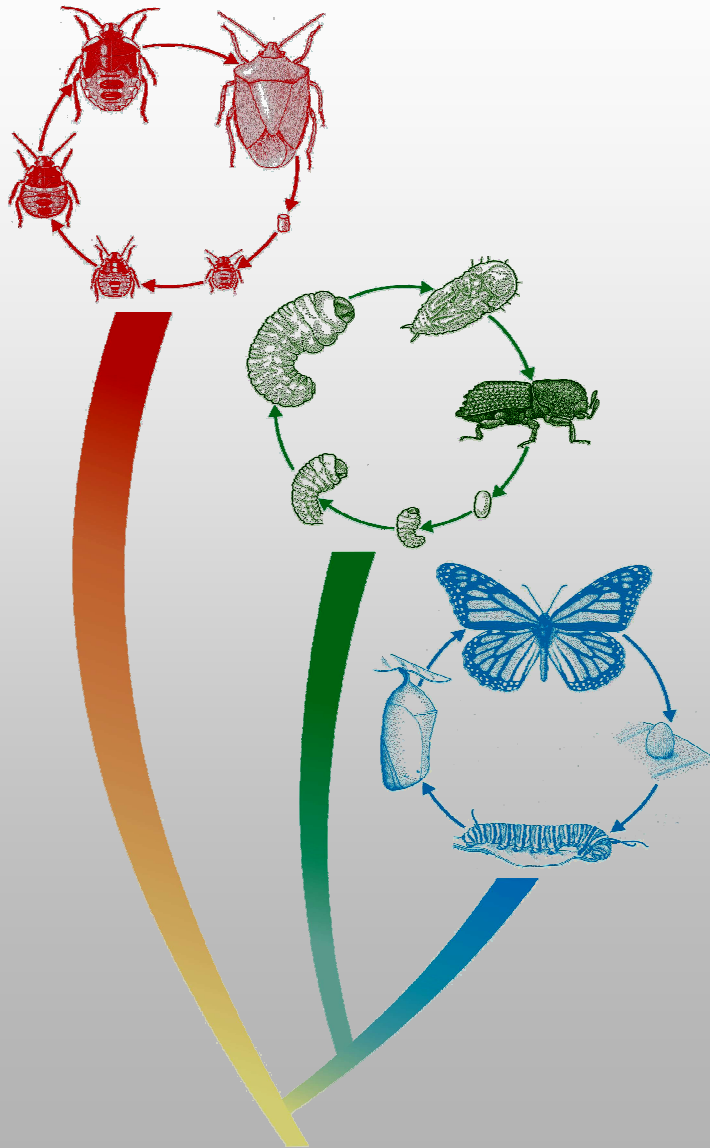


evo-devo





diversità



adattamento





selezione naturale





selezione sessuale

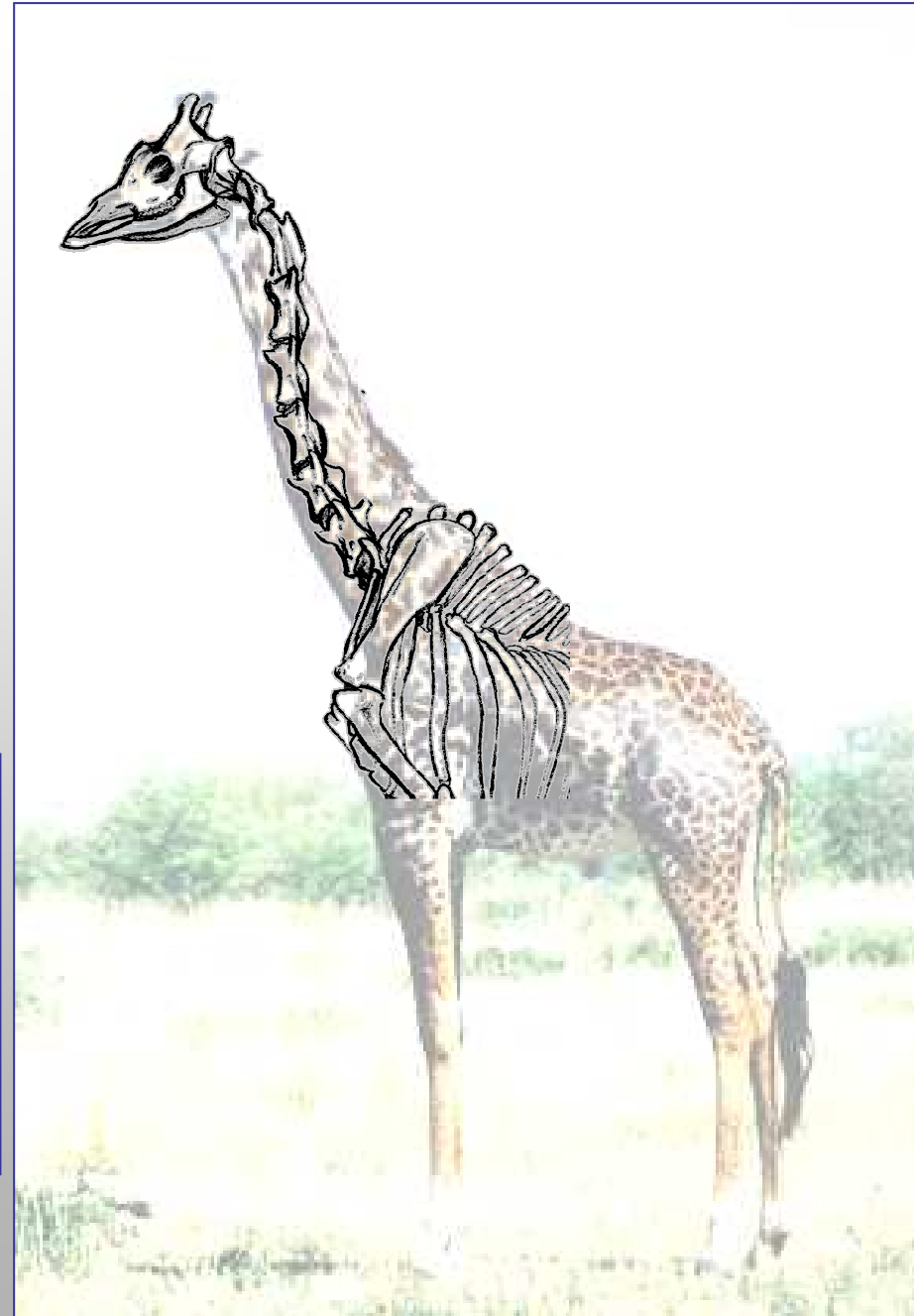








- Circa 4200 specie di mammiferi
- **Numero di vertebre cervicali (quasi) sempre SETTE!!**



Sirenia



6-8



6-9

Folivora



centopiedi geofilomorfi

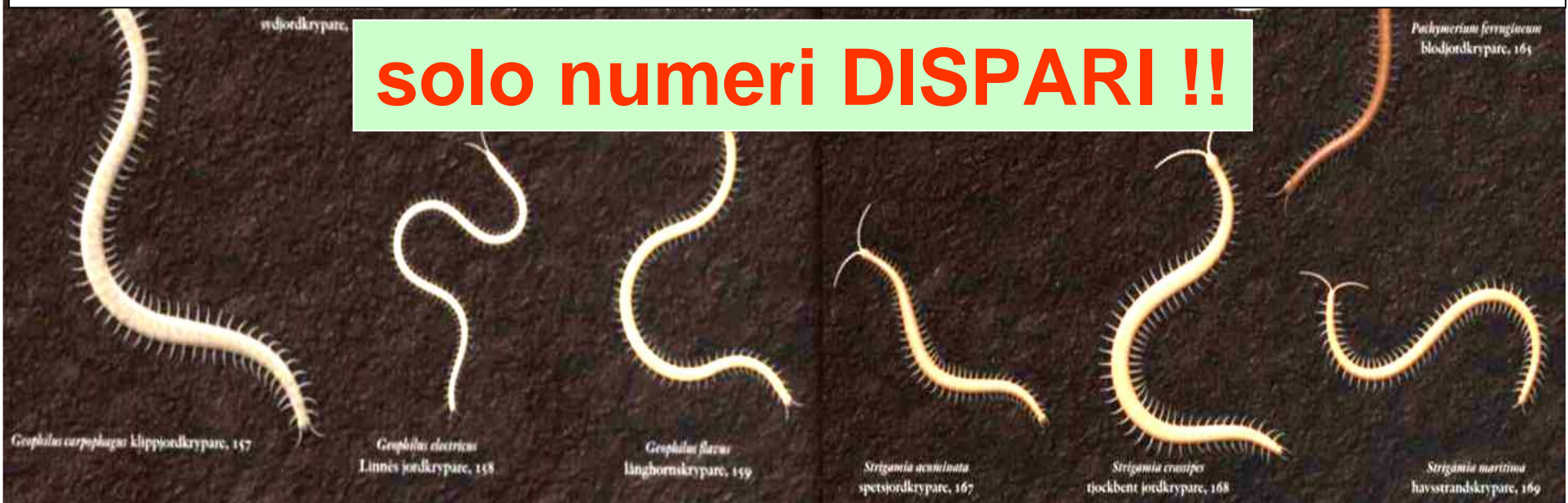


27

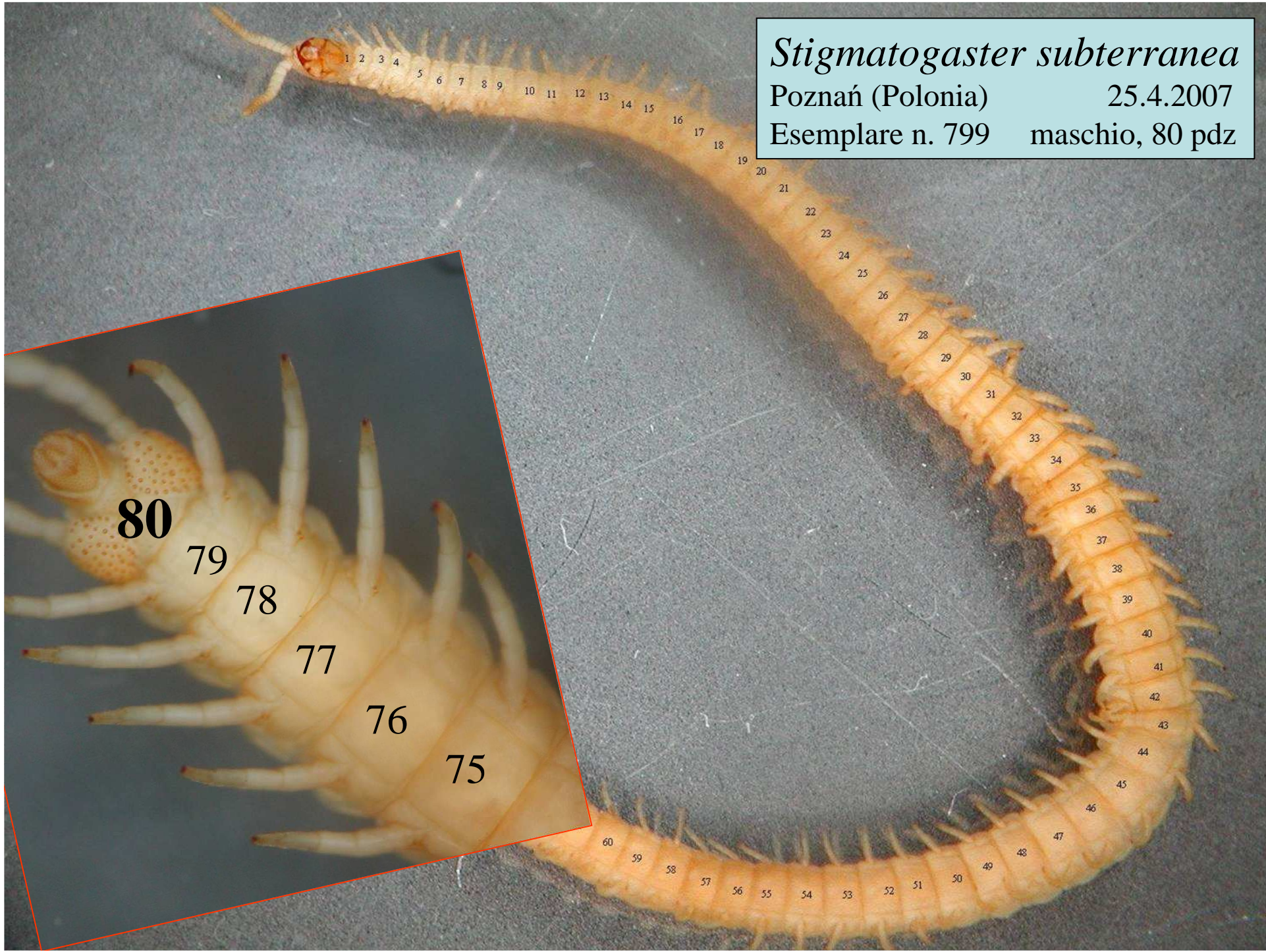
numero di segmenti con zampe

191

solo numeri DISPARI !!



Stigmatogaster subterranea
Poznań (Polonia) 25.4.2007
Esemplare n. 799 maschio, 80 pdz

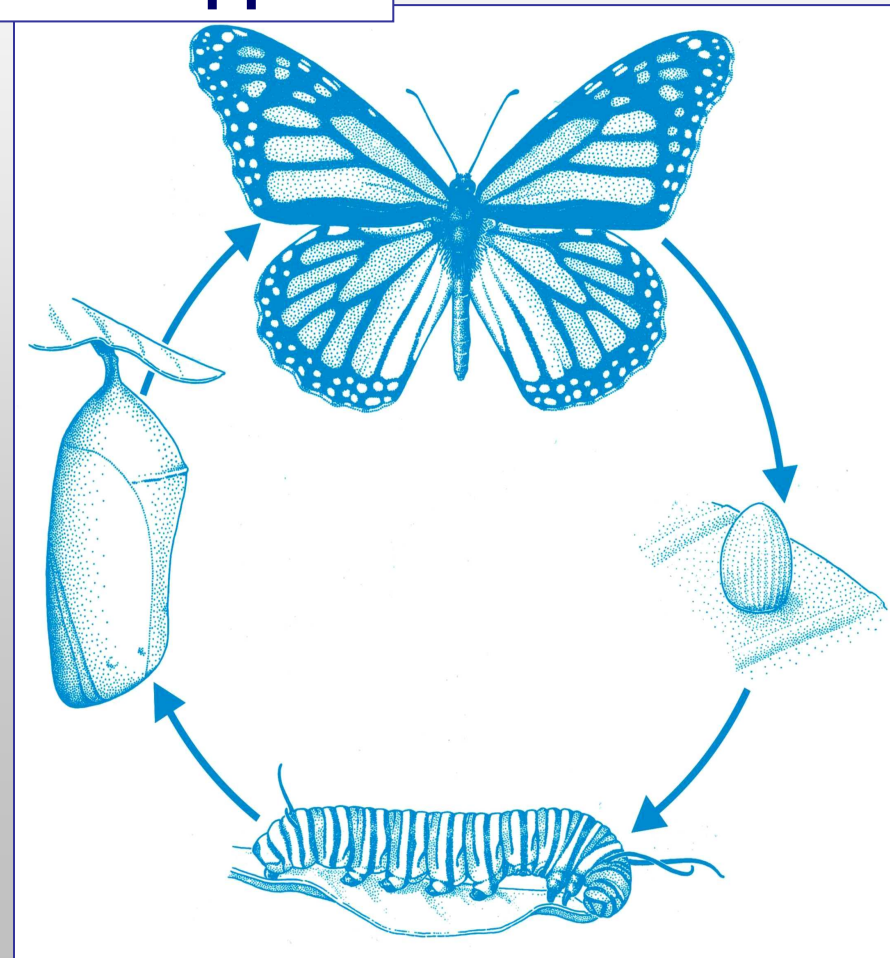
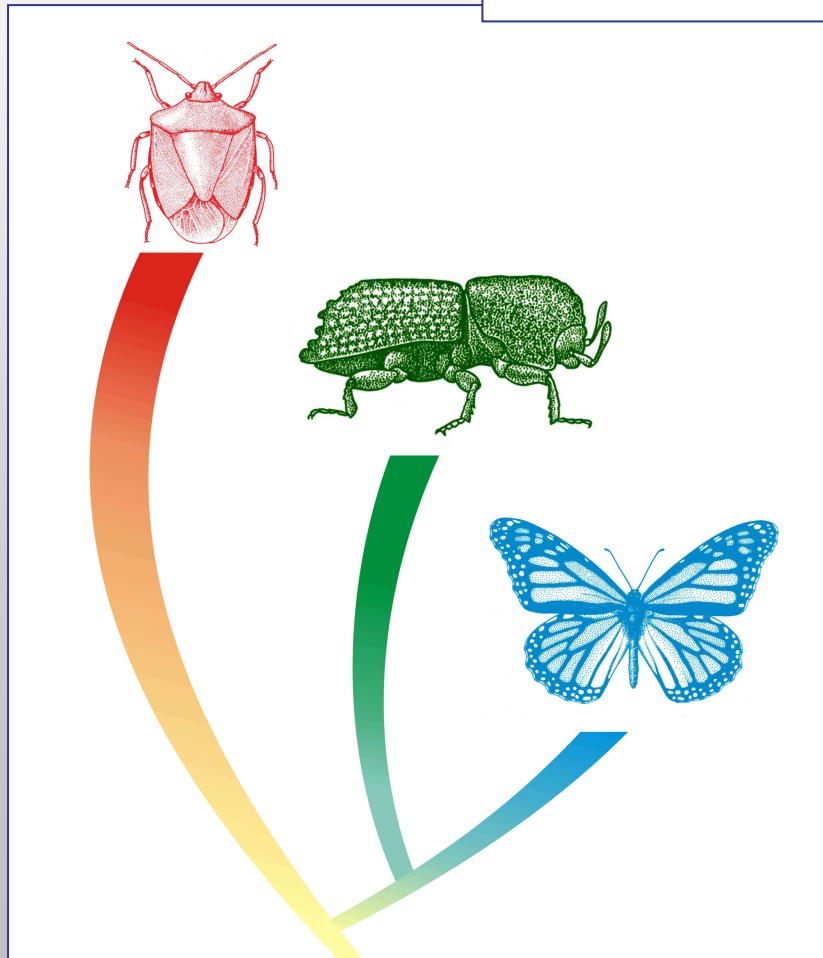


