

Character Acquisition Through Geological Time



Graeme T. Lloyd



Tempo through time



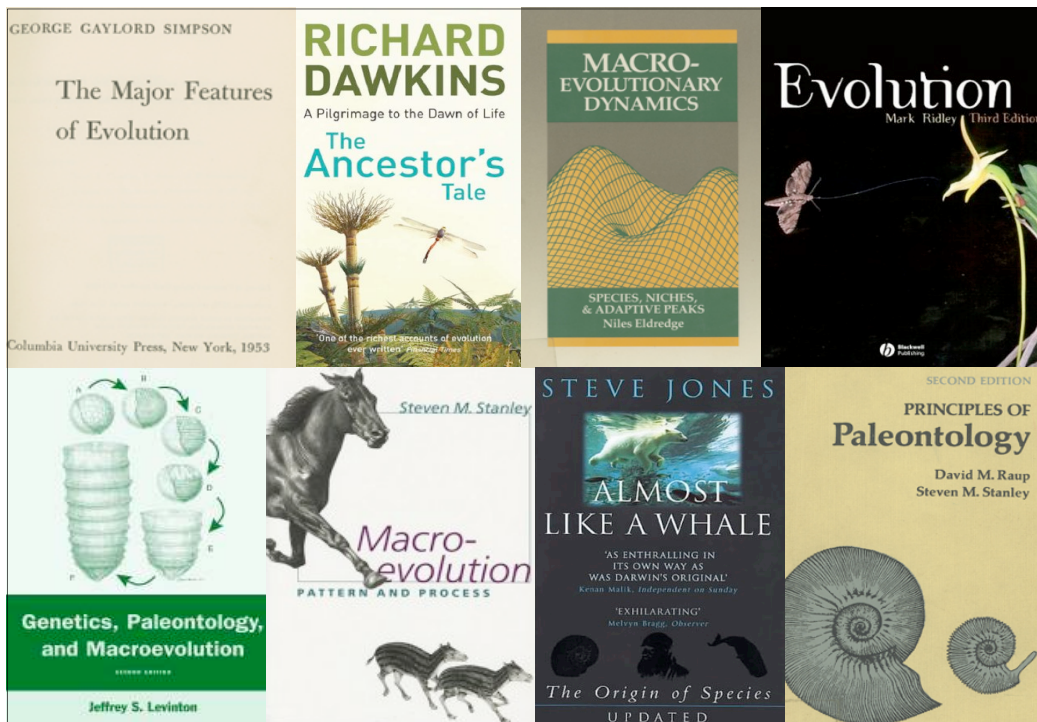
Darwin
1859



Simpson
1944



Westoll
1949



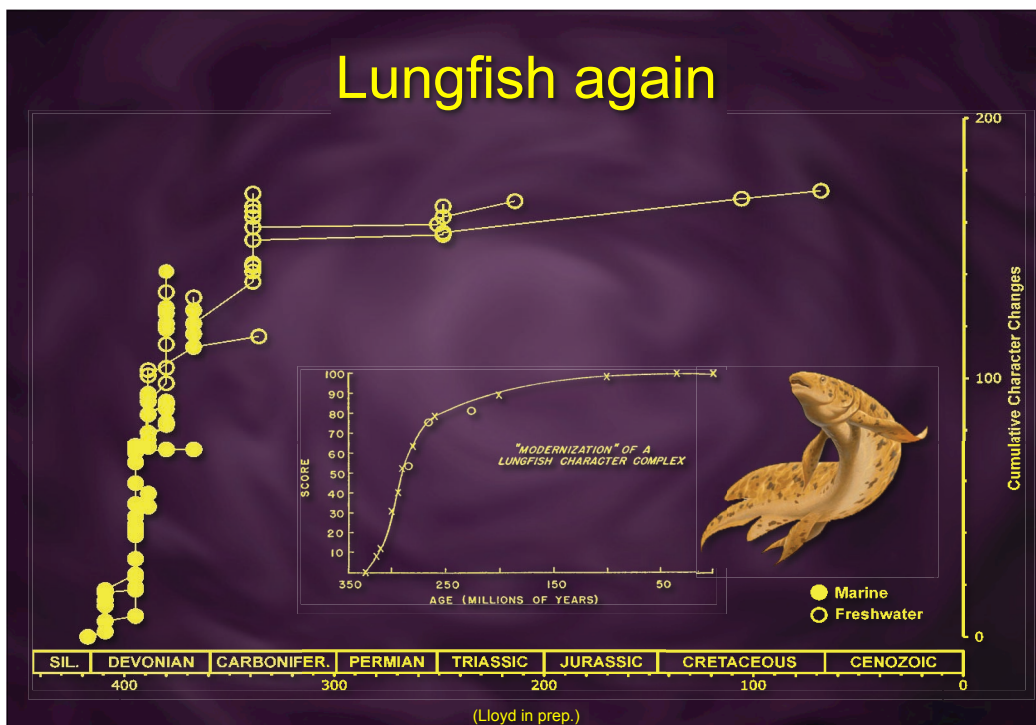
Questions

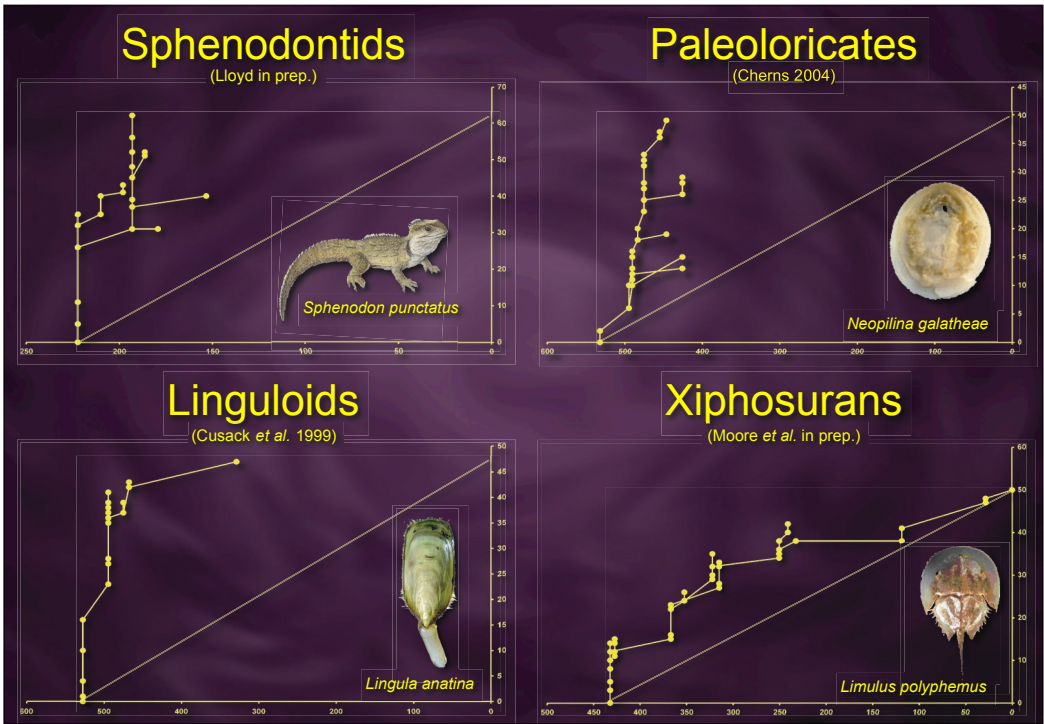
