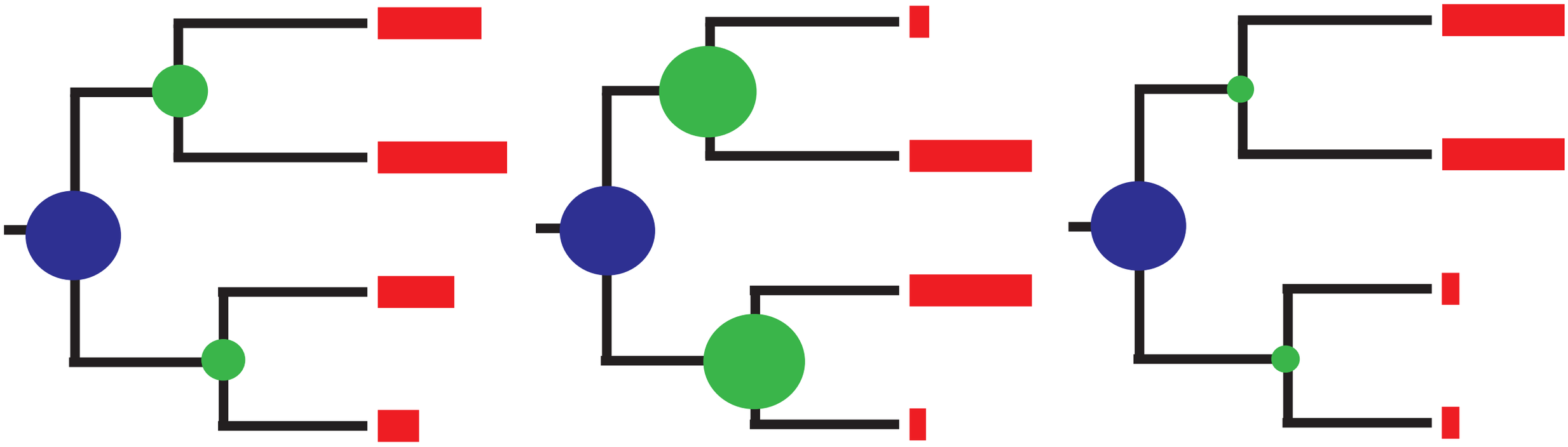
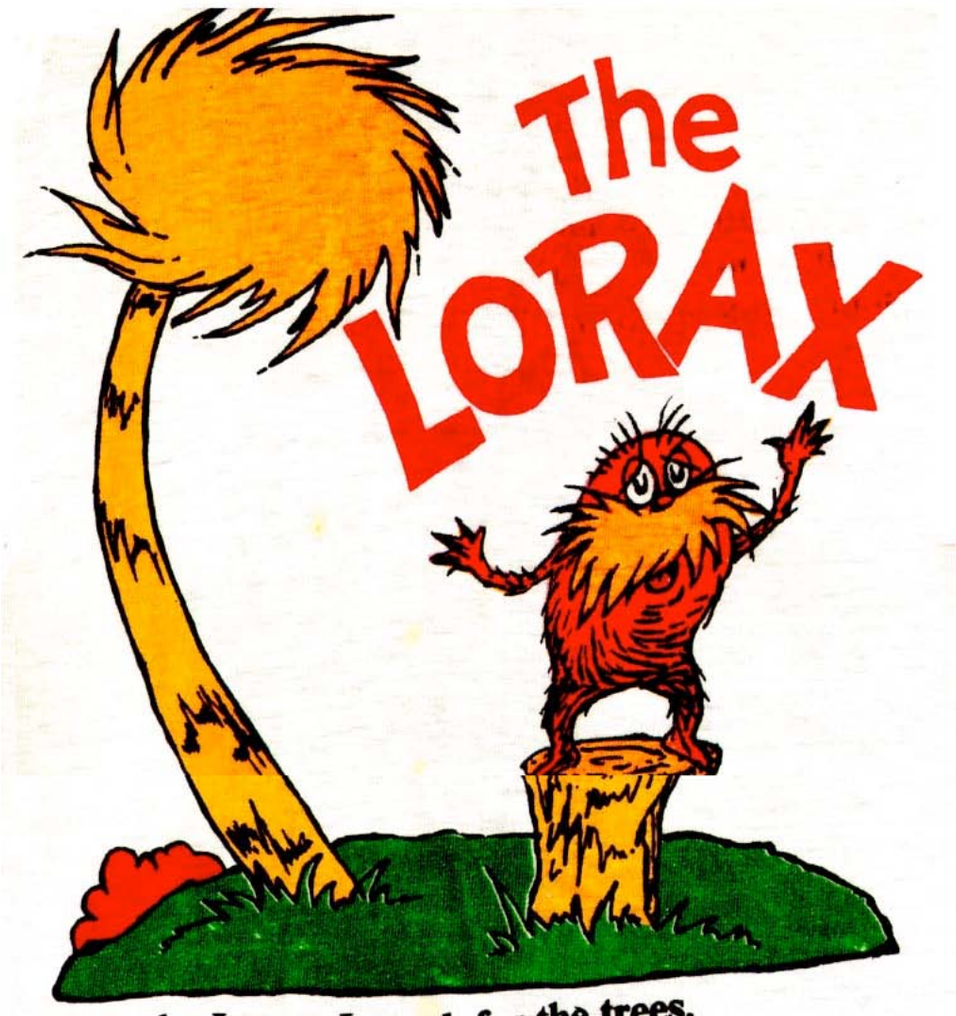
Introduction to Comparative Methods