evo-devo

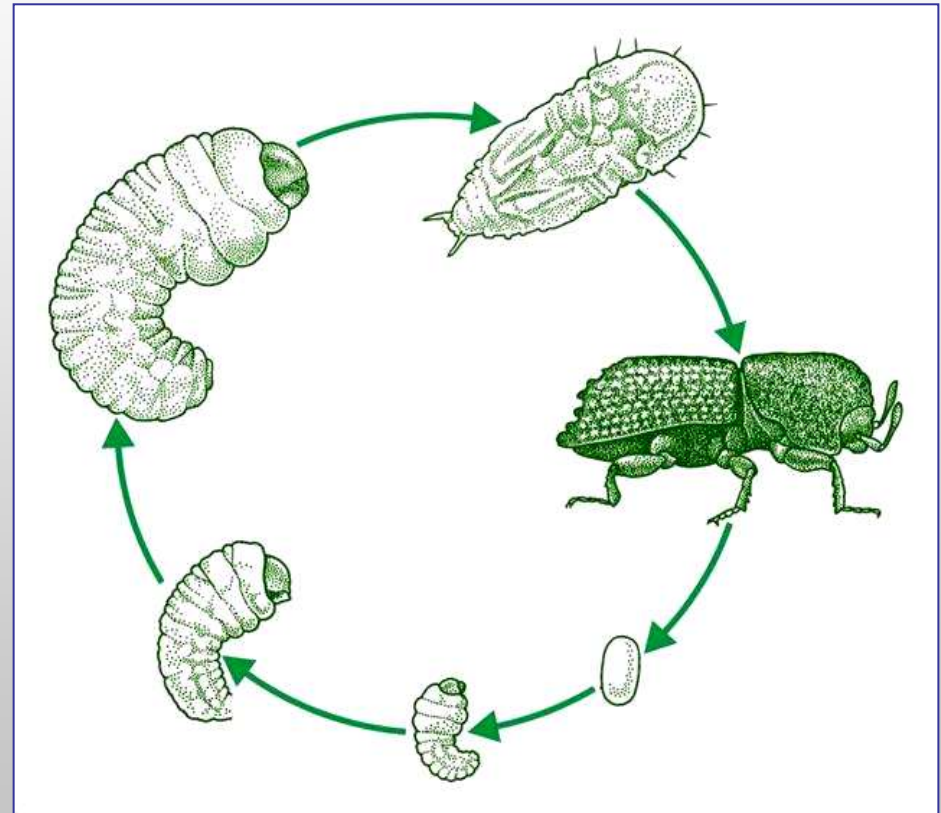
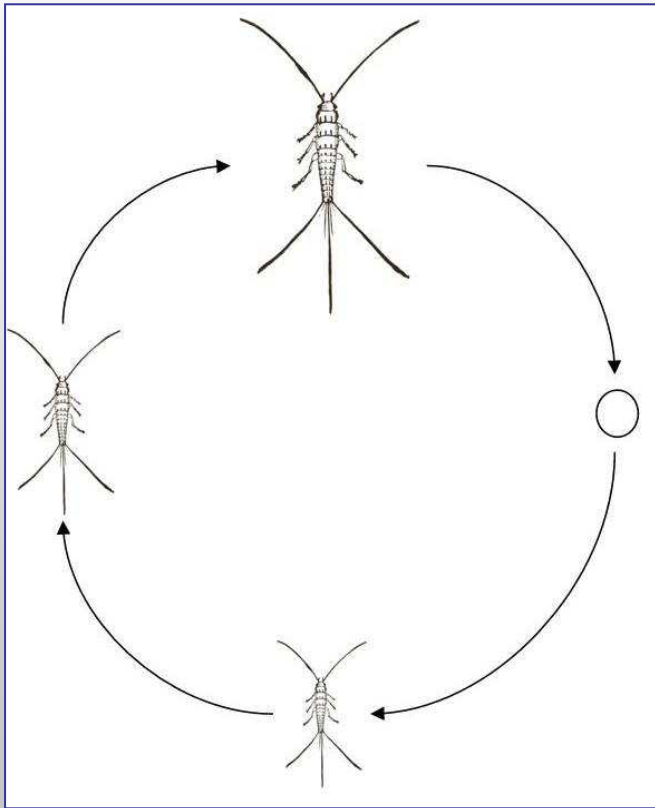
(evolutionary developmental biology)

evoluzione

sviluppo



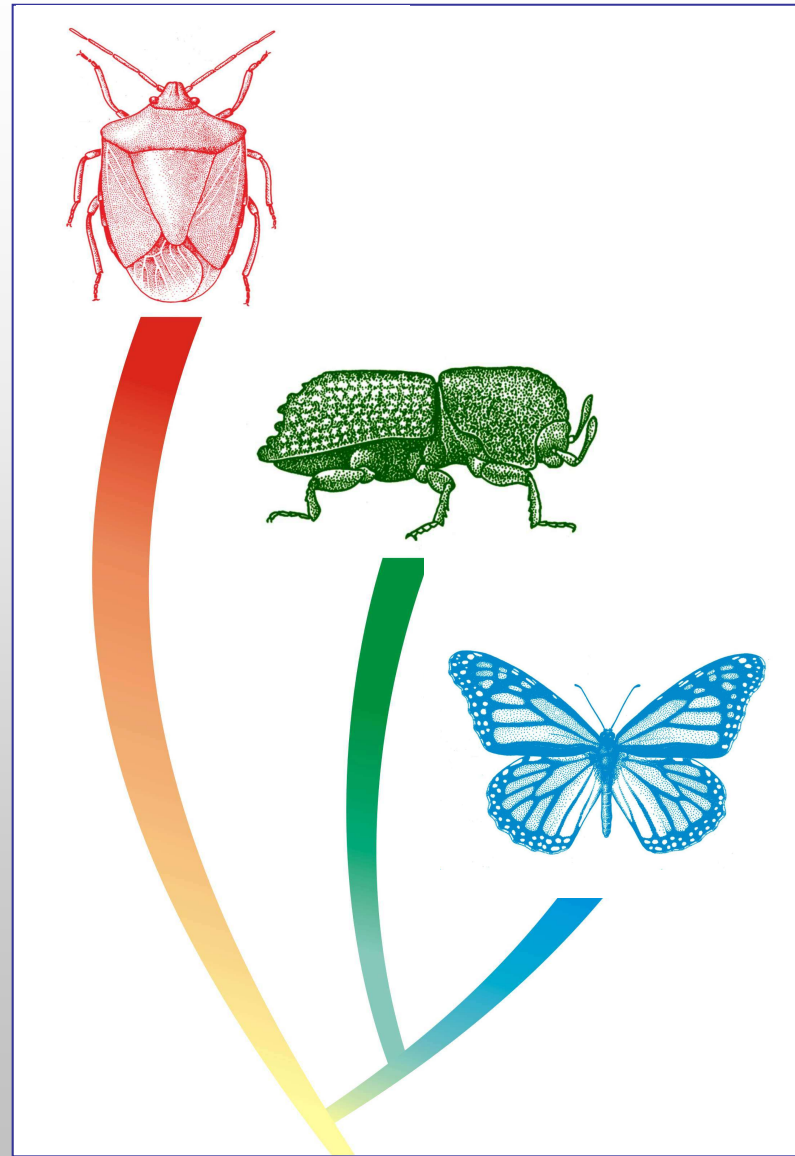
cambiamento evolutivo



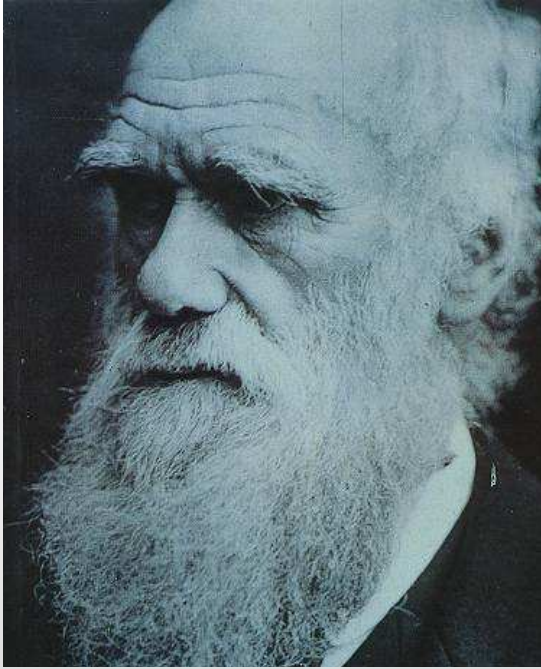
tempo



evolution and processes of speciation

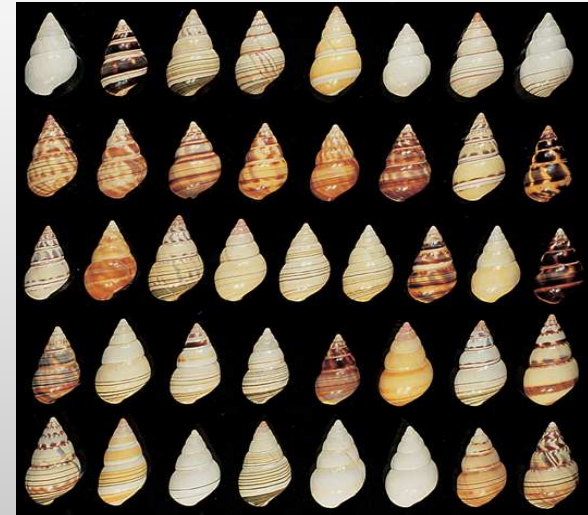


“concomitant with adaptive radiation”

