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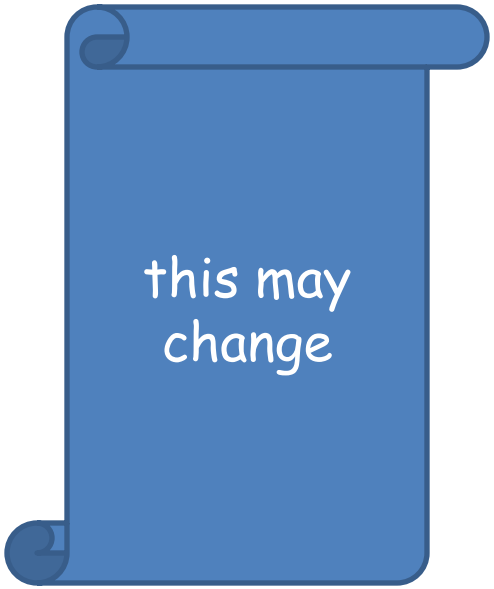
Slides and problem sets will be posted on the same web site…

Weeks 6 and 7
Intro to molecular evolution - what is it?
Neutral evolution and mutation
Purifying selection

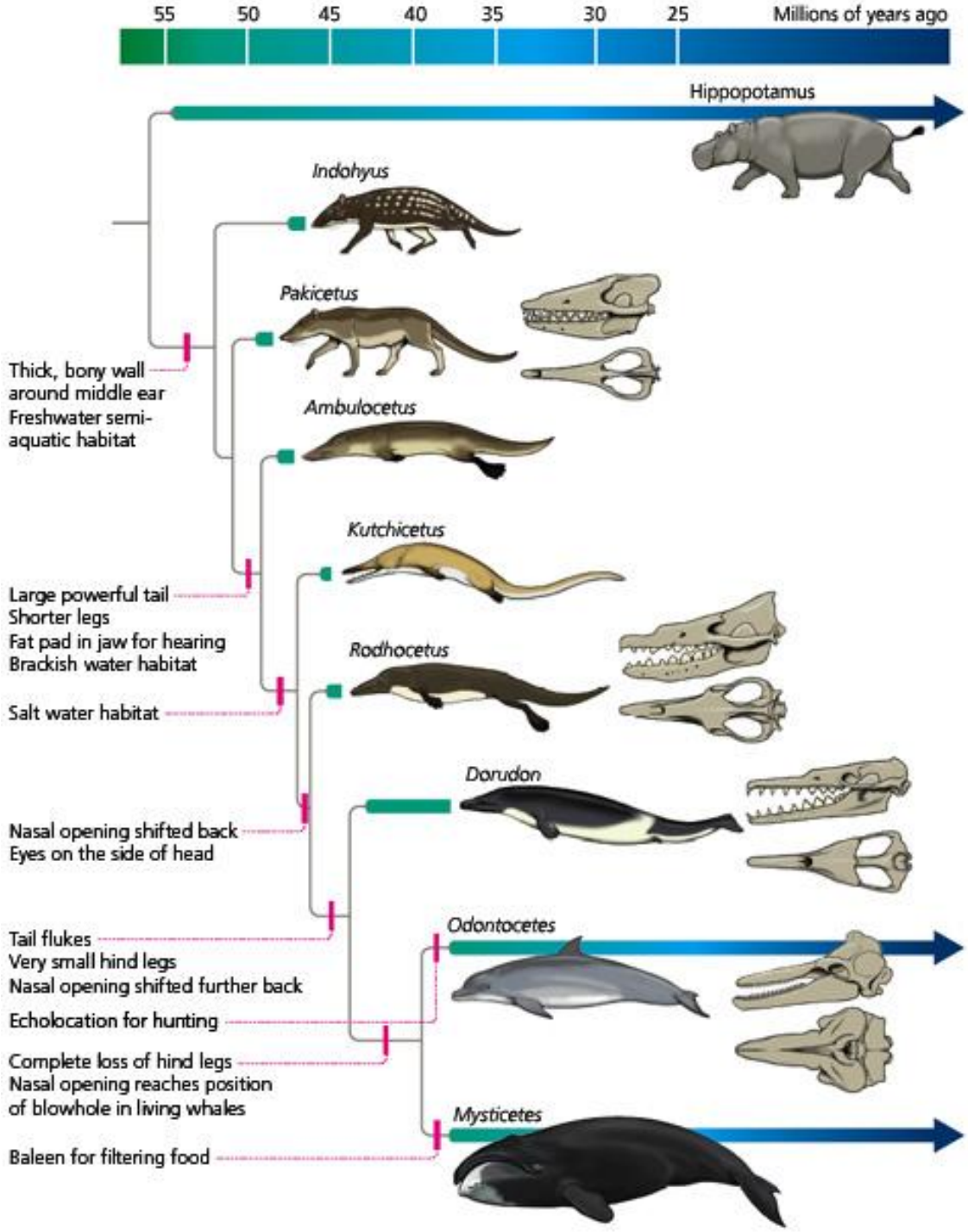
Week 8
Phylogeny and molecular methods
Deep branches
Lineage sorting and hybridization, coalescent

Week 9
Positive (Darwinian) selection
Positive selection dN/dS methods
Positive selection population methods

Week 10
Positive selection examples 1
Positive selection examples 2
Connecting genotype and phenotype - the challenge