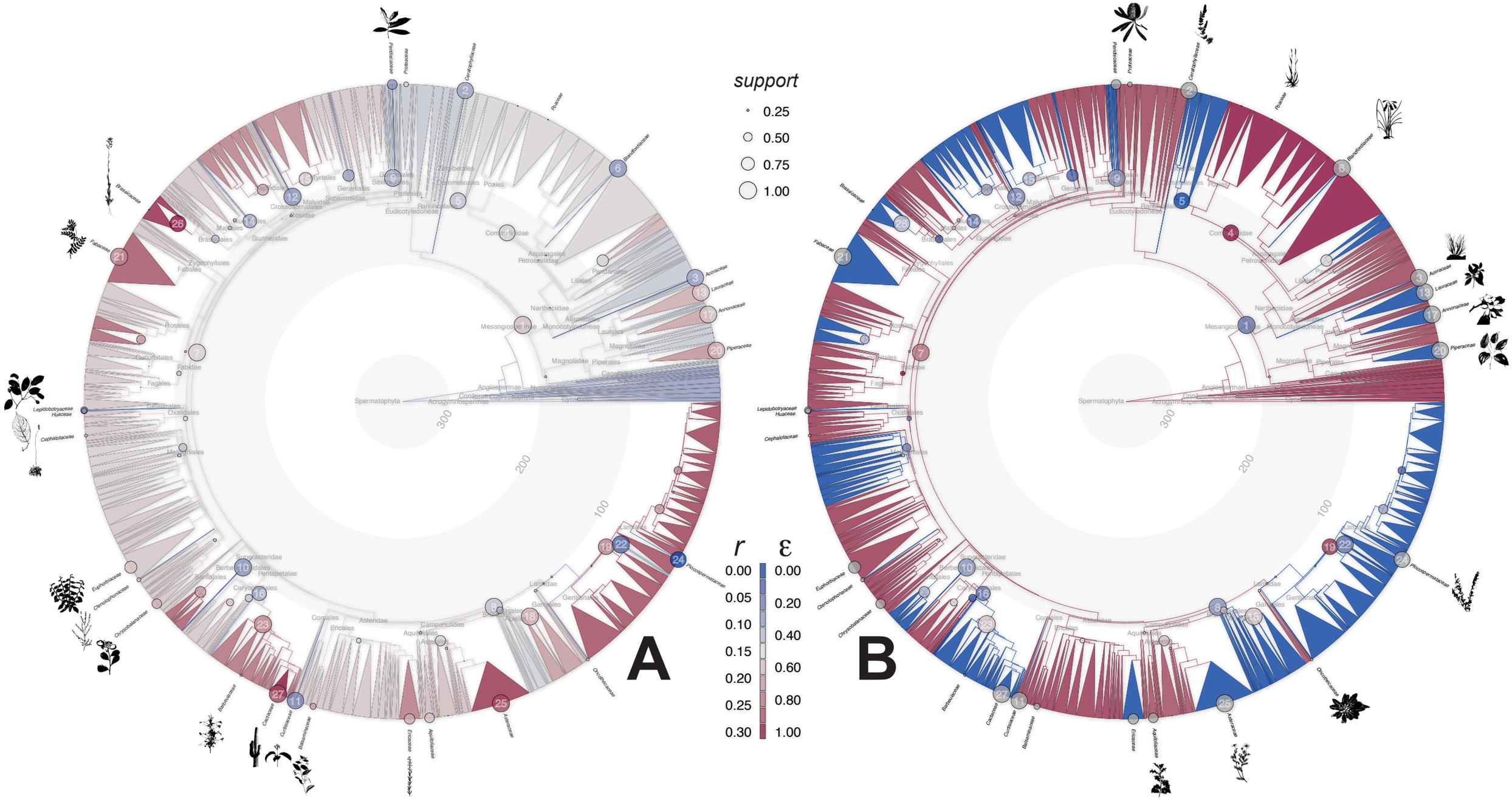


What can we learn from a tree?



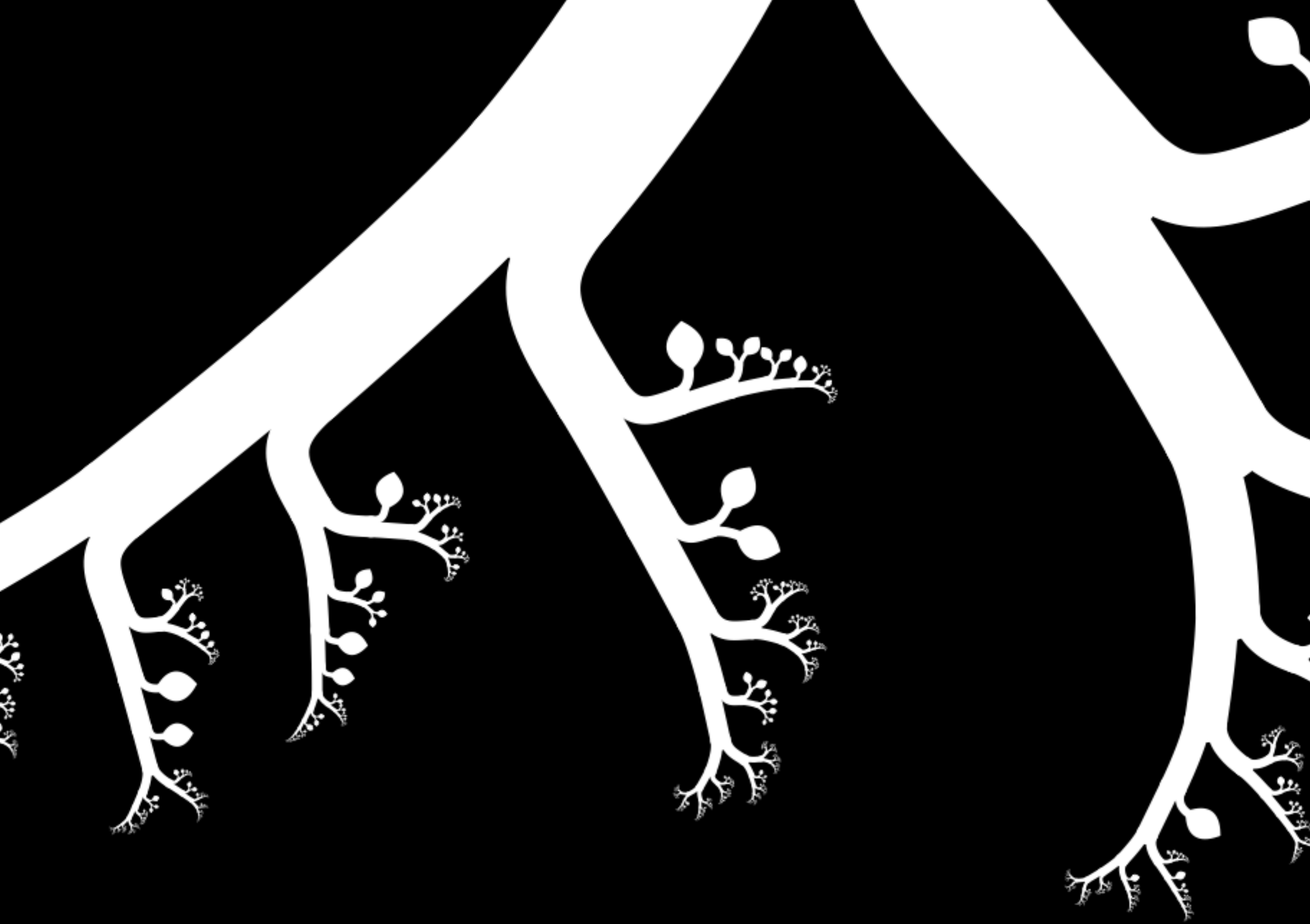
Net diversification (r)

Relative extinction (ε)



making trees is hard....