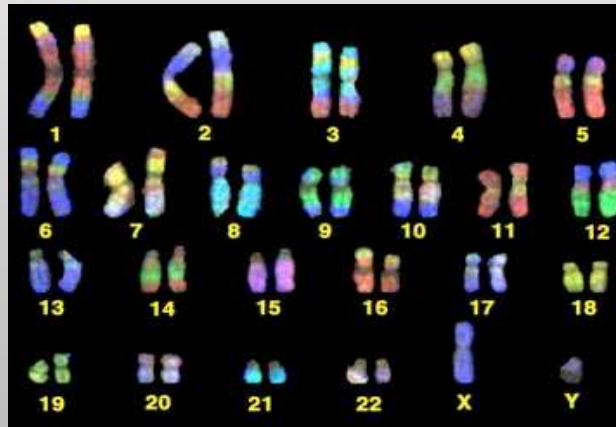


evoluzione: gli 'ingredienti' del cambiamento

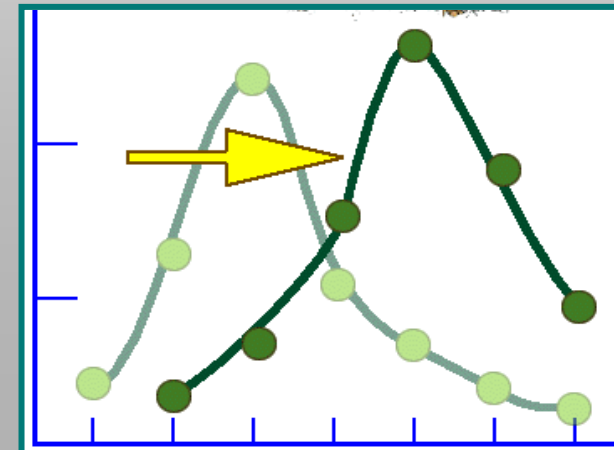
• **variazione**



• **eredità**



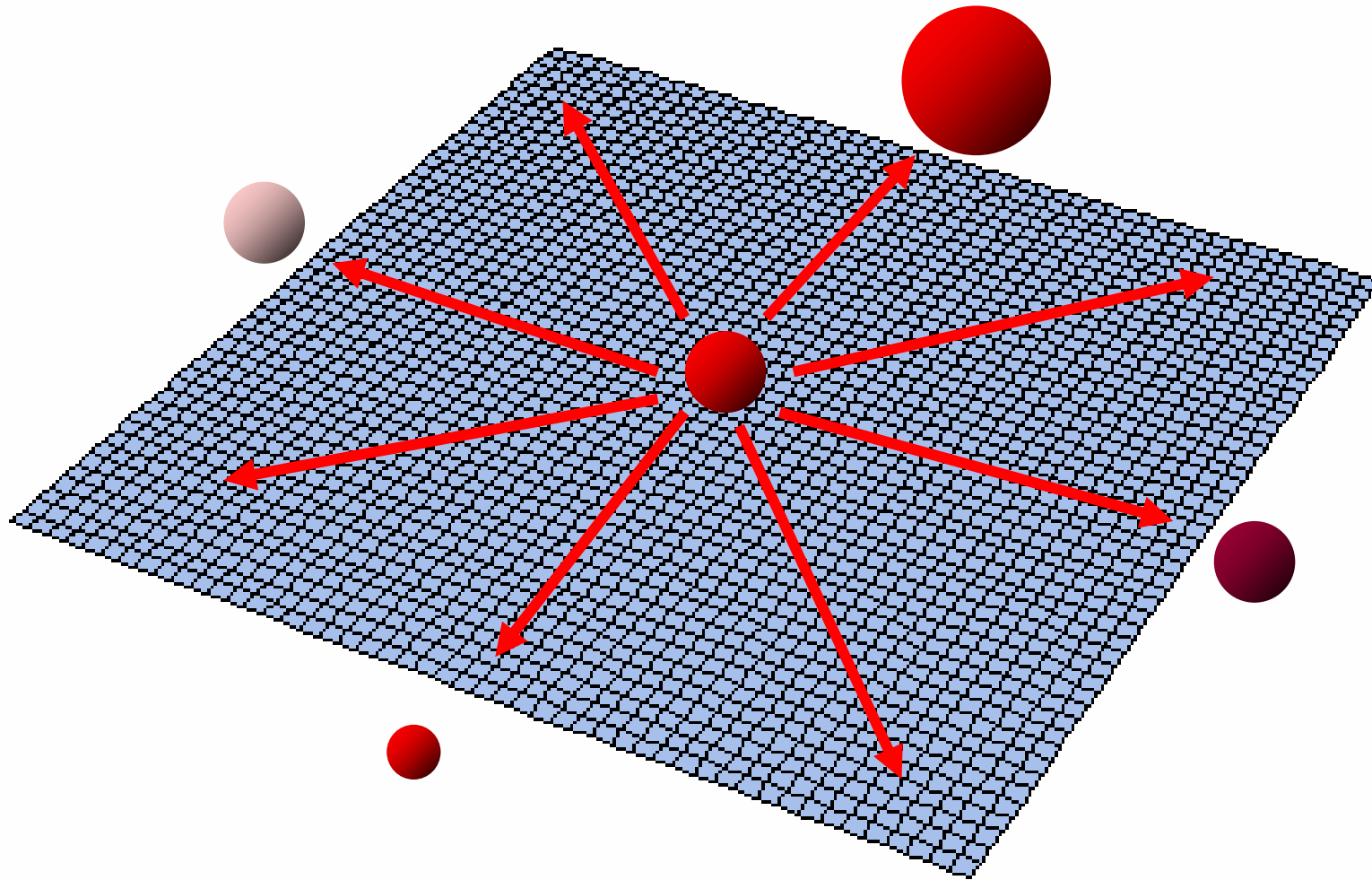
• **selezione**

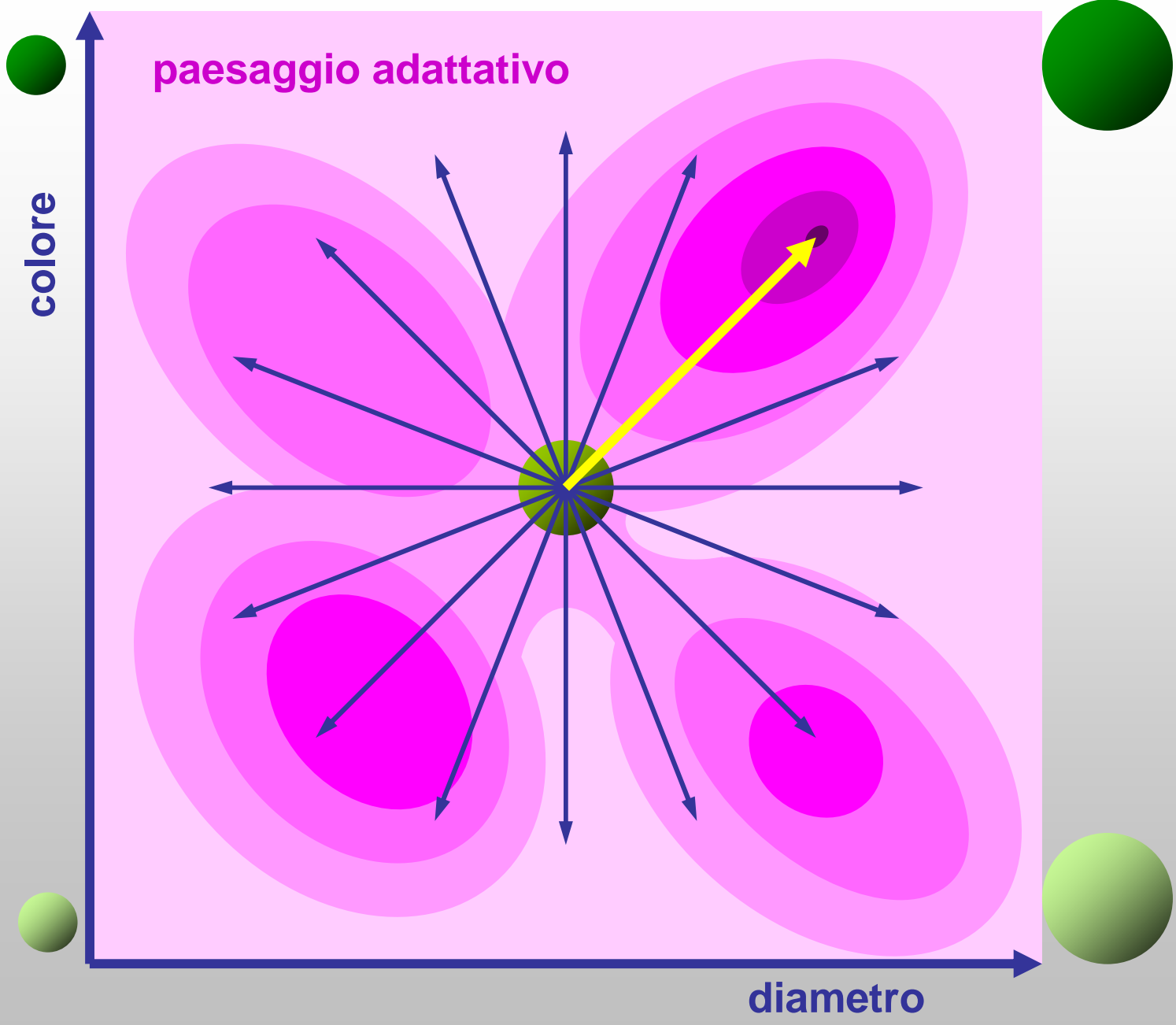


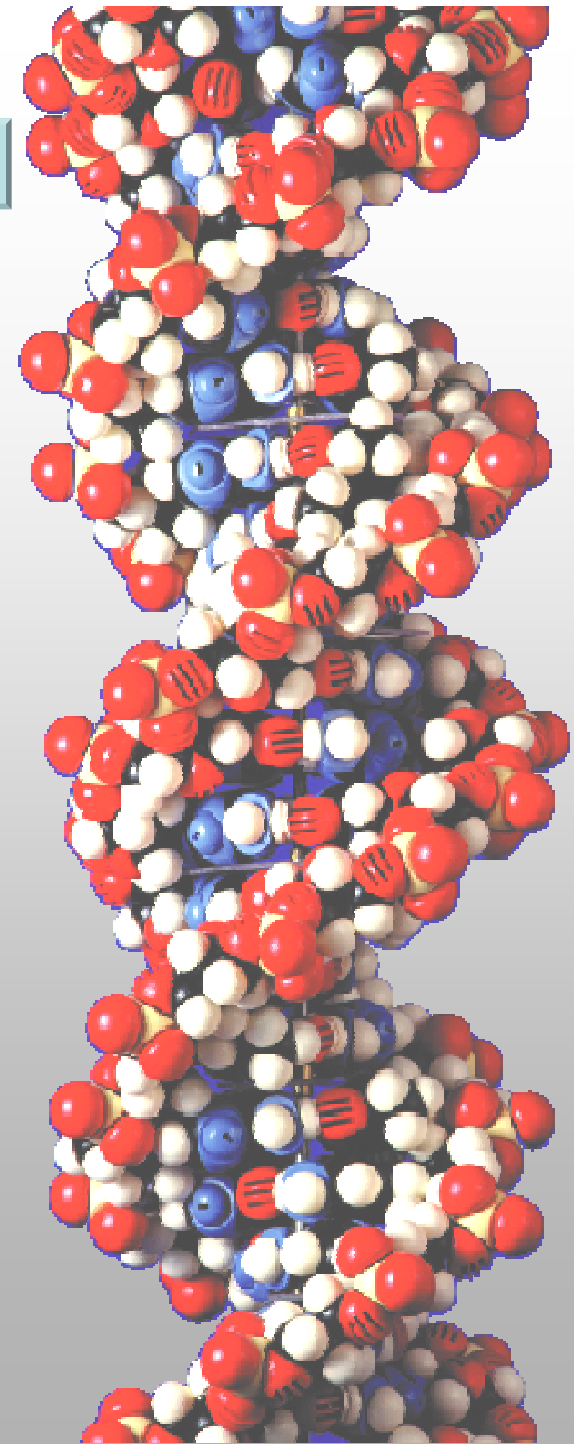
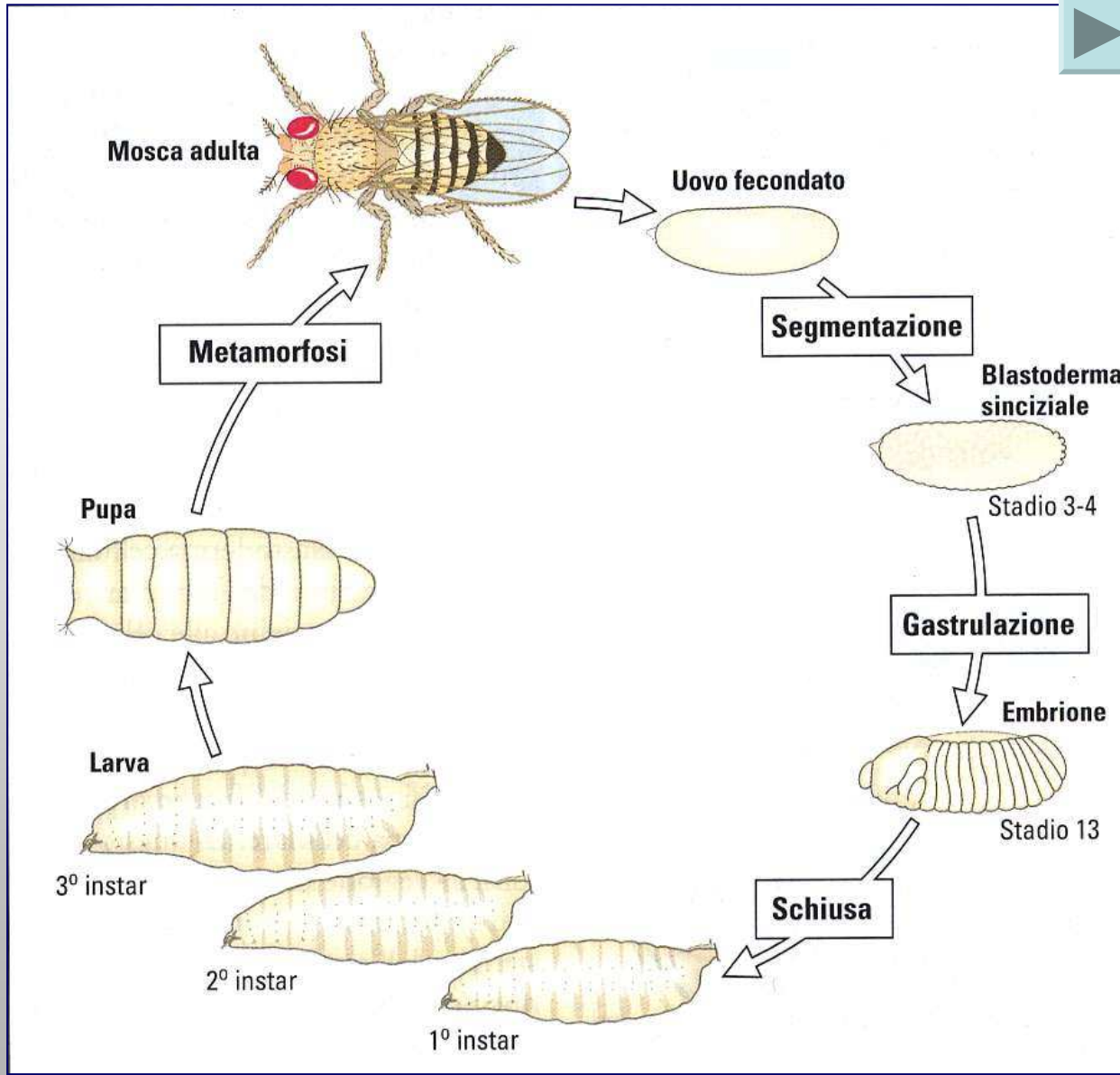
un ruolo per la variazione?

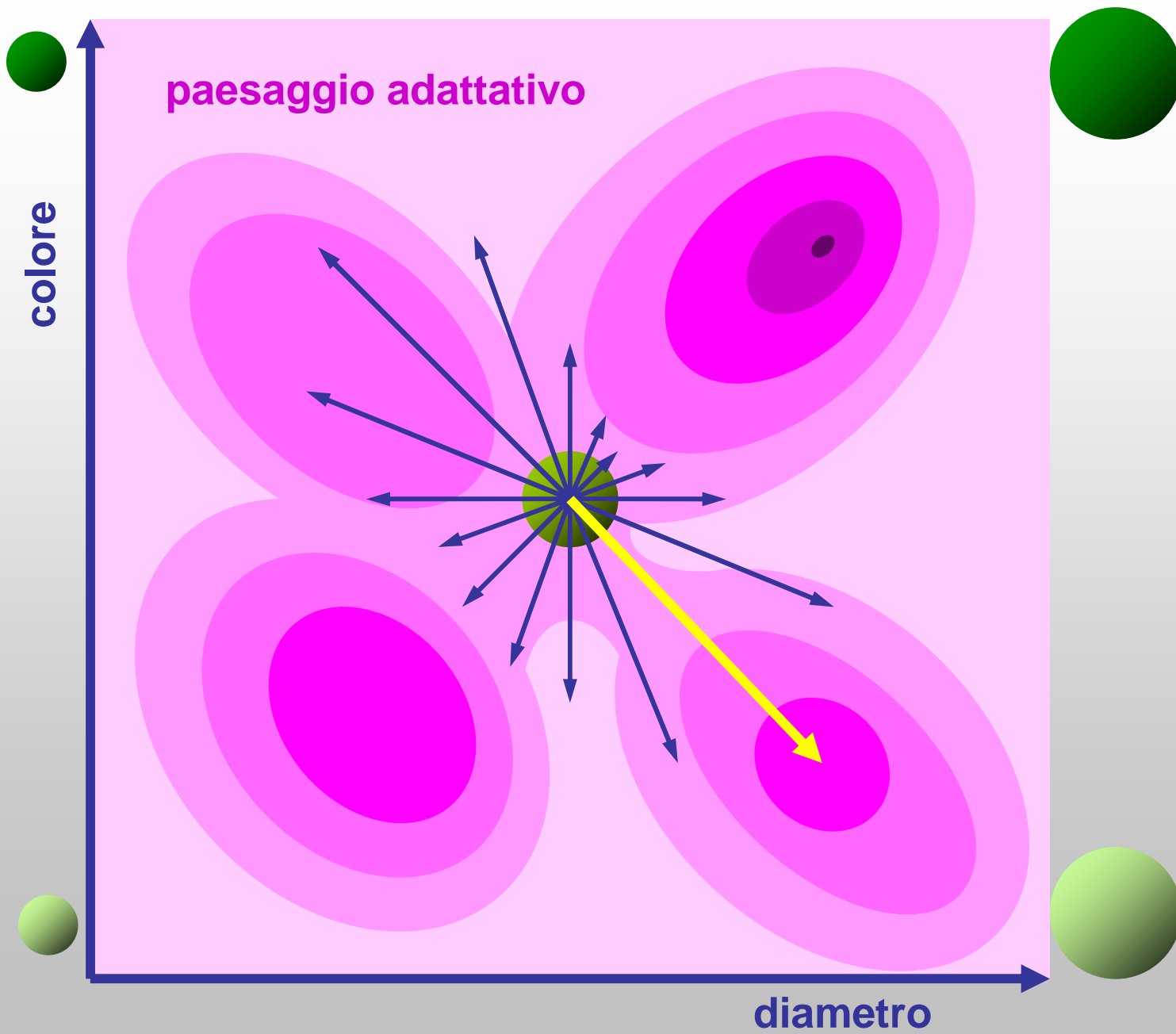


trasformazioni possibili

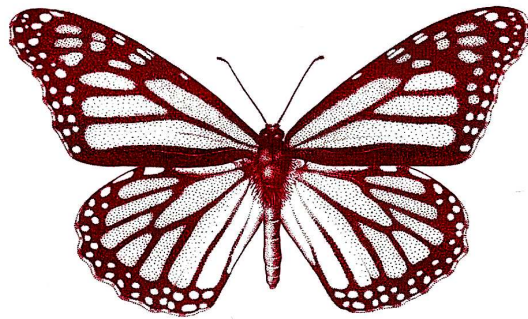
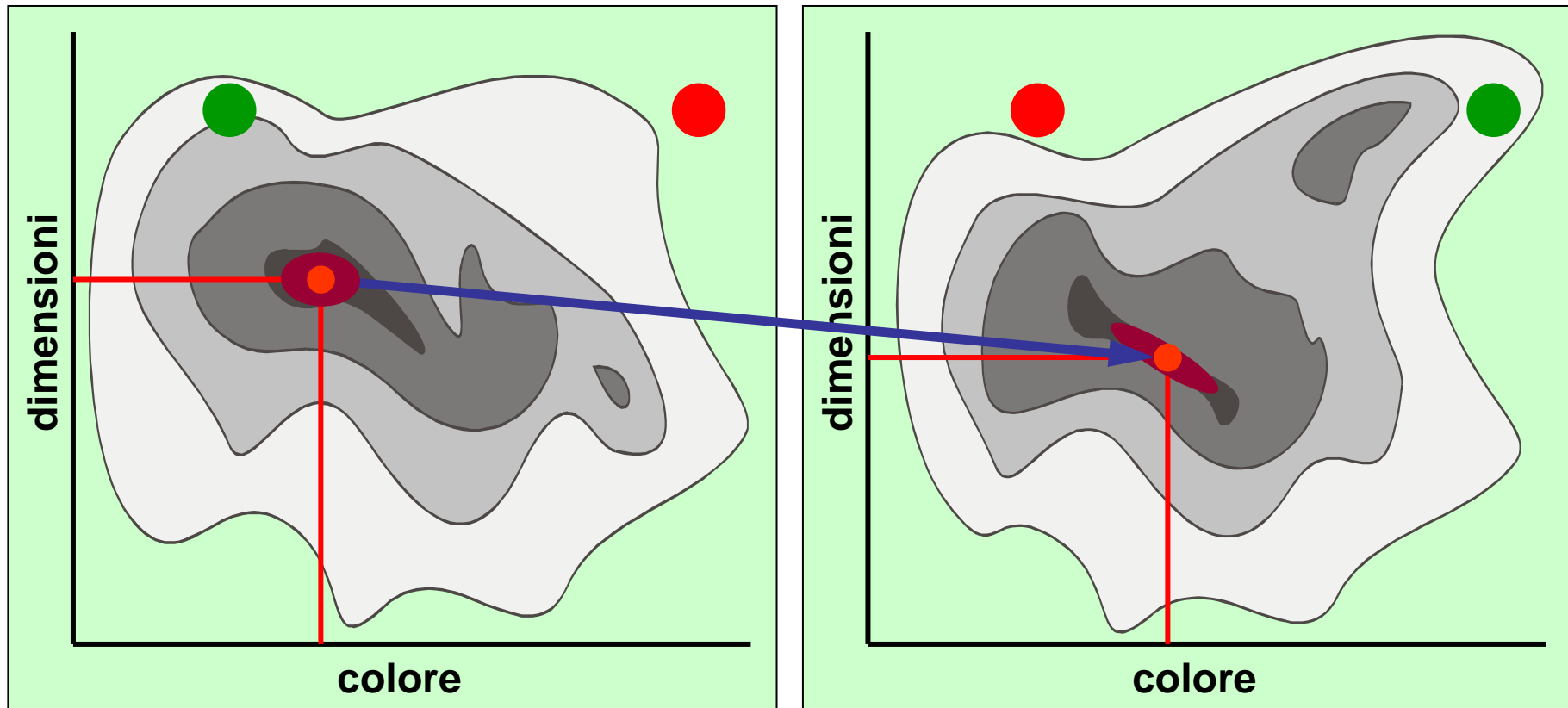




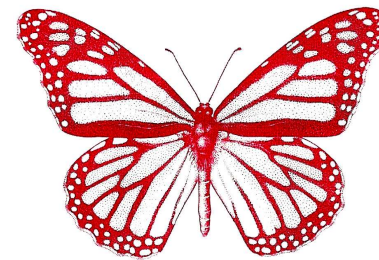




variazione individuale e 'paesaggio generativo'



Generazione n



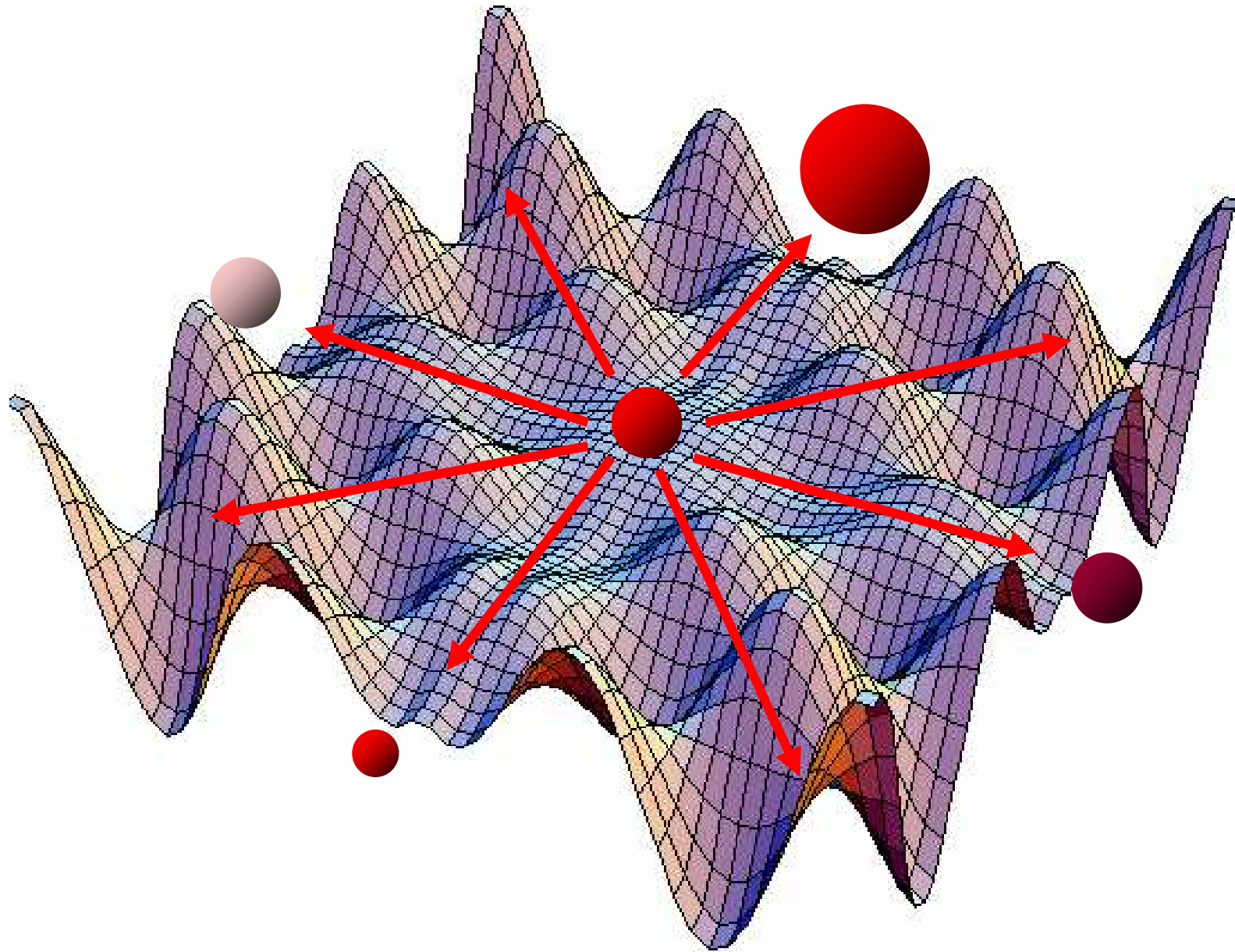
Generazione $n+1$

la selezione naturale spiega
the survival of the fittest
ma non può spiegare
the arrival of the fittest