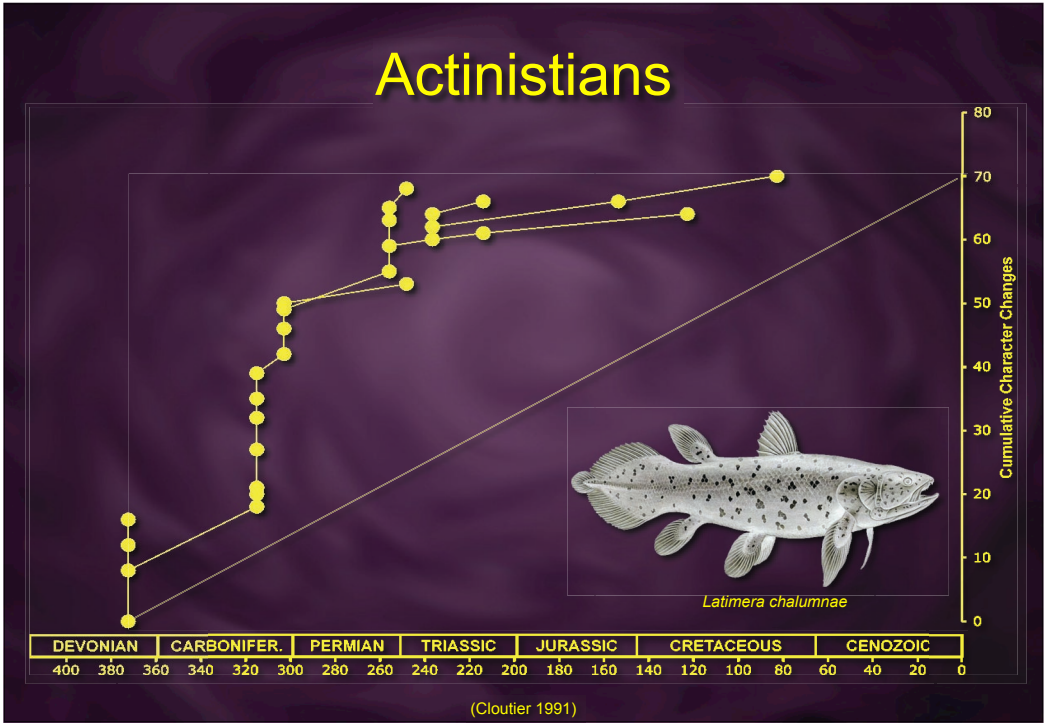
- Was Westoll right about lungfish evolution?
- Do other 'living fossils' show the same pattern?
- Do other taxa show a different pattern?
- Are these results methodological artefacts or peculiarities of the fossil record?