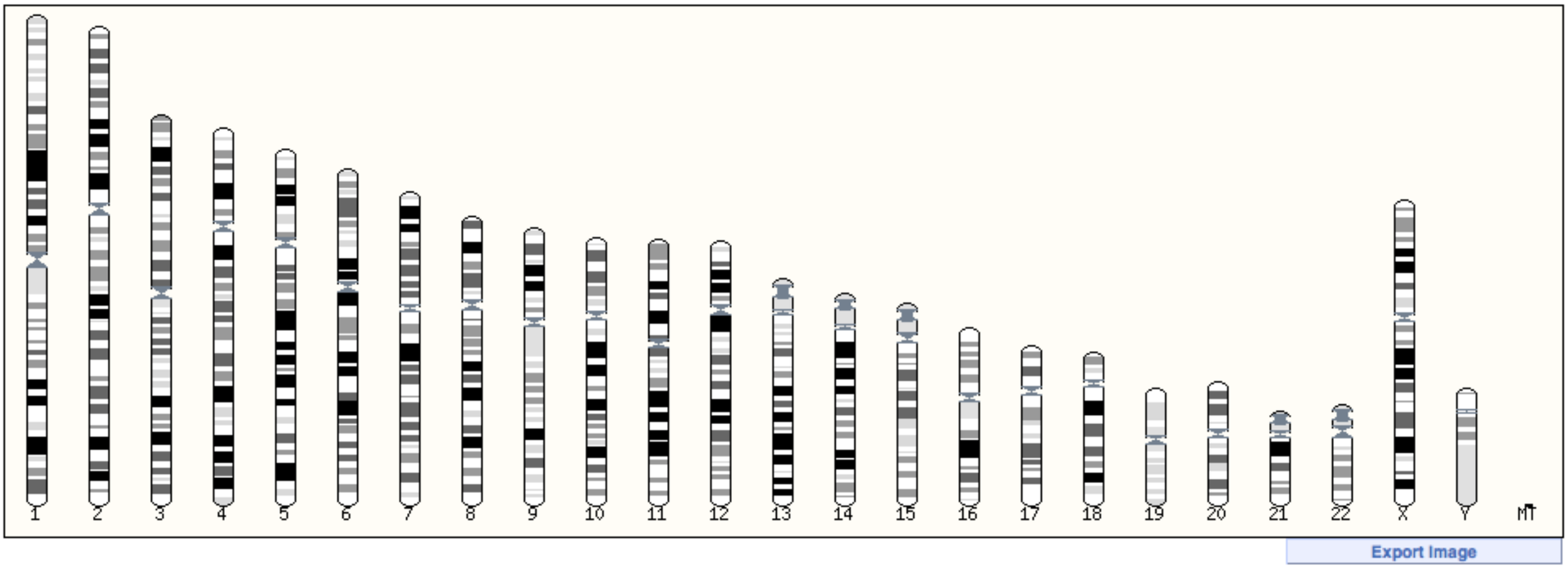
because trees are information-rich



the coming age of the megaphylogeny*

the coming age of the megaphylogeny*

* trees that are too big for your brain


1
2
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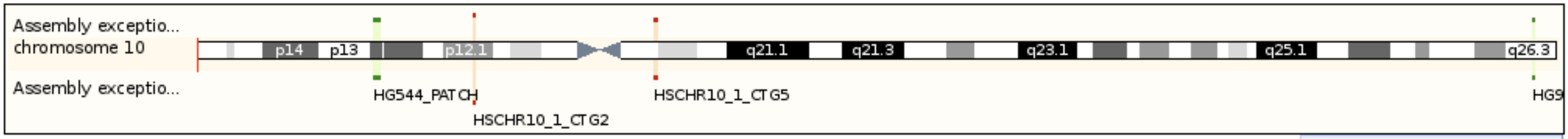
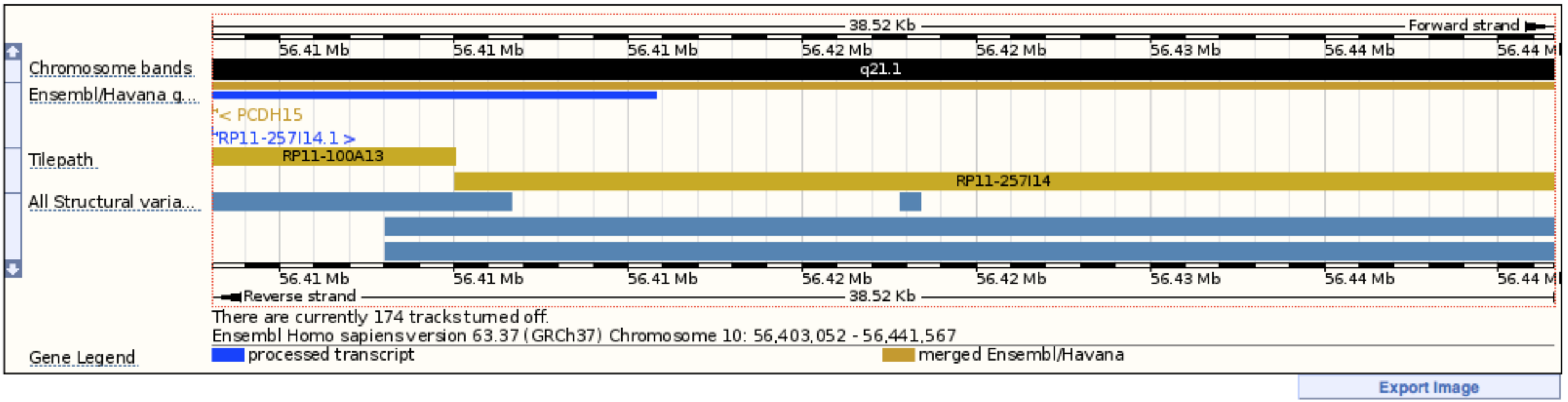
22
X
Y
MT
Export Image

ensembl



Export Image


38.52 Kb
Forward strand
56.41 Mb
56.41 Mb
56.41 Mb
56.42 Mb
56.42 Mb
56.43 Mb
56.44 Mb
56.44 M
Chromosome bands
q21.1
Ensembl/Havana g...
< PCDH15
RP11-257I14.1 >
Tilepath
RP11-100A13
RP11-257I14
All Structural varia...
56.41 Mb
56.41 Mb
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56.42 Mb
56.42 Mb
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56.44 Mb
56.44 M
Reverse strand
38.52 Kb
There are currently 174 tracks turned off.
Ensembl Homo sapiens version 63.37 (GRCh37) Chromosome 10: 56,403,052 - 56,441,567
Gene Legend
processed transcript
merged Ensembl/Havana
Export Image

