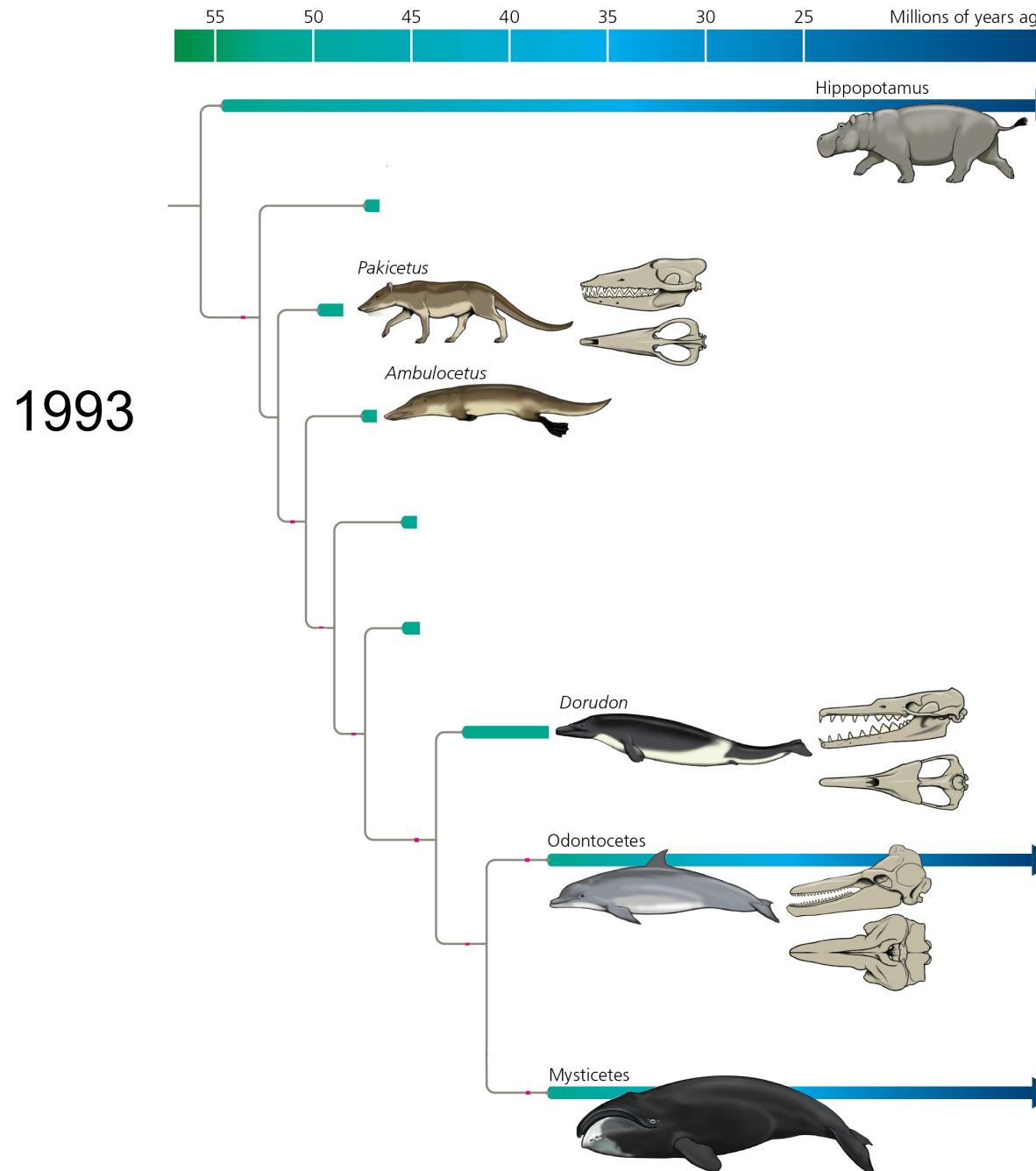
Crocoduck!