Problems with Westoll's method

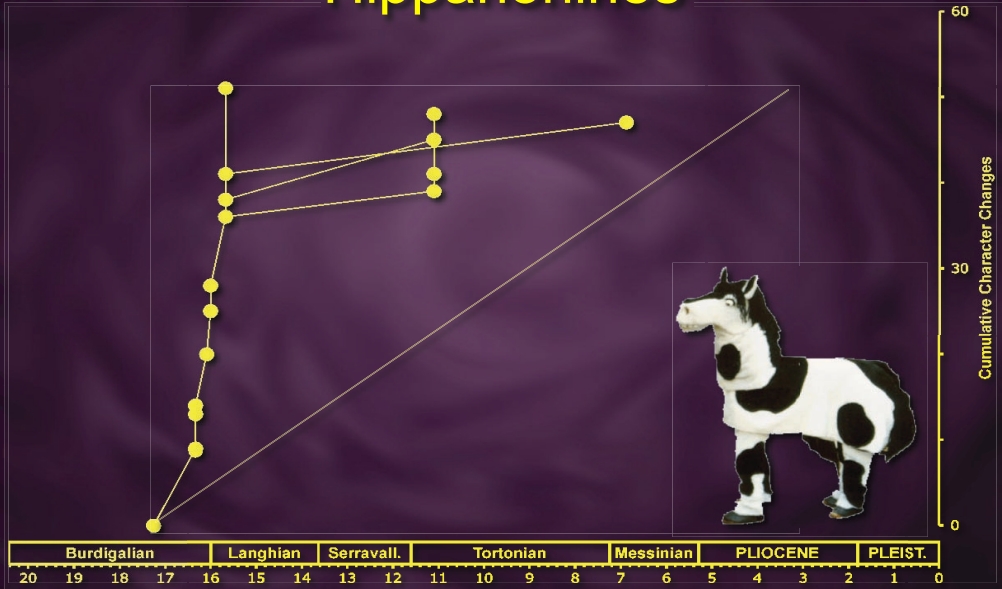
- Only well known taxa can be included (Knoll *et al.* 1984)
- Error bars required (constrain interpretation)
- Ancestor artificial (Schopf 1984)
- Reversals ignored (Derstler 1982)
- Assumes stratigraphically ordered ancestor-descendant sequence

Lungfish again





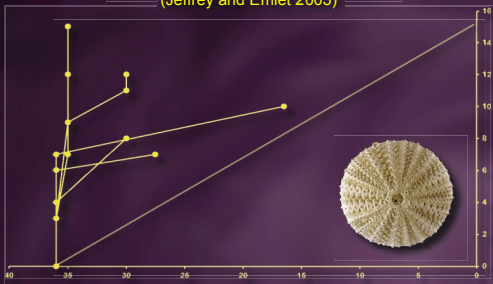
Hipparionines



(Alroy 1995)

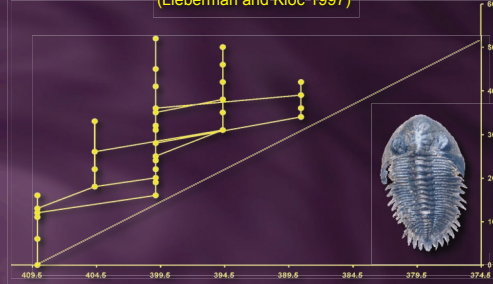
Temnopleurids

(Jeffrey and Emler 2003)



