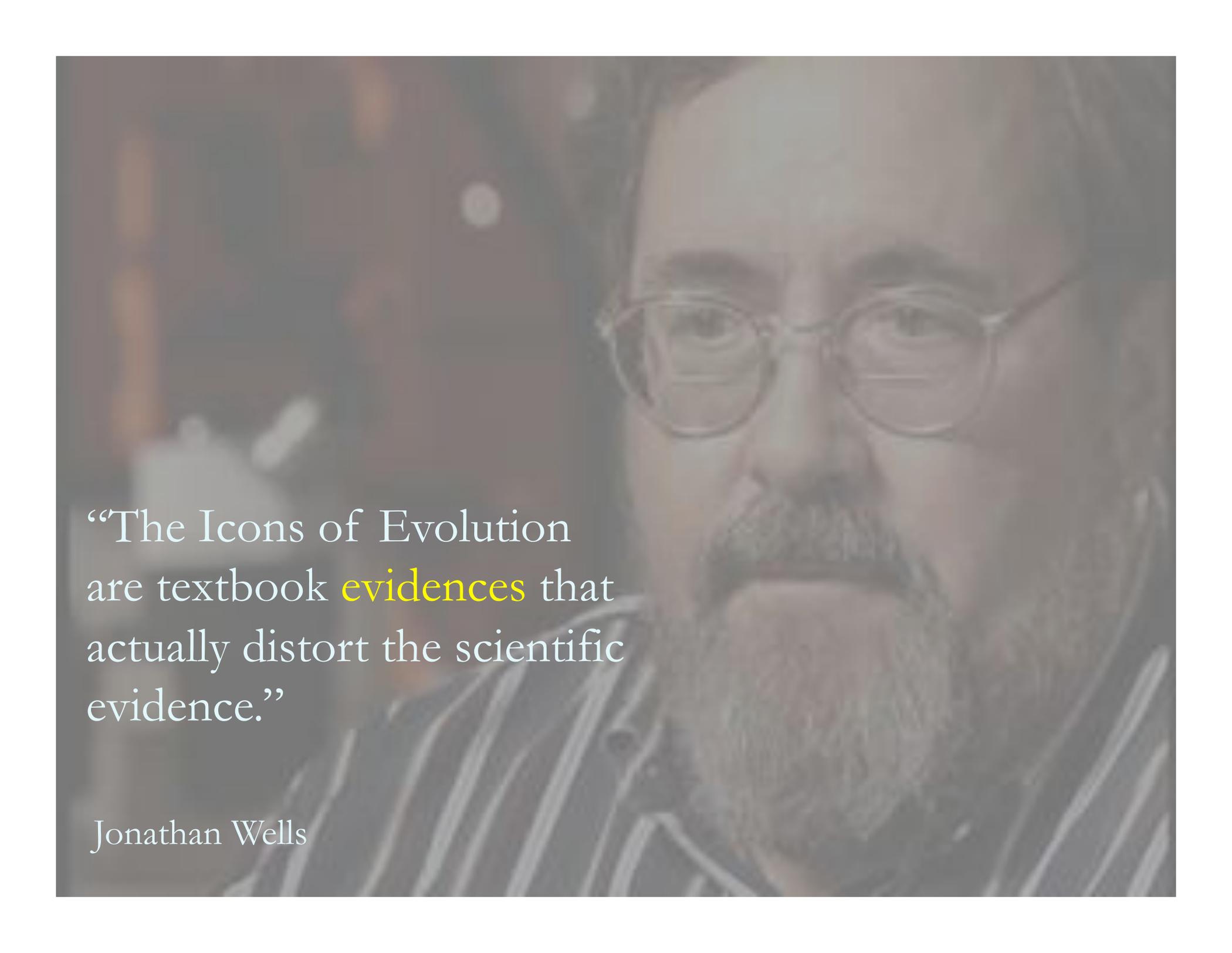


i·con ('I-"kän) *noun*:
an object of uncritical devotion



The “Icons of Evolution”



“The Icons of Evolution
are textbook **evidences** that
actually distort the scientific
evidence.”

Jonathan Wells

“Evidences”

“Now, this bill was of course drafted by a theologian or somebody versed in apologetics. There's an amusing bit of 'evidence' on that subject in the very language of the bill. The bill keeps using – the act keeps using the term 'evidences' in the plural. We lawyers never speak of 'evidences' in the plural; we speak of 'evidence' – the singular. I got nagged by it and I looked it up the other day. And of course the only dictionary reference to 'evidences' is to Christian apologetics – the 'evidences' for Christianity.”

Jay Topkis, *Edwards v. Aguillard* (12/10/86)

John Corrigan “Jonathan” Wells

- ▶ 1976 – Enters Unification Theological Seminary
- ▶ 1978 – Graduates with Masters in Religious Education (UTS); Begins Ph.D. in religious studies (Yale)
- ▶ 1986 – Awarded Ph.D.
- ▶ 1988 – Publishes book on Charles Hodge.



“Father's [Sun Myung Moon's] words, my studies, and my prayers convinced me that I should devote my life to destroying Darwinism, just as many of my fellow Unificationists had already devoted their lives to destroying Marxism. When Father chose me (along with about a dozen other seminary graduates) to enter a Ph.D. program in 1978, I welcomed the opportunity to prepare myself for battle.”



Sun Myung Moon



- ▶ Founder of Unification Church
- ▶ Self-proclaimed Second Coming of Christ and “Saviour”
- ▶ Owner of
 - *Washington Times*
 - *United Press International* (UPI)
 - *News World Communications*
- ▶ “This small church has played a pivotal role in the development of the conservative movement ... [and] the Christian Right” (Frederick Clarkson)
- ▶ “Moon has poured hundreds of millions of dollars into a plan to replace American democracy with a Unification theocracy.” (Barbara Forrest & Paul Gross).

Jonathan Wells

- ▶ 1989 – Begins Ph.D. in molecular and cellular biology (Berkeley, Gerhart lab)
- ▶ 1994 – Receives Ph.D. for “A confocal microscopy study of microtubule arrays involved in cortical rotation during the first cell cycle of *Xenopus* embryos”
- ▶ 1996 – Begins “postdoc” at Berkeley (Strohman lab)
 - Actually visiting scholar “working mostly at home, writing and doing library research” (Wells 1/99)
 - Position arranged by Phil Johnson and funded from unknown outside sources (Unification Church?).
- ▶ 1999 – Leaves Berkeley for ...

The Discovery Institute

- ▶ 1999 – Research Fellow
- ▶ 2000 – Senior Fellow
- ▶ 2000 – *Icons of Evolution* (Regnery)
- ▶ 2006 – *Politically Incorrect Guide to Darwinism and Intelligent Design* (Regnery)
- ▶ 2007 – *The Design of Life* (Foundation for Thought and Ethics)

Publications

- ▶ Larabell, Rowning, Wells, Wu & Gerhart, “Confocal microscopy analysis of living *Xenopus* eggs and the mechanism of cortical rotation” *Development* (1996).
- ▶ Rowning, Wells, Wu, Gerhart, Moon & Larabell, “Microtubule-mediated transport of organelles and localization of B-catenin to the future dorsal side of *Xenopus* eggs” *Proceedings of the National Academy of Sciences USA* (1997).
- ▶ Wells, “Do Centrioles Generate a Polar Ejection Force?” *Revista Di Biologia* (2005).

"Some a political threat, but this book" — Ben Carson



The Politically Incorrect Guide™ to **Darwinism and Intelligent Design**

© 2005 by Jonathan Wells, Ph.D. ISBN: 0-9752867-0-0

You think you know about Darwinism and
Intelligent Design. But did you know:

- 1 The famous "ape to man" species died is based on guesswork, not evidence
- 1 Intelligent design is based on scientific evidence, not religious belief
- 1 What many public schools teach about Darwinism is based on known falsehoods
- 1 Scientists at major universities can find good evidence for intelligent design
- 1 Scientists who question Darwinism are punished by public institutions using your tax dollars

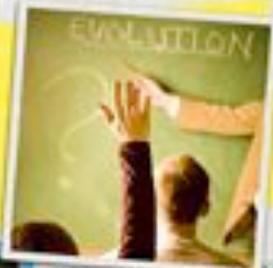
Jonathan Wells, Ph.D.



THE P.I.G.TM

The Politically Incorrect Guide to Darwinism and Intelligent Design

10 Serious Questions YOU MUST ASK!



ALL NEW

IS THE EVOLVING APE-BOY REAL?

CAUGHT IN PUBLIC



THEN

BOOKS DARWINISTS DON'T WANT YOU TO READ

WEBSITES THEY DON'T WANT YOU TO SEE

IT'S NO JOKE!



GET YOUR FACTS HERE

whose are **REAL**
whose are **FAKE**



"Clear beyond measure." —David Berlinski,
author of *A Tour of The Calculus*



The Politically Incorrect Guide™ to MATH

A part of the bestselling P.I.C. series

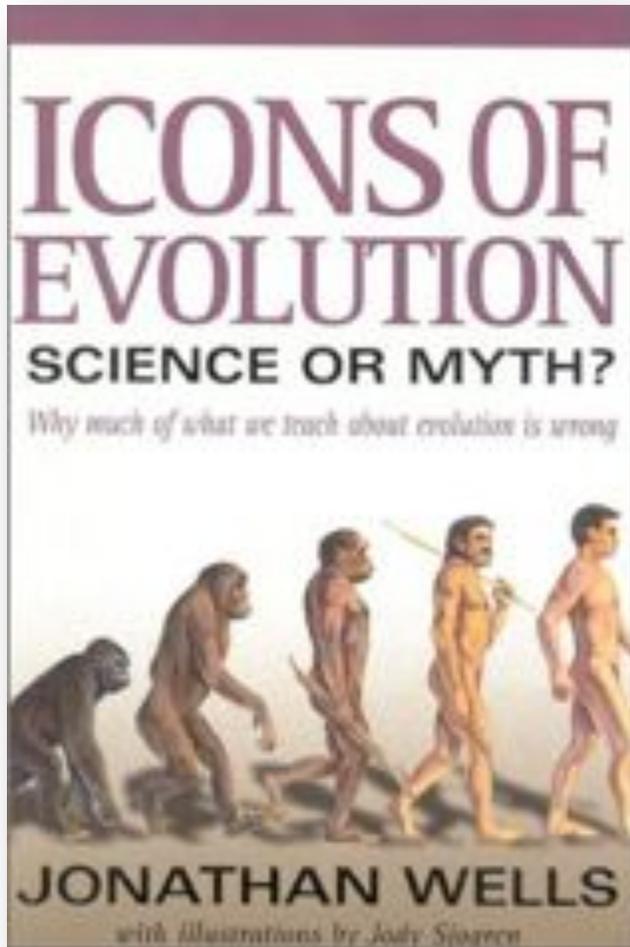
What your math teacher didn't
want you to know:

- Proofs are often unnecessary for real math
- Numerology is a fruitful research paradigm used by a growing number of scientists and mathematicians from all over the world
- Many prestigious mathematicians are beginning to question the relevance of Pythagoras' Theorem in geometry and are being censured by Pythagorists in government positions
- $0.9999\dots$ isn't actually equal to one
- $3997^2 = 4001^2 + 4017^2$

William Dembski, Ph.D.



Icons of Evolution



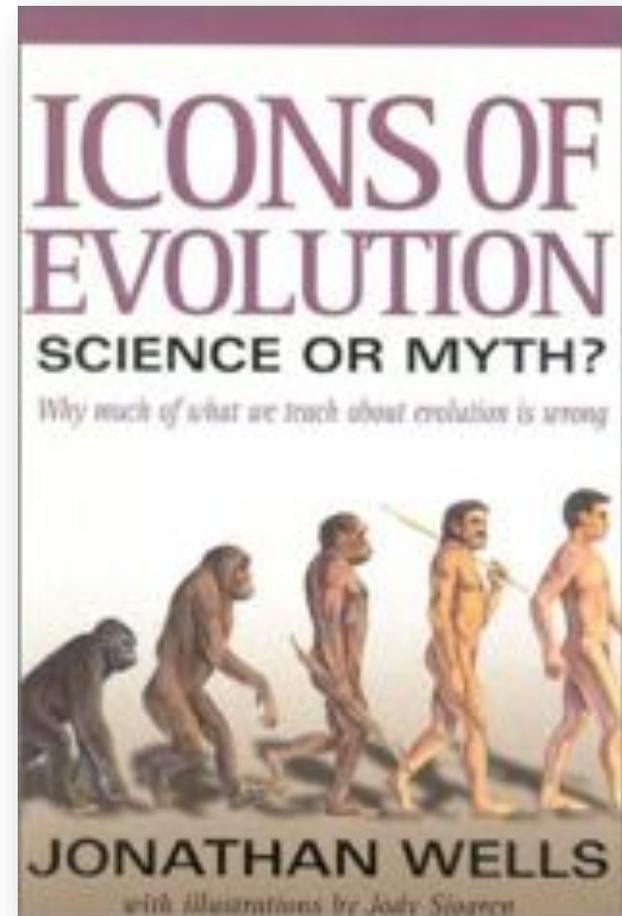
- ▶ High school textbook examples of evolution are full of errors ...
- ▶ This are the **best** evidences that **Darwinists** have ...
- ▶ Therefore, there is **no** real evidence for **evolution**.
- ▶ The icons persist because the evolutionists need to brainwash the students to maintain their cultural hegemony.

Jonathan Wells

“If the icons of evolution are supposed to be our **best evidence** for **Darwin’s theory**, and all of them are **false or misleading**, what does that tell us about the theory? Is it science, or **myth?**” (*Icons of Evolution* p. 8)

The “Icons of Evolution”

- ▶ Miller–Urey Experiment
- ▶ Universal Tree of Life
- ▶ Homology
- ▶ Vertebrate Embryos
- ▶ Archaeopteryx
- ▶ Peppered Moths
- ▶ Darwin’s Finches
- ▶ Fossil Horses
- ▶ Mutant Fruit Flies
- ▶ Human Origins



“[S]tudents should be warned, wherever necessary, that their books misrepresent the truth. Warning labels such as those below can be used for this purpose” (259)

WARNING: The Miller-Urey experiment probably did not simulate the earth's early atmosphere, and it does not explain the origin of life.

WARNING: Darwin's universal tree of life is inconsistent with the fossil record of the Cambrian explosion and with recent molecular evidence.

WARNING: If homology is defined as similarity due to common ancestry, it cannot be used as evidence for common ancestry; its causes are unknown.

WARNING: These pictures make vertebrate embryos look more similar than they really are; in their earliest stages they are quite different.

WARNING: The supposed dinosaur ancestors of Archaeopteryx appeared long after it, and modern birds are probably not descended from it.

WARNING: Peppered moths do not rest on tree trunks in the wild; Kettlewell's experiments were flawed, and these photos were staged.

WARNING: These finches did not inspire Darwin with the idea of evolution, and natural selection on their beaks produced no long-term change.

WARNING: Four-winged fruit flies must be artificially bred, and their extra wings are useless; these mutations are not raw materials for evolution.

WARNING: Evidence from fossil horses does not justify the claim that evolution was undirected, which is philosophical rather than empirical.

WARNING: The subject of human origins is very controversial, and most claims rest on little evidence; drawings of "ancestors" are hypothetical.

Michael Behe

“Wells demonstrates with stunning clarity that the textbook examples Darwinists themselves choose as the **pillars of their theory** are false or misleading. What does this imply about their scientific standards? **Why should anyone now believe any of their other examples?**”



Phillip E. Johnson

“This is one of the most important books ever written about the evolution controversy. It shows how devotion to the ideology of Darwinism has lead to **textbooks which are *full of misinformation.***”

<http://www.iconsofevolution.com/press/>



Jonathan Wells

“[T]he icons of evolution have been advertised for years as the **best evidence we have** ... Many of these biologists believe in Darwinian evolution because that’s what they learned from their textbooks.” [p. 229]

“[D]ogmatic promoters of Darwinism did not see themselves as deceivers. Yet they seriously **distorted** the evidence – often **knowingly**. If this is **fraud** when a stock promoter does it, what is it when a scientist does it?” [p. 234]

DISCOVERY
INSTITUTE

**AN EVALUATION
OF TEN RECENT
BIOLOGY TEXTBOOKS**

A REPORT FOR THE
CENTER FOR THE RENEWAL
OF SCIENCE AND CULTURE
BY SENIOR FELLOW DR. JONATHAN WELLS

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1400 15th Ave. South, WA, WA 98008
(206) 261-0000 (206) 261-0000 FAX
www.discovery.org www.dionysus.org

Examining
the “Icons”

Grading The Textbooks

TEXTBOOK	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
ICON										
<i>Miller-Urey</i>	D	D	F	F	D	F	D	F	F	F
<i>Darwin's tree of life</i>	F	D	D	F	F	F	F	F	F	F
<i>Vertabrate limb homology</i>	D	D	D	D	F	F	D	F	D	D
<i>Haeckel's embryos</i>	F	D	F	F	F	D	F	F	F	F
<i>Archaeopteryx</i>	C	B	D	D	D	F	D	F	F	F
<i>Peppered moths</i>	X	n/a	D	F	F	F	F	D	F	F
<i>Darwin's finches</i>	F	D	D	X	D	F	F	D	F	F
OVERALL GRADE	D -	D +	D -	F						

SPECIFIC EVALUATION CRITERION

In general, an "A" requires full disclosure of the truth, discussion of relevant scientific controversies, and a recognition that Darwin's theory -- like all scientific theories -- might have to be revised or discarded if it doesn't fit the facts. An "F" indicates that the textbook uncritically relies on logical fallacy, dogmatically treats a theory as an unquestionable fact, or blatantly misrepresents published scientific evidence.

Cambrian Explosion

A = explicitly treats universal common ancestry as a theory rather than a fact; clearly points out that the "top-down" Cambrian explosion contradicts the "bottom-up" pattern of Darwinian evolution, and acknowledges the theoretical possibility of multiple origins and separate lines of descent; also mentions problems for universal common ancestry posed by recent evidence from molecular phylogeny.

B = explicitly treats universal common ancestry as a theory rather than a fact; clearly points out that the "top-down" Cambrian explosion contradicts the "bottom-up" pattern of Darwinian evolution, and acknowledges the theoretical possibility of multiple origins and separate lines of descent; but does not mention recent problems in molecular phylogeny.

C = explicitly treats universal common ancestry as a theory rather than a fact; discusses the Cambrian explosion as a problem for Darwinian evolution, but does not mention the theoretical possibility of multiple origins and separate lines of descent.

D = assumes the truth of universal common ancestry without questioning it (and may call it a "fact"); mentions the Cambrian explosion in the body of the text (briefly mentioning it in a note at the end of the chapter, without explaining what it is, is not sufficient), but does not discuss the problem it poses for Darwinian evolution.