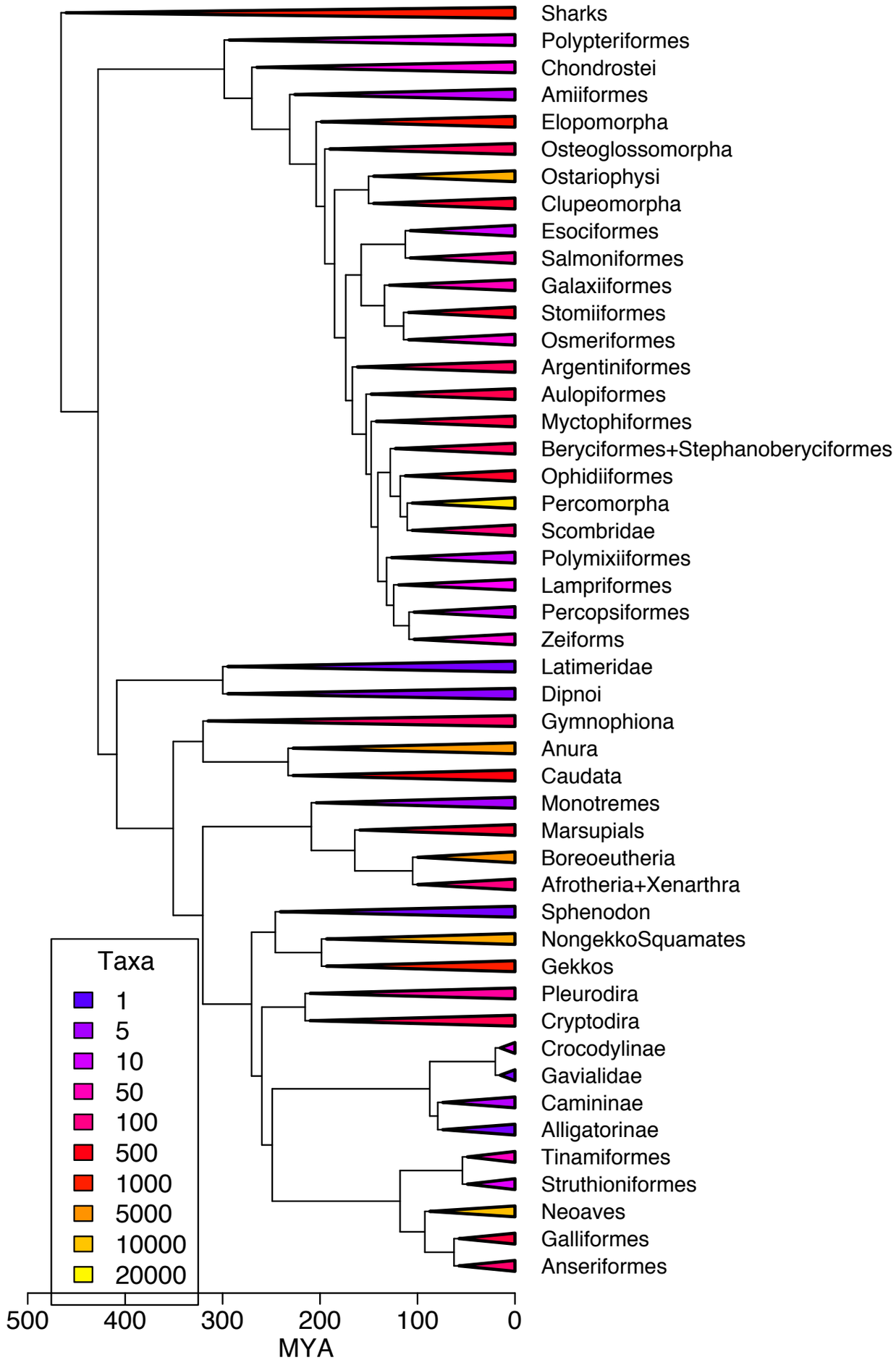
Why do you want to make or use trees?

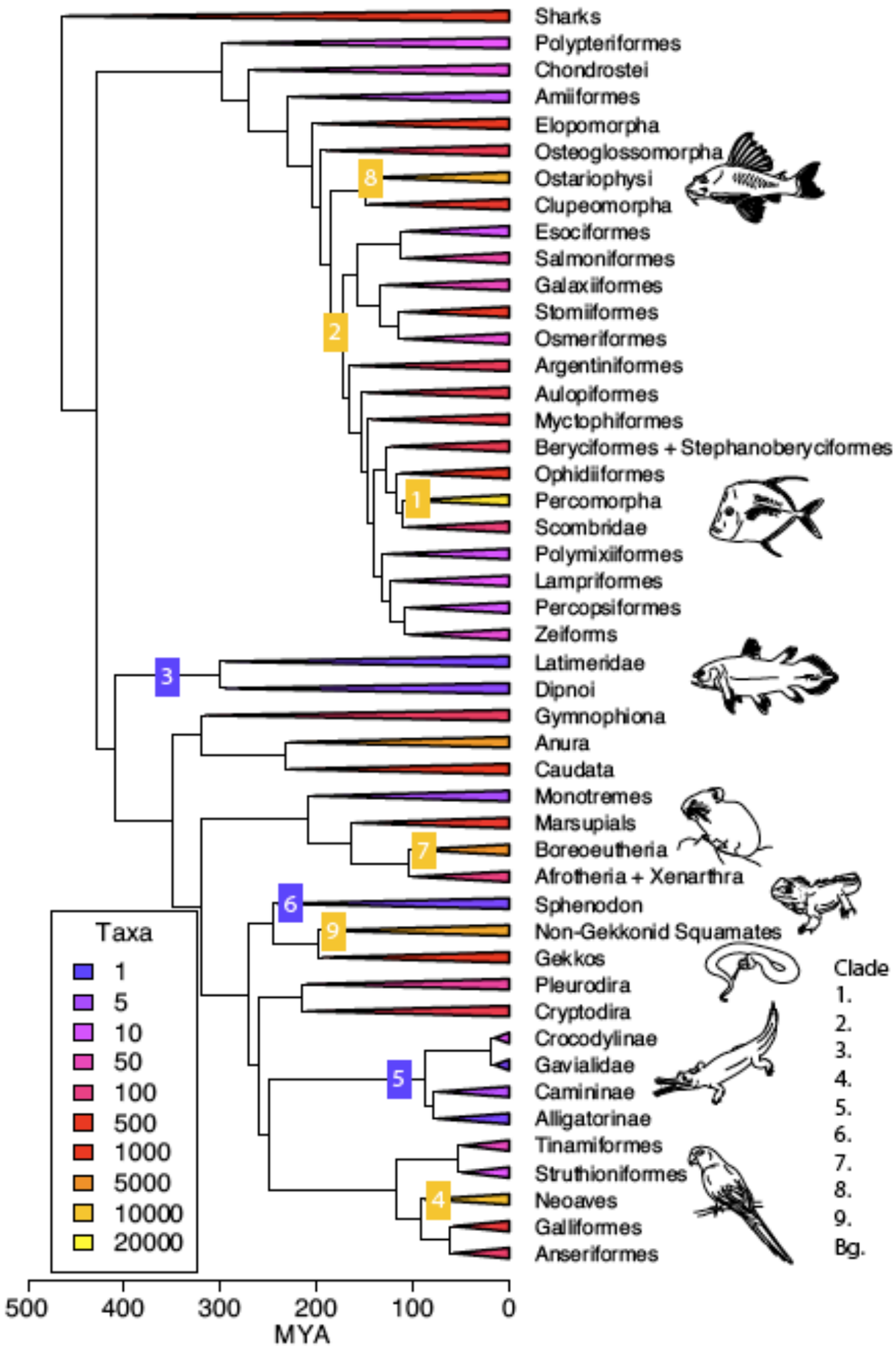
What do you hope to learn?