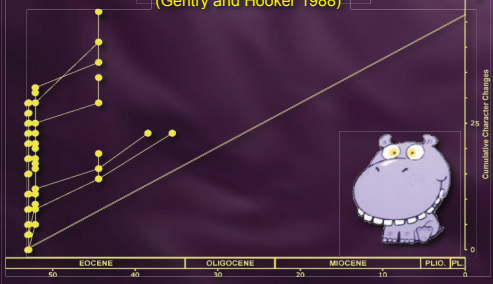
Asteropygines

(Lieberman and Kloc 1997)



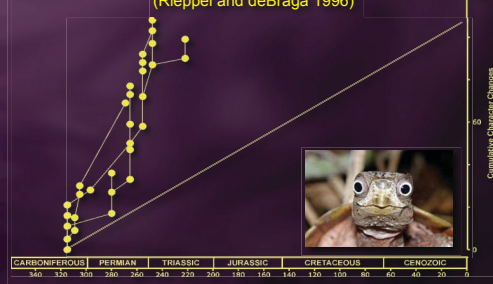
Artiodactyls

(Gentry and Hooker 1988)



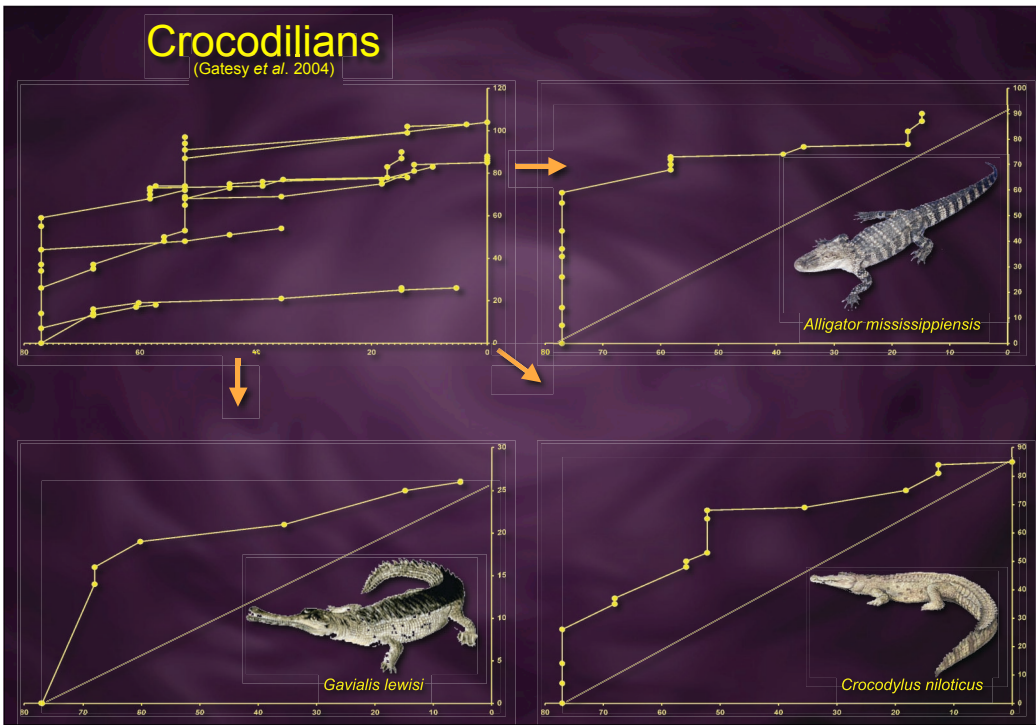
Reptiles

(Rieppel and deBraga 1996)