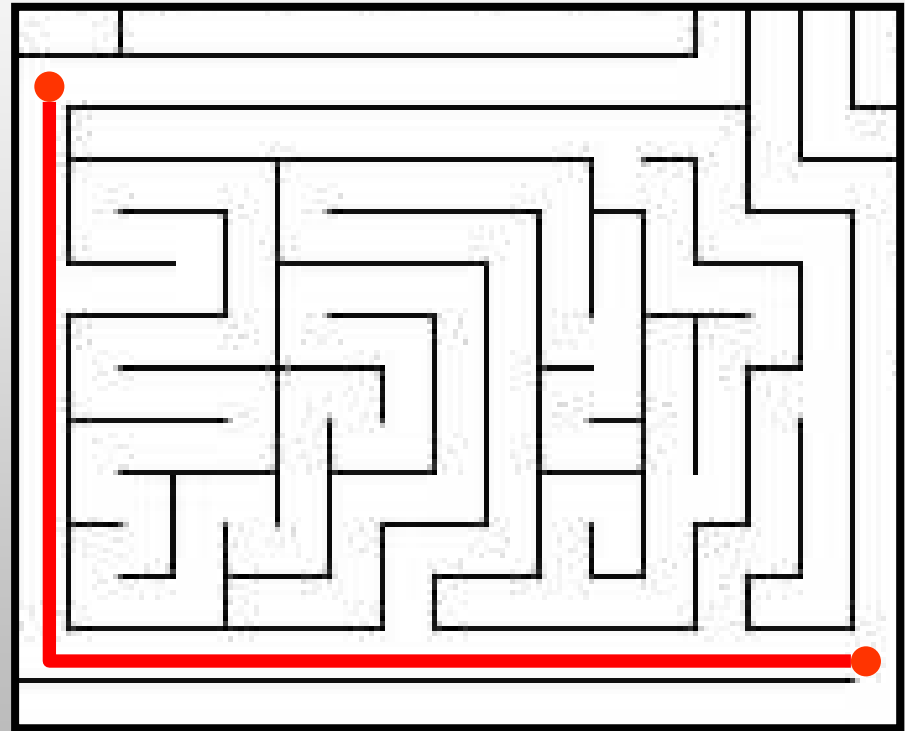
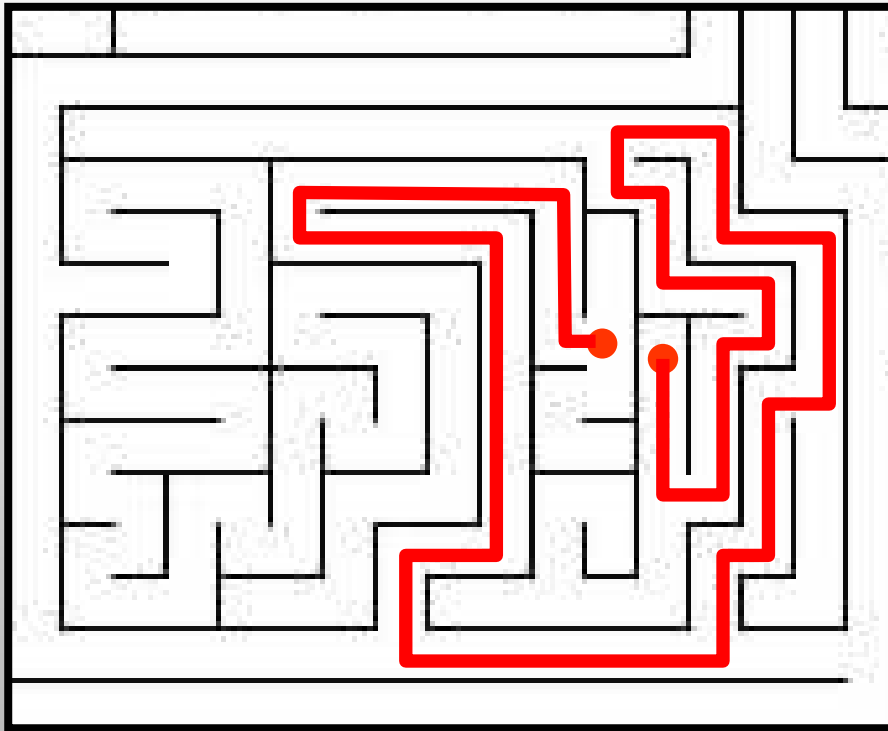
A. Harris in De Vries 1904

la variazione non ha solo un ruolo **permissivo**,
ha evidentemente un ruolo **istruttivo**

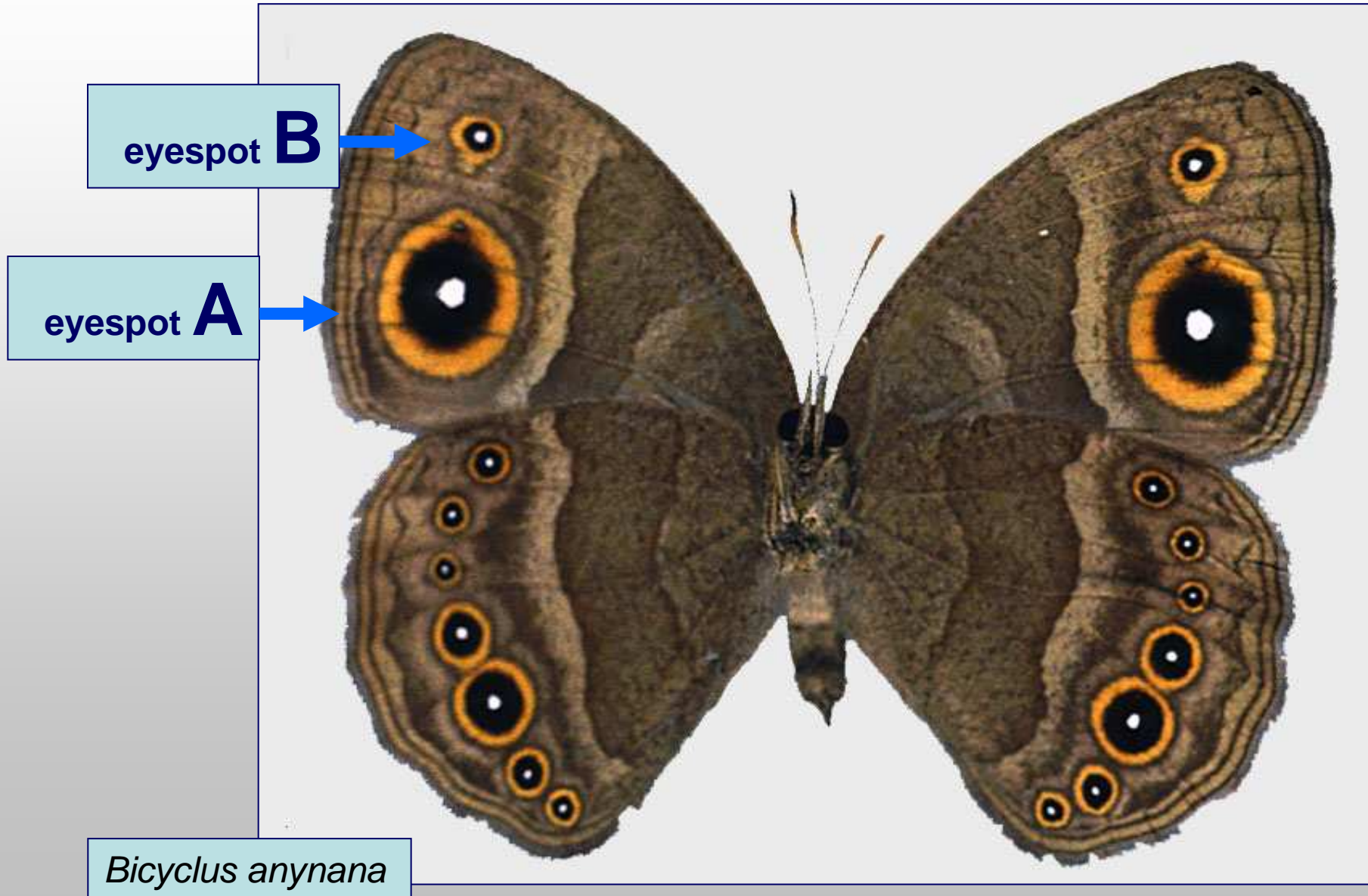
trasformazioni possibili



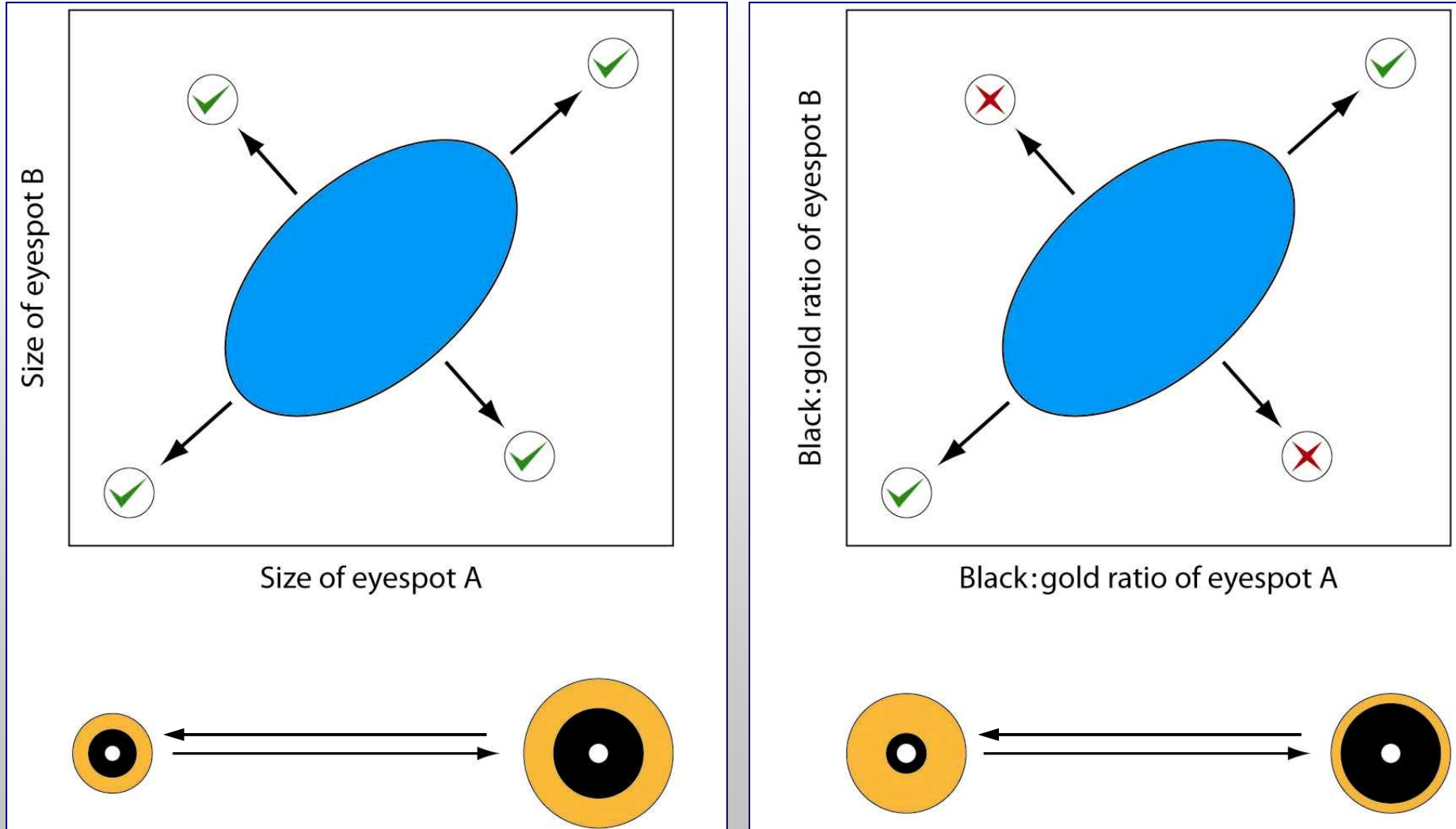
prossimità e distanza



developmental constraints (dev. biases)

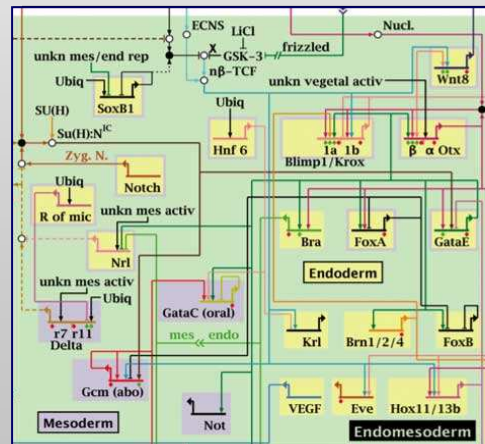
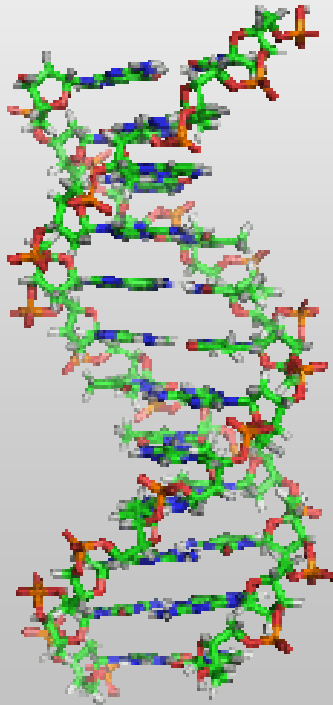


selection experiments

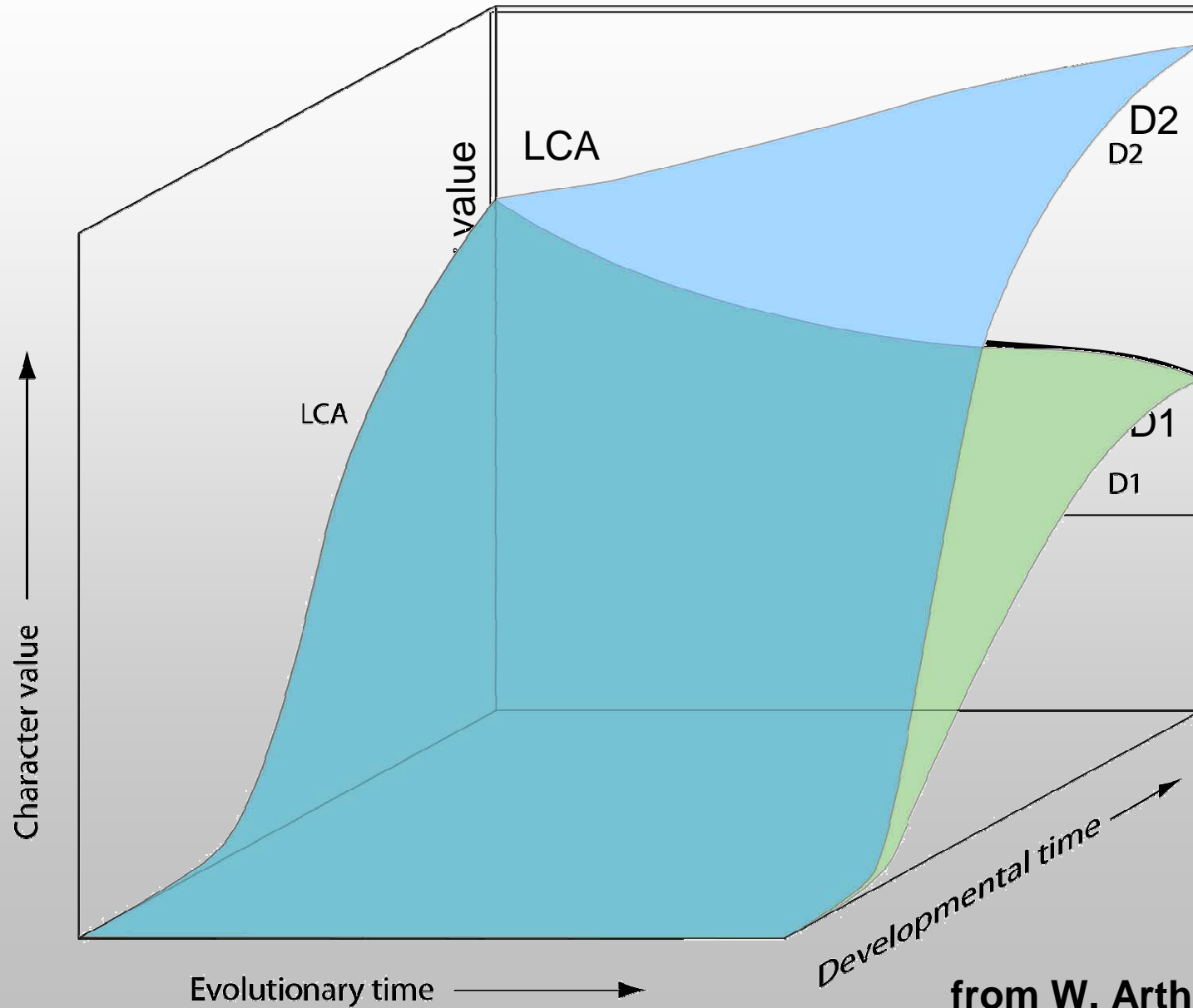


redrawn from Brakefiel et al. (several sources)

opening the 'black box'