What can you do?

- Diversification (speciation and extinction)
- Character evolution
- Characters and diversification
- Biogeography
- Testing complex evolutionary models

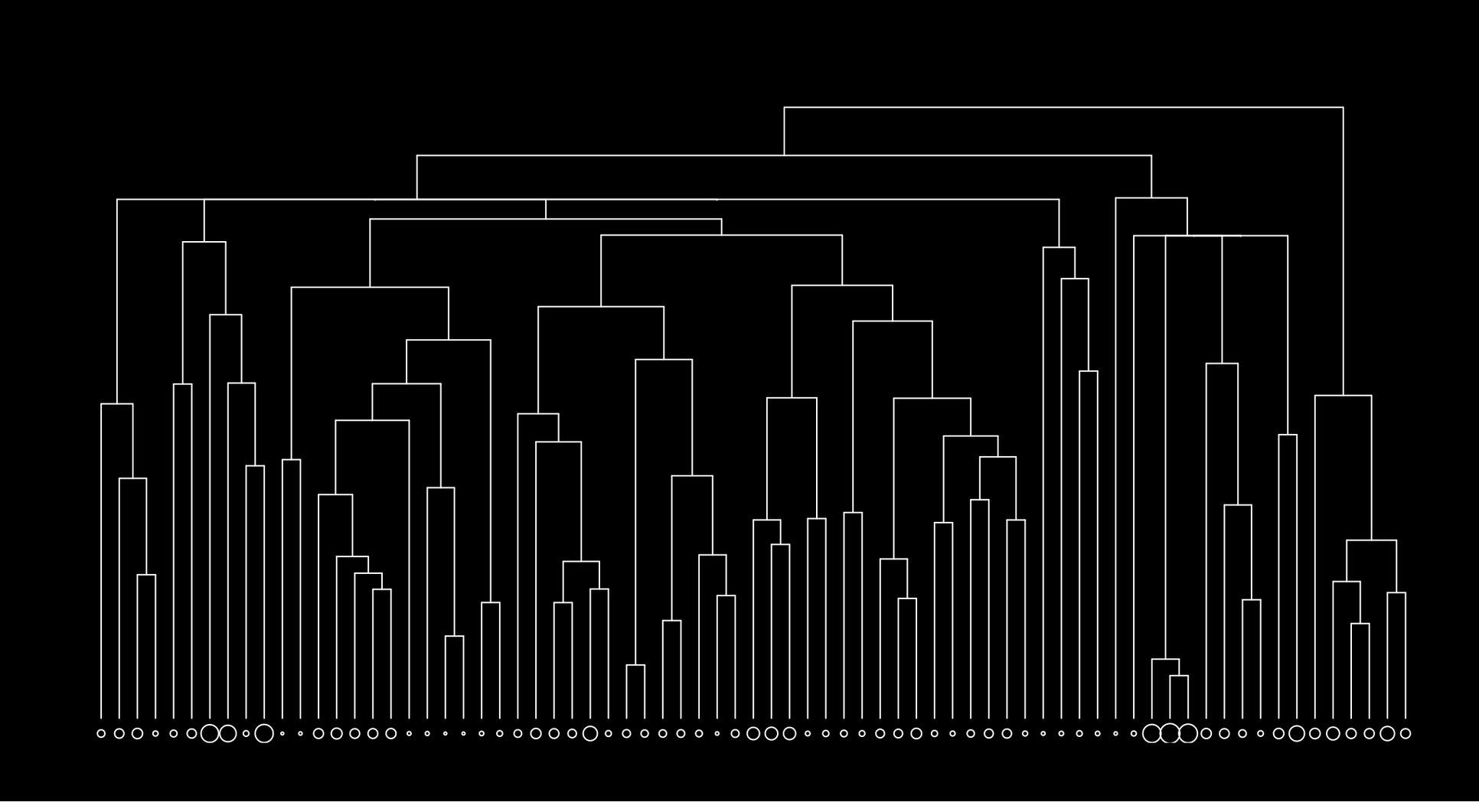
Diversification (speciation and extinction)


Sharks
Polypteriformes
Chondrostei
Amiiformes
Elopomorpha
Osteoglossomorpha
Ostariophysi
Clupeomorpha
Esociformes
Salmoniformes
Galaxiiformes
Stomiiformes
Osmeriformes
Argentiniformes
Aulopiformes
Myctophiformes
Beryciformes+Stephanoberyciformes
Ophidiiformes
Percomorpha
Scombridae
Polymixiiformes
Lampriformes
Percopsiformes
Zeiforms
Latimeridae
Dipnoi
Gymnophiona
Anura
Caudata
Monotremes
Marsupials
Boreoeutheria
Afrotheria+Xenarthra
Sphenodon
NongekkoSquamates
Gekkos
Pleurodira
Cryptodira
Crocodylinae
Gavialidae
Camininae
Alligatorinae
Tinamiformes
Struthioniformes
Neoaves
Galliformes
Anseriformes
Taxa
1
5
10
50
100
500
1000
5000
10000
20000
500
400
300
200
100
0
MYA