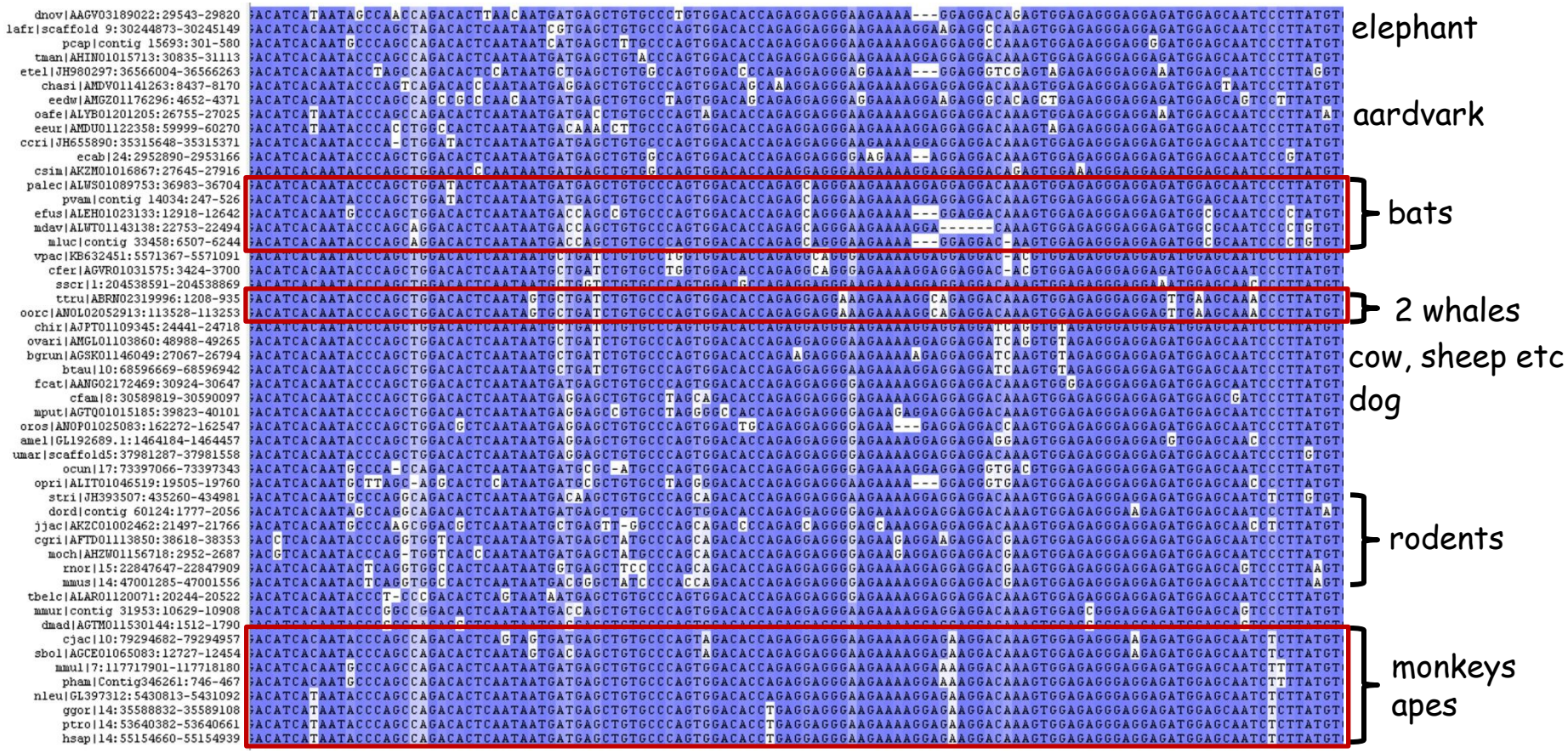


Evolution of whales in the fossil record



Molecular Evolution - What is it?

Molecular evolution - one hundred millionth (10^{-8}) of the genomes of 68 mammals:



The two fundamentals of evolution

1) heritable variation

2) natural selection

Heritable variation

Phenotypically familiar:

hair color
hair curliness
eye color
ear lobes (attached or not)
freckling
hair line (widow's peak or not)
cleft chin

At least 10 genes, three of which have major effects:

EYCL1 - green/blue alleles - chromosome 19
HERC2 - central brown ring eye color gene - chromosome 15
OCA2 - brown/blue alleles - chromosome 15

PLUS, more than 2 common alleles with functional consequences for each gene

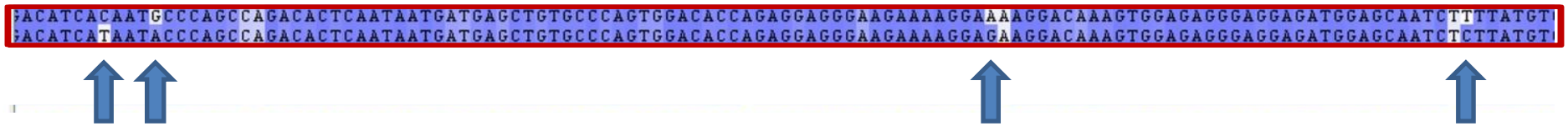
What about molecular variation?

Molecular variation - only one kind - change in DNA sequence (or RNA for some viruses)

MRCA about 25 mYA (most recent common ancestor)

Papio hamadryas (baboon)

Nomascus leucogenys (gibbon)



(other sequences are other primates, mostly from older branches)

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```

Natural Selection

Phenotypically familiar:

- Selection for long neck in giraffes
- Selection for bill type in Darwin's finches
- Selection for antibiotic resistance
- Selection for camouflage coloration
- Selection against sterility

etc.

What about selection on molecular variants?

What about selection on molecular variants?

Acts via the capacity for a sequence variant to <u>affect its own perpetuation</u>.

Recommended reading - "The Selfish Gene" by Richard Dawkins