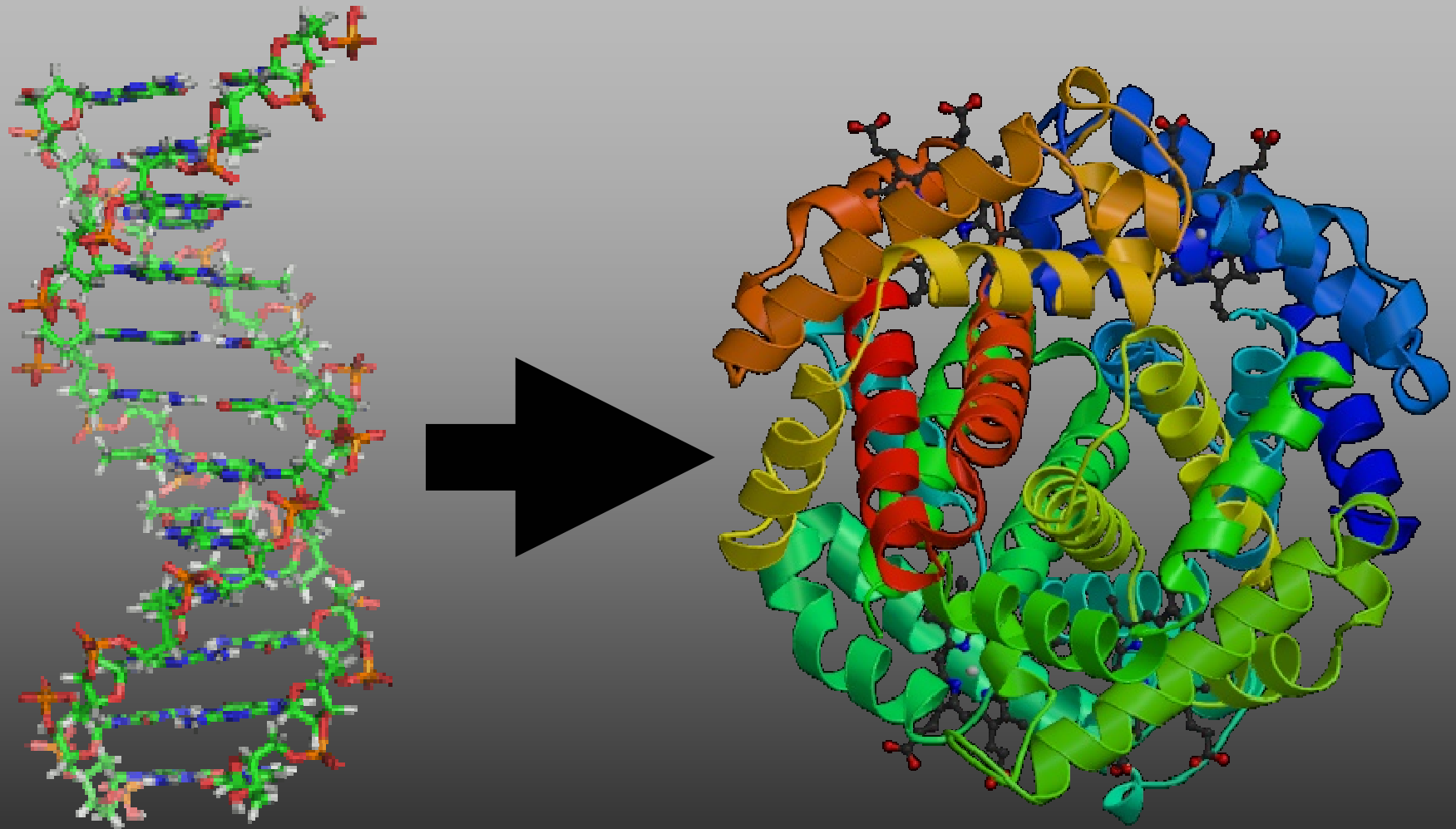
evolution by developmental repatterning



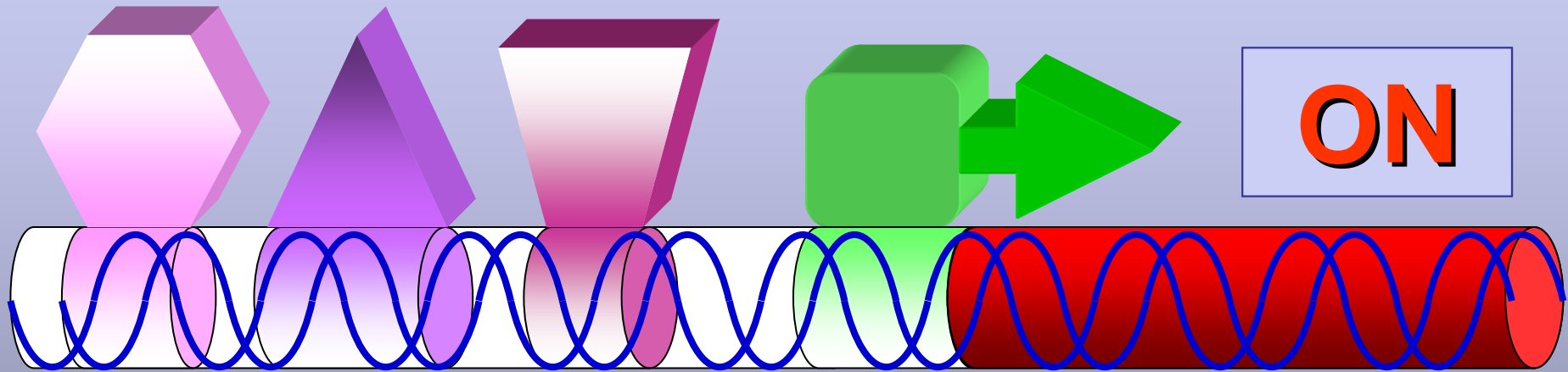
from W. Arthur, in press










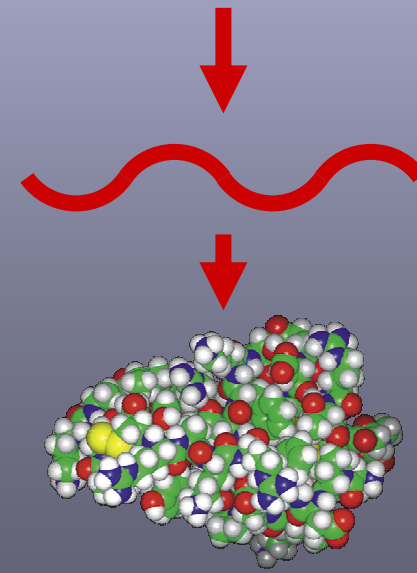
espressione genica



dal gene alla proteina regolazione della trascrizione



			ON
			ON
			OFF
			ON

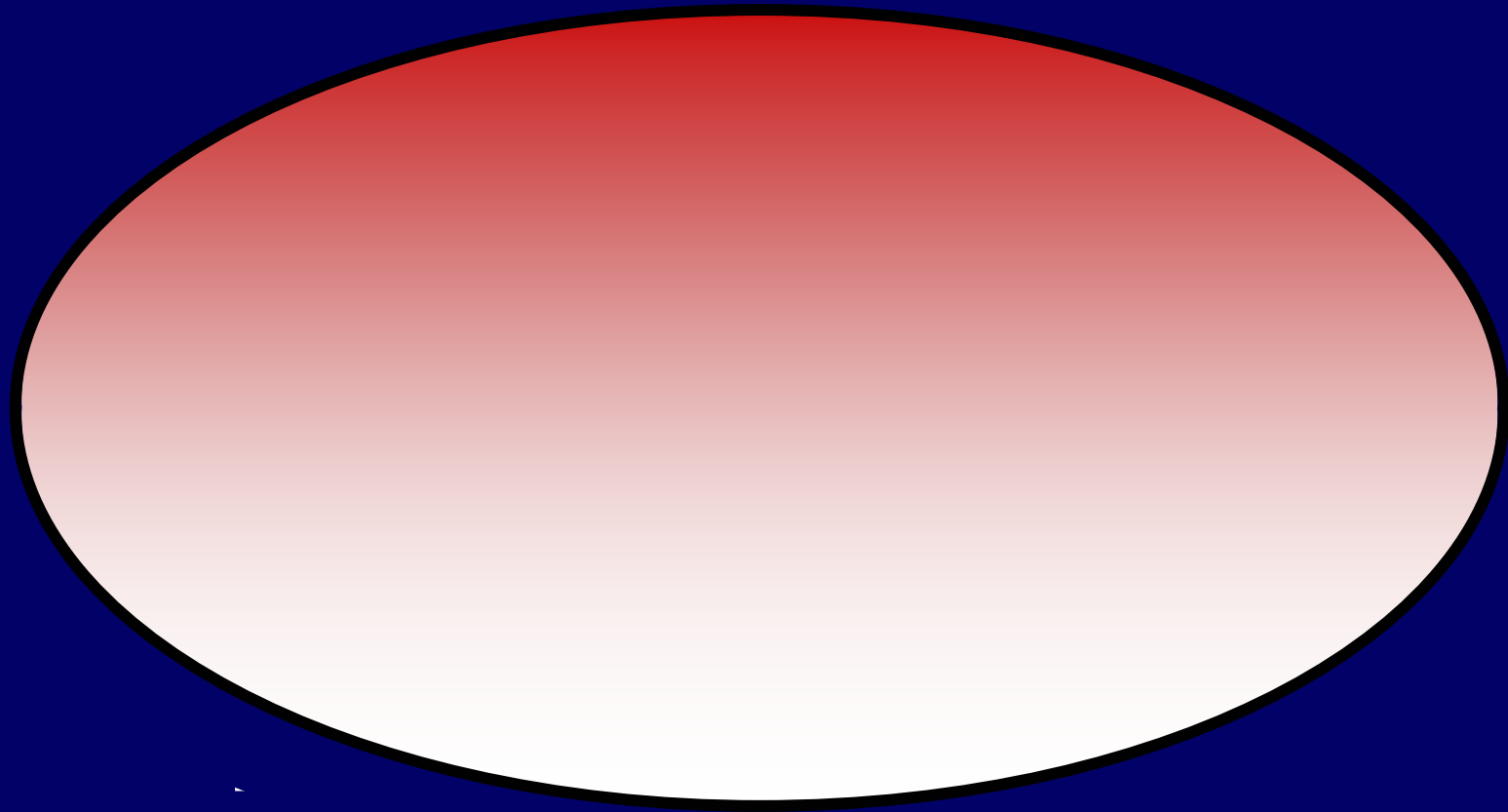


dorsale

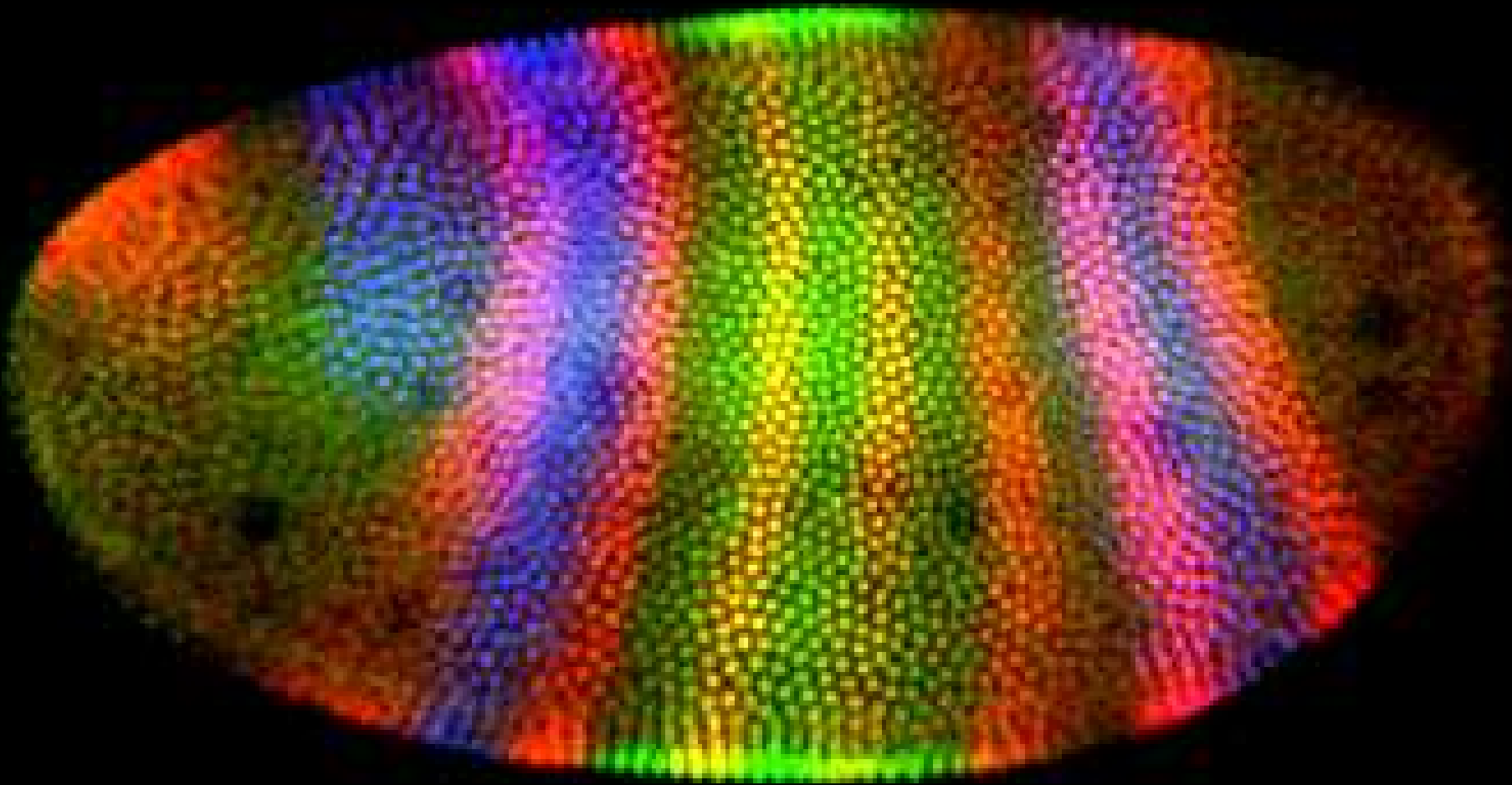
ant.

post.