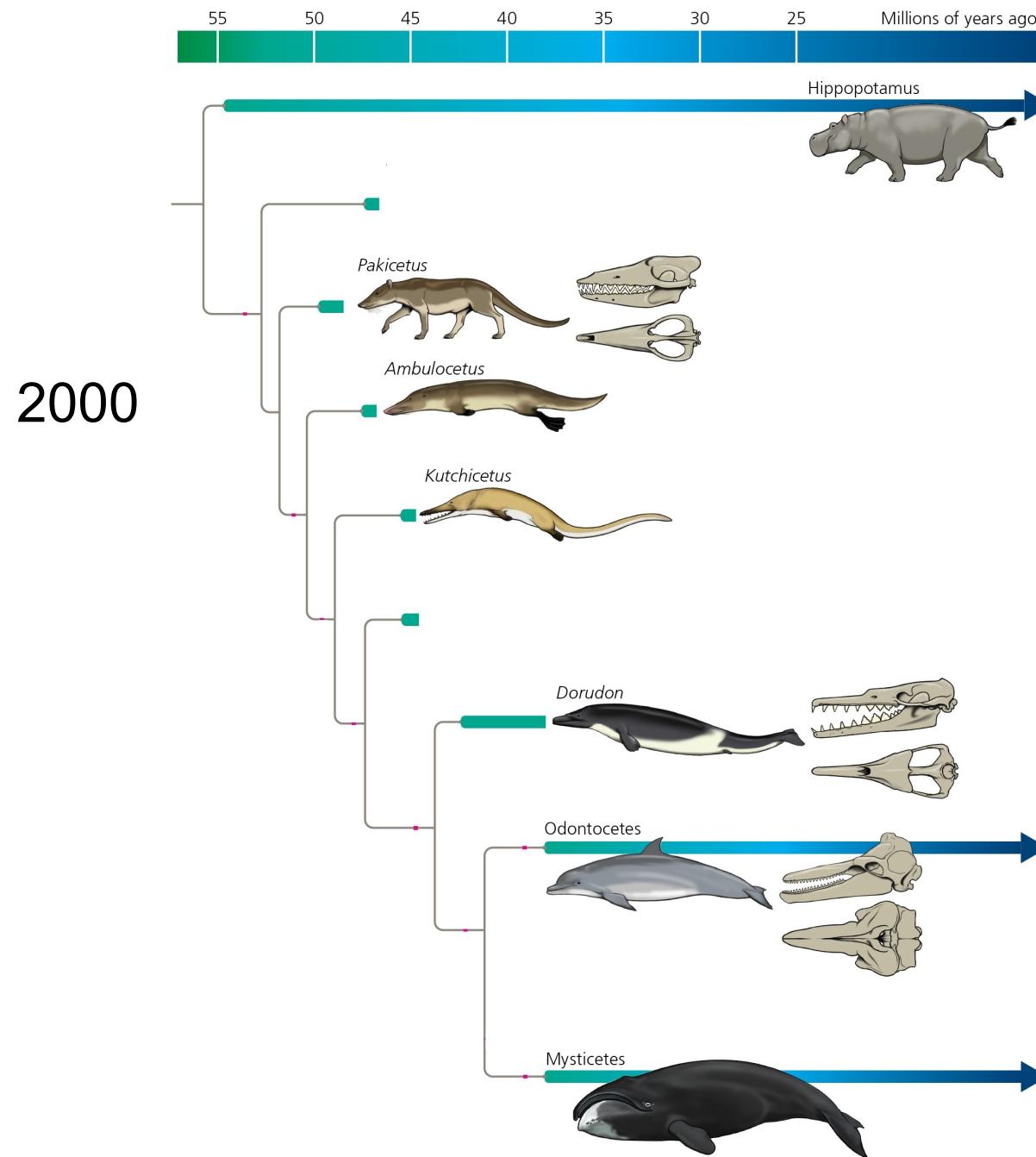
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