F = assumes the truth of universal common ancestry without questioning it (and may call it a "fact"); does not even mention the Cambrian explosion.

Alan Gishlick's Analysis of Well's "Icons" in Context

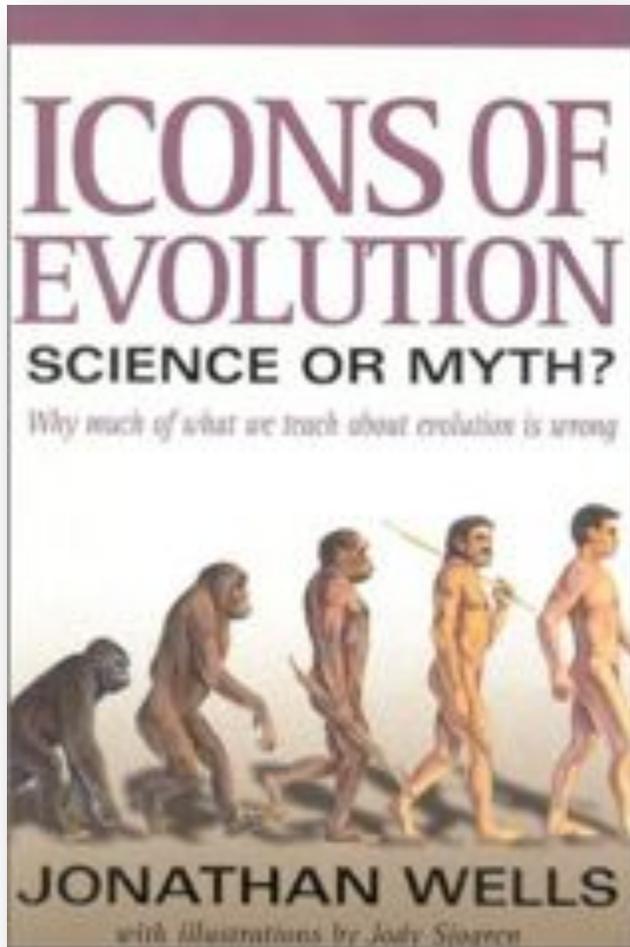
Text (pages)	Origin of Life	Homol.	Haeckel	Archae.	Tree of Life	Finches	Moths	Total
A	0.50	1.00	0.25	0.10	0.75	0.50	1.50	4.60
B	1.00	1.00	0.25	0.33	0	0.75	1.00	4.33
C	2.00	1.00	0.50	0.50	1.00	0.10	0.33	5.43
D	0.50	1.00	1.00	0.33	1.00	2.50	1.50	5.58
E	0.25	0.25	0.50	1.00	0	0.50	0.75	3.25
F	0.25	1.00	0.50	0.50	1.00	0.25	0.75	4.25
G	0.25	0.50	0.25	0.25	0	0.75	1.00	3.00
H	0.66	0.25	0.25	1.00	0	2.00	2.00	6.16
I	1.00	0.75	0.75	0.75	0	0.25	0	3.50
J	1.33	2.00	1.50*	1.50	1.00	2.00	0.25	8.58

* historical discussion

Alan Gishlick's Analysis of Well's "Icons" in Context

Text	Pages	Evolution	% of Total	"Icons"	% of Evol.
A	944	44	4.70	4.60	10.40
B	895	99	11.06	4.33	4.37
C	1119	103	9.20	5.43	5.27
D	1214	150	12.36	5.58	3.72
E	920	143	15.54	3.25	2.28
F	1175	200	17.02	4.25	2.13
G	944	109	11.54	3.00	2.75
H	1284	226	17.60	6.16	2.73
I	1175	300	25.53	3.50	1.17
J	761	761	100.00	8.58	1.13

Well's “Icons” in Context



- ▶ No textbook examined presents the “icons” as the “best evidences” for evolution.
- ▶ The “icons” are discussed in relation to evolutionary **concepts** (e.g. selection, adaptive radiation, importance of developmental processes) rather than as **evidence**.

WARNING: The Miller-Urey experiment probably did not simulate the early atmosphere, and it does not explain the origin of life.

Not an issue for evolutionary biology.

WARNING: The subject of human origins is very controversial, and the claims rest on little evidence; drawings of "ancestors" are hypothetical.

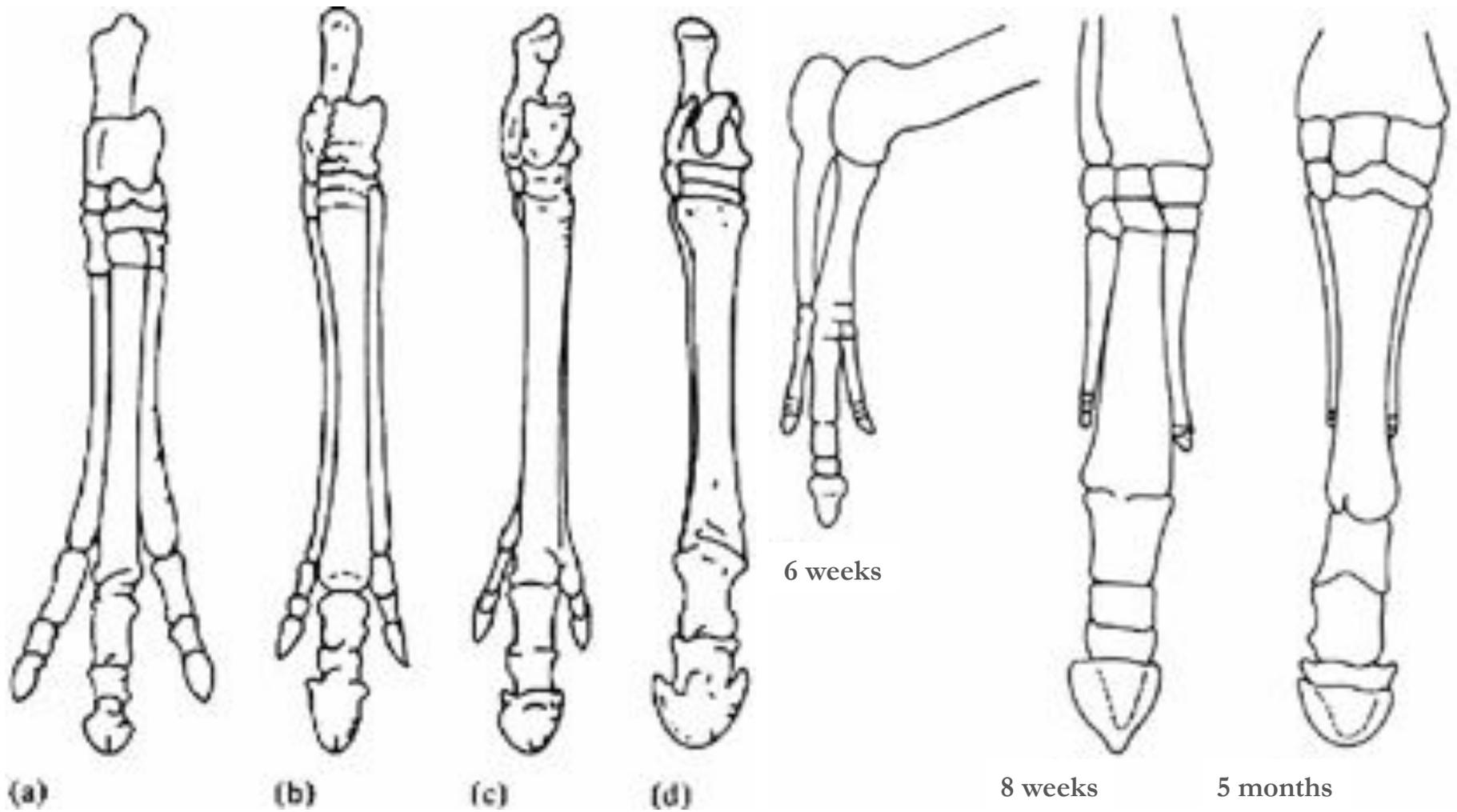
There is ample genetic and fossil evidence

WARNING: Four-winged fruit flies must be artificially bred, and their extra wings lack muscles; these disabled mutants are not raw materials for evolution.

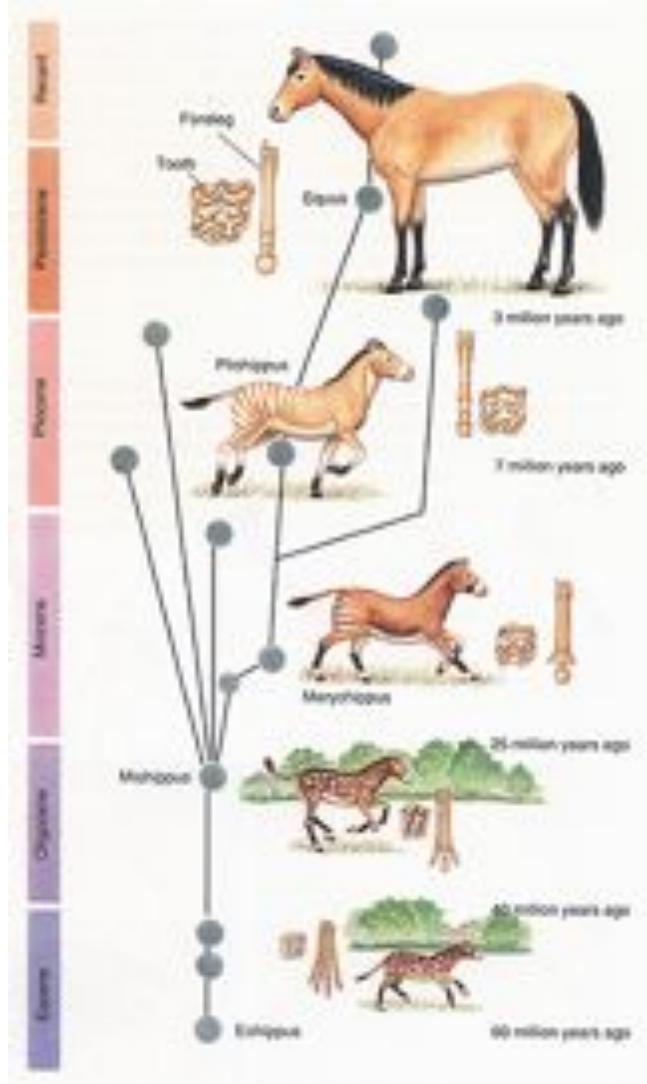
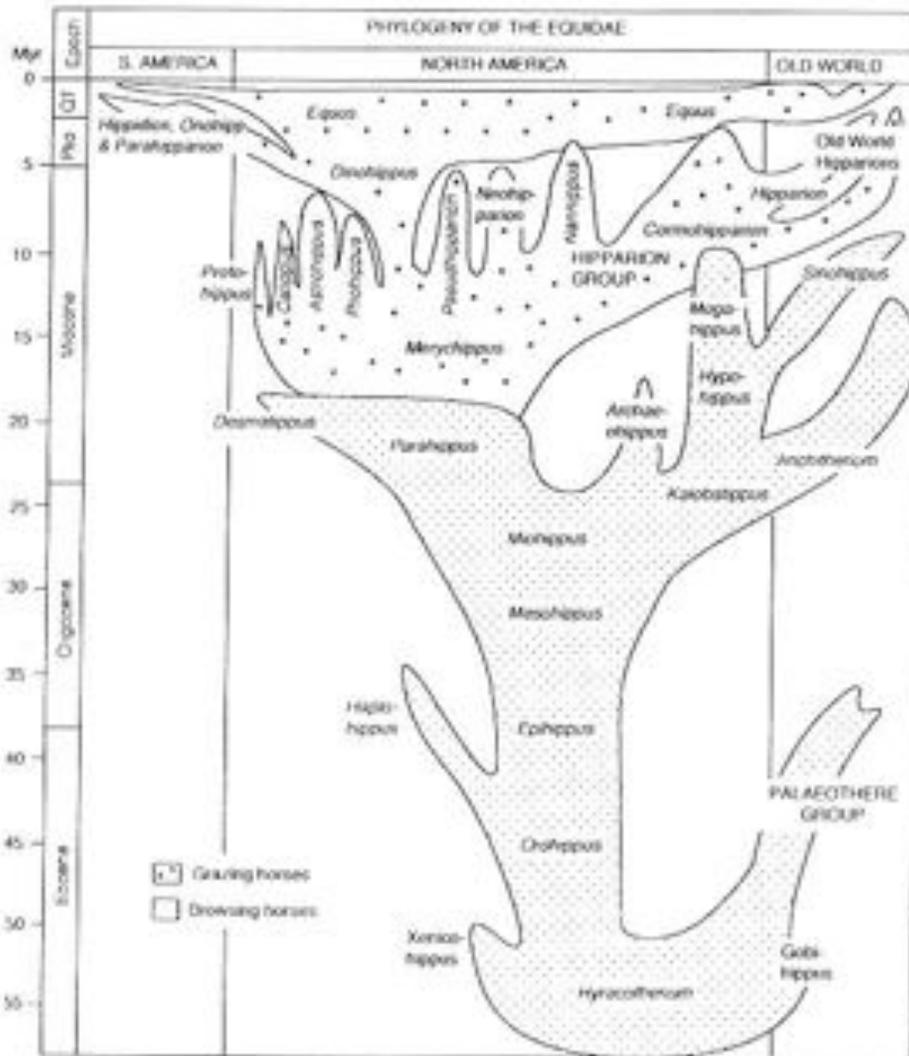




Horses Toes and Atavisms



WARNING: Evidence from fossil horses does not justify the claim that evolution was undirected, which is philosophical rather than empirical



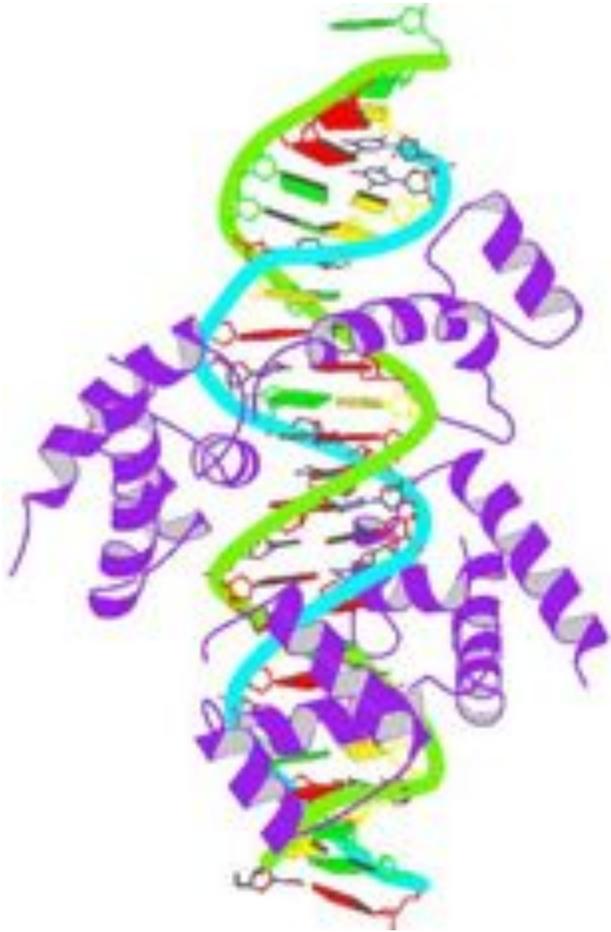
ubx – Ultrabithorax



Antennapedia (*antp*)