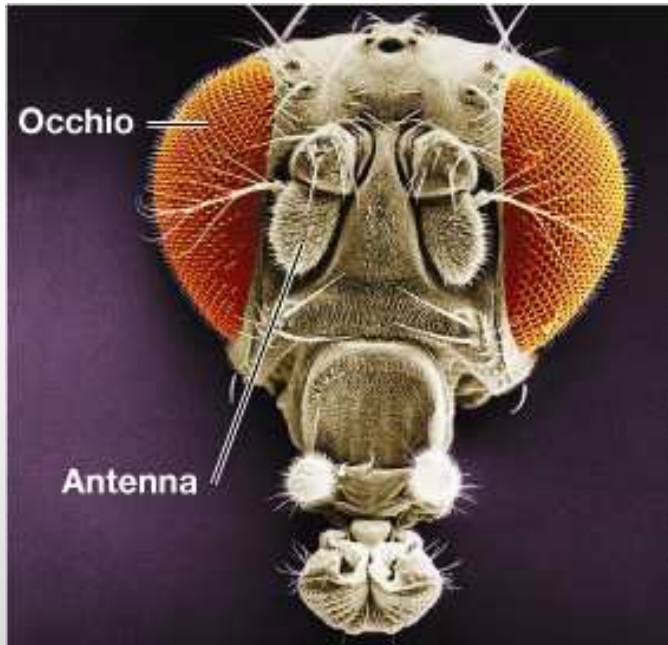
ventrale



Geni dello sviluppo

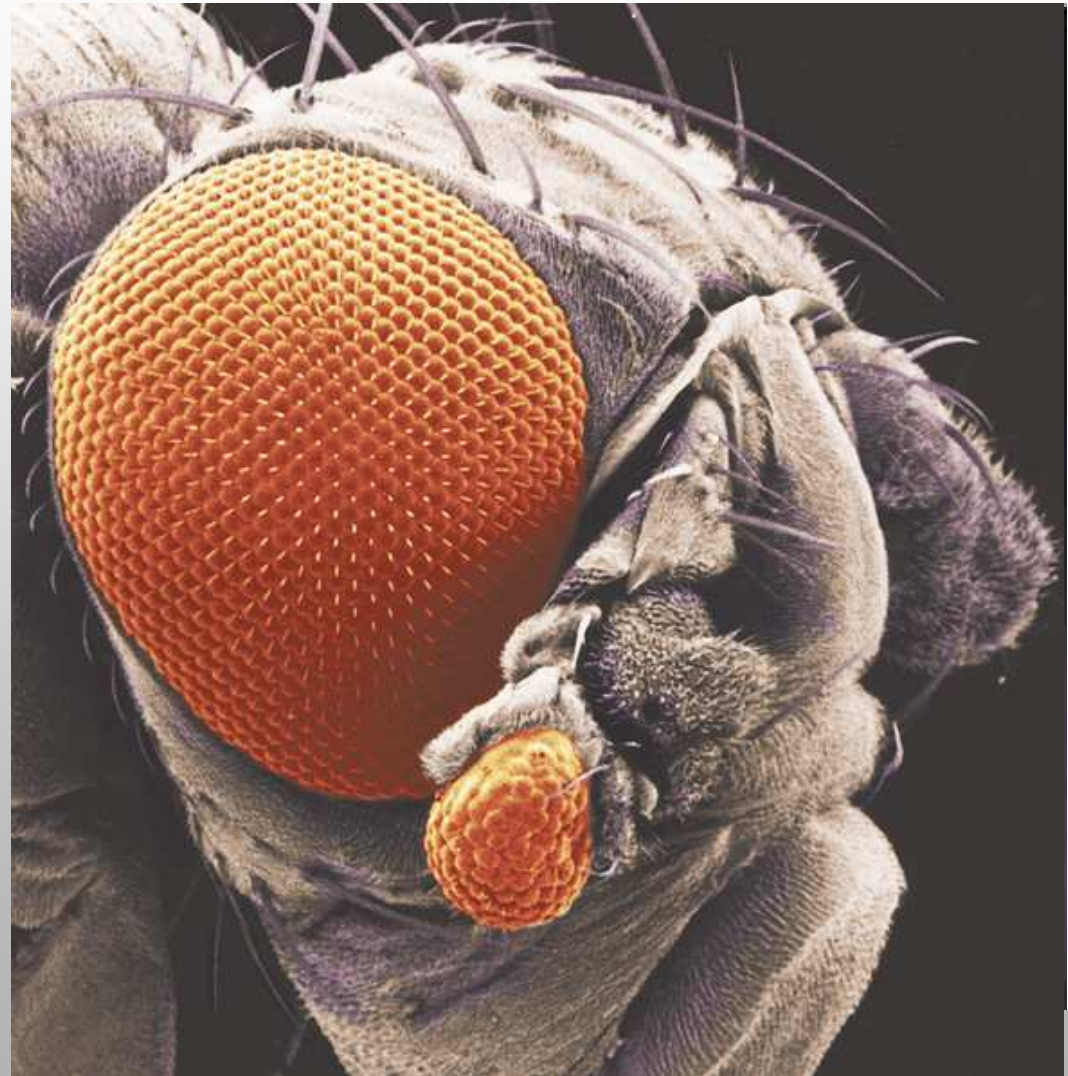


embrione precoce di *Drosophila*



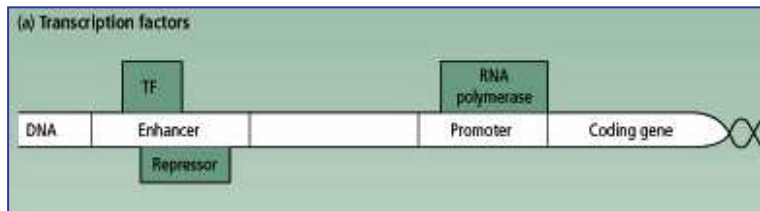
forma normale

forma mutante

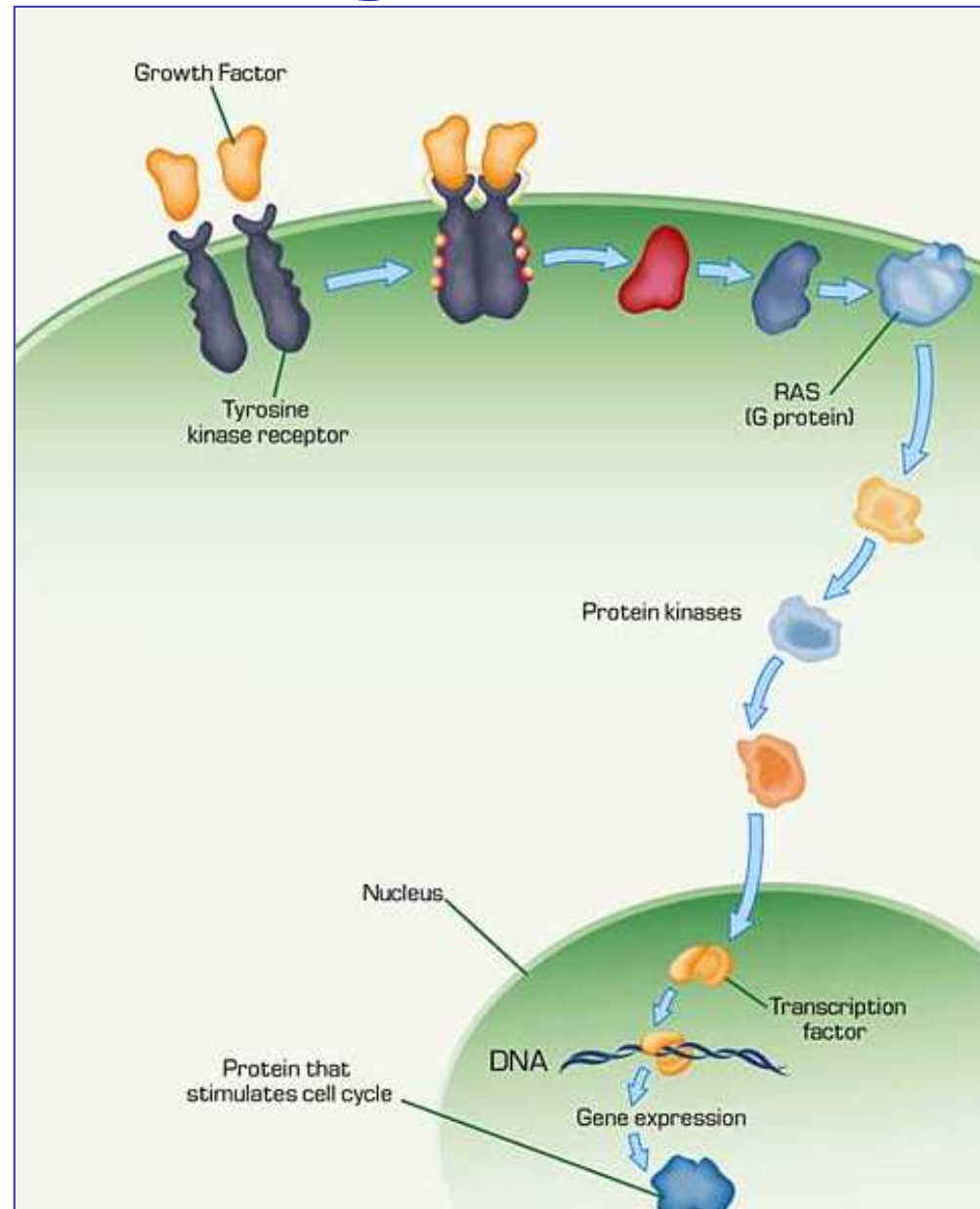
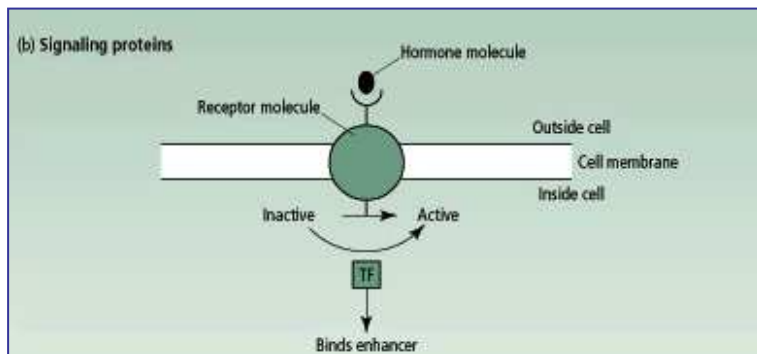


'master control genes'

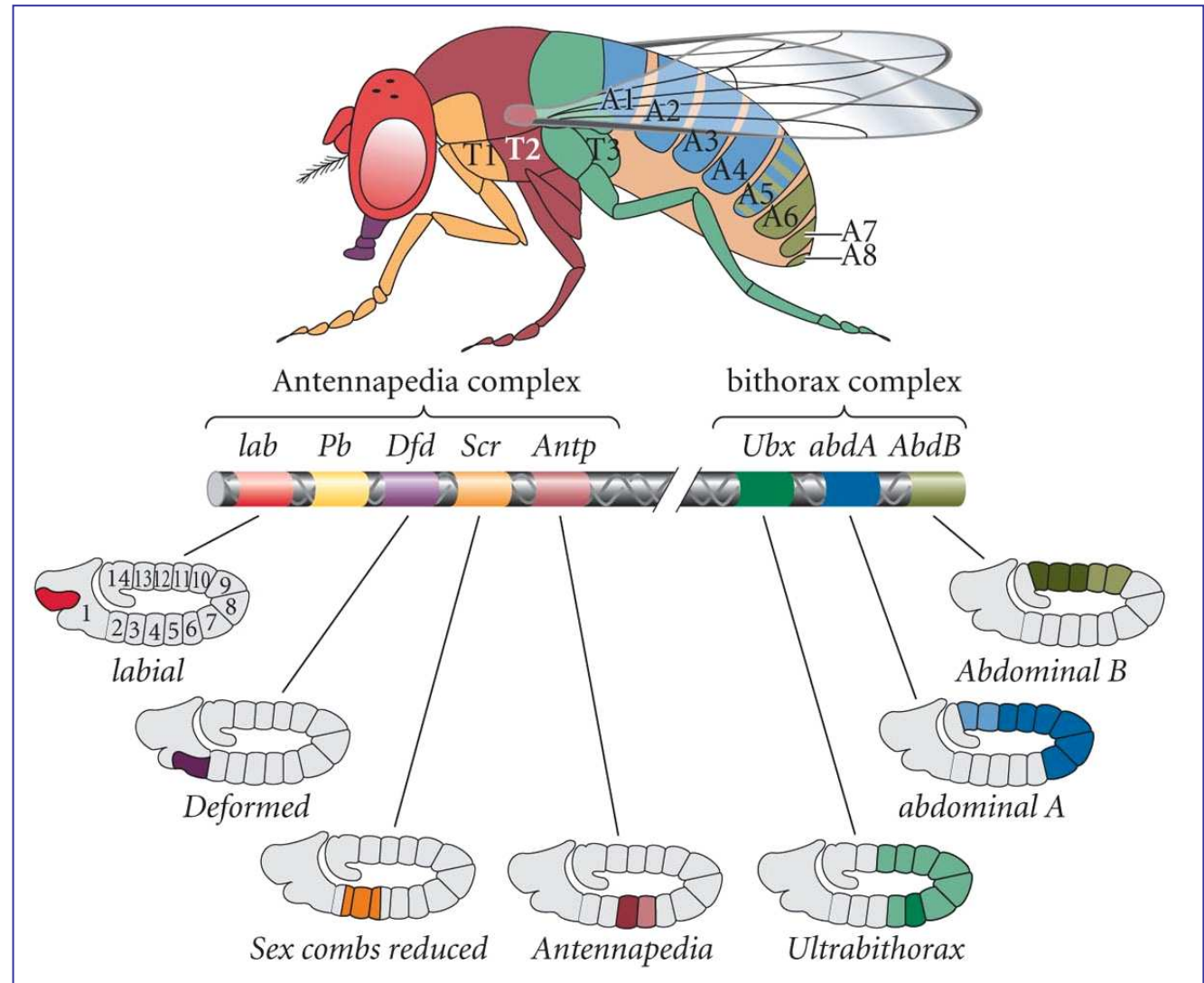
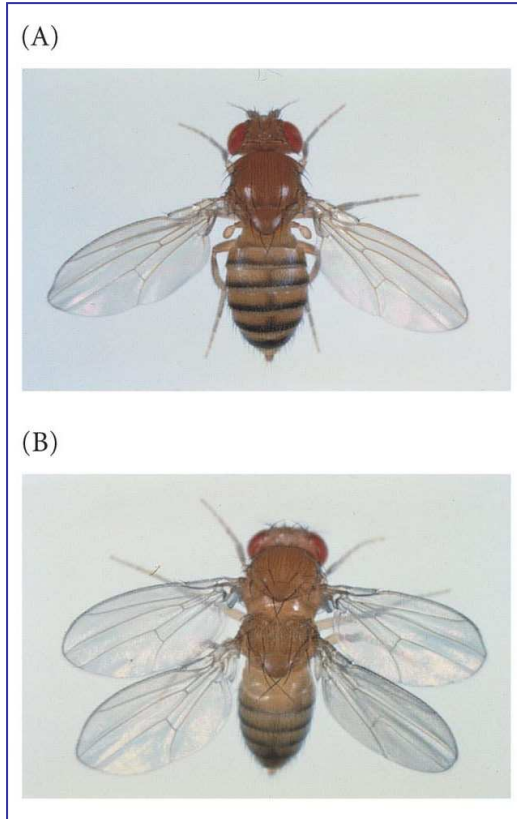
- transcription factors



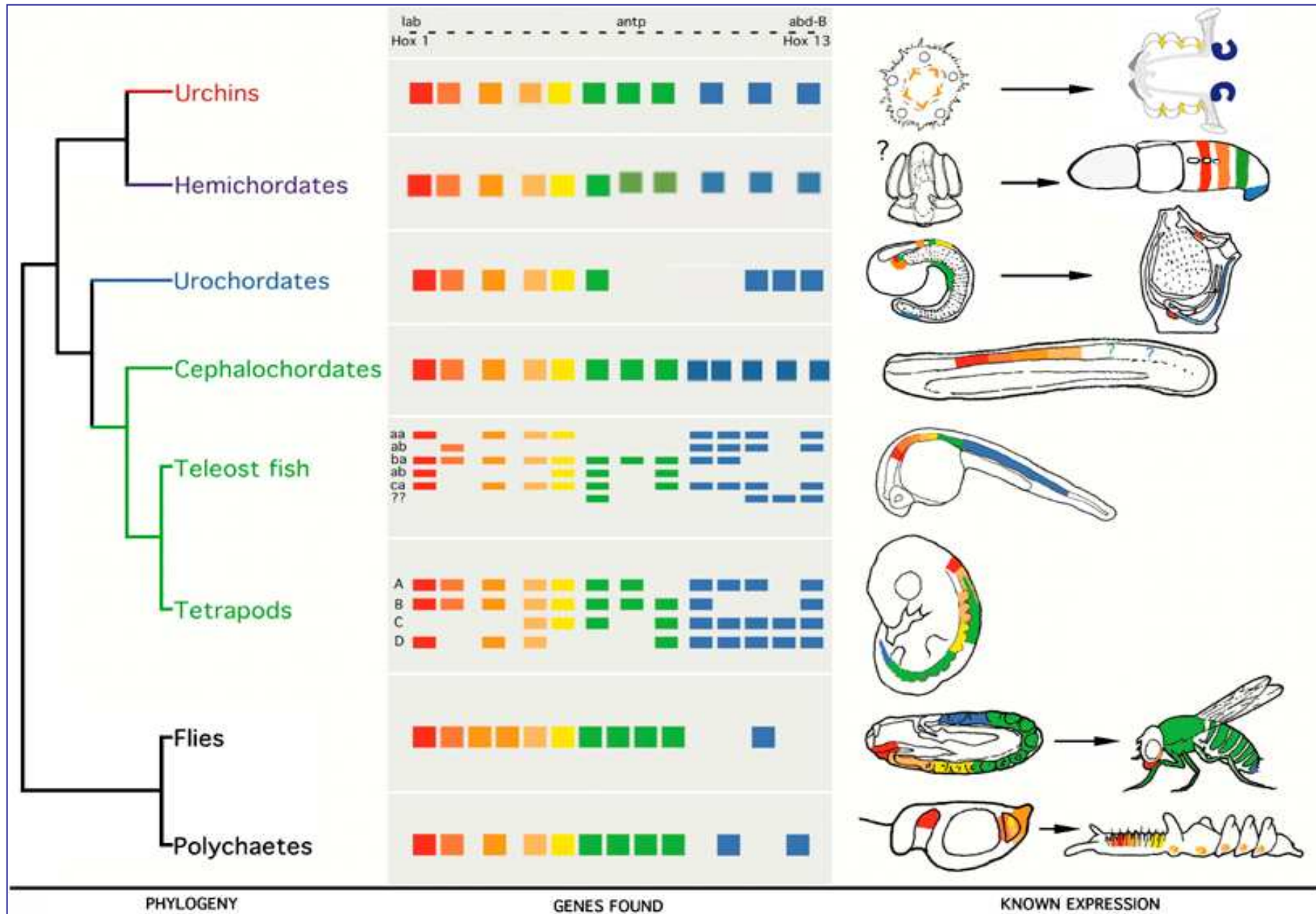
- elements of the signal transduction pathway



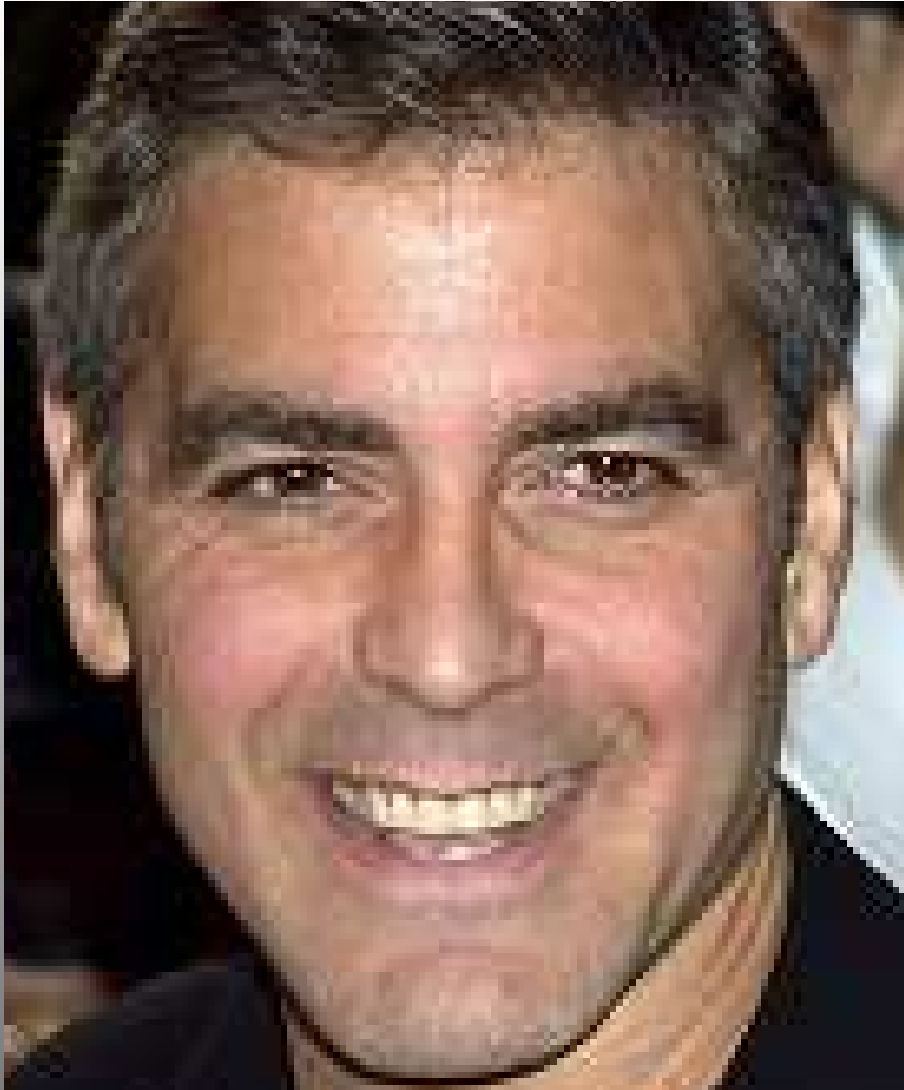
geni *Hox* in *Drosophila*



geni *Hox*

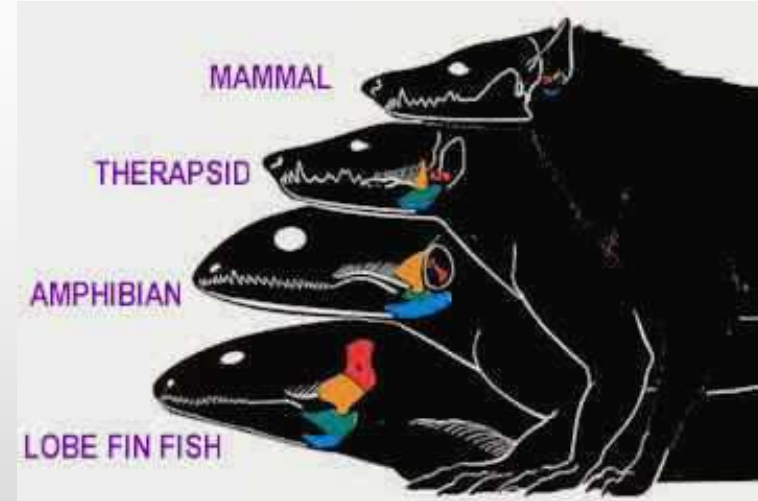


somiglianza (genetica): 99%

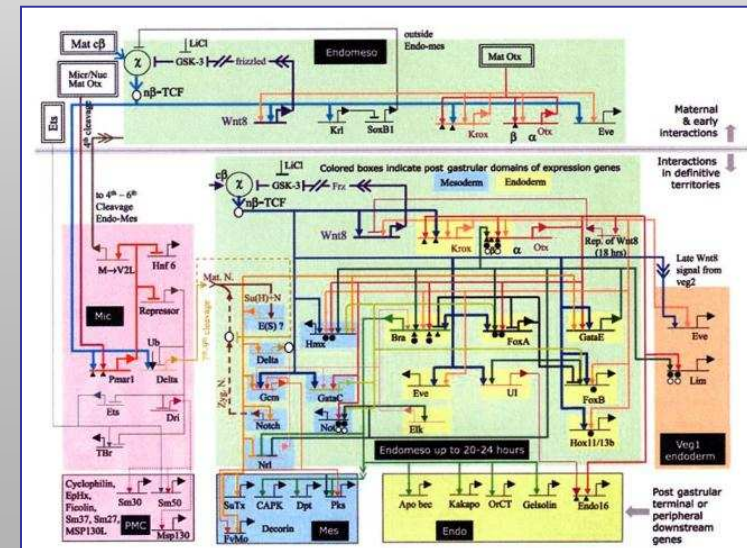


cooptazione-multifunzionalità-ridondanza- modularità

‘l’evoluzione è bricolage’