Clade	r	ε	ΔAIC
1.	0.082	*	24.6
2.	0.039	0.00	46.4
3.	0.0017	0.56	22.3
4.	0.089	*	17.7
5.	0.00006	0.99	10.7
6.	0.0014	*	7.4
7.	0.072	*	6.1
8.	0.053	*	11.9
9.	0.040	*	5.6
Bg.	0.010	0.99	

Character evolution



Bolitoglossinae

shift direction

- 1.00
- 0.80
- 0.50
- 0.20
- 0.00
- -0.20
- -0.50
- -0.80
- -1.00

posterior rates

- 3.011
- 0.519
- 0.090
- 0.015
- 0.003
- 0.000
- 0.000
- 0.000
- 0.000

shift probability

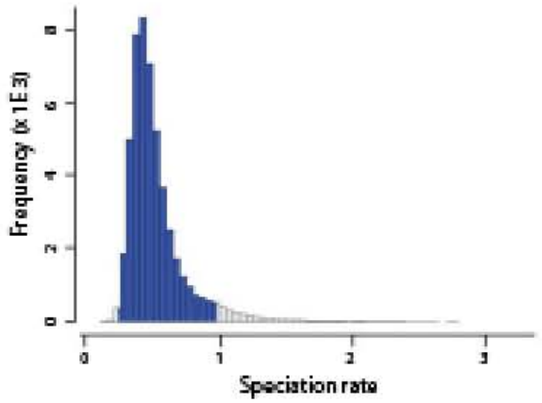
- 1.000
- 0.875
- 0.750
- 0.625
- 0.500
- 0.375
- 0.250
- 0.125
- 0.000