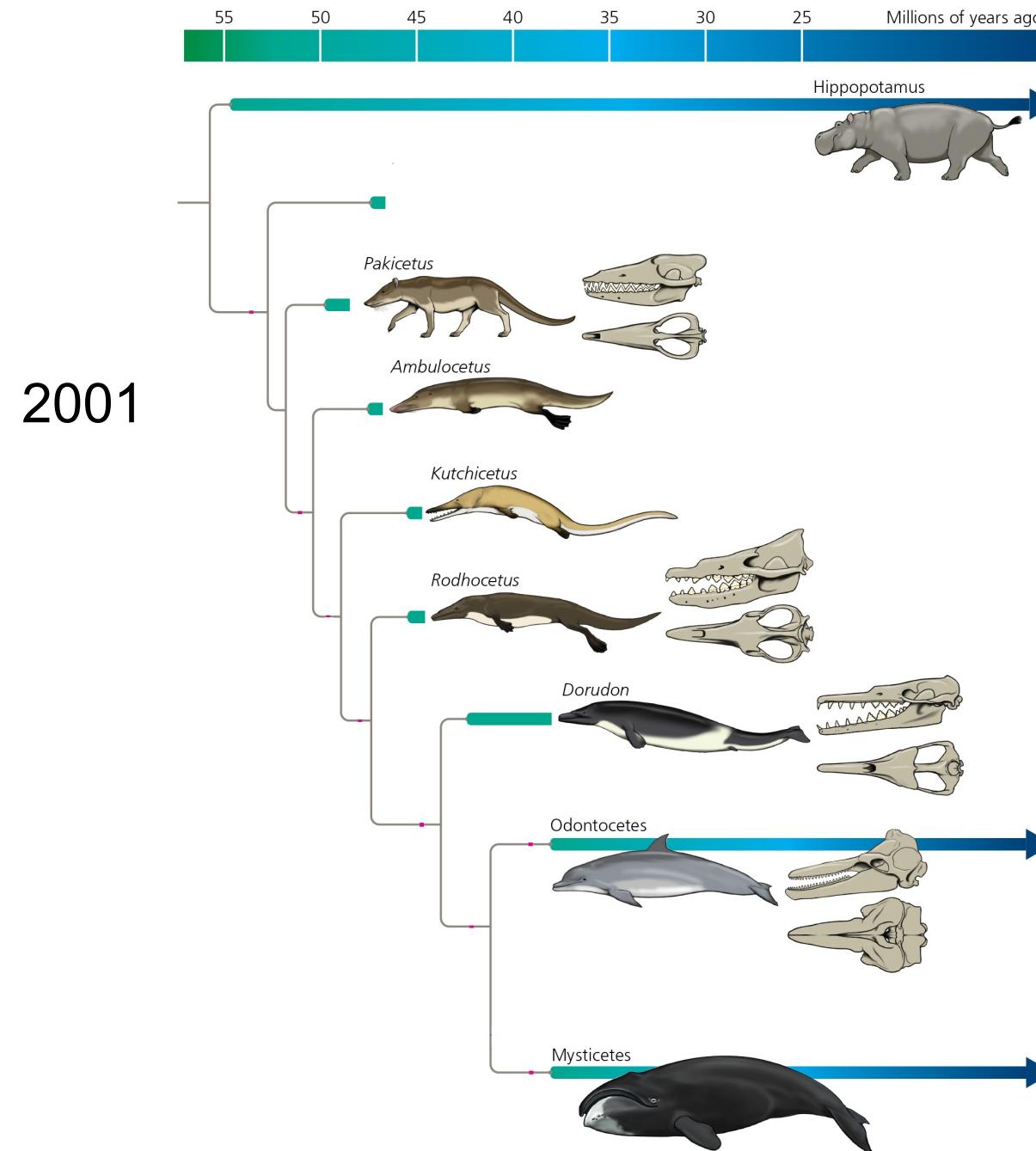
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