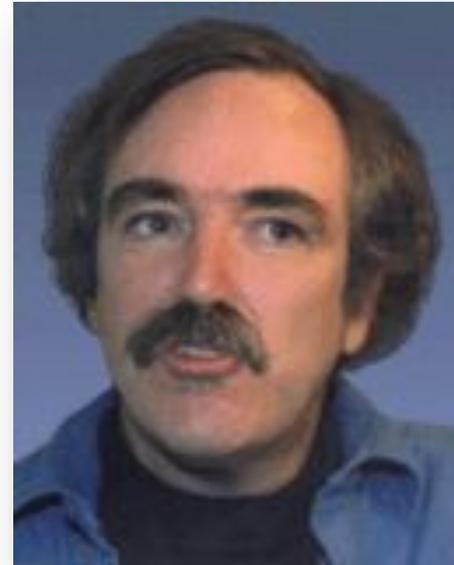


Homeotic Genes

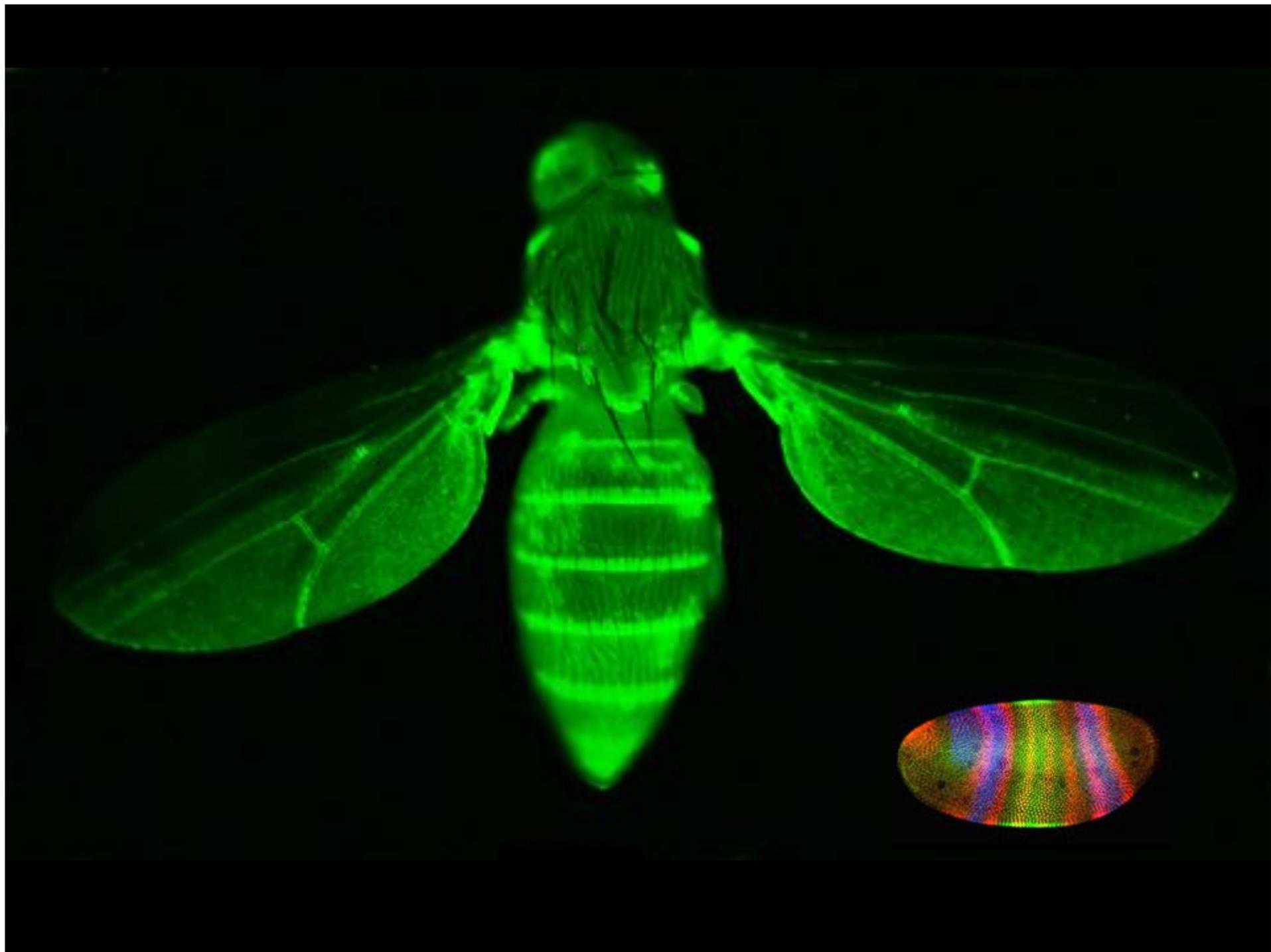


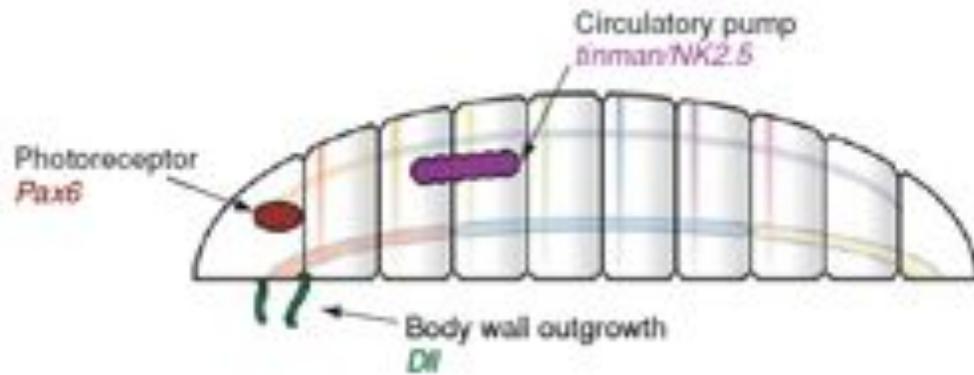
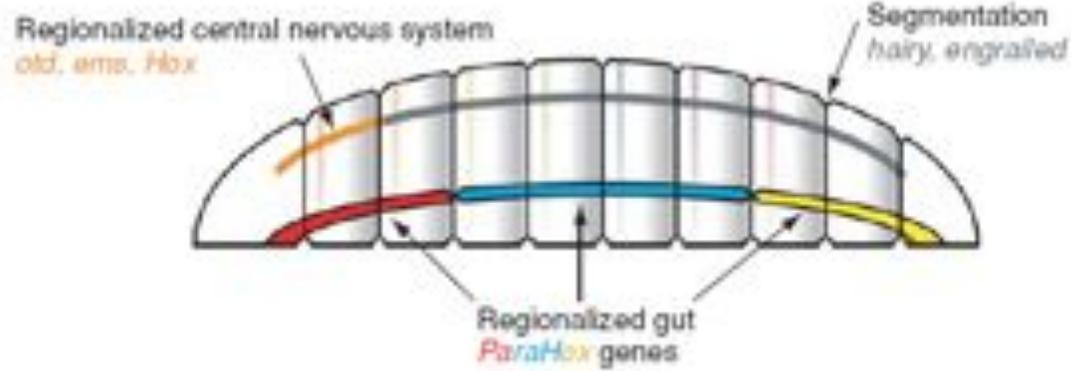
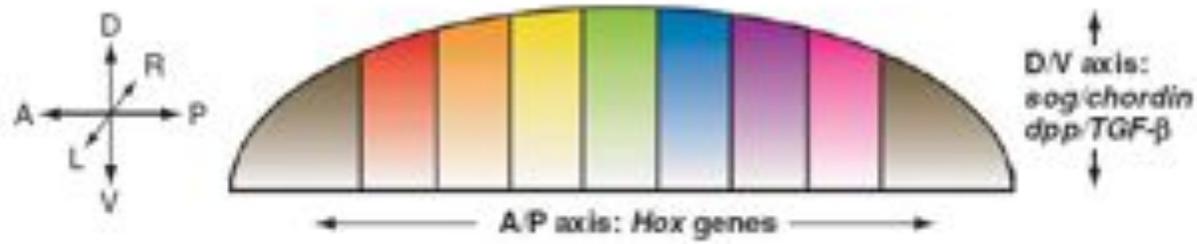
- ▶ **Homeobox**: 180 base pairs long sequence that encodes a protein domain (the *homeodomain*) which can bind DNA and thus controls gene expression.
- ▶ **Homeotic** genes (e.g. the *Hox* family) control patterning, segmentation, and development in organisms and are spatially arranged.
- ▶ These relatively conserved sequences are found throughout the animal kingdom and often duplicate (which allows rapid evolution)

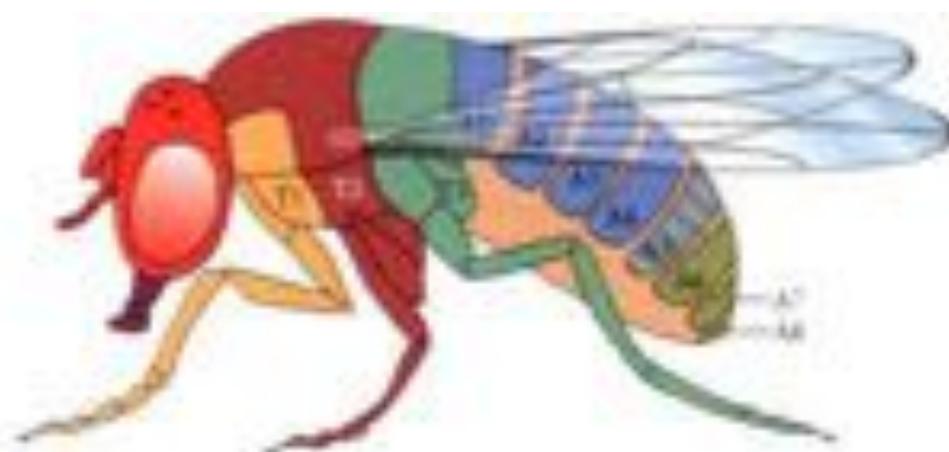
Nobel Prize, 1995



To Edward B. Lewis, Christiane Nüsslein-Volhard and Eric Wieschaus for their discoveries concerning “the genetic control of early embryonic development”.







Antennapedia complex

bithorax complex

lab Pb Dfd Scr Antp

Ubx abdA AbdB



labial (lab)



Deformed (Dfd)



Sex comb reduced (Scr)



Antennapedia (Antp)



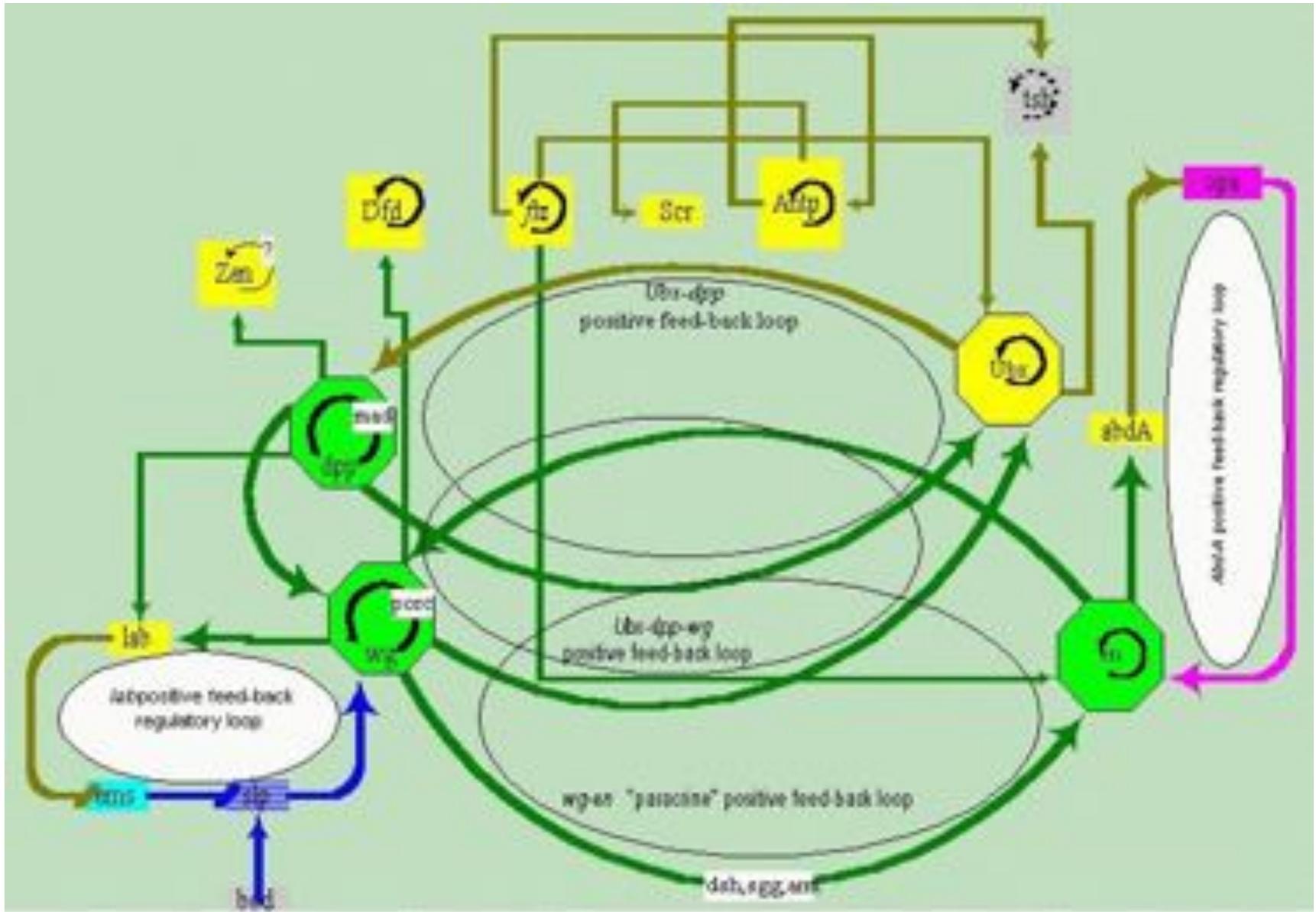
Ultrabithorax (Ubx)



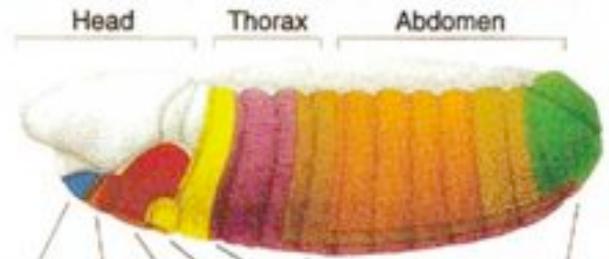
Abdominal B (AbdB)



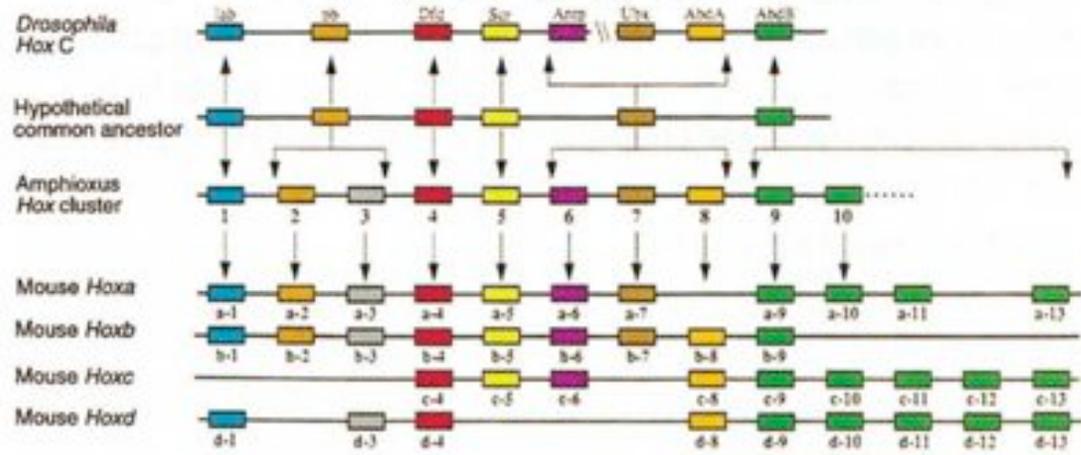
abdominal A (abdA)



Drosophila embryo



Urbilateria



Mouse embryo





pax / ey

eye
formation

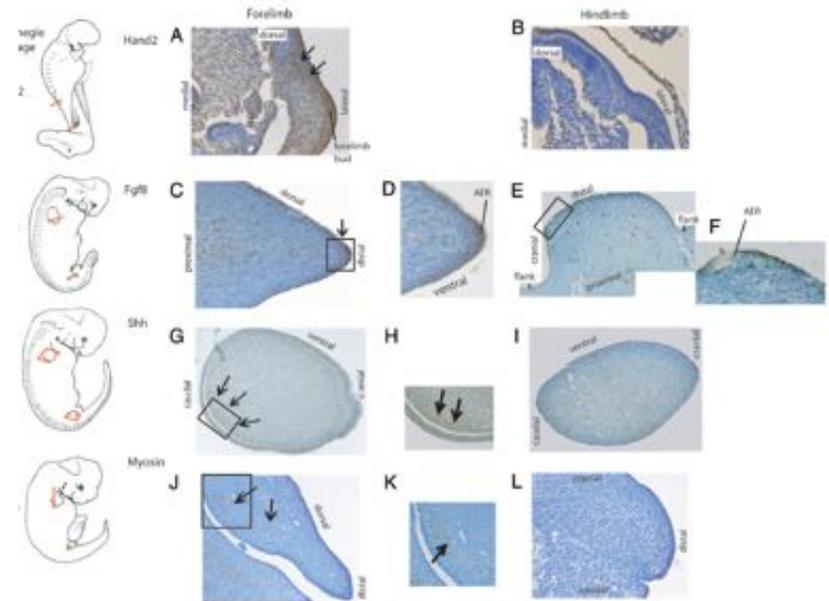
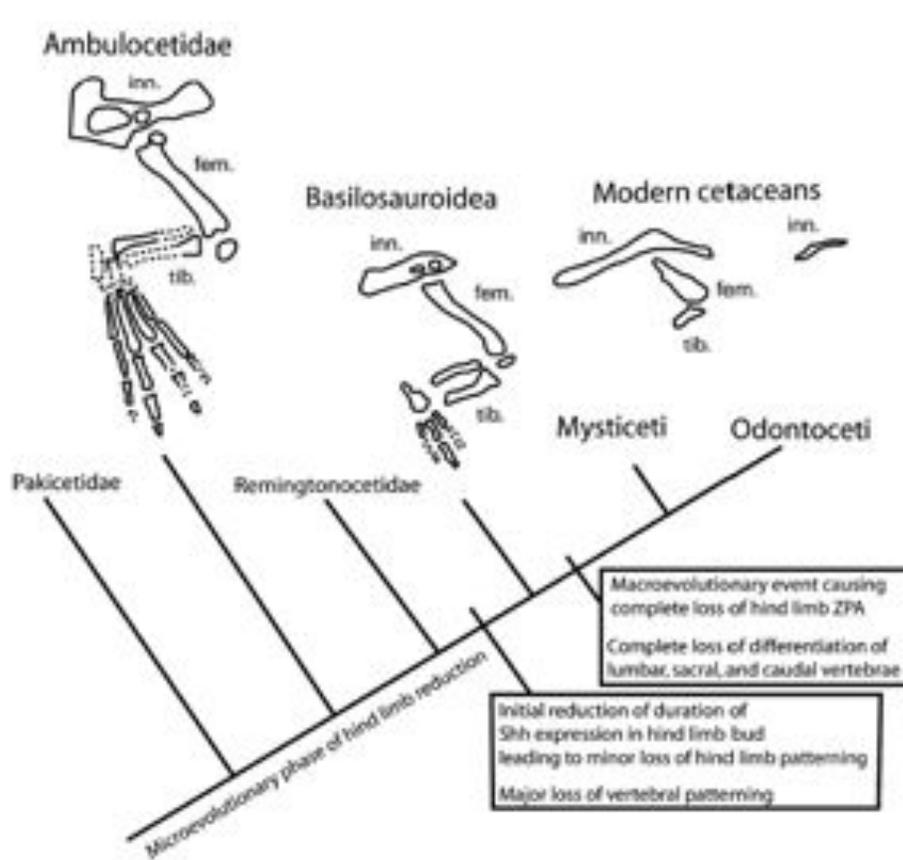


Developmental basis for hind-limb loss in dolphins and origin of the cetacean bodyplan

J. G. M. Thewissen^{1*}, M. J. Cohn², L. S. Stevens³, S. Bajpai⁴, J. Heyning⁵, and W. E. Horton, Jr.⁶

¹Department of Anatomy, Northeastern Ohio Universities College of Medicine, Rootstown, OH 44272; ²Departments of Zoology and Anatomy and Cell Biology, University of Florida, Gainesville, FL 32611; ³Department of Earth Sciences, Indian Institute of Technology, Roorkee-247 667, Uttaranchal, India; and ⁴Department of Mammalogy, Natural History Museum of Los Angeles County, Los Angeles, CA 90007

Communicated by Alan Walker, Pennsylvania State University, University Park, PA, April 10, 2006 (received for review November 16, 2005)



WARNING: Four-winged fruit flies must be artificially bred, and their extra wings lack muscles; these disabled mutants are not raw materials for evolution.

What do mutant four-winged fruit flies demonstrate?



*Libelloide
longicornis*



Diptera



Lepidoptera



Coleoptera

Evolution of *Hox*-independent forewing patterns and *Ubx*-regulated hindwing patterns



Four winged ancestor

WARNING: Darwin's universal tree of life is inconsistent with the fossil record of the **Cambrian explosion** and with recent molecular evidence.