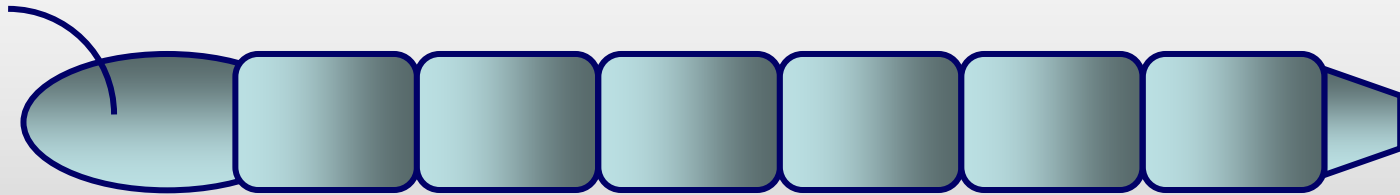
‘ il segreto dell’evoluzione è la riconversione di vecchi geni a nuovi mestieri’



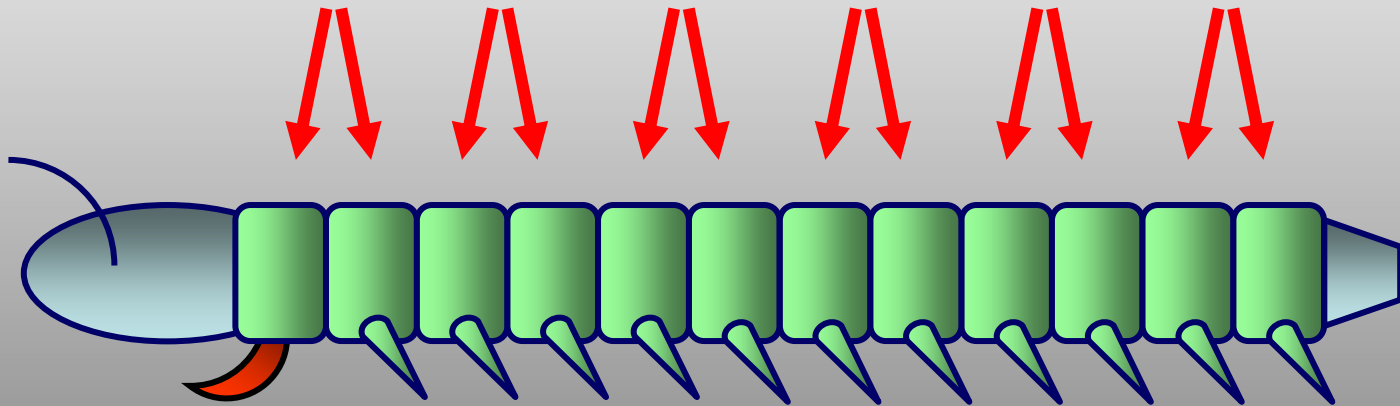
il caso dei
geofilomorfi



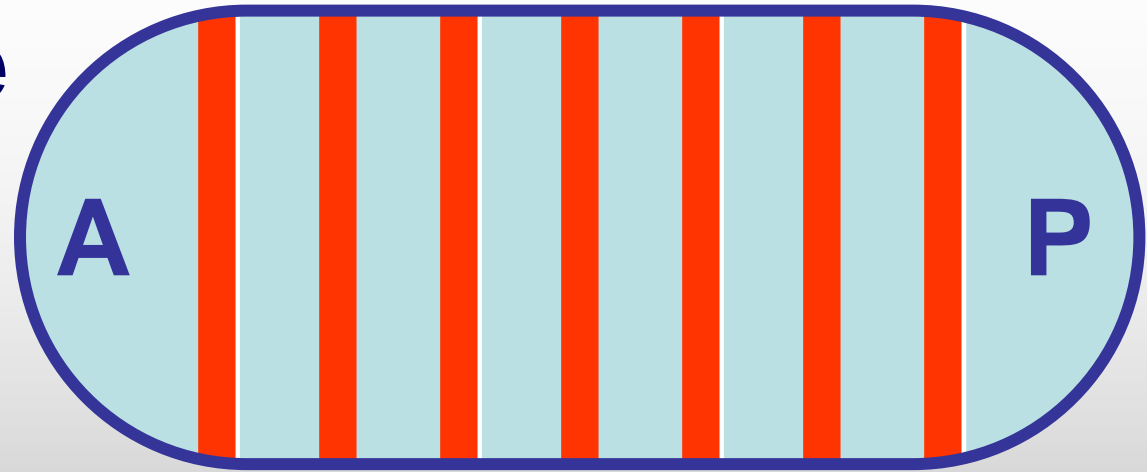
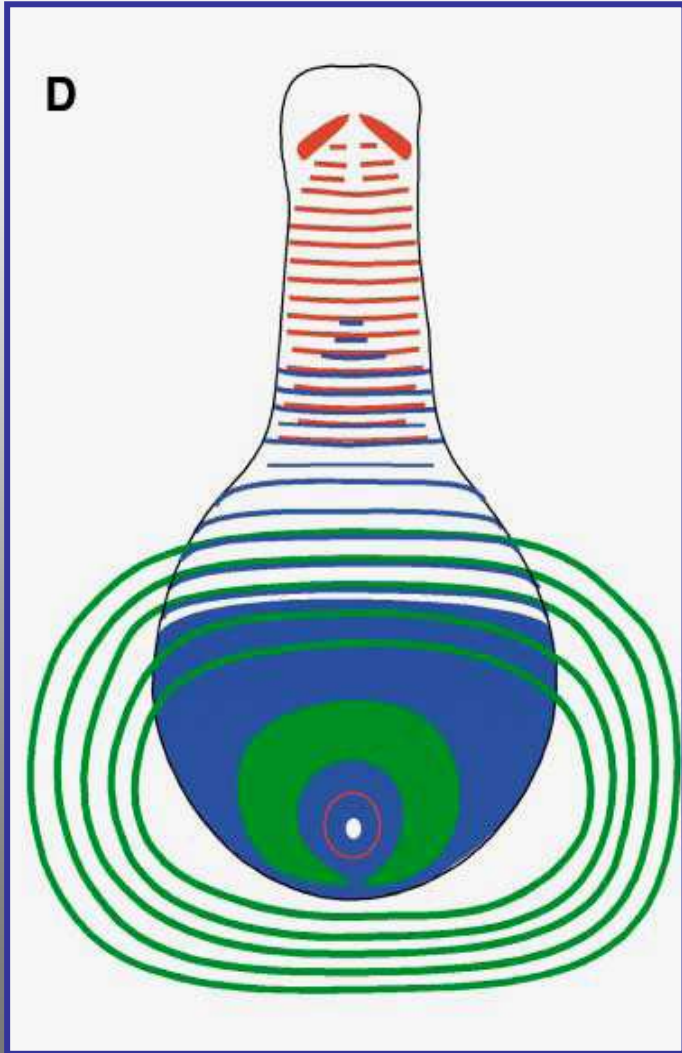
I



II



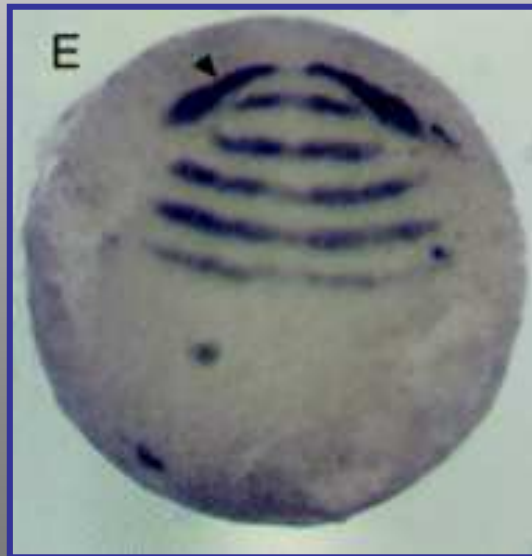
geni della segmentazione



odd-skipped

caudal

engrailed

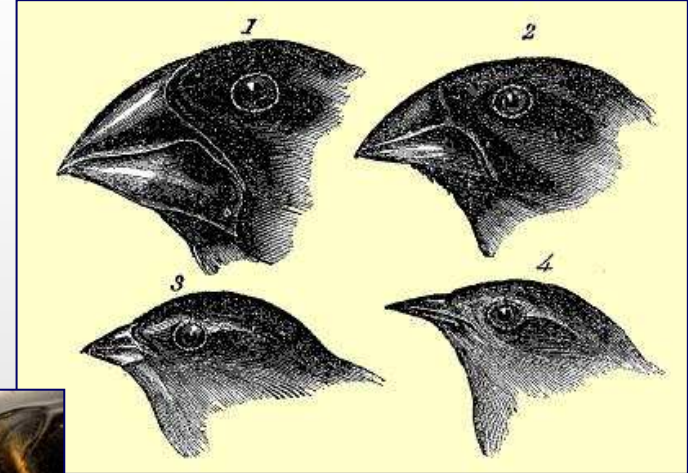


Strigamia maritima

(Chipman *et al.* 2004)

evo-devo's main insights

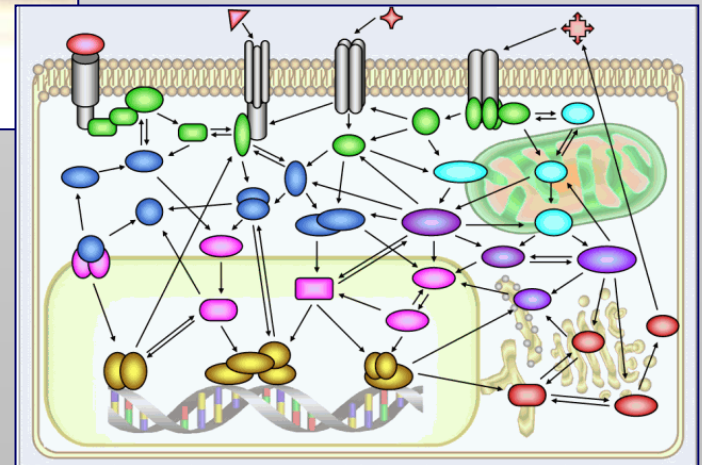
evolvability



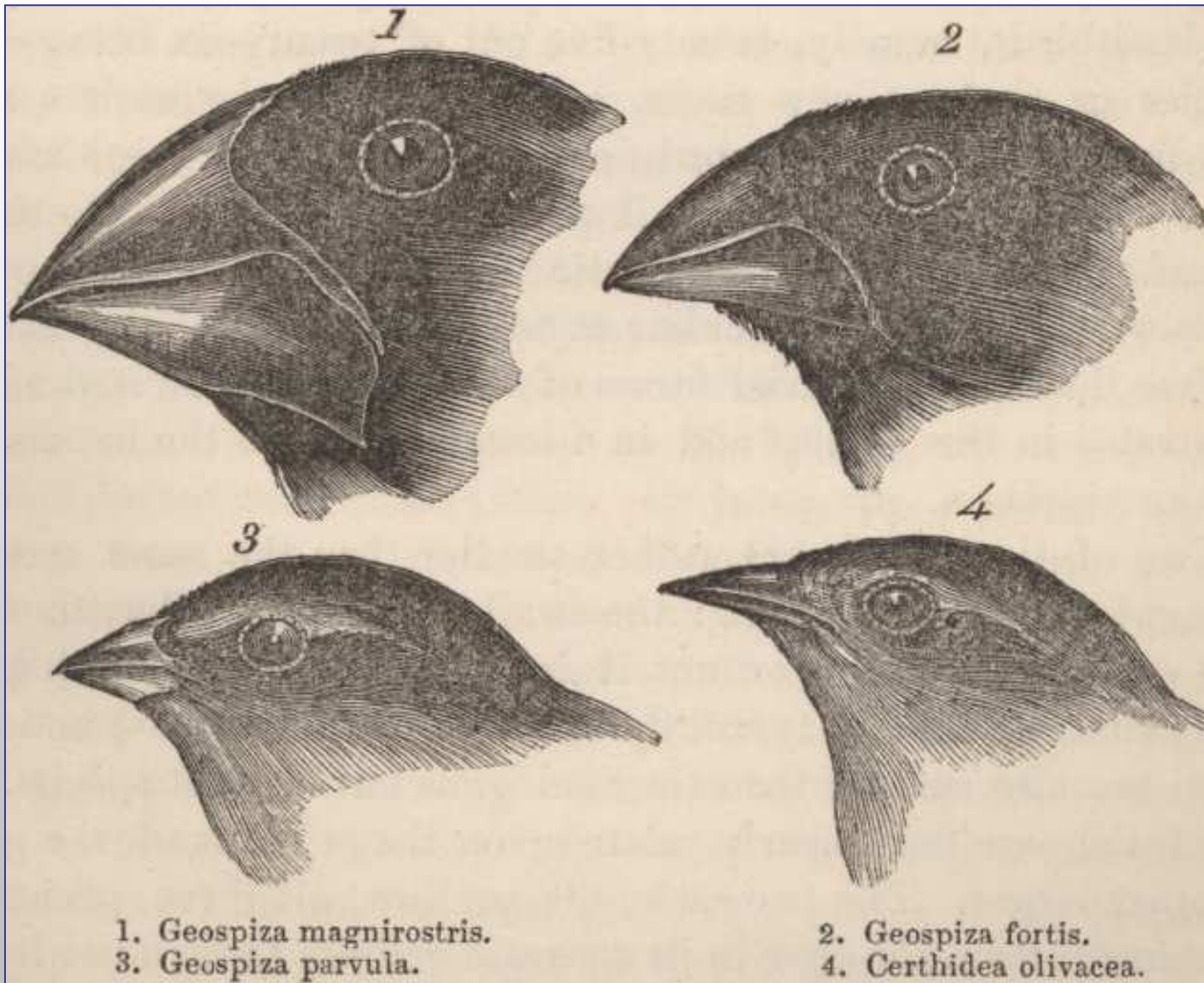
co-option

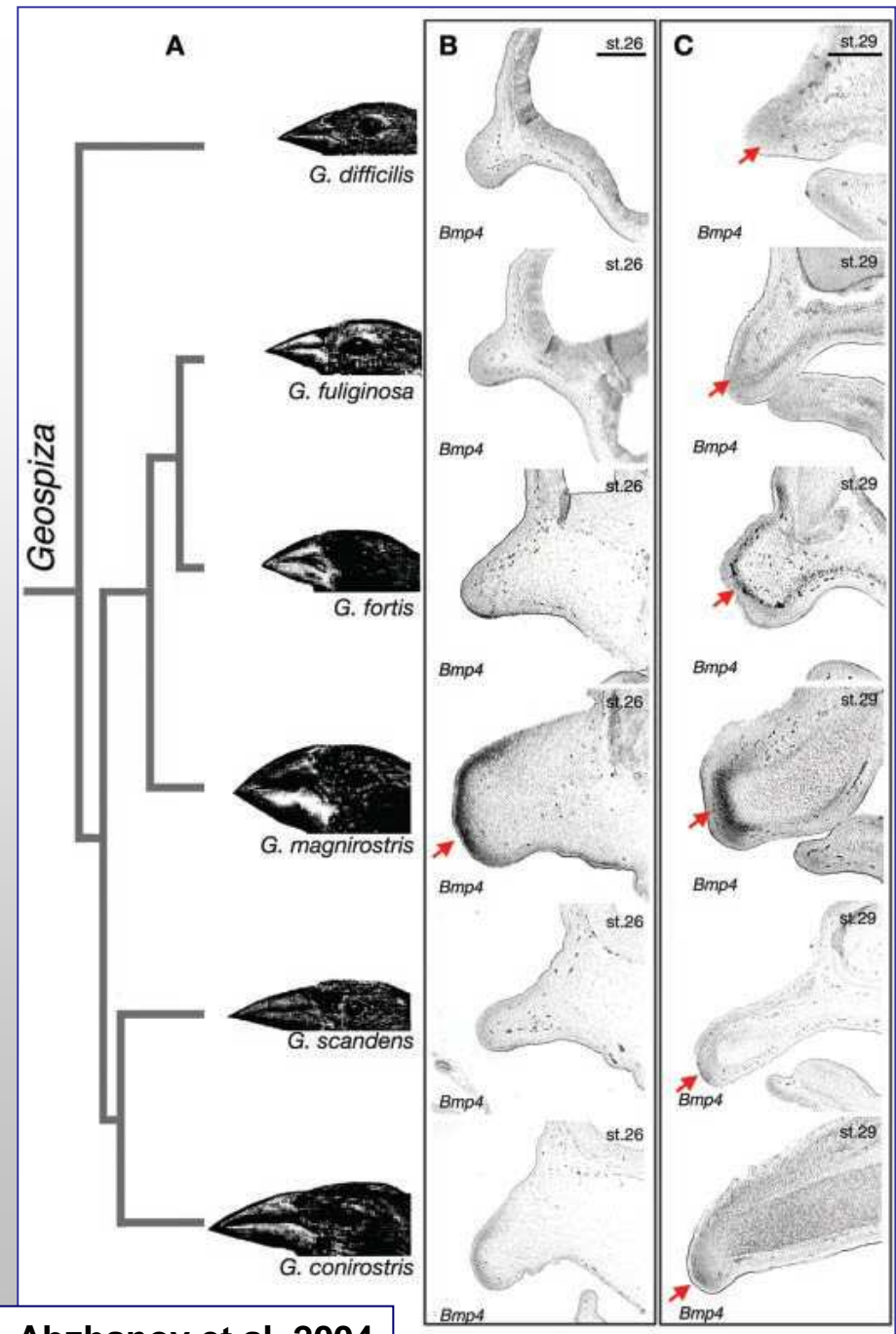
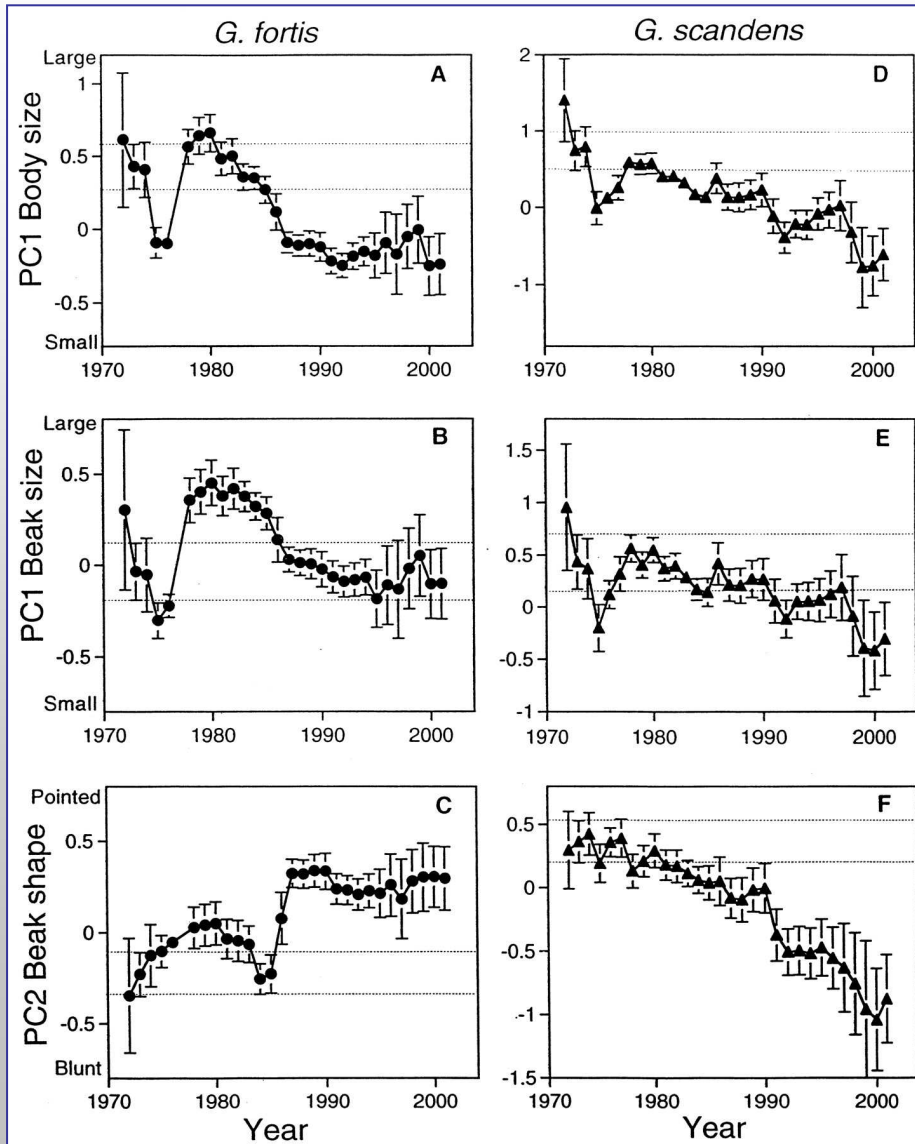