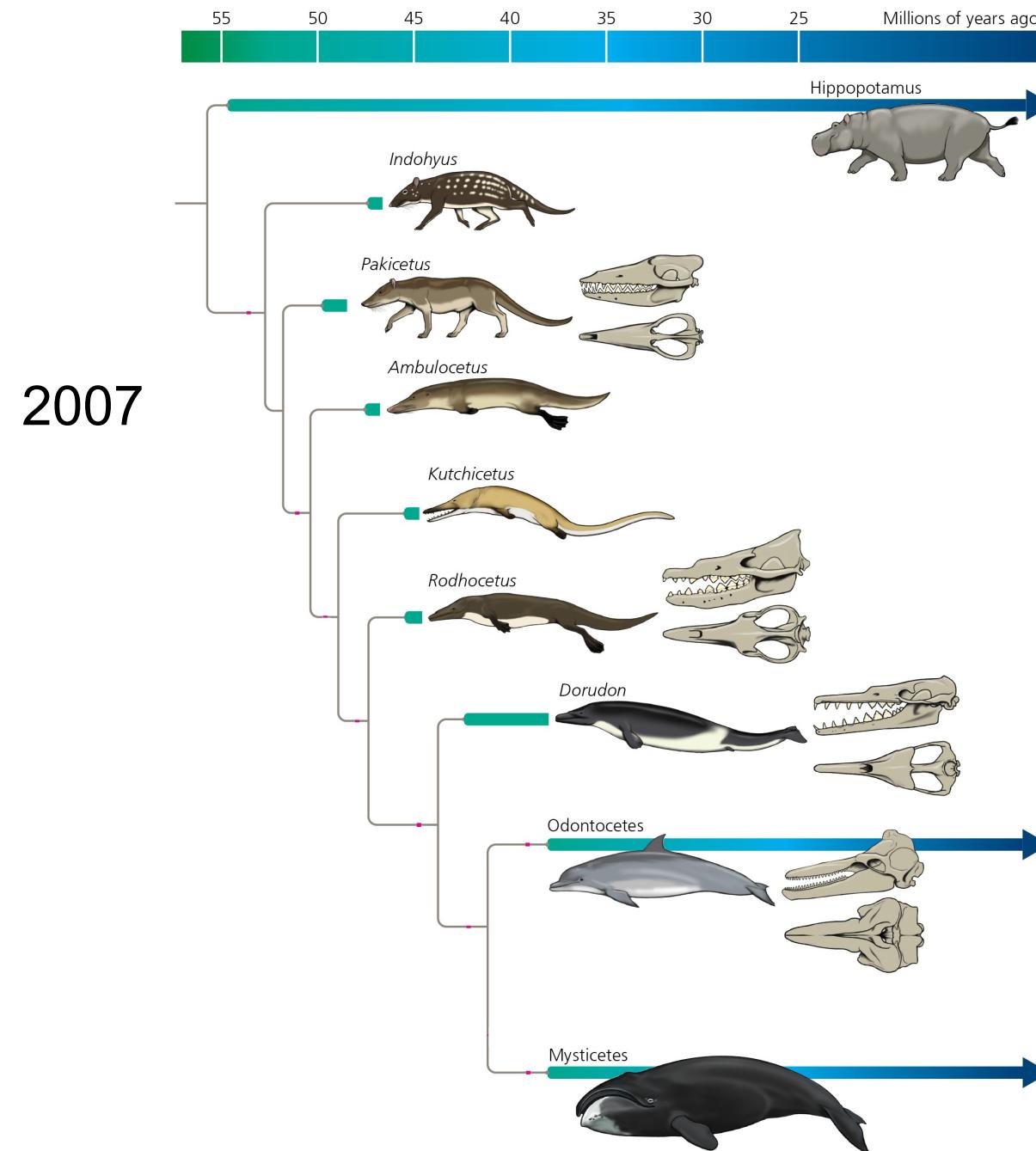
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