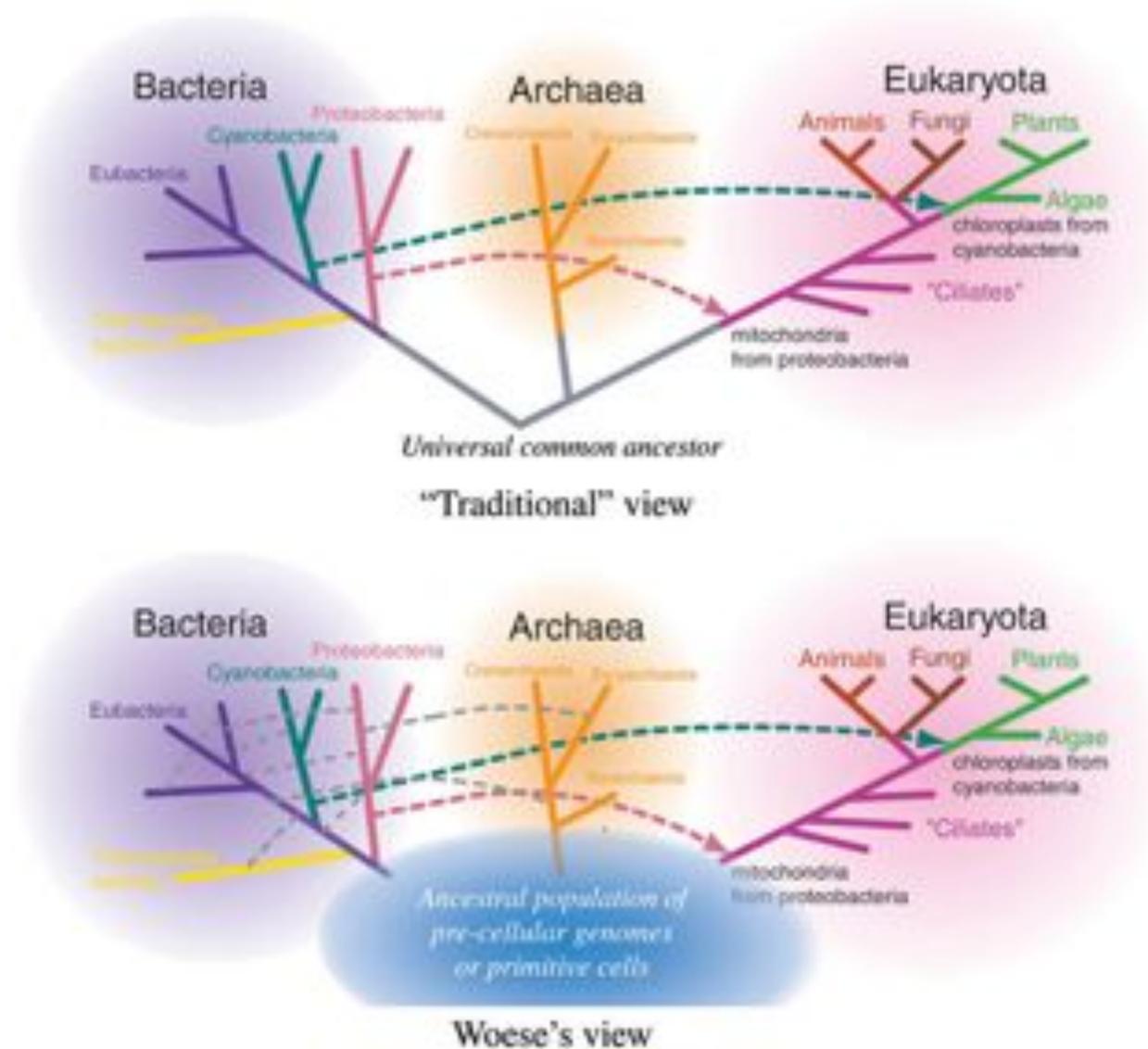
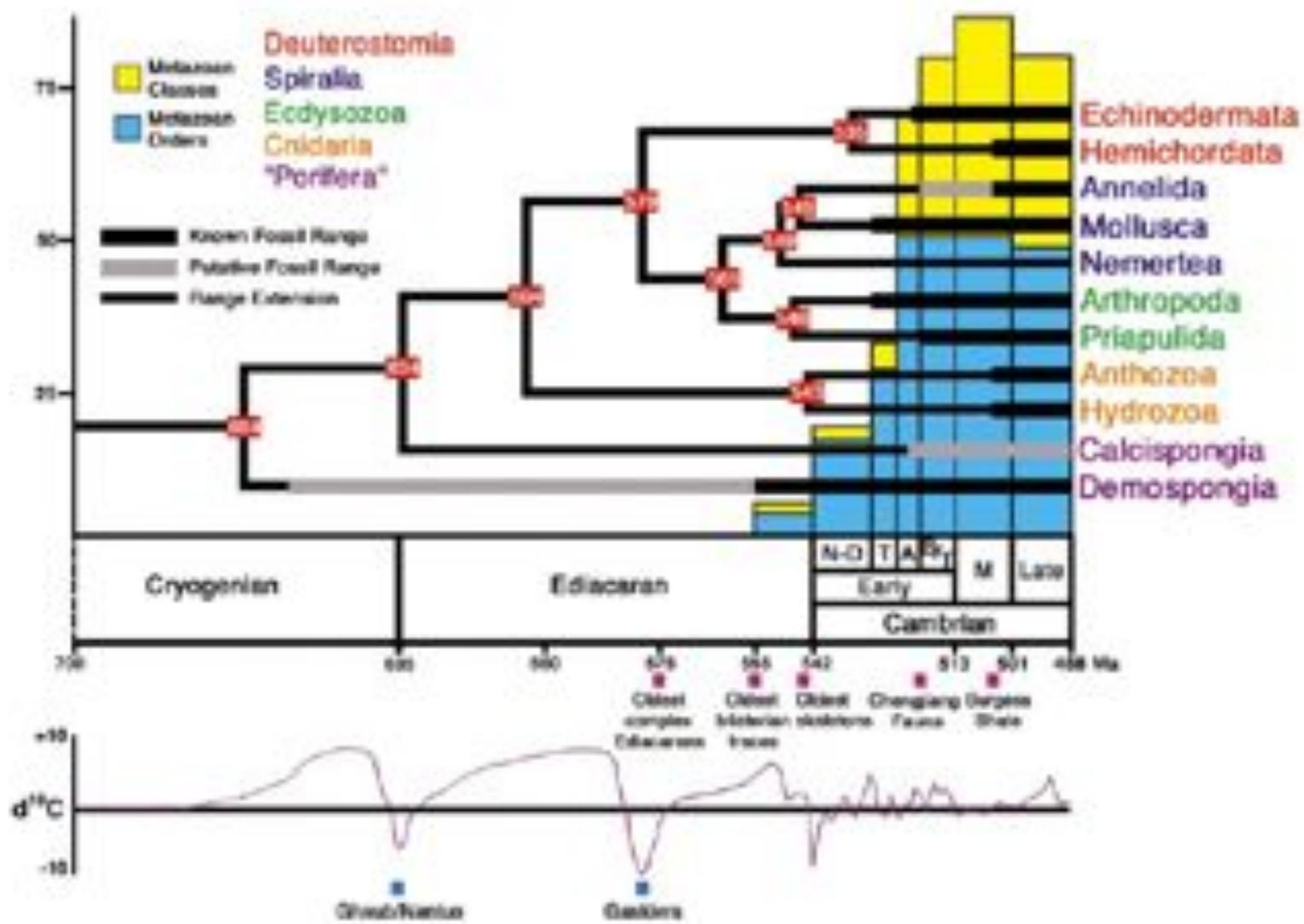


Figure 5. The traditional view of phylogenetic relationships for three "domains" of life compared to Woese's view. Note that the only difference is at the base, whether there is a single "root" for the tree. Regardless, eukaryotes, archaeans, and bacteria all share a common ancestor on both phylogenies, although Woese does posit a greater degree of lateral transfer for single celled organisms



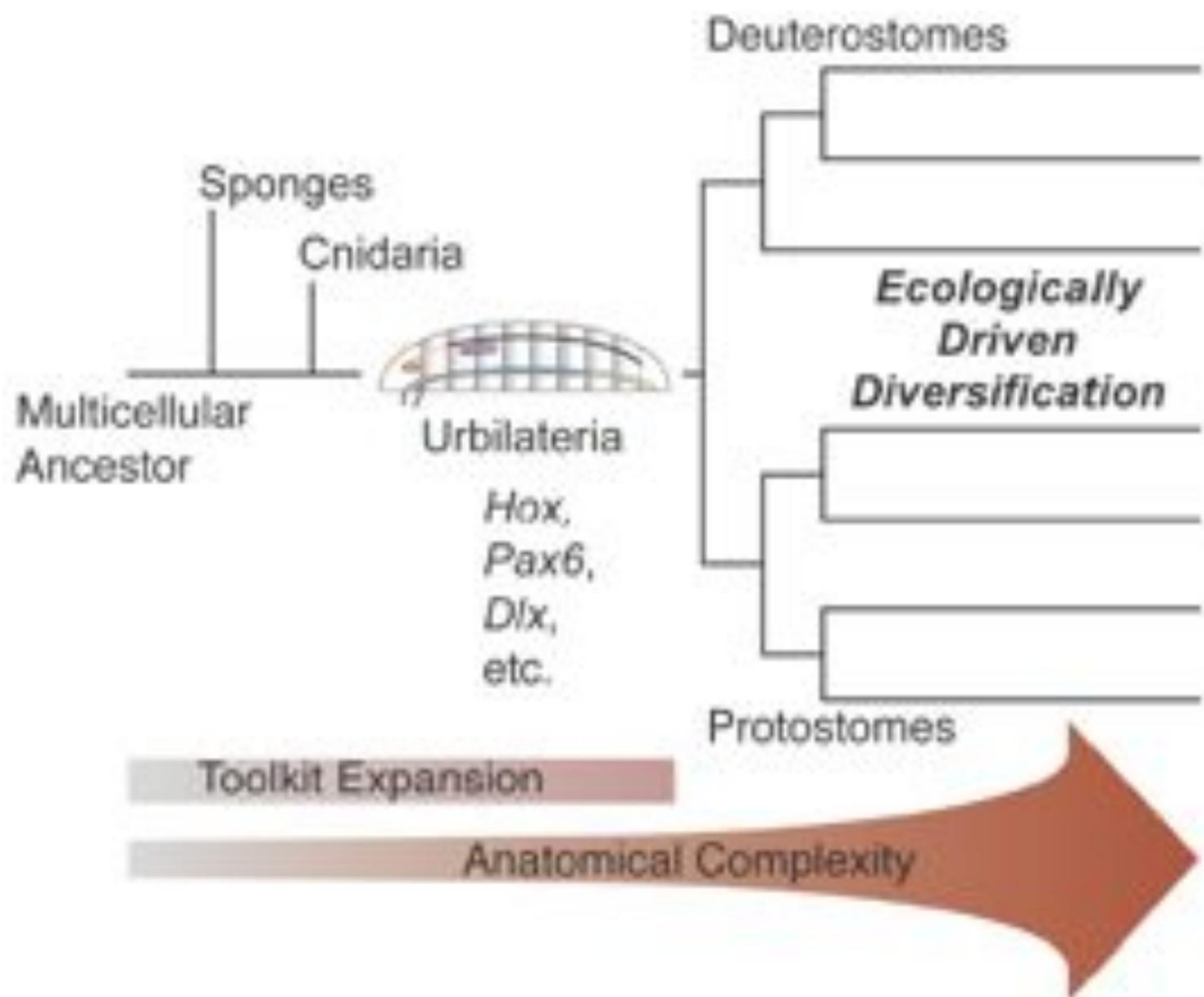
Cnidaria have
Antennapedia!

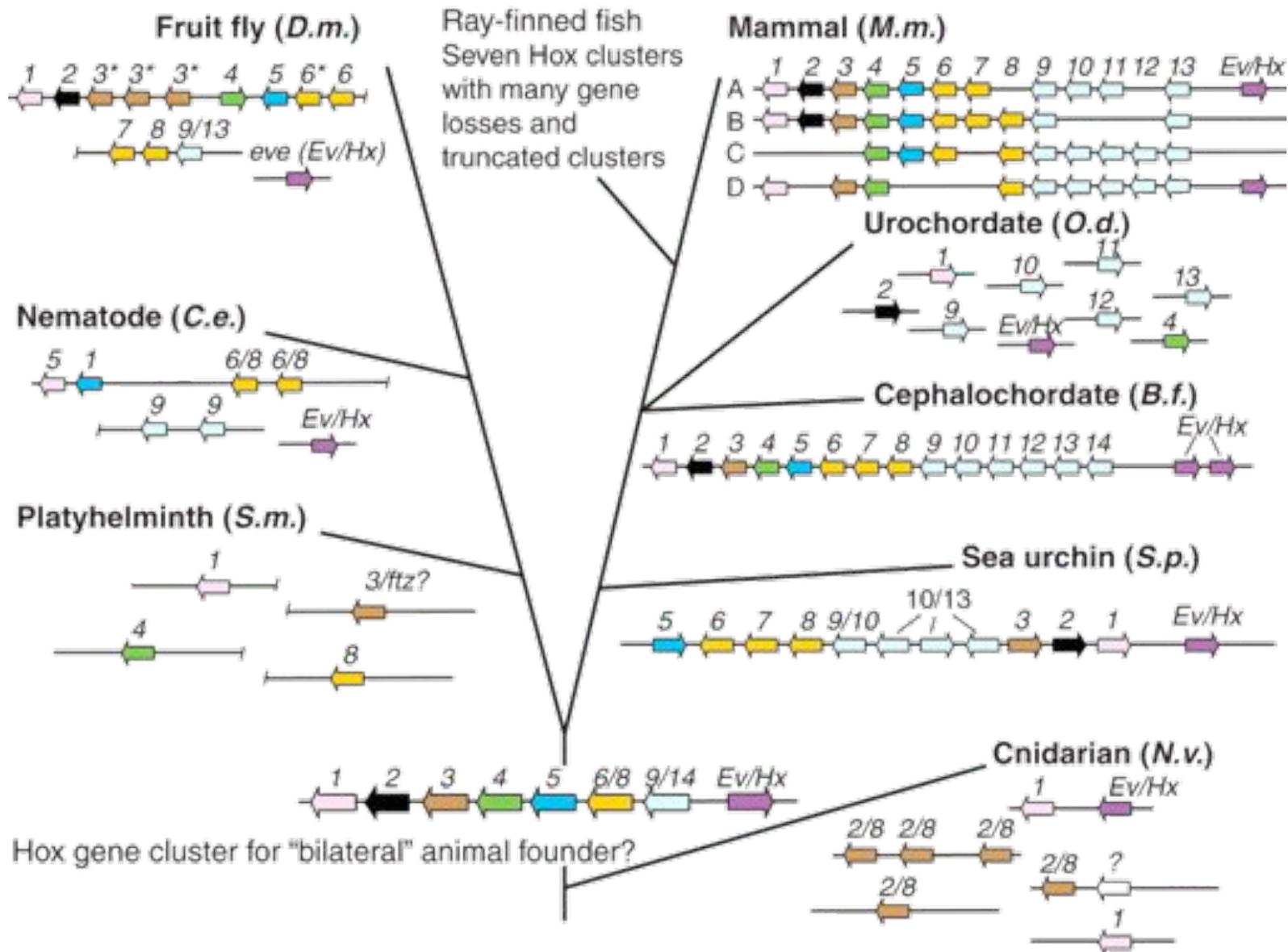


“Early Animal Evolution: Emerging Views from Comparative Biology and Geology”

- ▶ Assembly of the modern genetic tool kit for development and the initial divergence of major animal clades occurred during the Pre-Cambrian.
- ▶ Crown group morphologies diversified in the Cambrian through **changes in the genetic regulatory networks** that organize animal ontogeny.
- ▶ This radiation may have been triggered by **environmental perturbation** near the Proterozoic–Cambrian boundary and subsequently amplified by **ecological interactions within reorganized ecosystems**.