gene network evolution

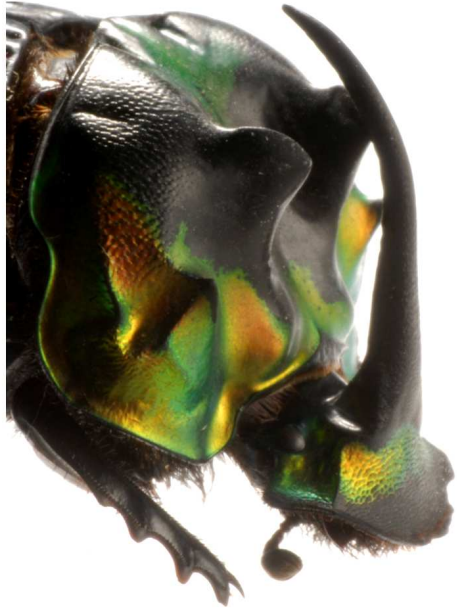


evolvability



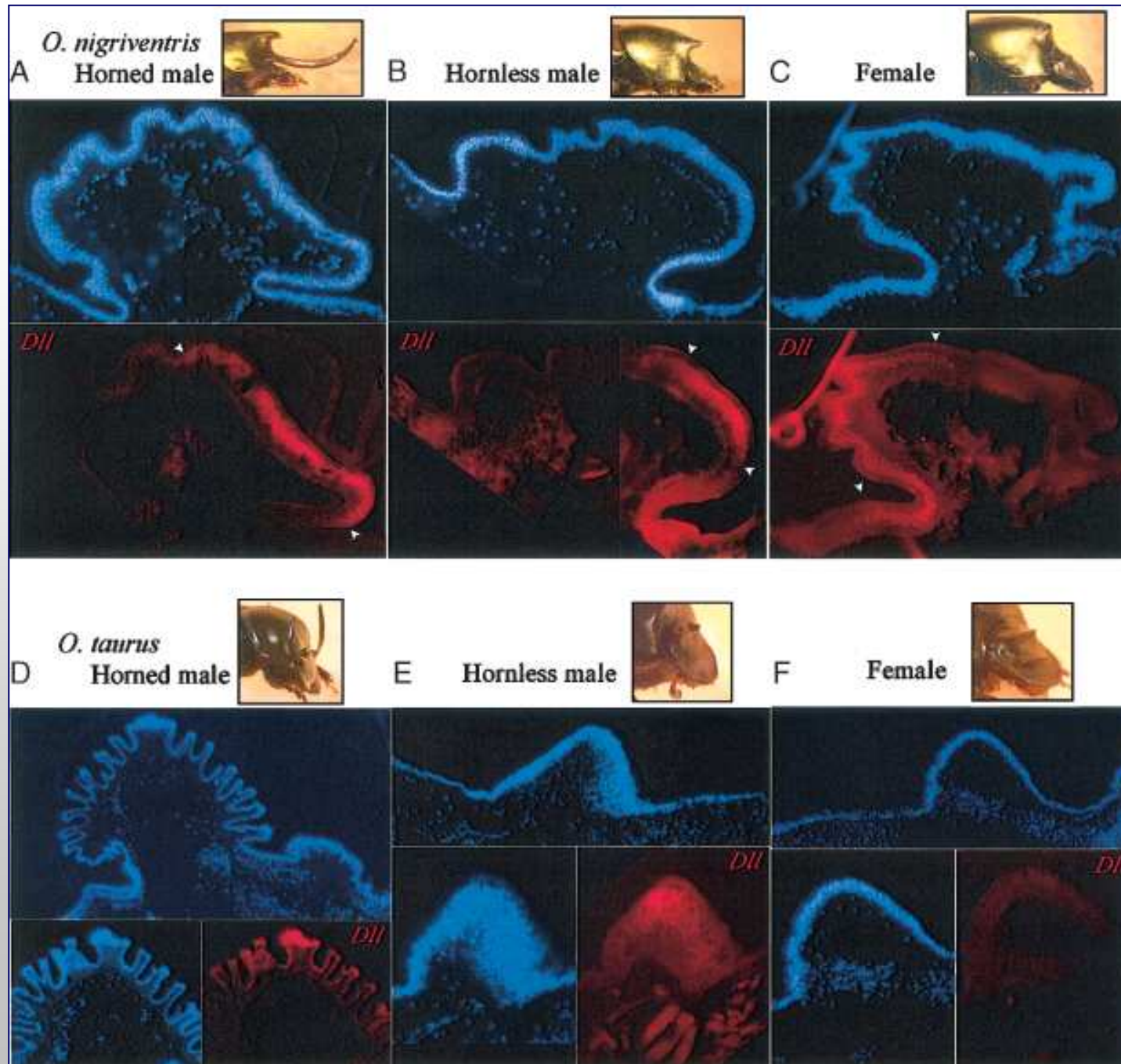


Abzhanov et al. 2004



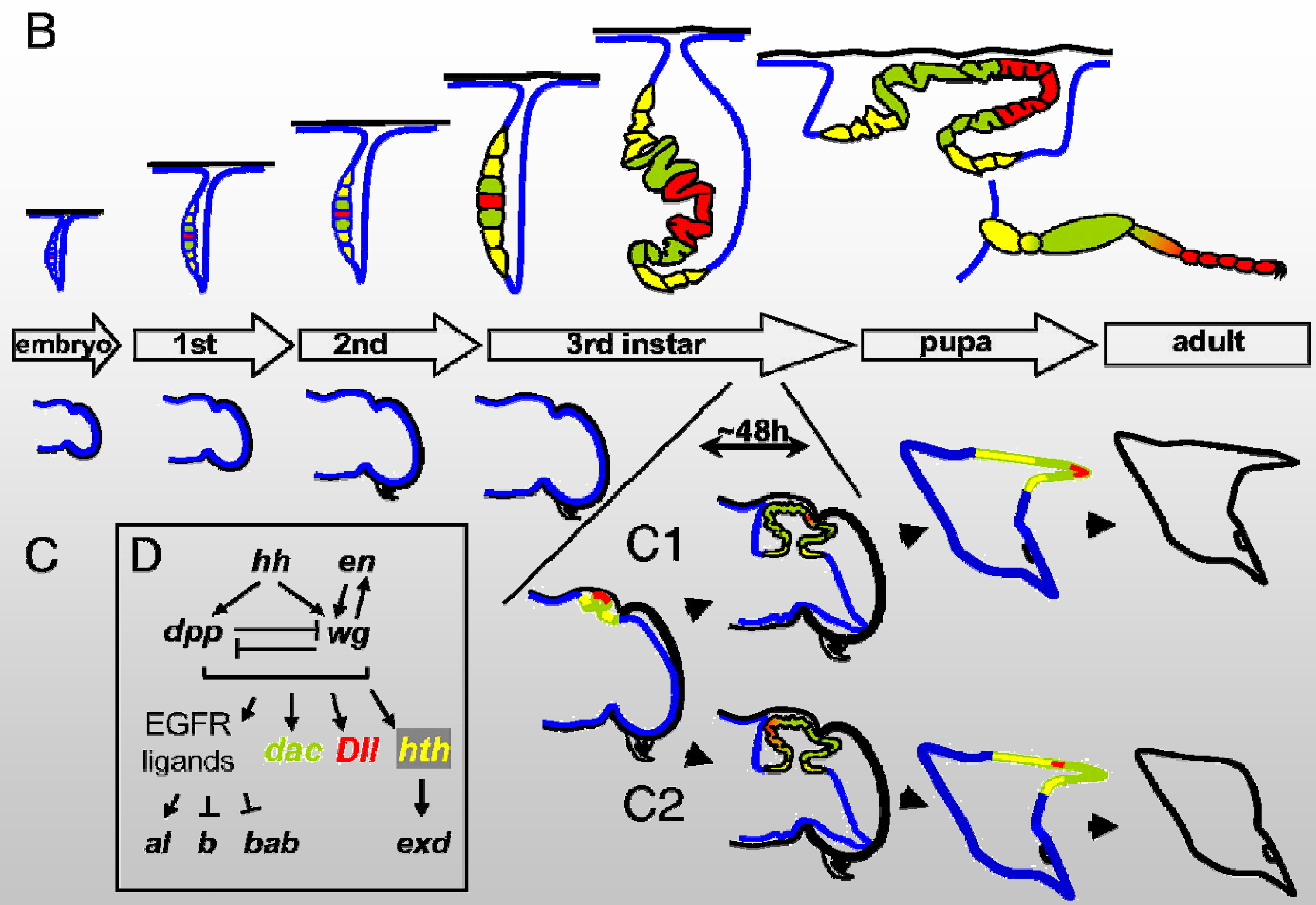
co-option



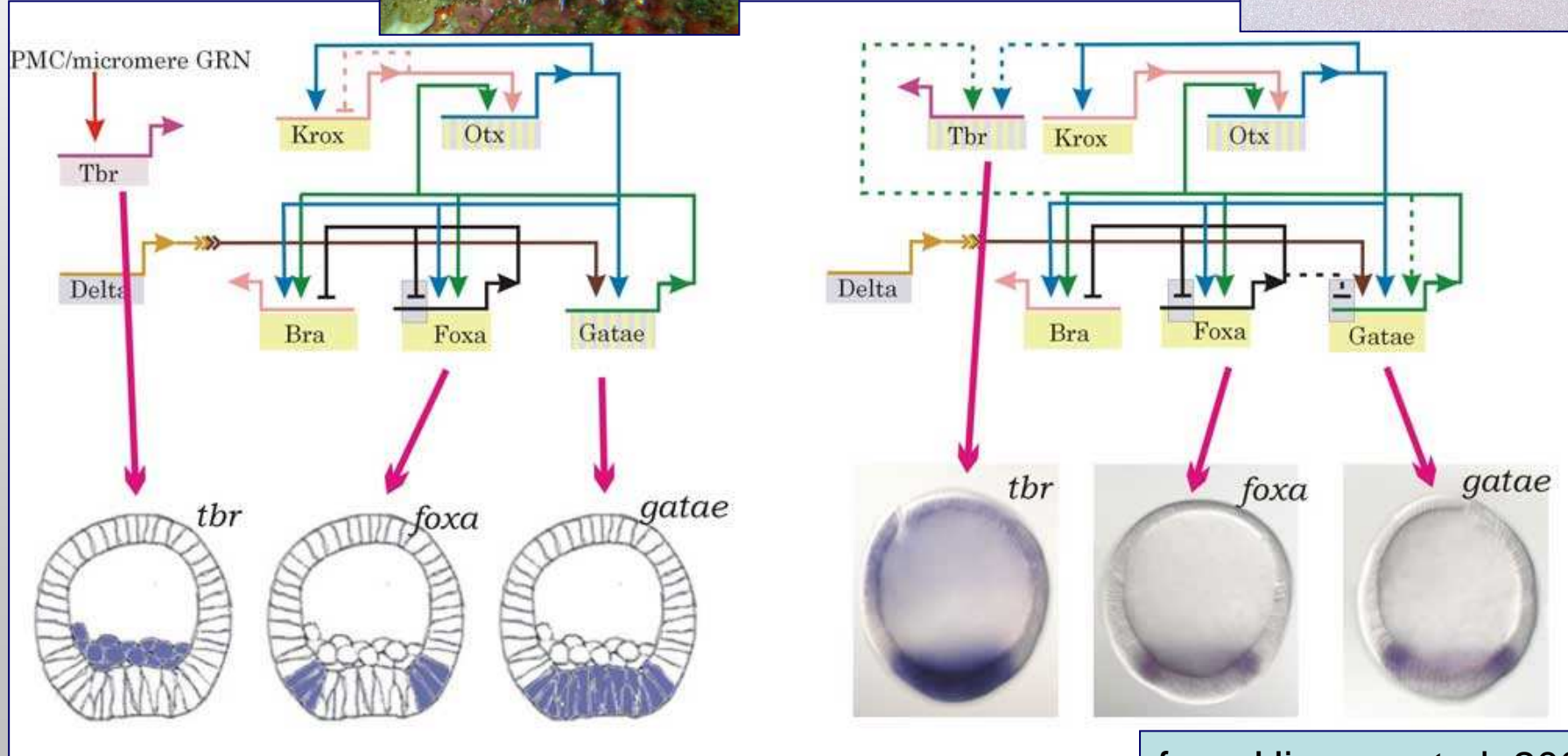


L
E
G

H
O
R
N



regulatory gene network evolution



from Hinman et al. 2007

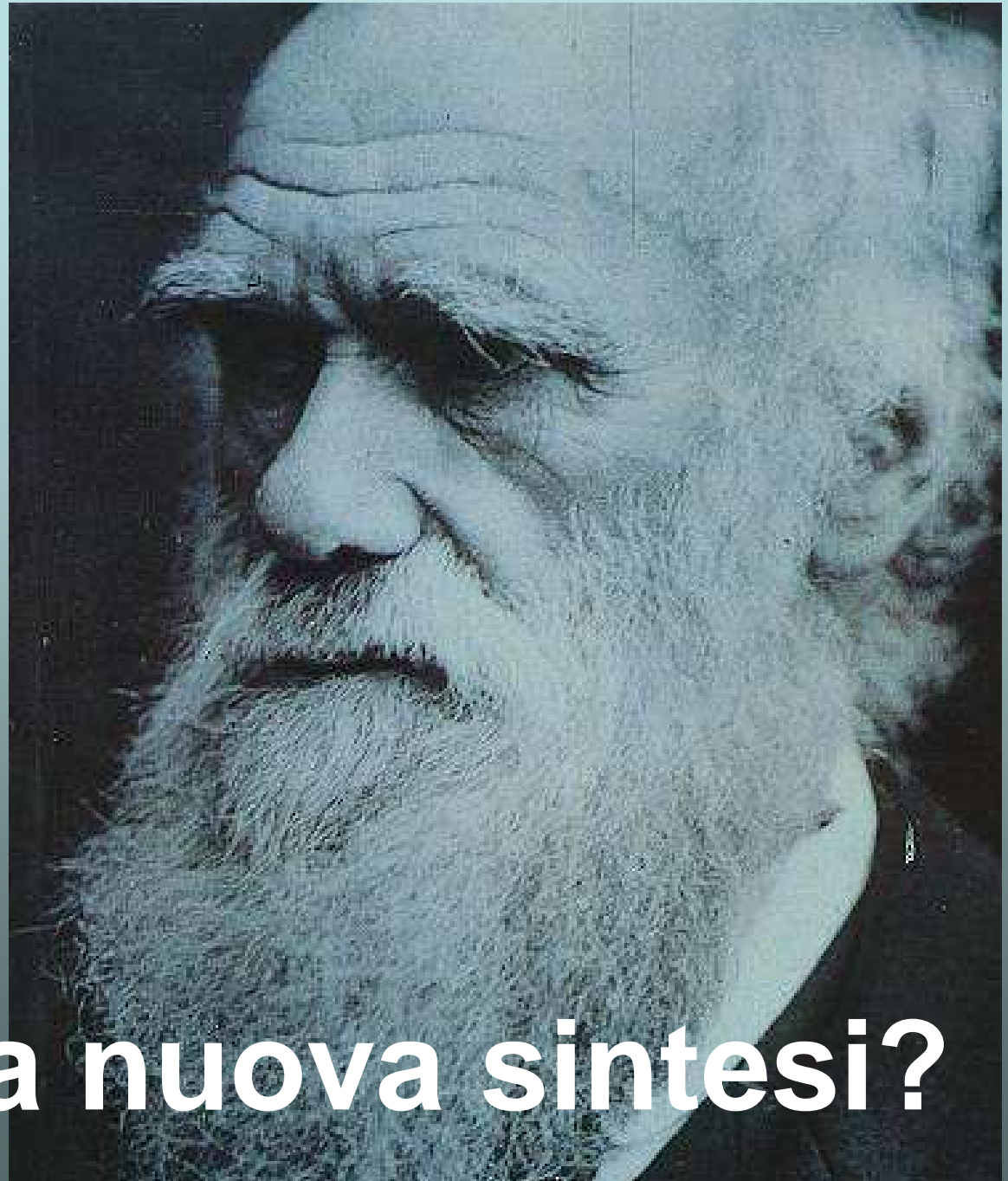
does it all matter?

“a study of the effects of genes during development is as essential for an understanding of evolution as are the study of mutation and that of selection”

J. S. Huxley 1942

“a theory of evolution requires, as some part of it, a theory of development”

C. H. Waddington 1975



verso una nuova sintesi?