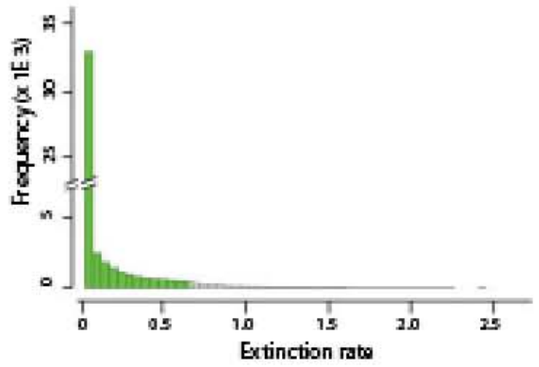
photos from wiki commons

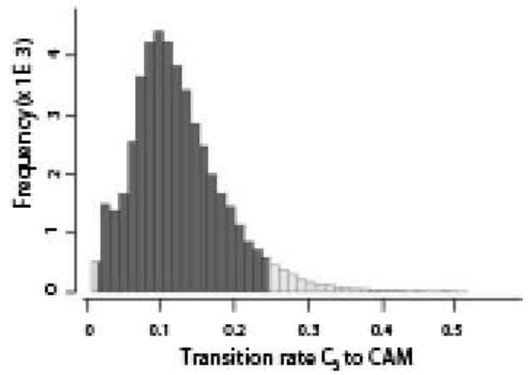
Characters and diversification

Photosynthetic pathway

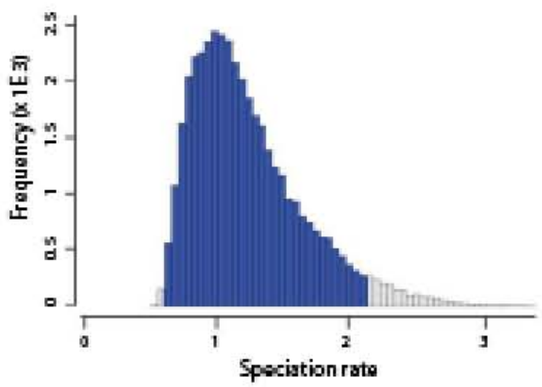
C_3

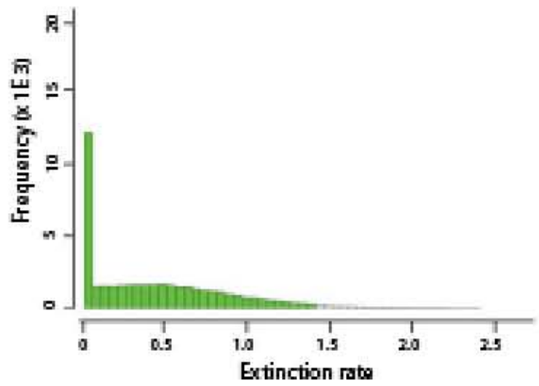


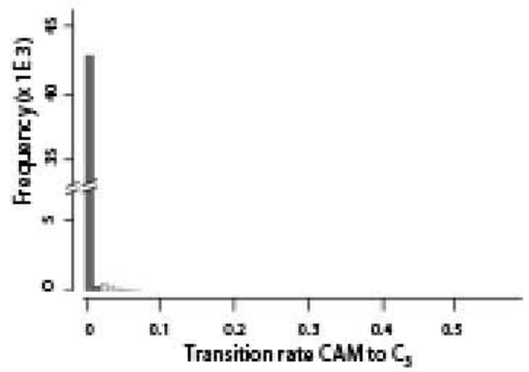




CAM

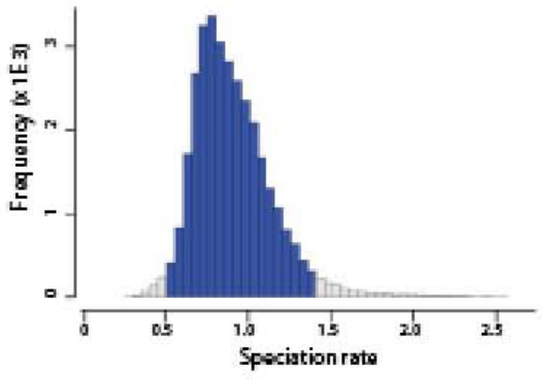


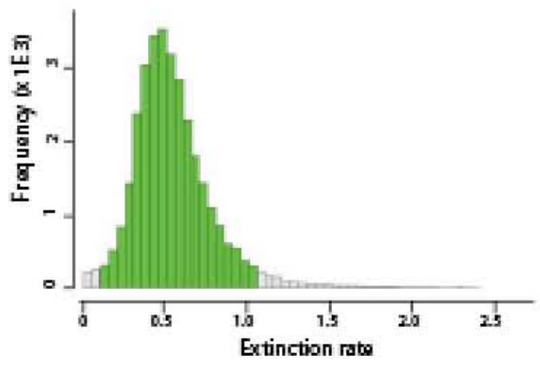


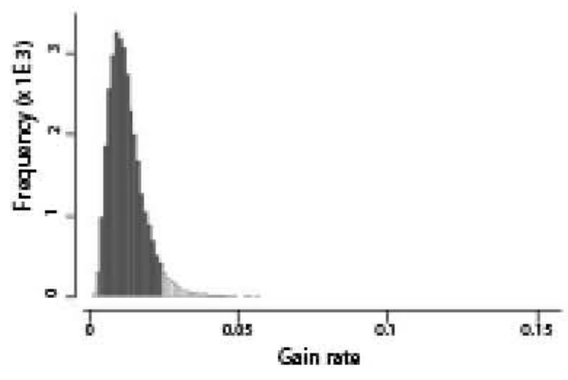


Tank habit