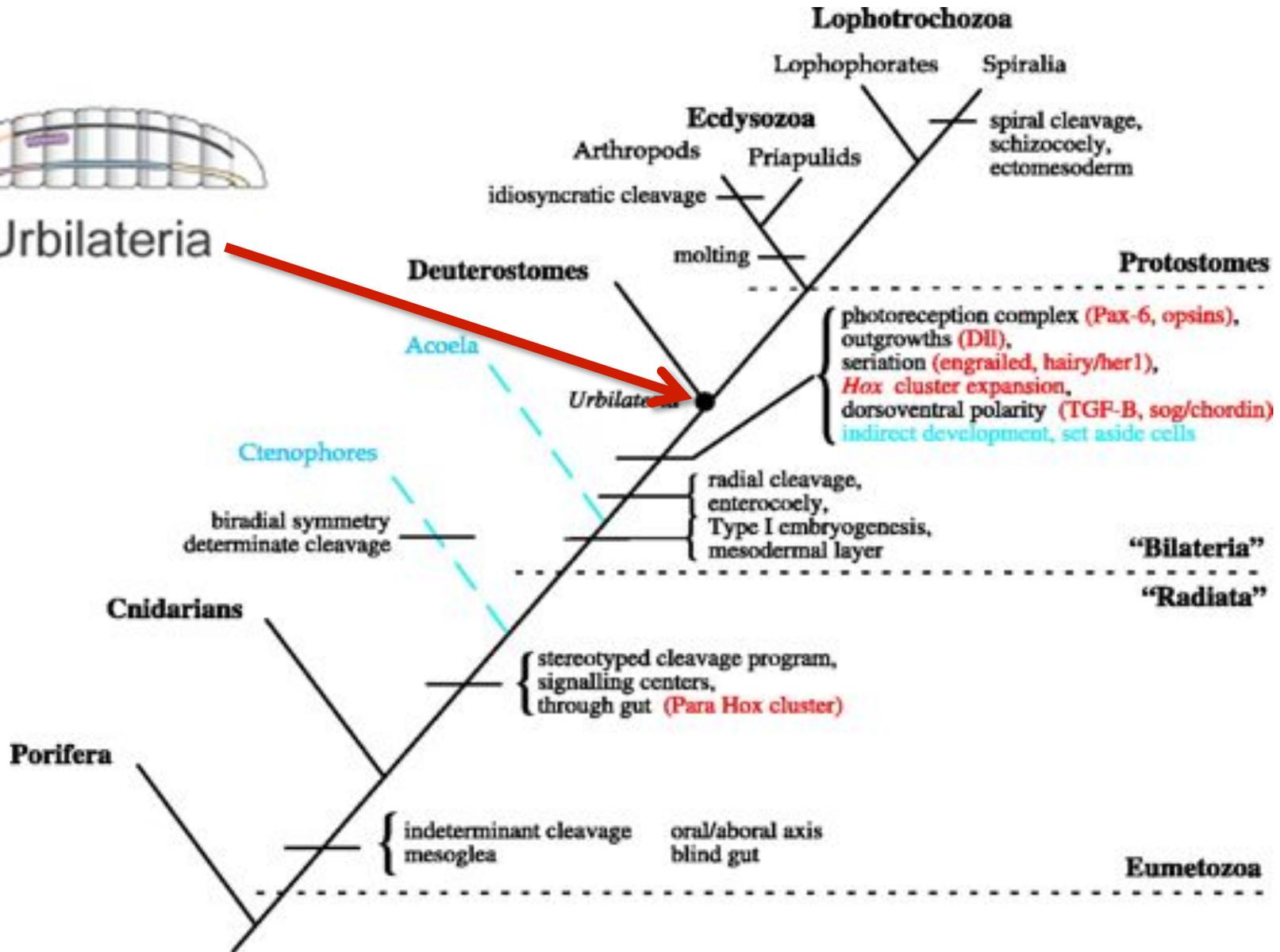
Knoll & Carroll, *Science* 284: pp. 2129 – 2137

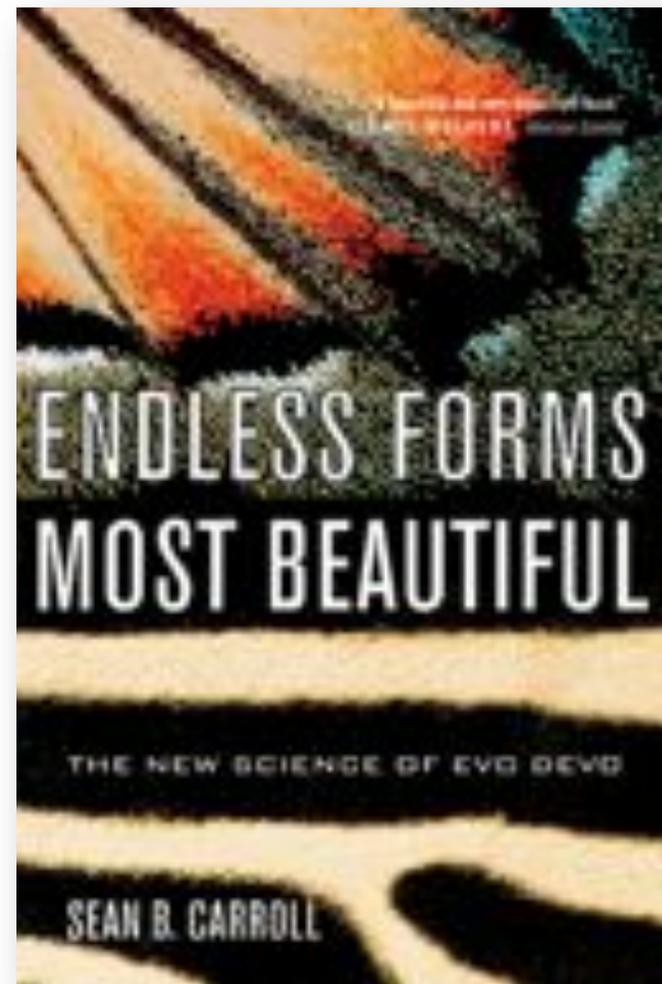
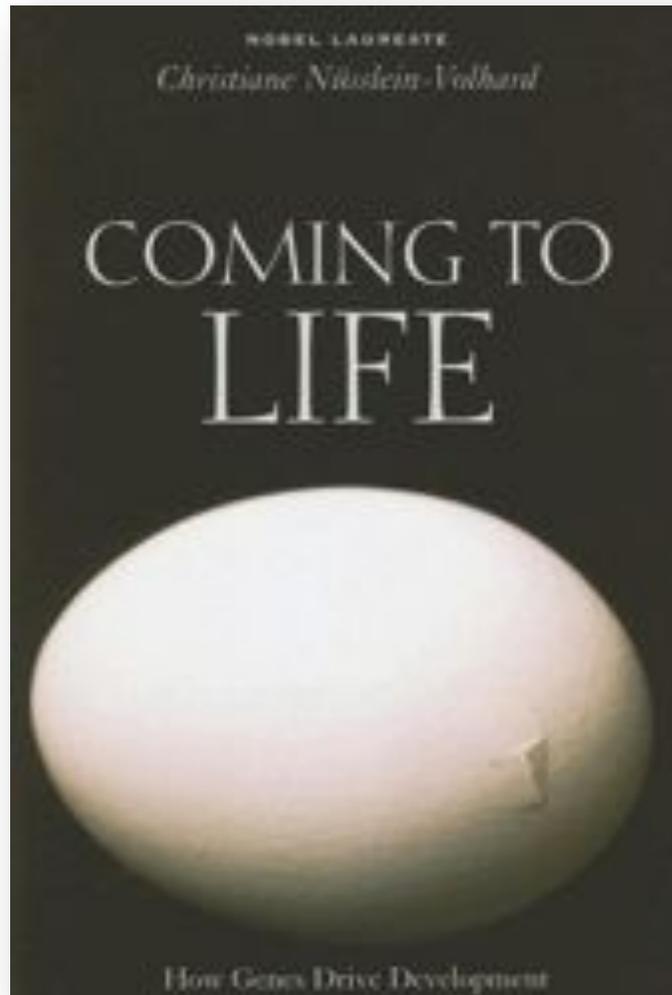




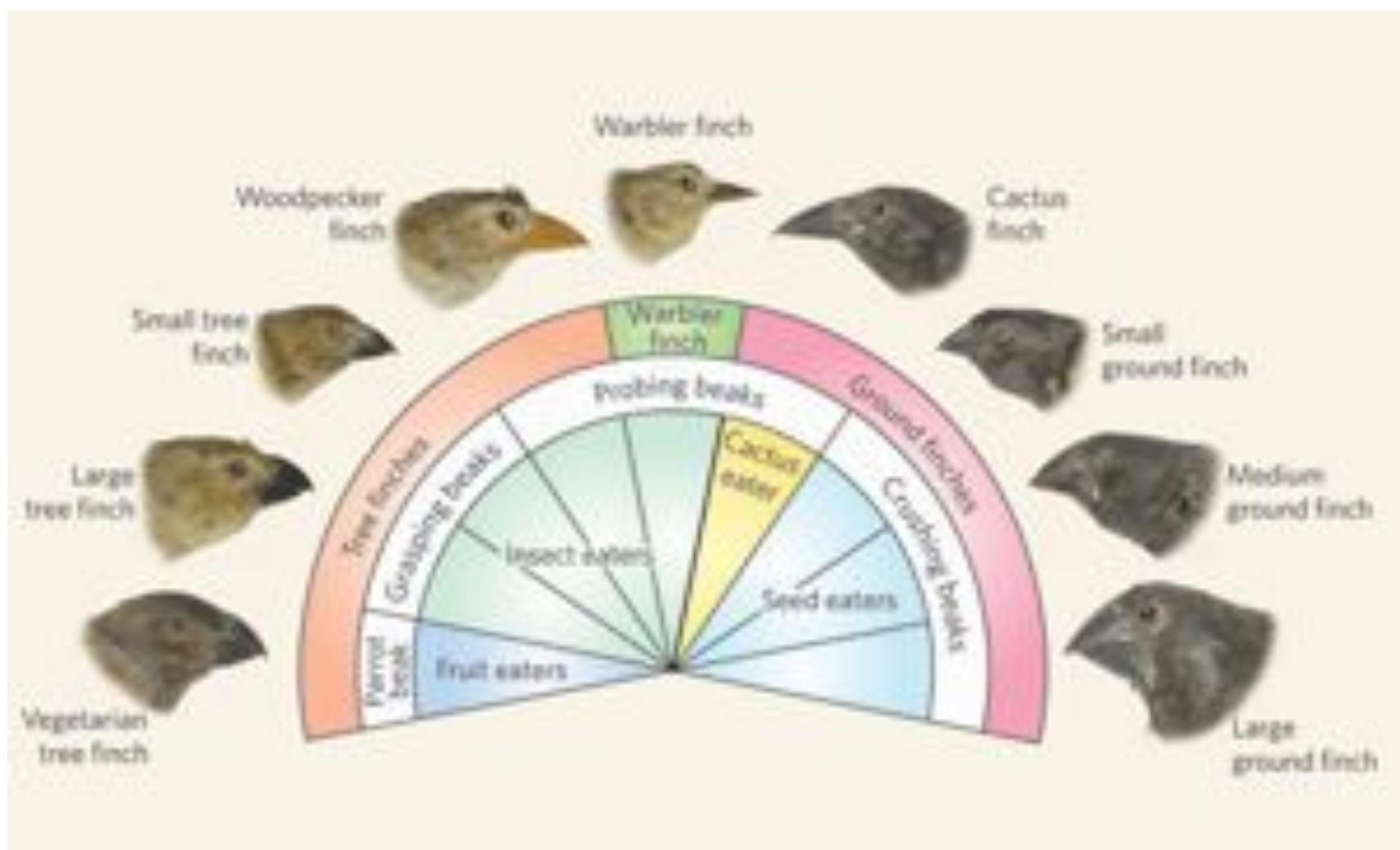


Urbilateria



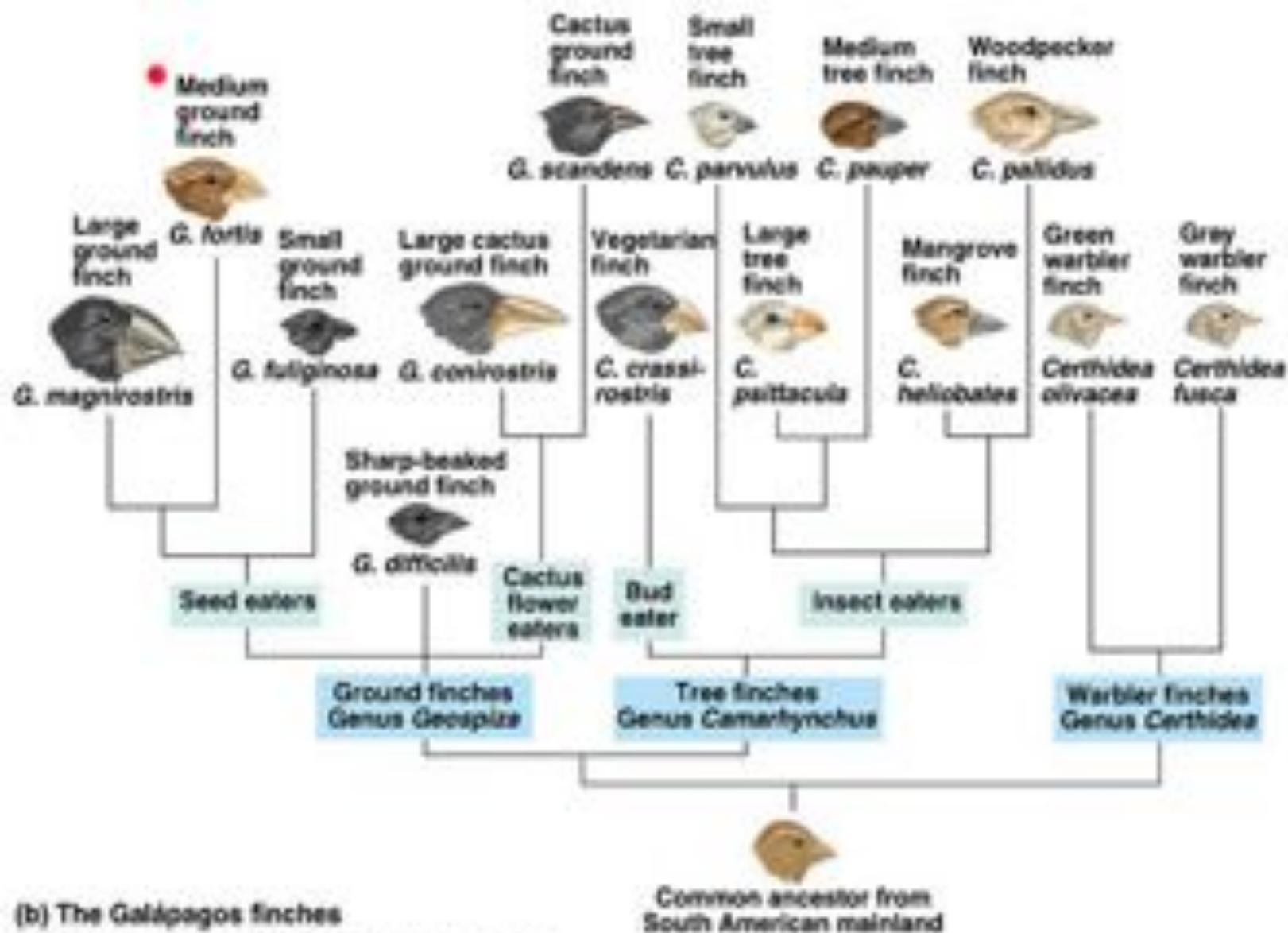


WARNING: The Galapagos finches did not inspire Darwin with the idea of evolution, and oscillating natural selection on their beaks produces no observable net change.



Wells claims

- ▶ Finches are “similar except for size and shape of beaks”
 - Ignores behavioral etc differences
- ▶ Finches are “thought to share common ancestry”
 - Ignores genetic data
- ▶ Finches are used to demonstrate “macroevolution”
 - They are not – they are used to demonstrate natural selection due to environmental variation.



(b) The Galapagos finches

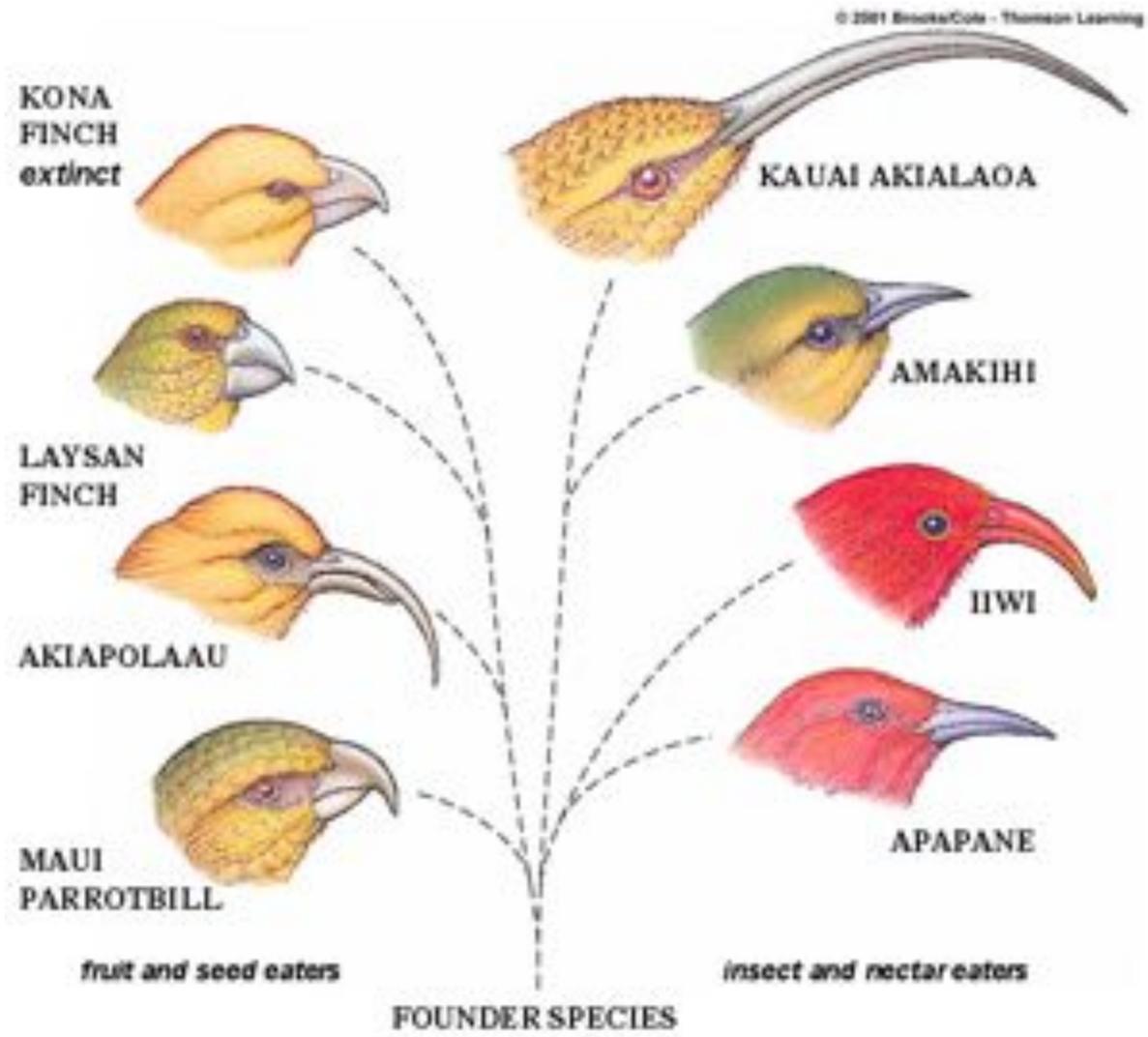
Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