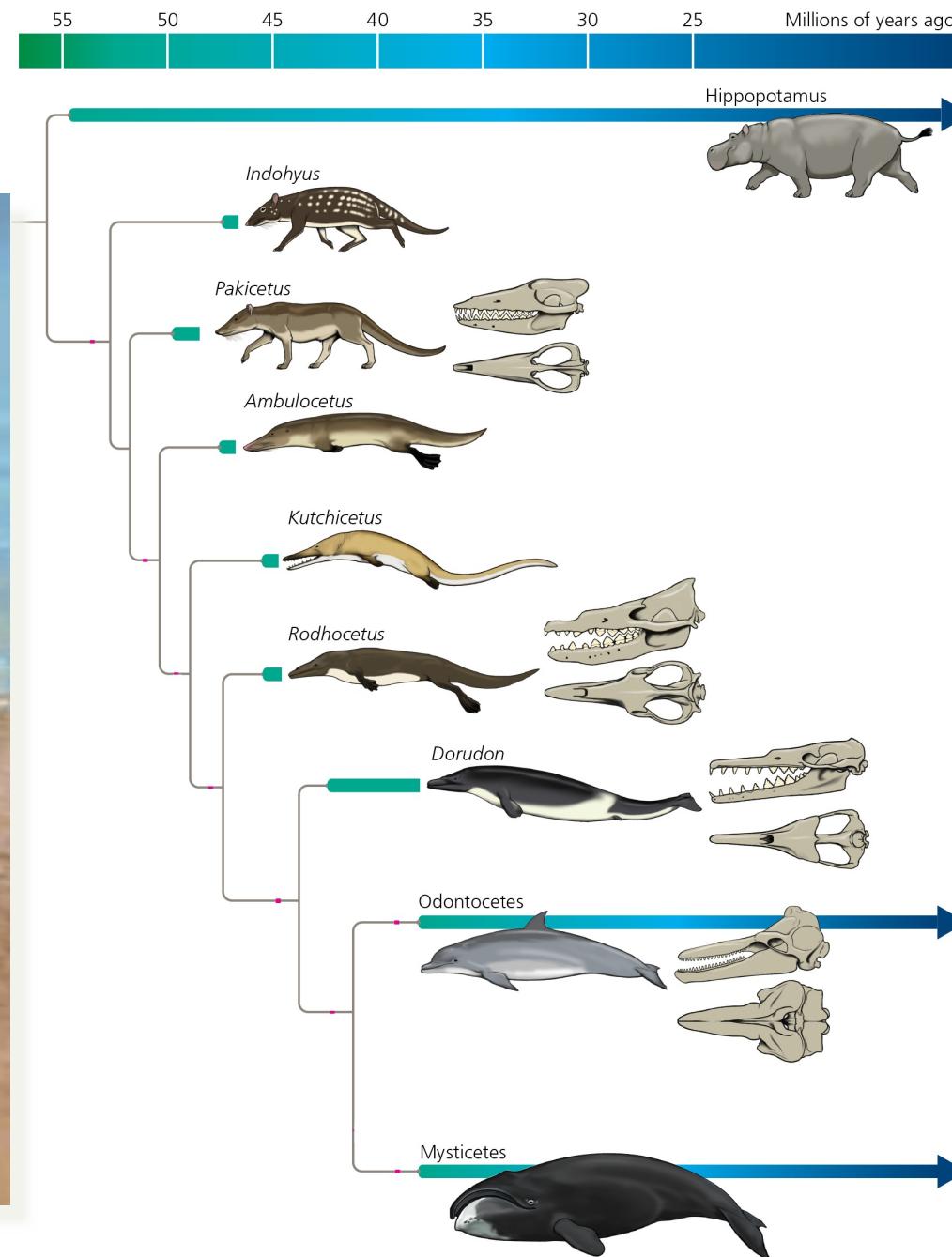
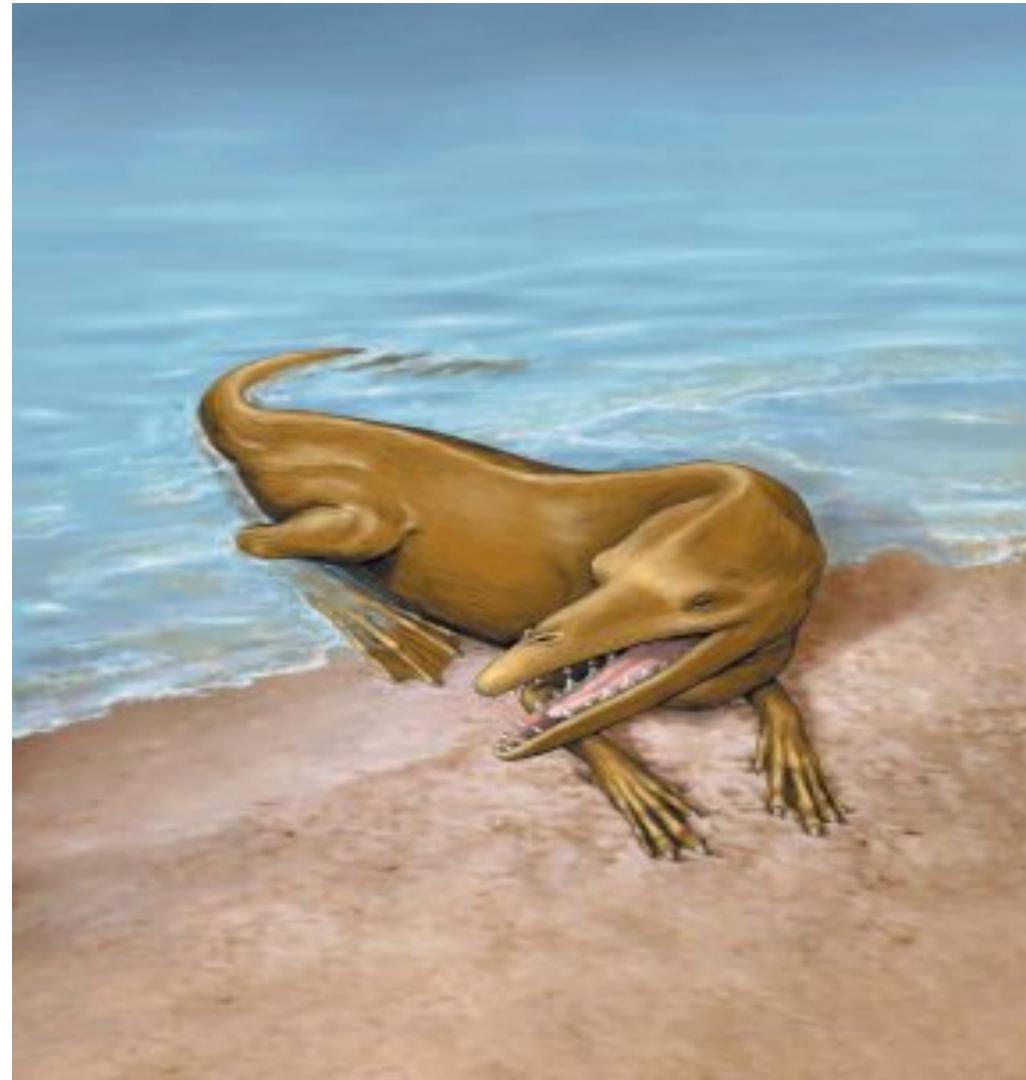