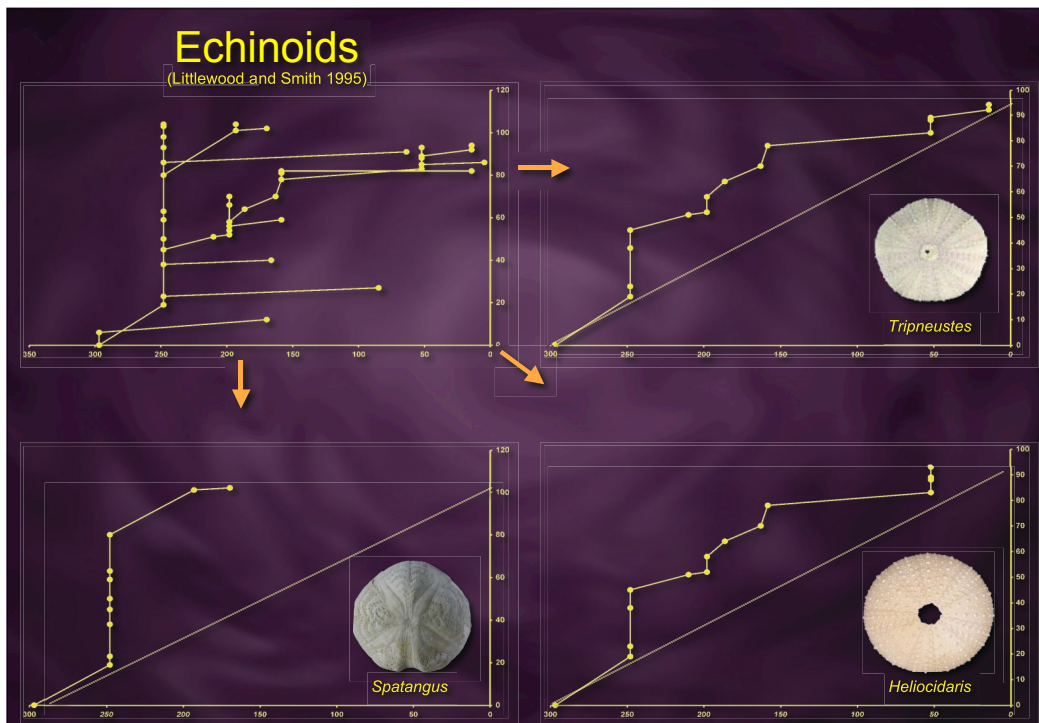
Crocodylians

(Gatesy et al. 2004)



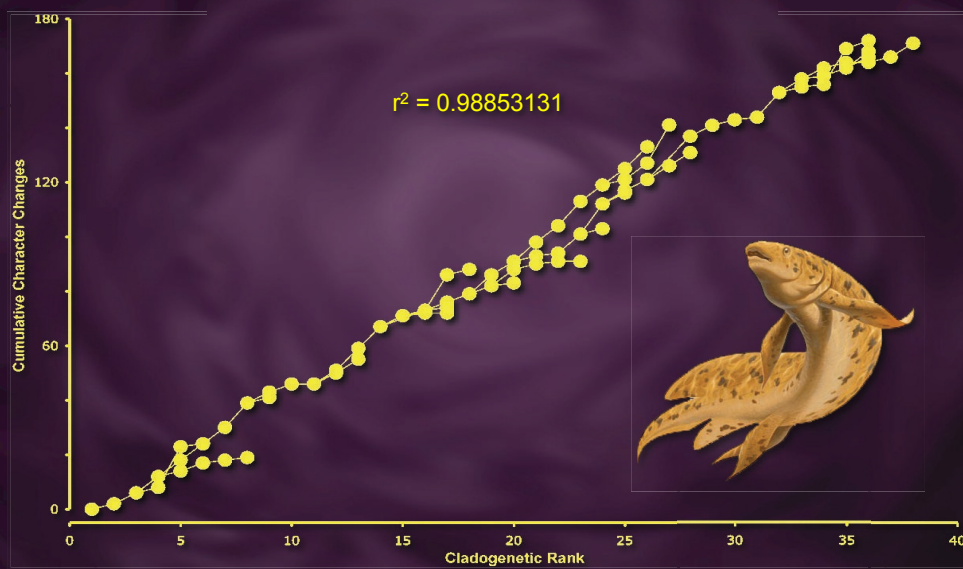
Echinoids

(Littlewood and Smith 1995)



Common pattern
=
Common explanation

Character distribution



Character distribution

Source	Taxon	R-squared	Pearson
Alroy 1995	Hipparionines	0.99	0.99
Cherns 2004	Paleoloricates	0.98	0.99
Cloutier 1991	Actinistians	0.99	0.99
Cusack et al. 1999	Linguloids	0.97	0.99
Gatesy et al. 2004	Crocodylians	0.87	0.93
Gentry and Hooker 1988	Artiodactyls	0.75	0.75
Jeffrey and Emler 2003	Temnopleurids	0.78	0.89
Lieberman and Kloc 1997	Asteropygines	0.96	0.98
Littlewood and Smith 1995	Echinoids	0.81	0.90
Lloyd in prep.	Lungfish	0.99	0.99
Lloyd in prep.	Sphenodontids	0.96	0.98
Moore et al. in prep.	Xiphosurans	0.94	0.97
Rieppel and deBraga 1996	Reptiles	0.95	0.97

Taxon sampling vs. stratigraphic fit



Questions

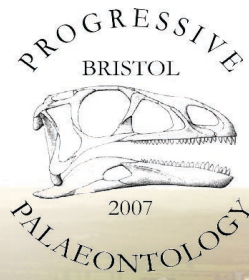
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Acknowledgements



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