Vampire Finch

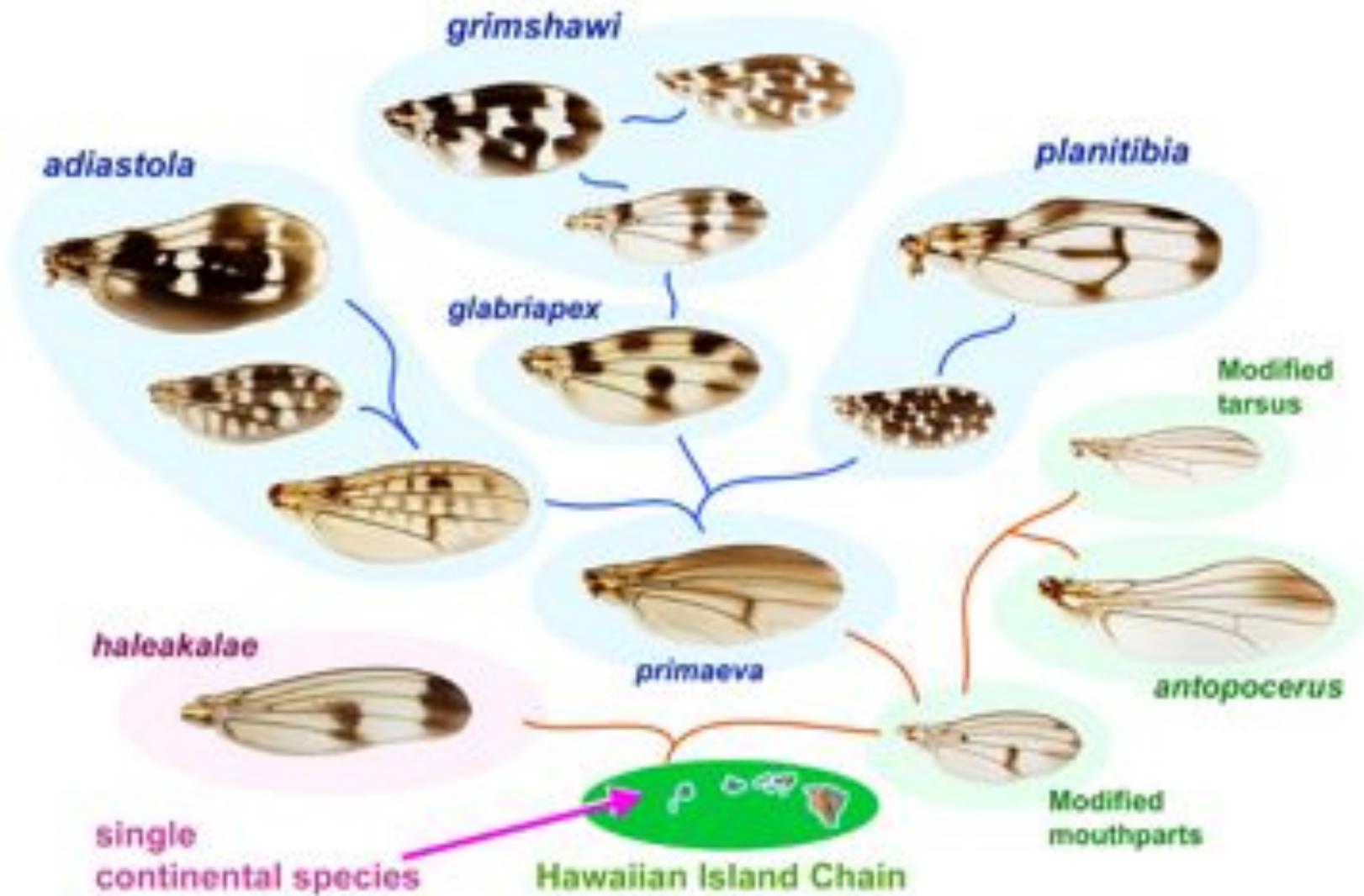
(Geospiza difficilis septentrionalis)



Hawaiian Honeycreepers



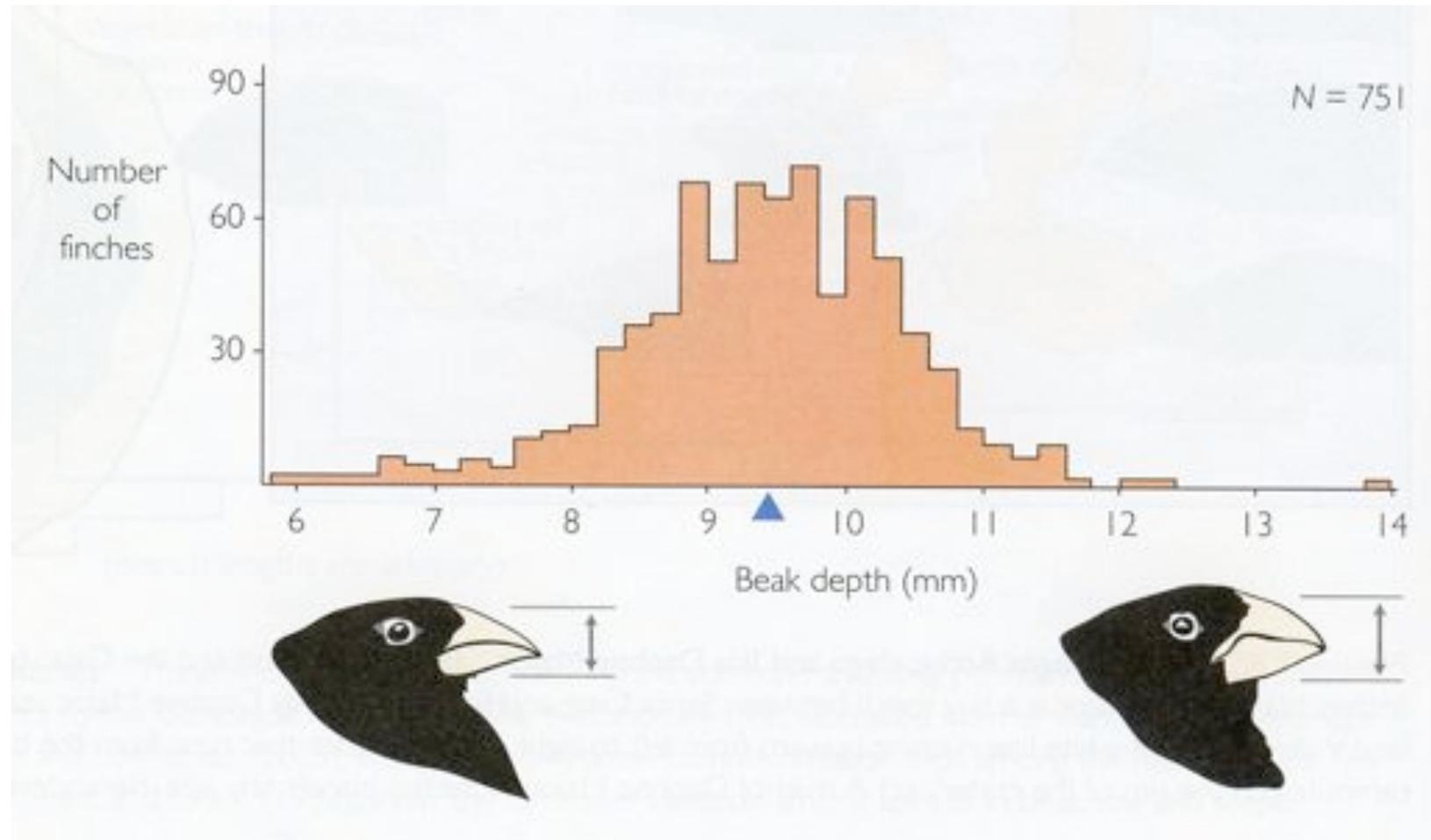
Hawaiian "Picture Wing" Drosophilids



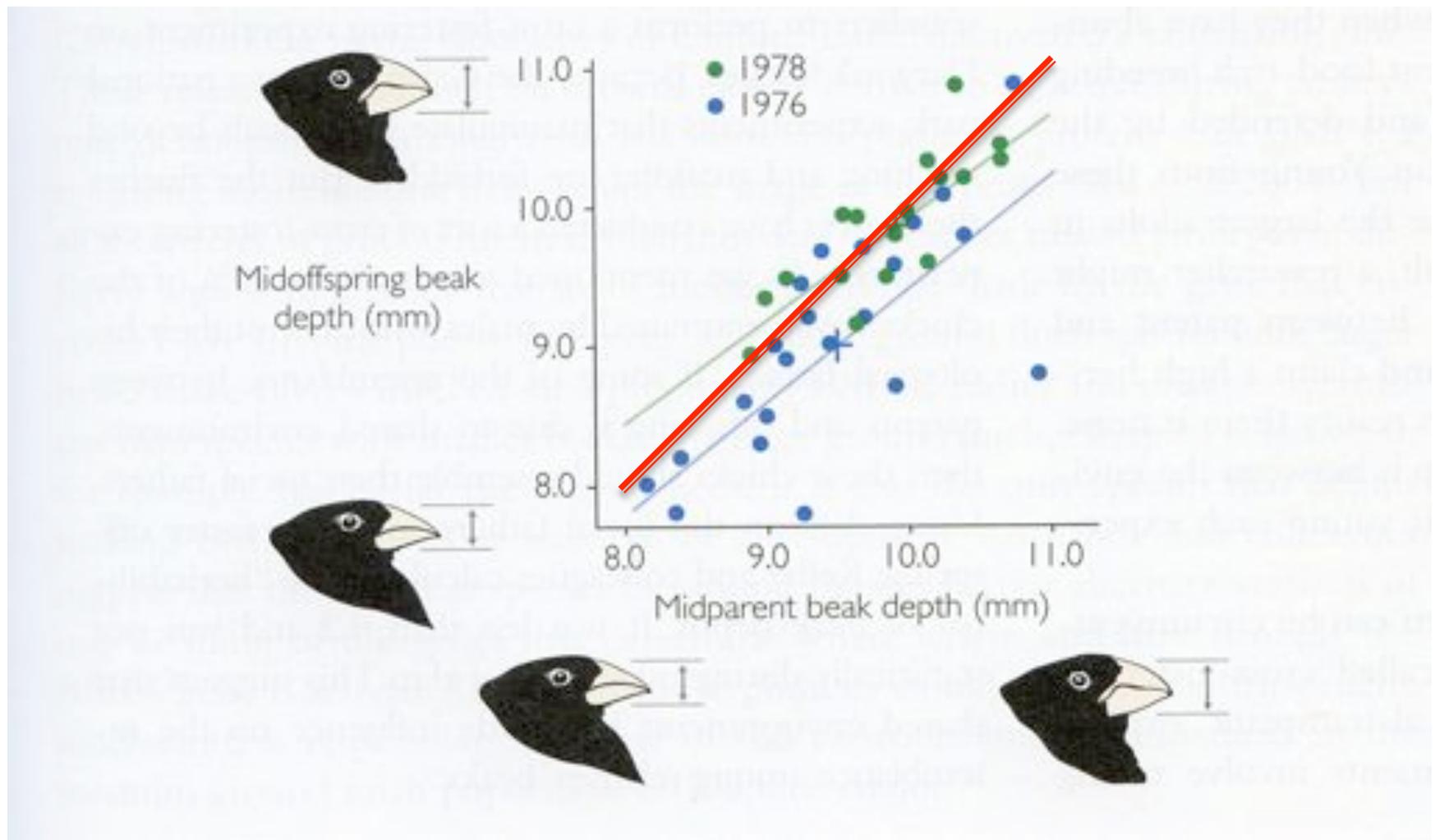
Key to Analysis of Selection Events

1. Is the **population** variable?
2. Is some of the variation among **individuals** within the **population** heritable?
3. Do **individuals** vary in their success as surviving or reproducing?
4. Are survival and reproduction non-random?
5. Did the **population** evolve?

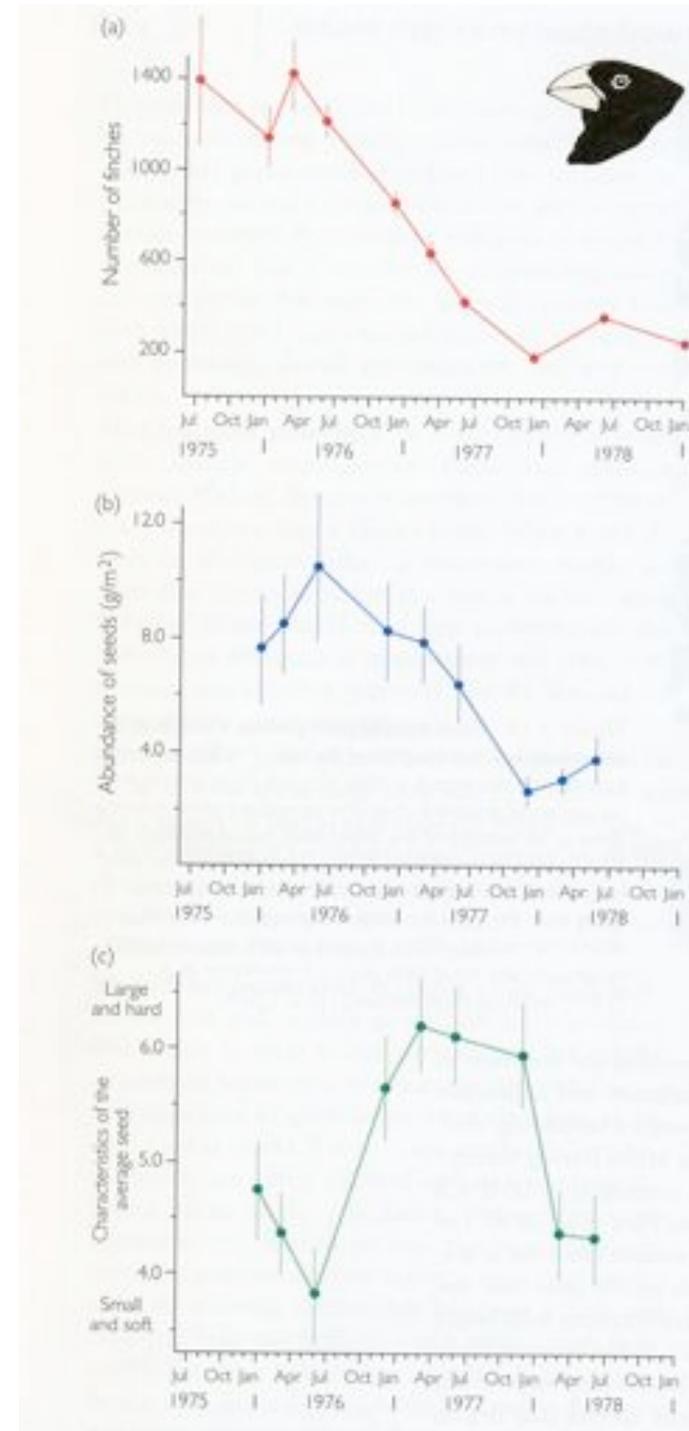
Is the population variable?



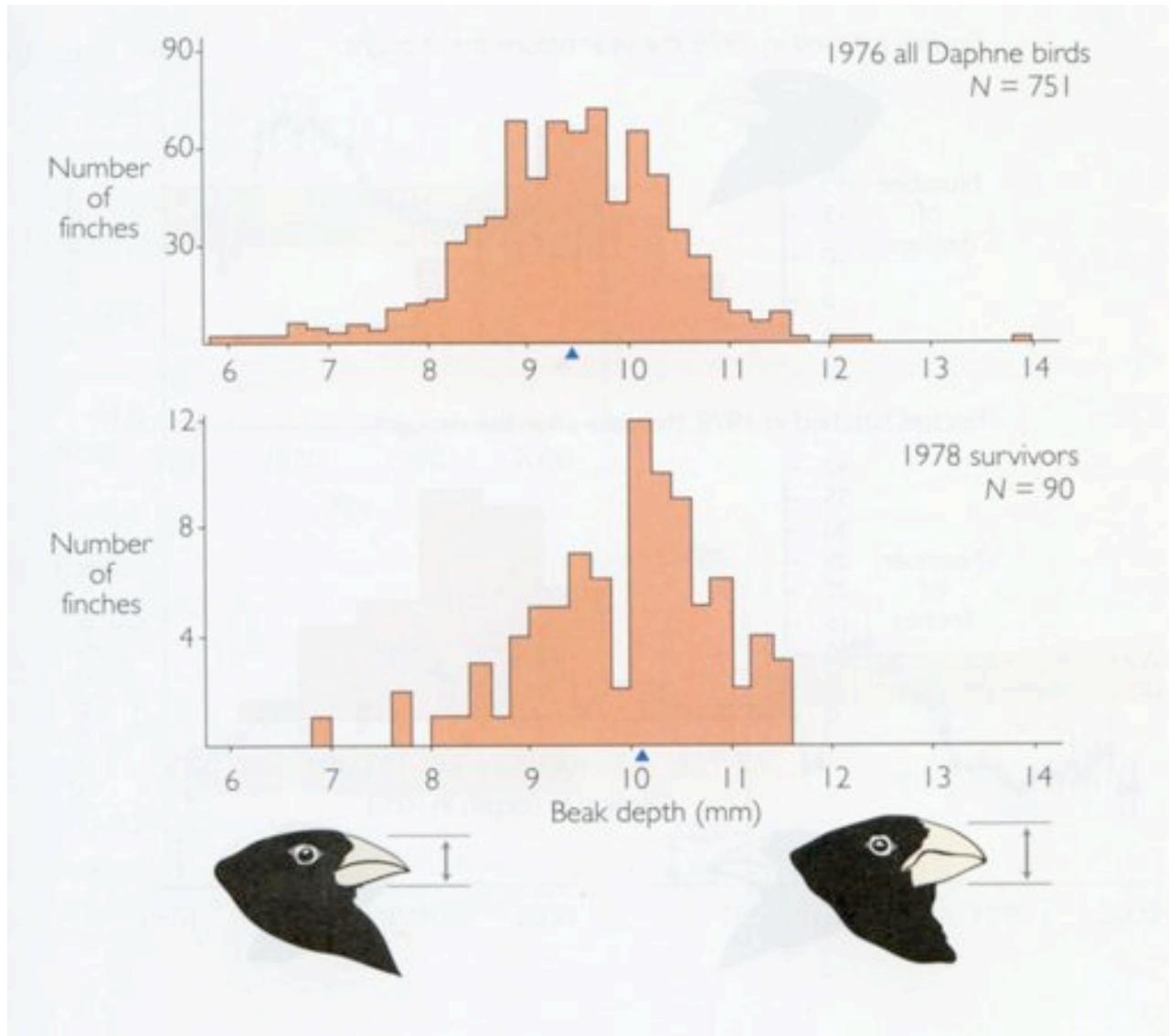
Is some of the variation heritable?



Do individuals vary in their success at surviving or reproducing?

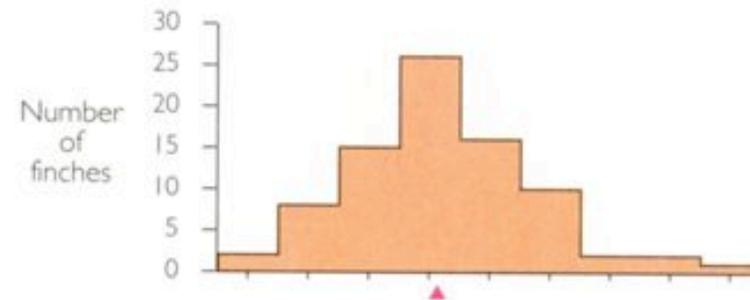


Are Survival and Reproduction Non-Random?