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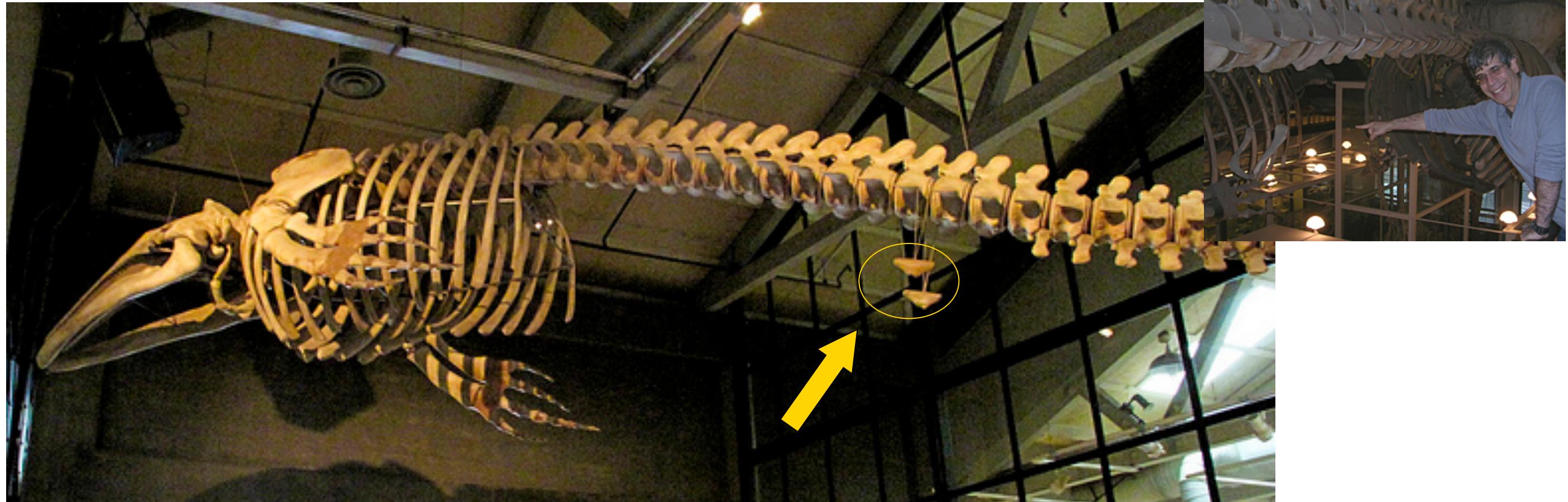
Missing Links?