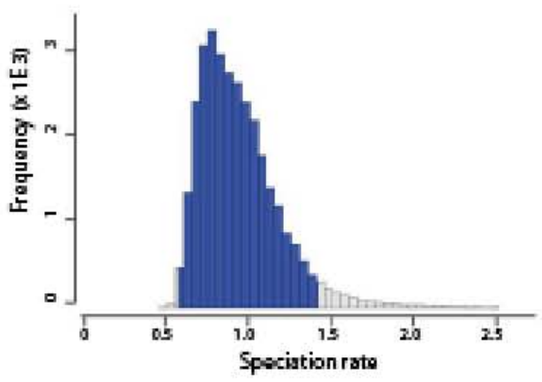
Tank-less

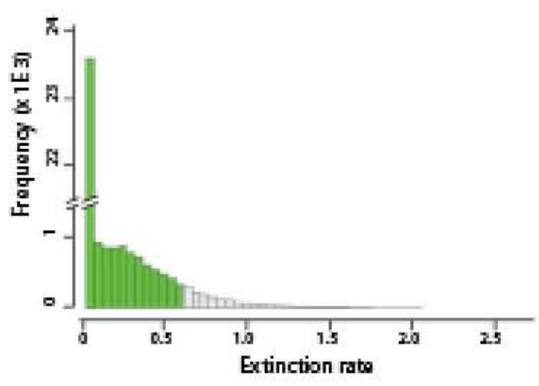


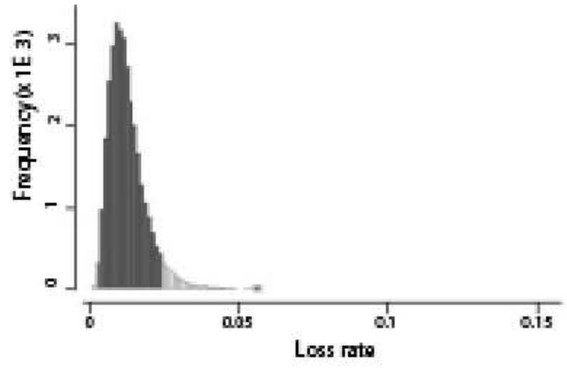




Tank-forming







Silvestro et al. 2013
Evolution

Biogeography

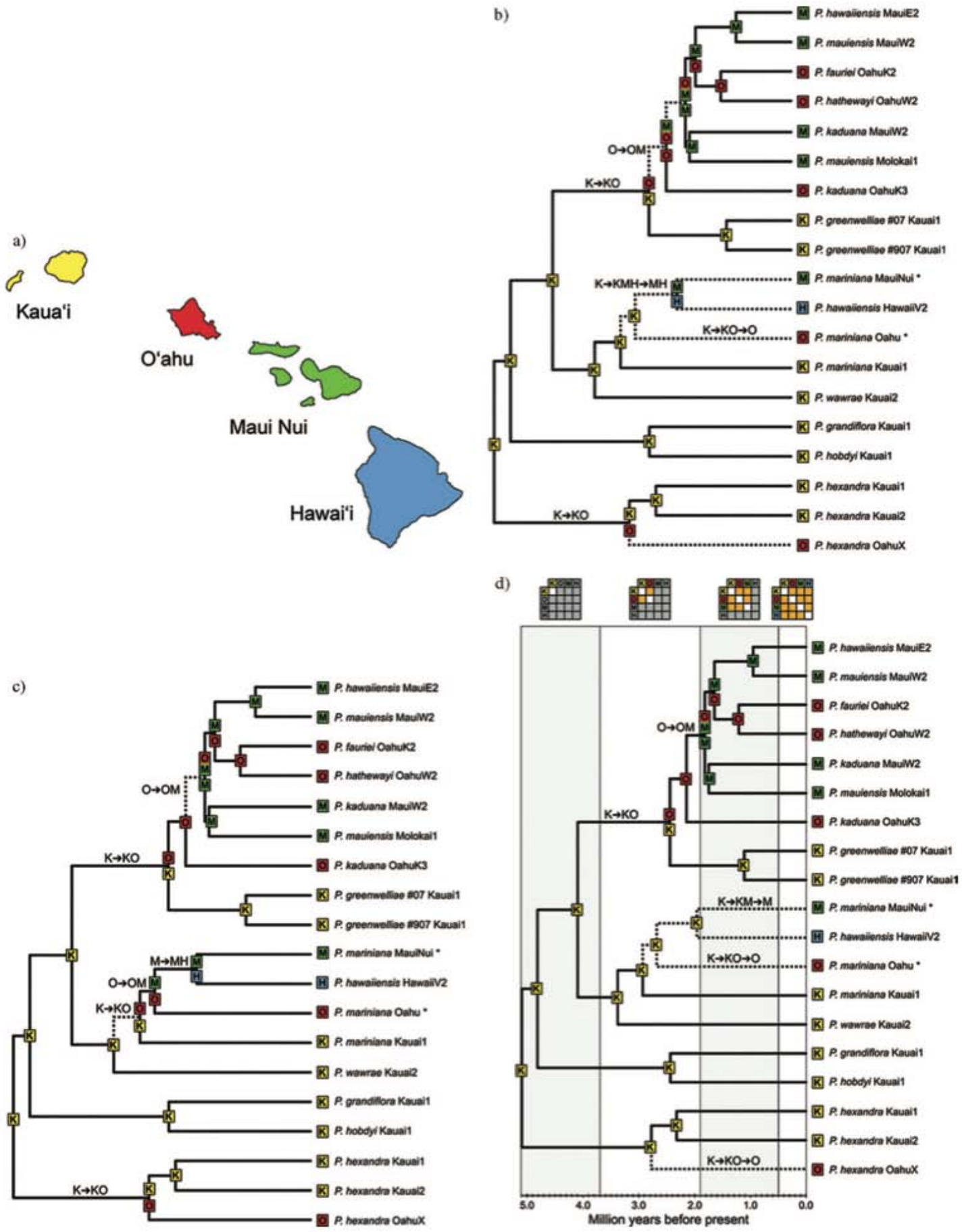
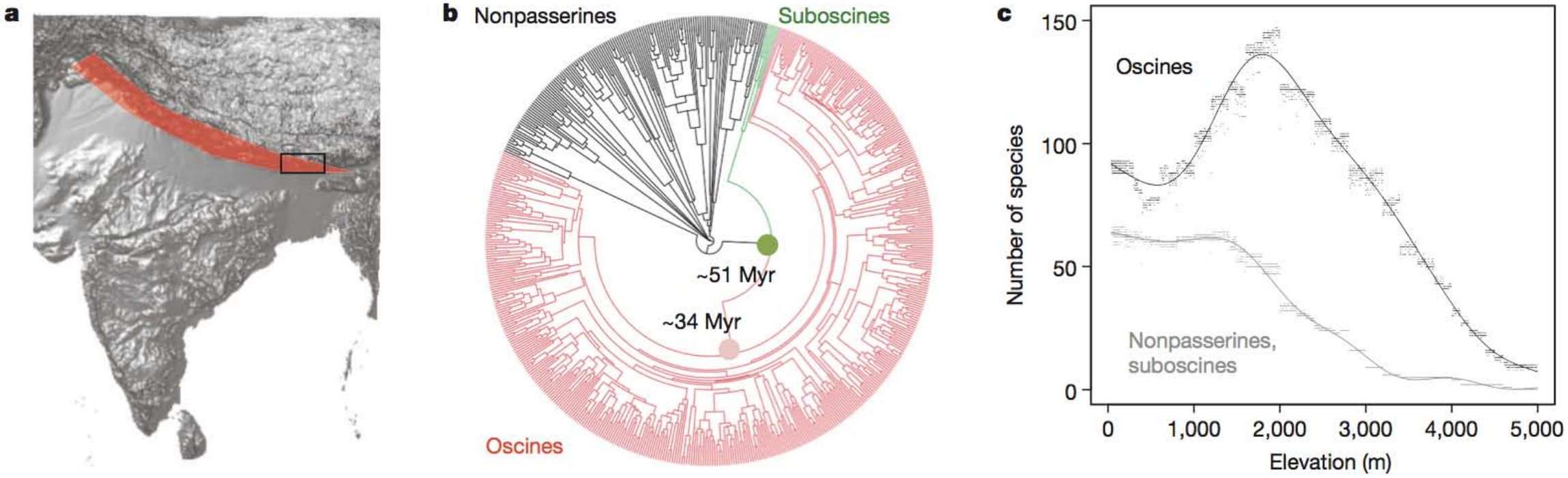
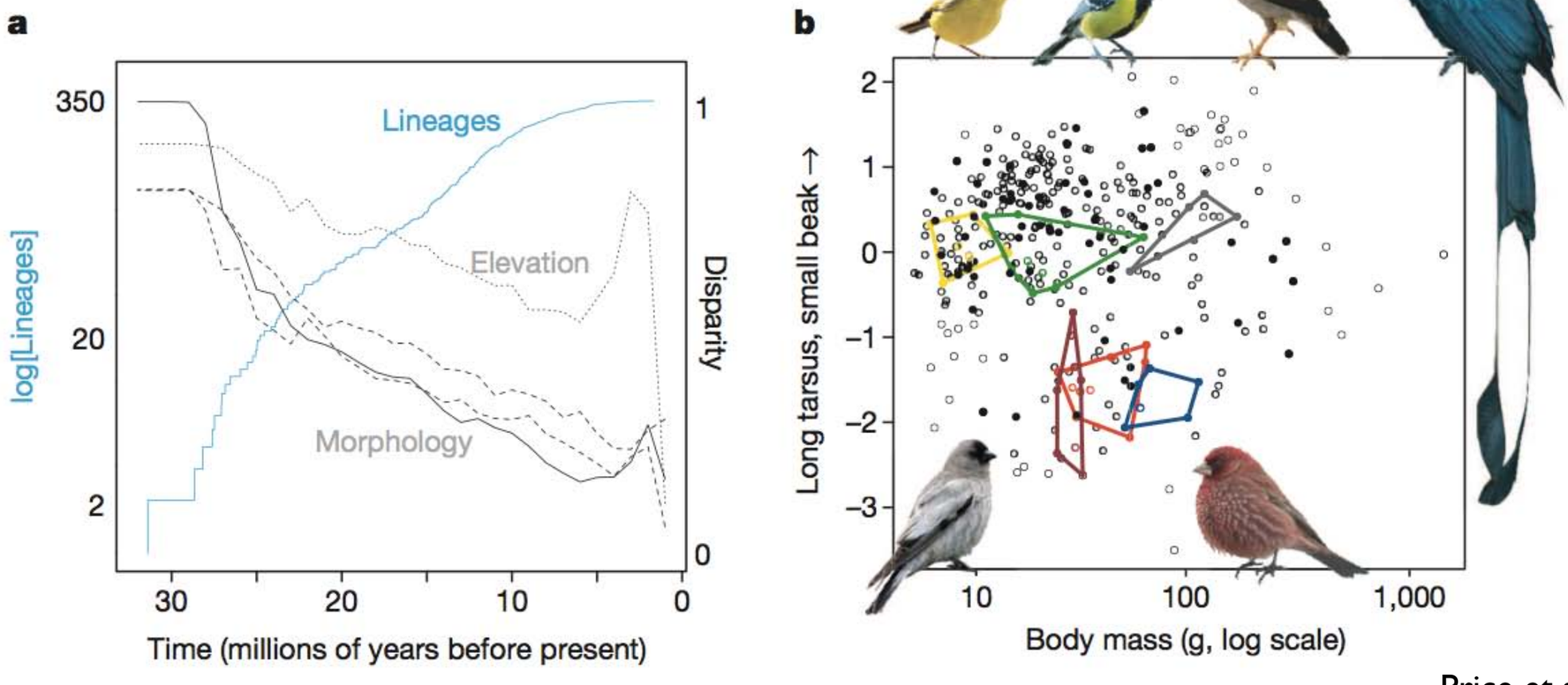


FIGURE 3.

Ree and Smith 2008 Sys Biol

Testing Complex Evolutionary Models





Price et al. 2014 Nature