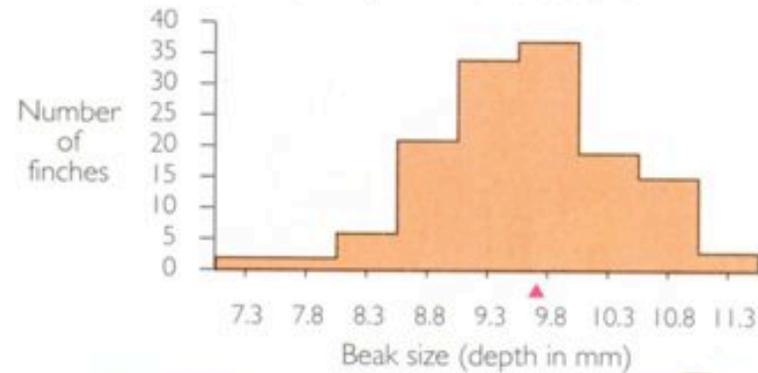


Did the Population evolve?

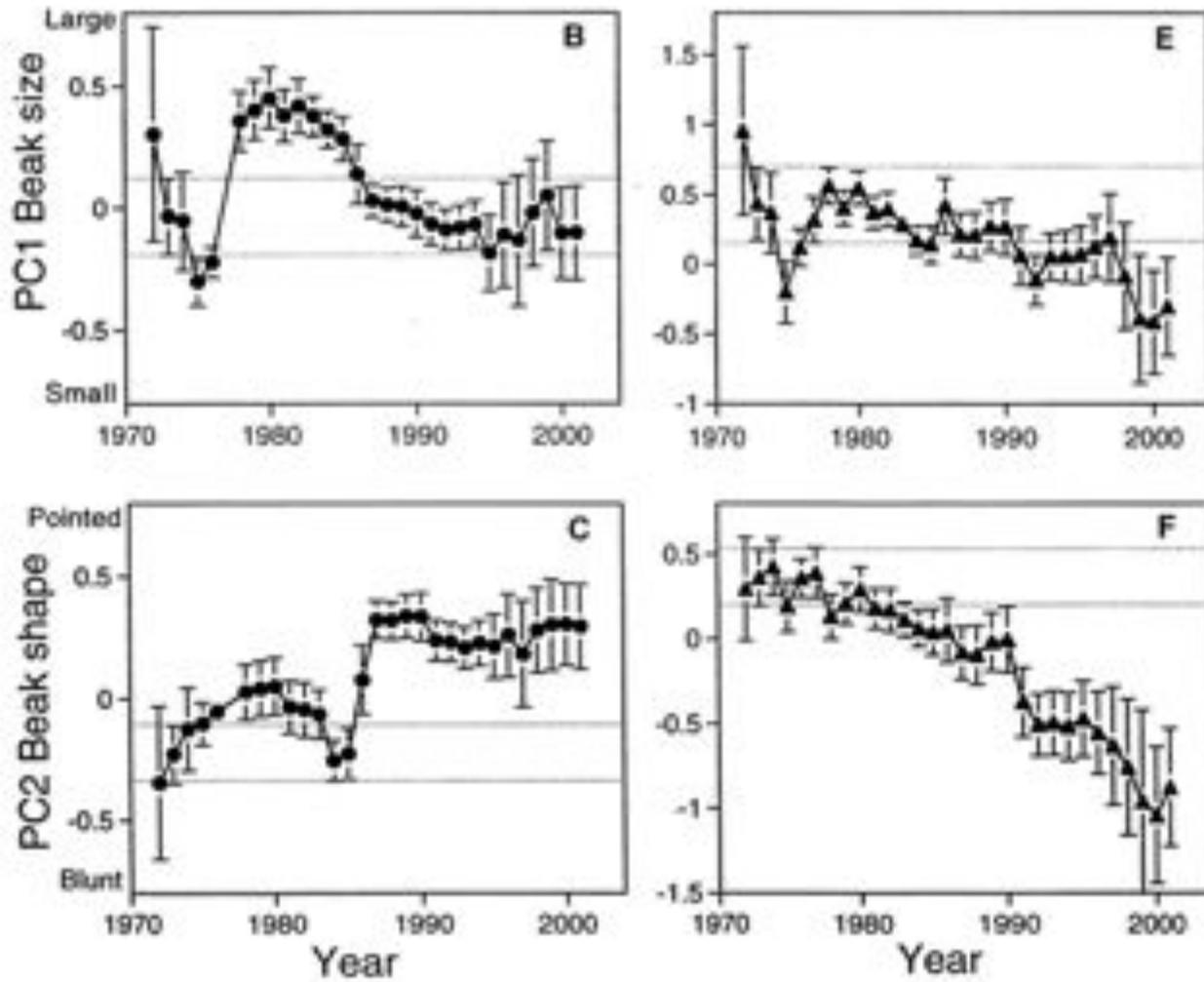
Finches hatched in 1976, the year before the drought



Finches hatched in 1978, the year after the drought



Geospiza fortis & *G. scandens*



Importance

- ▶ As example of **adaptive radiation**
 - Evidence from genetics, biogeography, behavior, etc.
 - Compare with cichlid fishes in East Africa and Hawaiian honeycreepers
- ▶ As example of measurable **natural selection** in the wild.
 - Point is **not** to study (or claim) speciation
 - Point is to discuss reasonable extrapolations *if* drought trend did continue
 - c.f. astronomers studying comets

RESEARCH ARTICLES

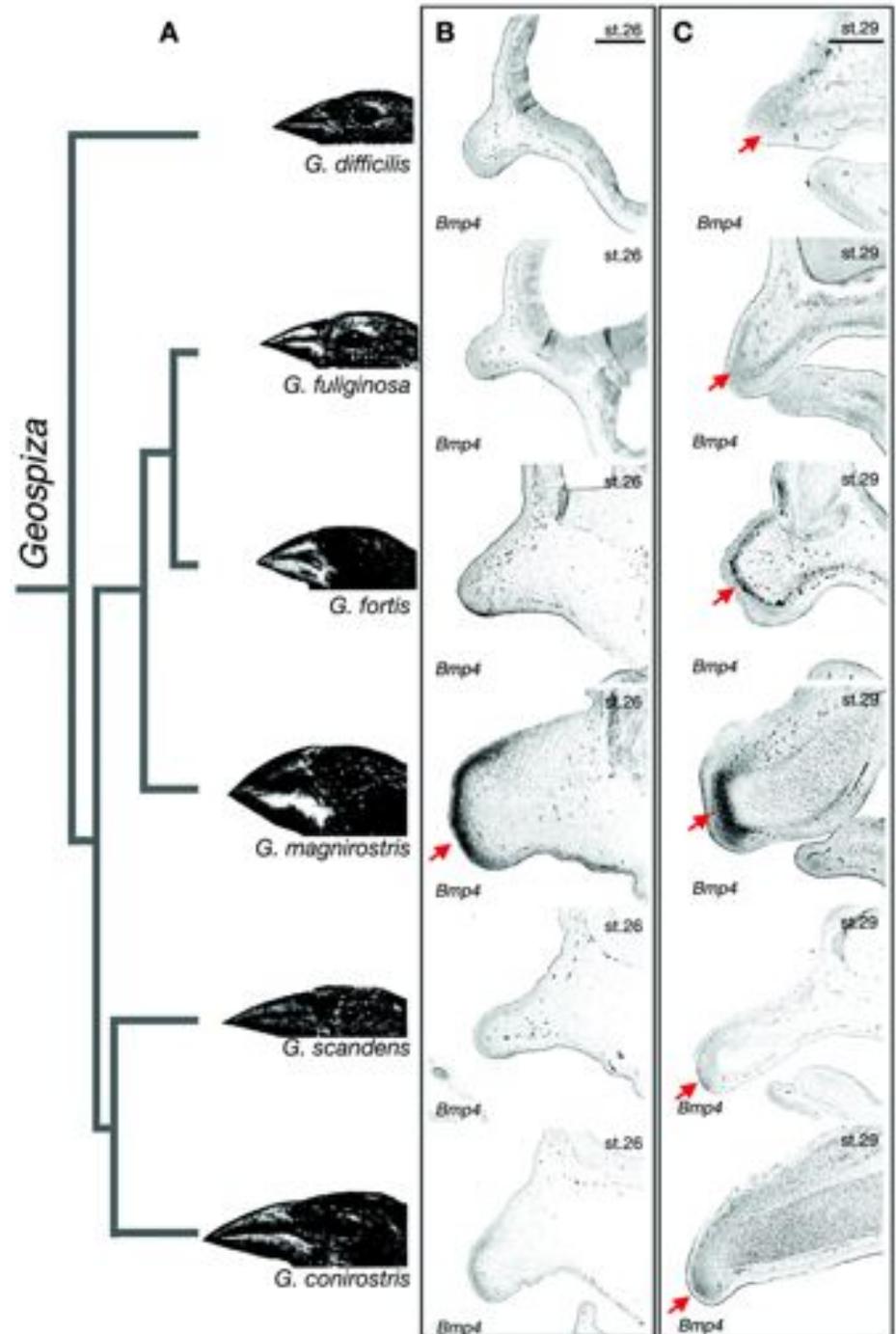
Unpredictable Evolution in a 30-Year Study of Darwin's Finches

Peter R. Grant and B. Rosemary Grant

Evolution can be predicted in the short term from a knowledge of selection and inheritance. However, in the long term evolution is unpredictable because environments, which determine the directions and magnitudes of selection coefficients, fluctuate unpredictably. These two features of evolution, the predictable and unpredictable, are demonstrated in a study of two populations of Darwin's finches on the Galápagos island of Daphne Major. From 1972 to 2001, *Geospiza fortis* (medium ground finch) and *Geospiza scandens* (cactus finch) changed several times in body size and two beak traits. Natural selection occurred frequently in both species and varied from unidirectional to oscillating, episodic to gradual. Hybridization occurred repeatedly though rarely, resulting in elevated phenotypic variances in *G. scandens* and a change in beak shape. The phenotypic states of both species at the end of the 30-year study could not have been predicted at the beginning. Continuous, long-term studies are needed to detect and interpret rare but important events and nonuniform evolutionary change.

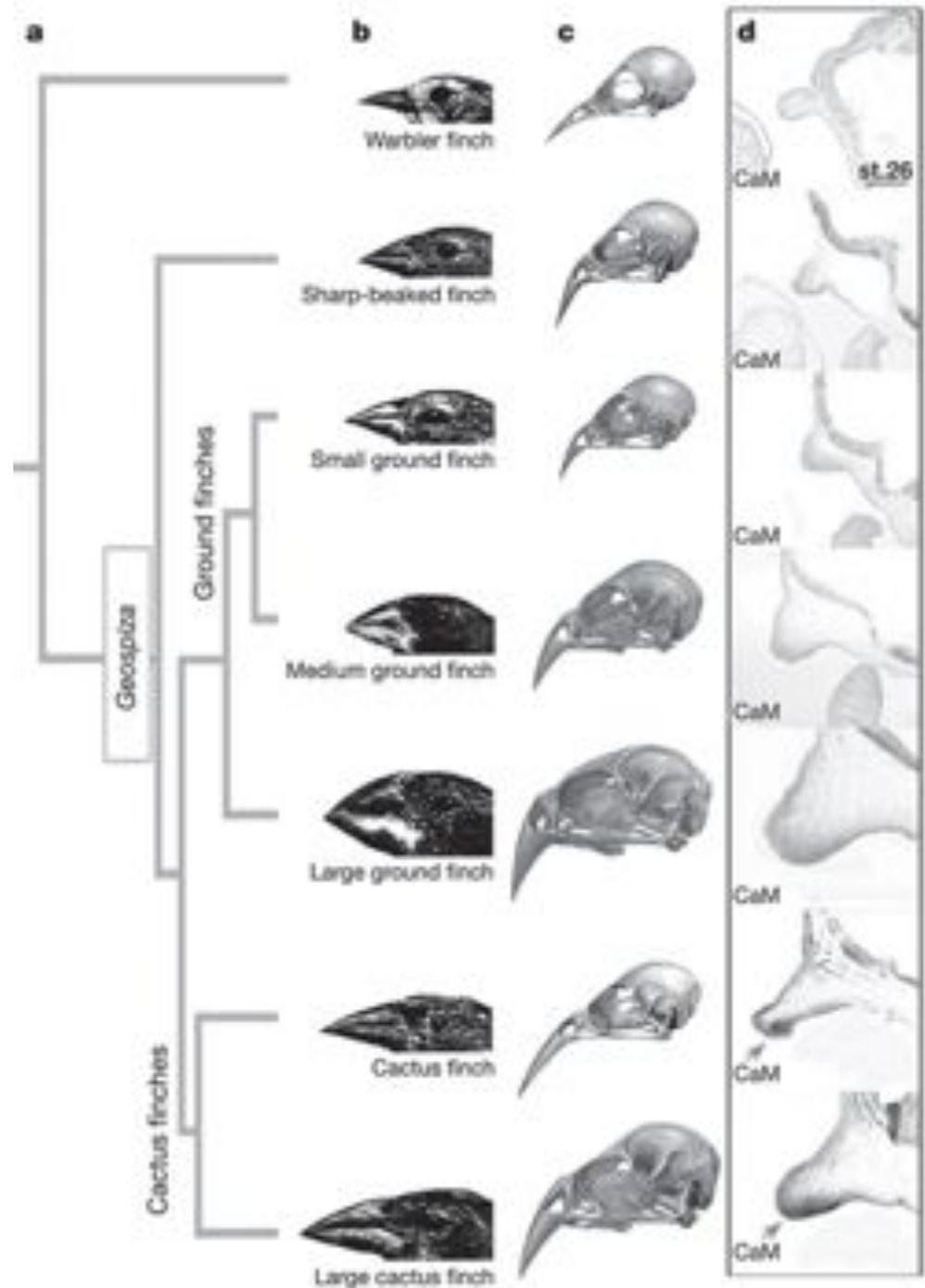
BMP4 Expression

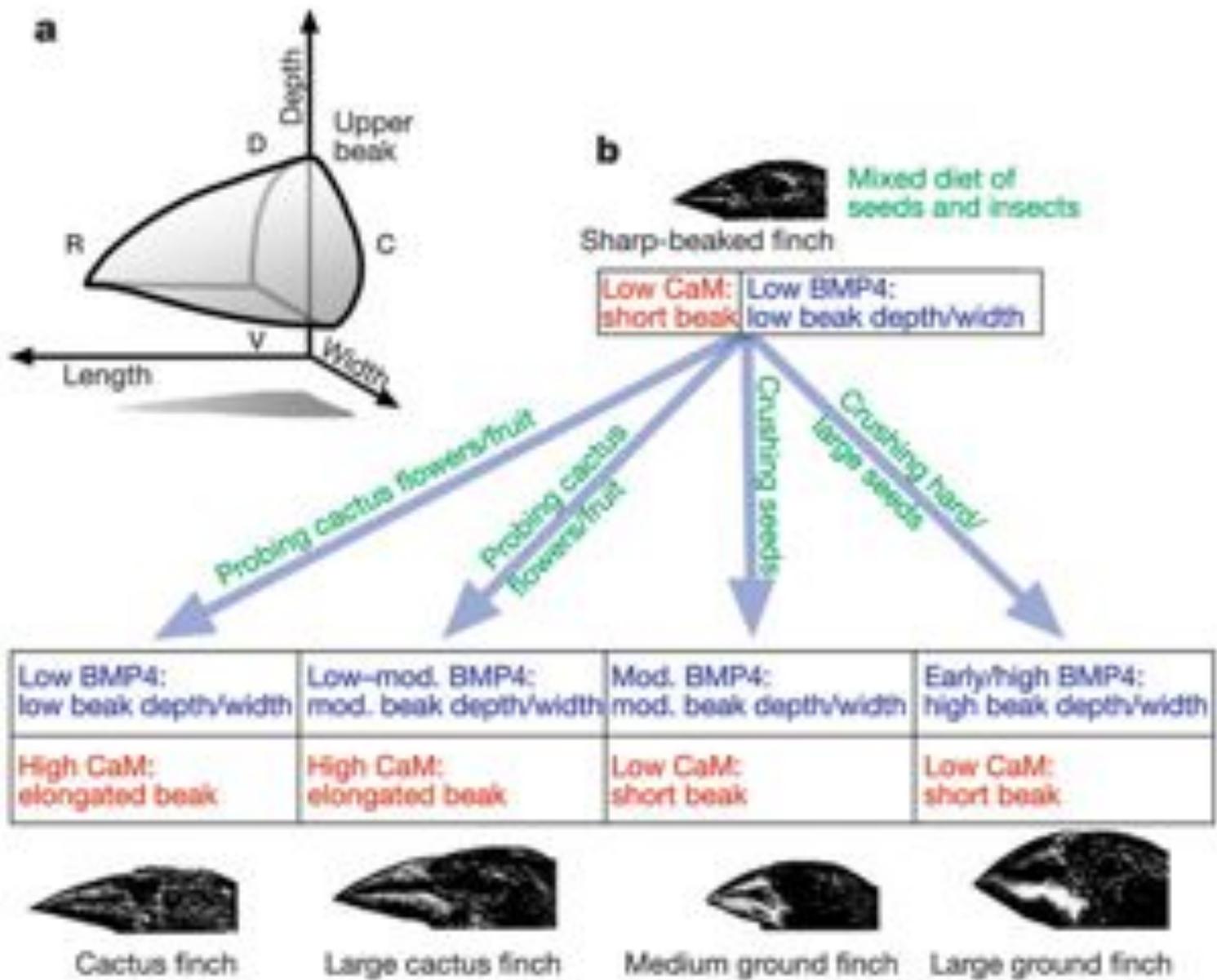
(A) Previous studies suggest that *G. difficilis* is the most basal species of the genus *Geospiza*, and the rest of the species form two groups: ground and cactus finches, with distinct beak morphologies. (B) At stage (st.) 26, *Bmp4* is strongly expressed in a broad distal-dorsal domain in the mesenchyme of the upper beak prominence of *G. magnirostris* and at significantly lower levels in *G. fortis* and *G. conirostris*. No *Bmp4* was detected in the mesenchyme of *G. difficilis*, *G. fuliginosa*, and *G. scandens*. (C) At stage 29, *Bmp4* continues to be expressed at high levels in the distal beak mesenchyme of *G. magnirostris*. Broad domains of *Bmp4* expression are detectable around prenasal cartilages of *G. fuliginosa* and *G. fortis*. A small domain of strong *Bmp4* expression is also found in the most distal mesenchyme of *G. conirostris*, and weaker expression is seen in *G. scandens* and *G. fortis* (red arrows). Scale bars: 1 mm in (B) and 2 mm in (C)



CaM Expression

a, b, *Geospiza* group species displaying distinct beak morphologies form a monophyletic group. c, The differences in beak morphology are skeletal. d, CaM is expressed in a strong distal-ventral domain in the mesenchyme of the upper beak prominence of the large cactus finch, *G. conirostris*, somewhat lower levels in cactus finch, *G. scandens*, and at significantly lower levels in the large ground finch and medium ground finch, *G. magnirostris* and *G. fortis*, respectively. Very low levels of CaM were detected in the mesenchyme of *G. difficilis*, *G. fuliginosa* and the basal warbler finch *Certhidea olivacea*. CaM expression domains are indicated with short arrows in d.