“Retrodictions”

- Some observations support the idea of evolution and common descent, even if not necessarily predicted ahead of time

Retrodictions: vestigial organs



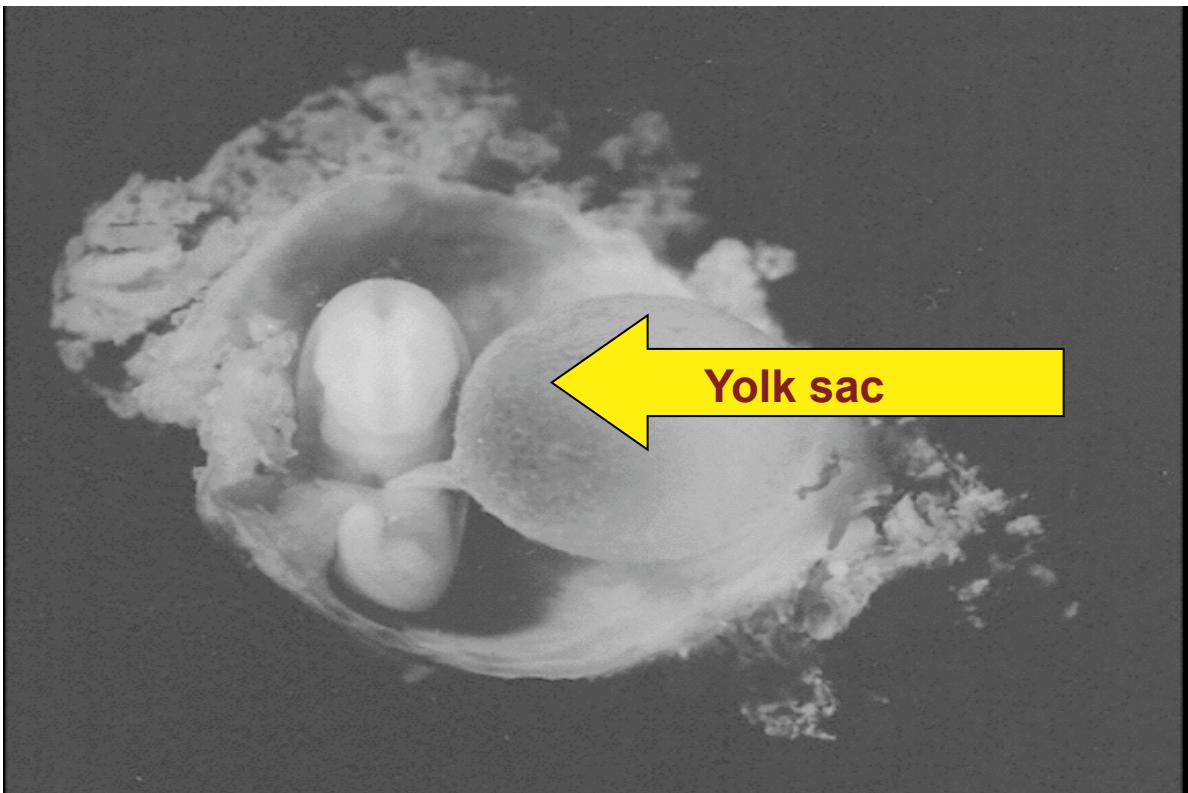
Vestigial hind limbs of gray whale

Retrodictions: vestigial (dead) genes

Genes for making yolk proteins

Genes for making vitamin C

Olfactory receptor proteins



Retrodictions: biogeography

Many native birds and insects, but
lack of *native* mammals, amphibians,
and freshwater fish on oceanic islands



Proof that mammals and amphibians CAN live in Hawaii



INDIAN
MONGOOSE



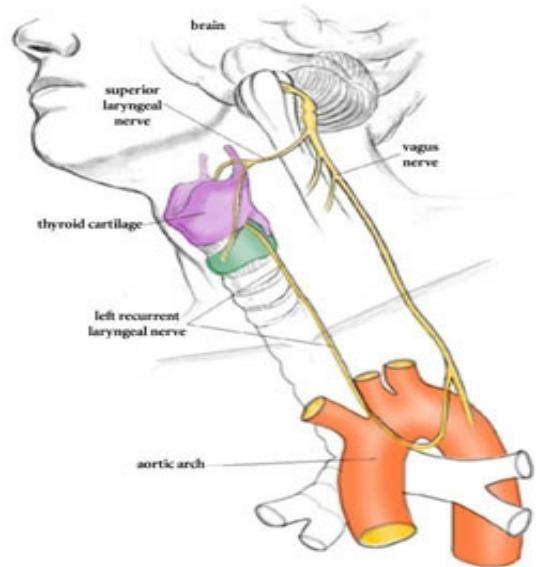
CANE TOAD

Retrodictions: biogeography

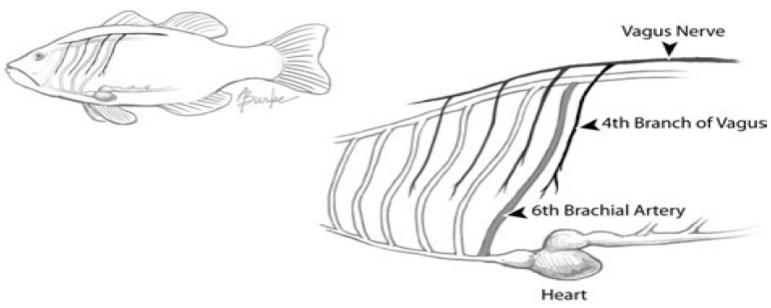
Most similar species to those on oceanic islands are usually found on the nearest mainland



Retrodictions: inefficient design



Loop of laryngeal nerve around aorta
works fine for ancestral fish-like form, but very
inefficient for humans and especially giraffe



Evolution worked with materials available- couldn't produce “more efficient design”

Fig 19
in Coyne book

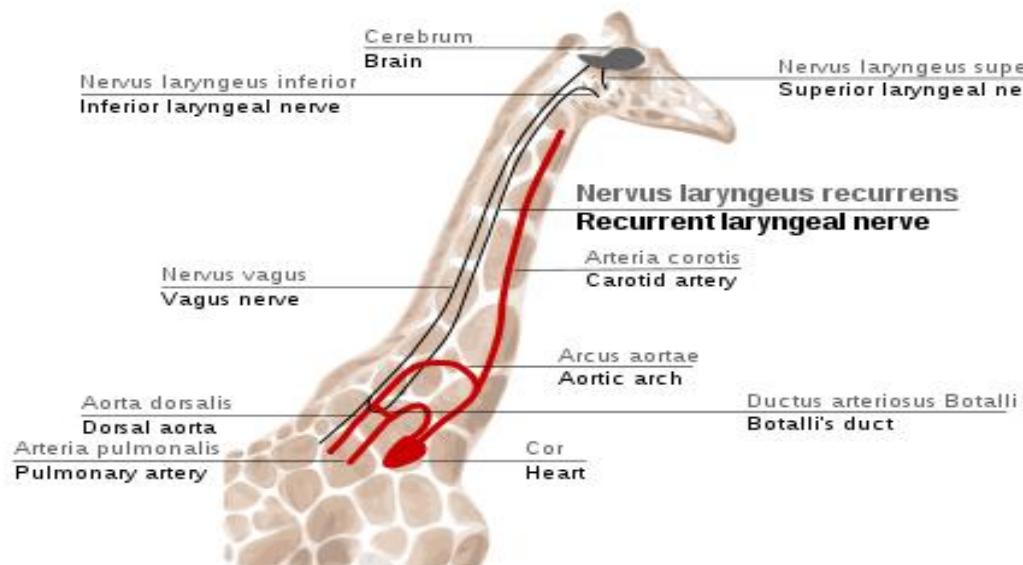


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