WARNING: Peppered moths do not rest on tree trunks in the wild; Kettlewell's experiments were flawed, and these photos were staged.

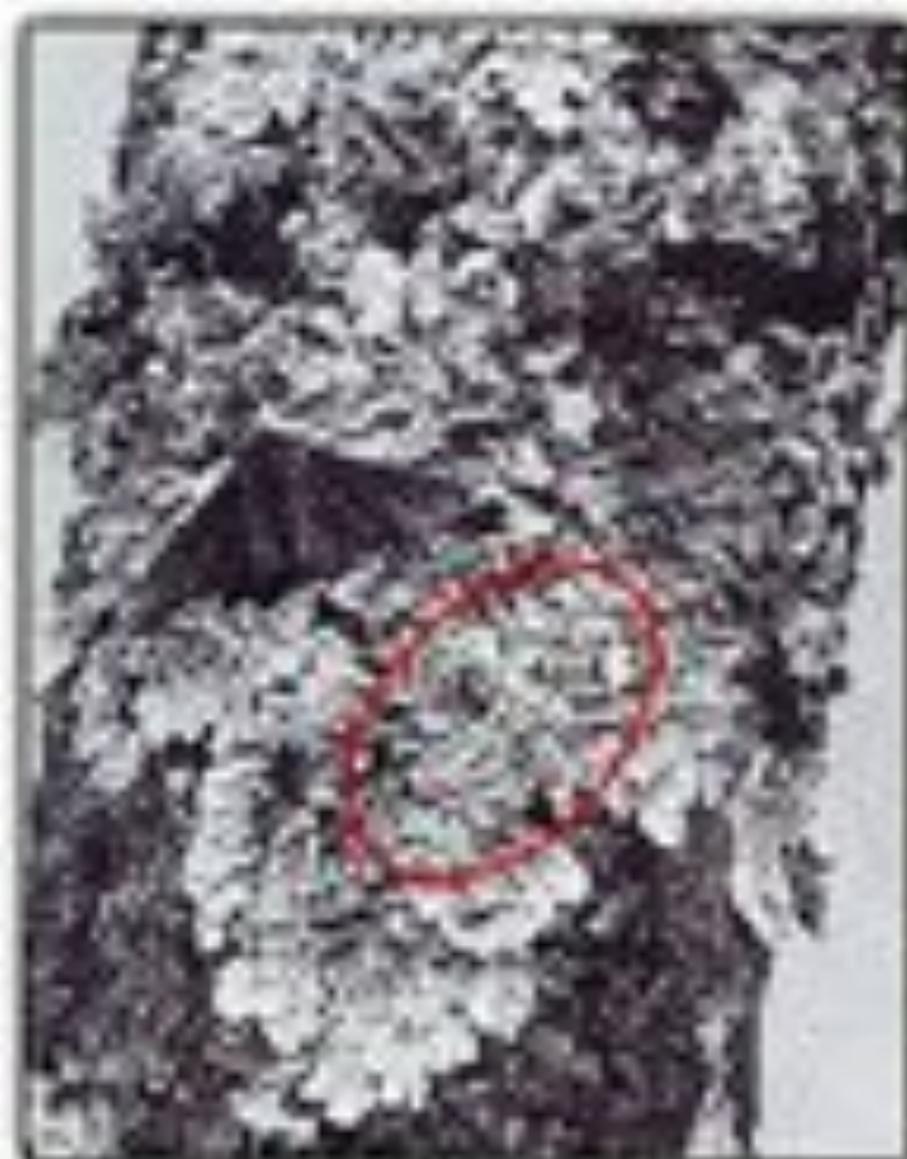
Biston betularia betularia



carbonaria







0-20% of mother dark-skinned



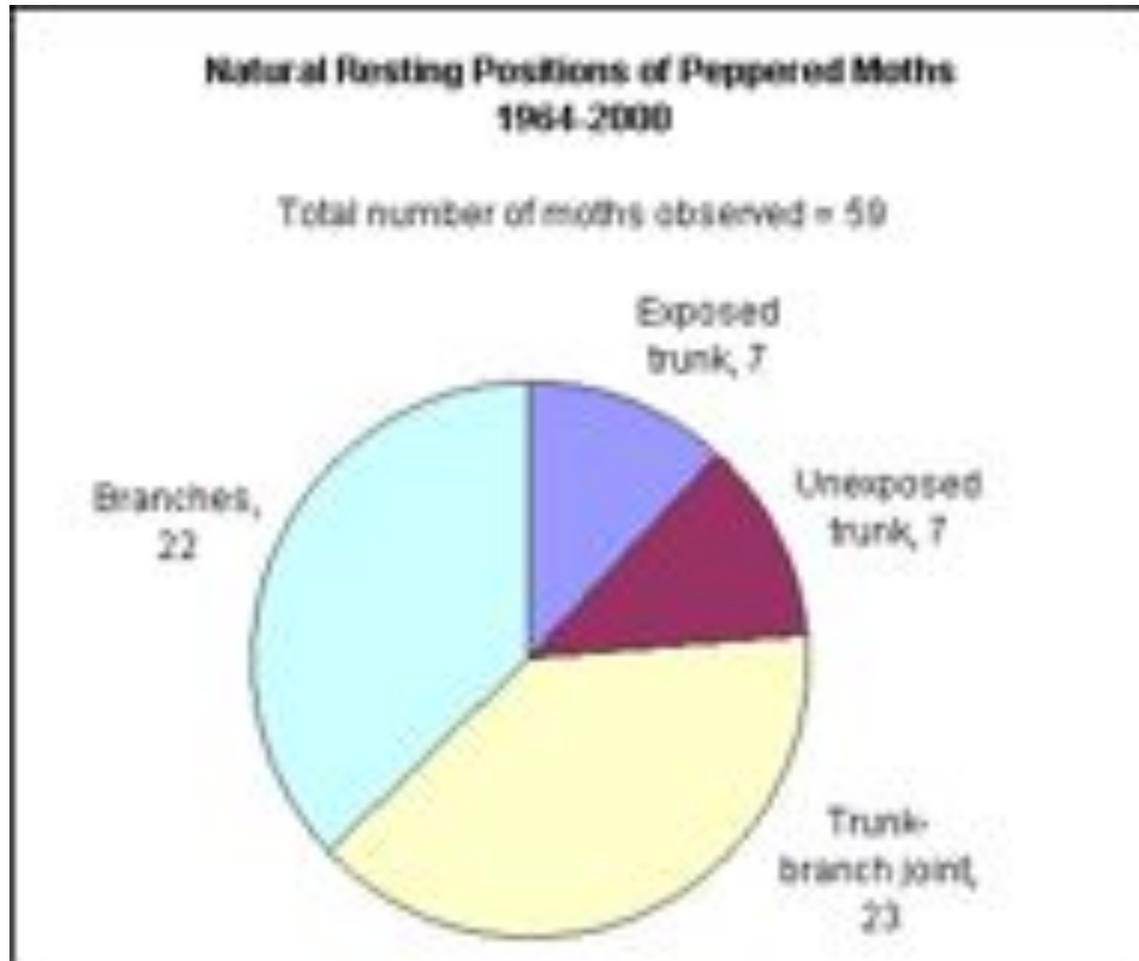
20-67% of mother dark-skinned



67-100% of mother dark-skinned



Resting Positions

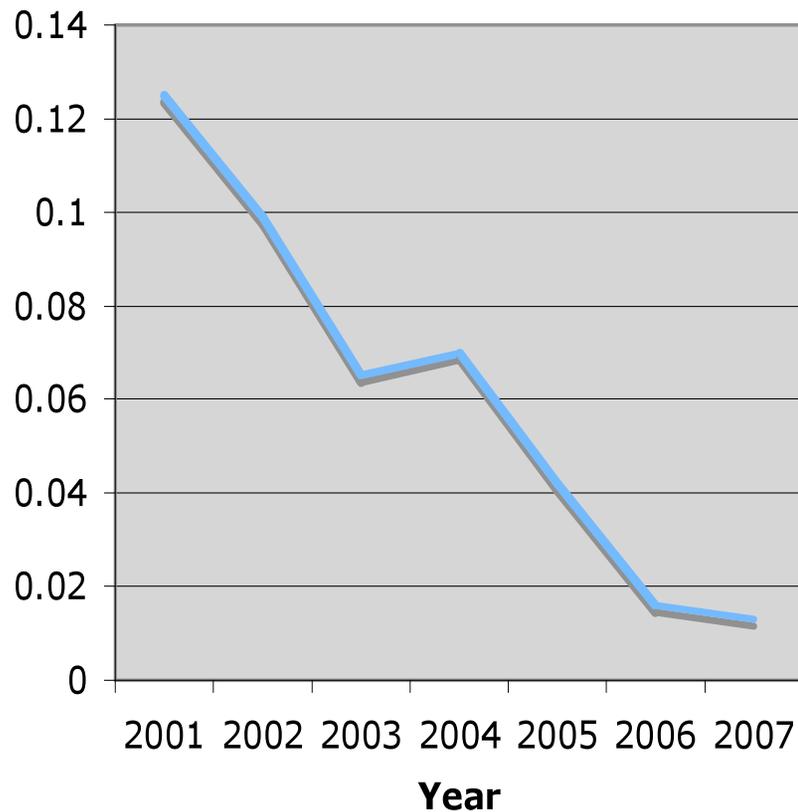


Michael Majerus (2005)

“The case of the peppered moth provides irrefutable proof of biological evolution through the process of natural selection. While there is strong circumstantial evidence that differential bird predation is the main agent of selection, the evidence is only circumstantial.”

Michael Majerus (2007)

carbonaria



“I conclude that differential bird predation here is **a major factor responsible** for the decline in *carbonaria* frequency in Cambridge between 2001 and 2007.”

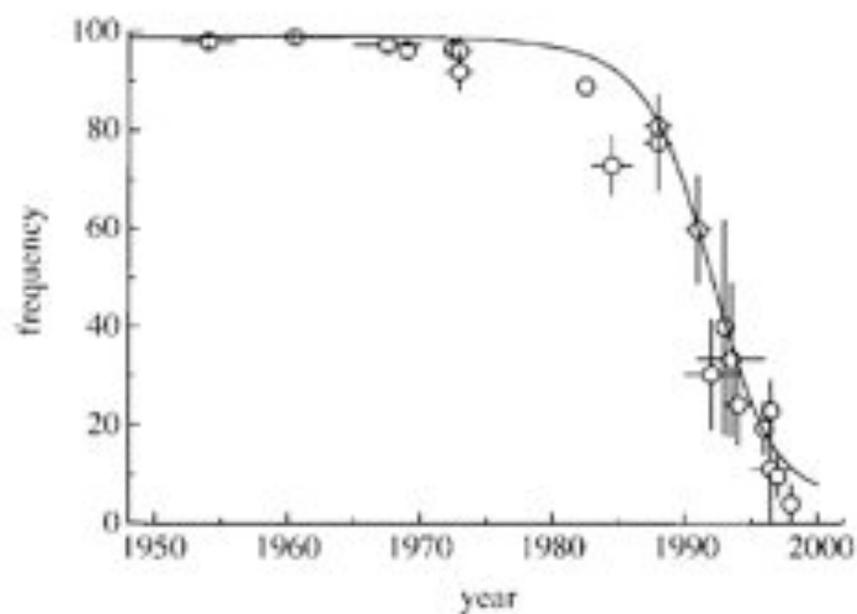
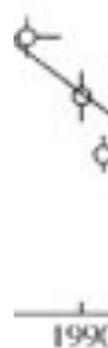
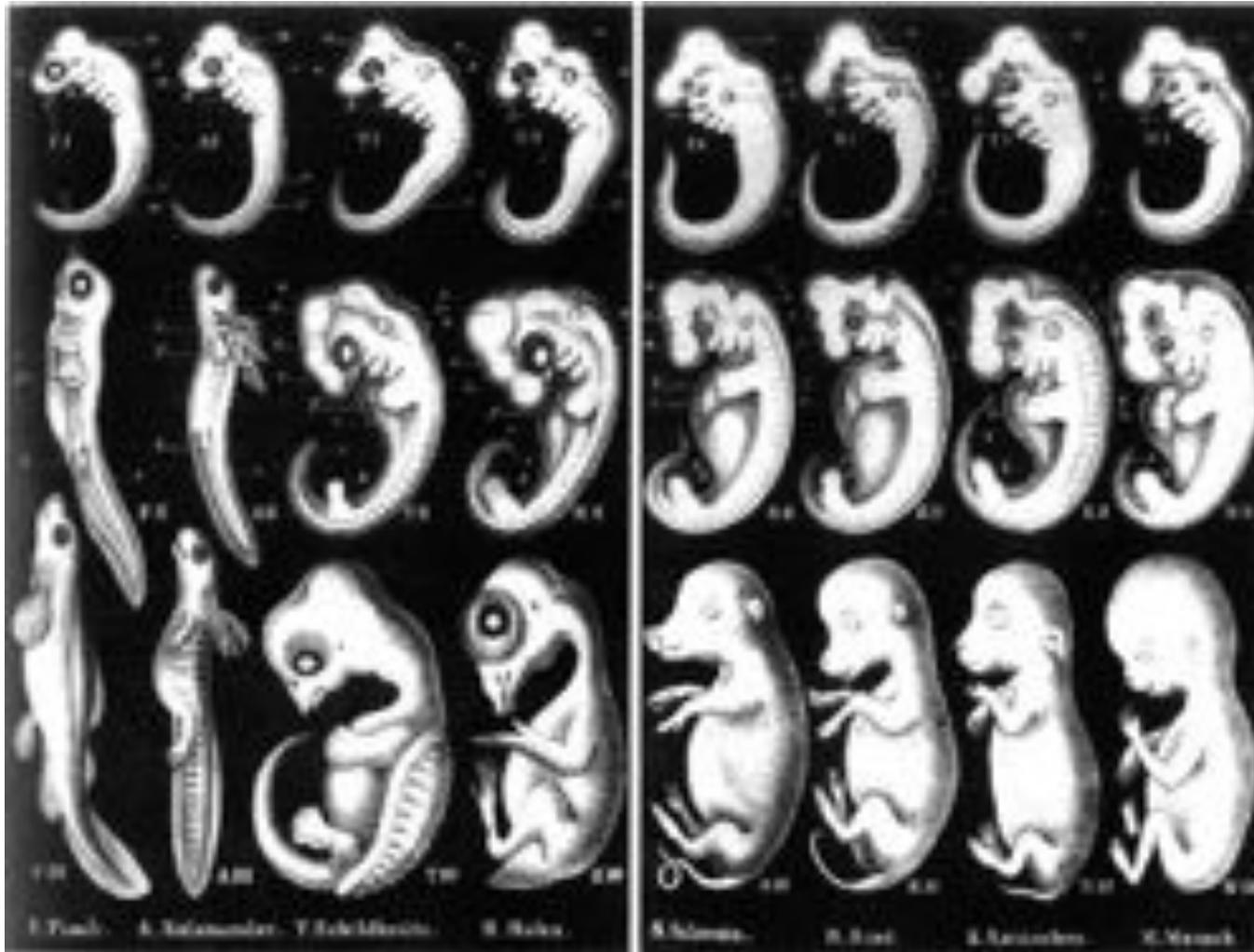


Figure 1. Change in frequency of the *carbonaria* form of the peppered moth *Biston betularia* (L.) in the Manchester area since 1950. Data are from Bishop *et al.* (1978a), Cook *et al.* (1986) and table 1. Vertical lines show standard error, horizontal lines range of years included. The curve is the theoretical prediction from the model of Mani (1982, 1990) with modified fitness.



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WARNING: These pictures make vertebrate embryos look more similar than they really are; it is not true that vertebrate embryos are most similar in their earliest stages.

Ernst Haeckel

1834 - 1919



Biogenetic Law

“Ontogeny recapitulates phylogeny”

Haeckel and Darwin

“Darwin was not an embryologist, so he relied for his evidence on the work of others. One of those was ... Haeckel. Darwin wrote in *The Origin of Species* that Professor Haeckel ‘brought his great knowledge and abilities to bear on what he calls **phylogeny**, or the lines of descent of all organic beings. In drawing up the several series he trusts chiefly to embryological characters’.” (Wells, p. 82)

Problem!

- ▶ Darwin's discussion of embryology comes from Von Baer, not Haeckel.
- ▶ Wells implies Darwin is a fraud because he relied on Haeckel's fraudulent images. He didn't!
- ▶ *Anthropogenie* was published in 1874, 15 years after the publication of *Origin*. Darwin is praising Haeckel for his generation of **phylogenies** (6th edition, 1872).
- ▶ The figure referred to by Wells is actually in George Romanes' 1892 work, *Darwin and After Darwin*.

Wells Quotes Darwin on Haeckel

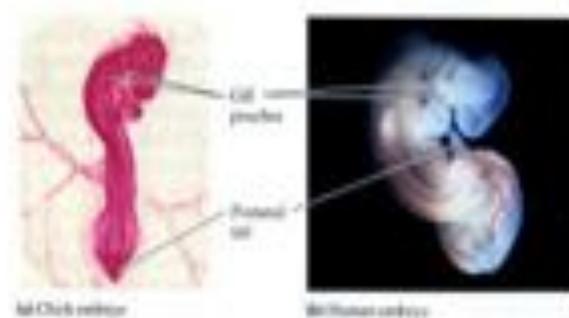
“Professor Haeckel in his ‘Generelle Morphologie’ and in another works, has recently brought his great knowledge and abilities to bear on what he calls **phylogeny**, or the lines of descent of all organic beings. In drawing up the several series he trusts chiefly to embryological characters

but receives aid from homologous and rudimentary organs, as well as from the successive periods at which the various forms of life are believed to have first appeared in our geological formations. He has thus boldly made a great beginning, and **shows us how classification will in the future be treated.**”

(*Origin*, 6th Edition, Chapter 14)



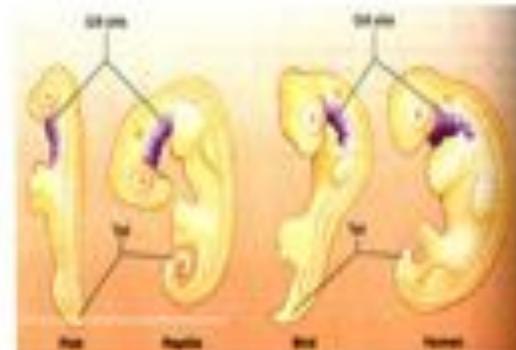
Futuyma (1998) p. 653



Campbell, Reese and Mitchell (1999) p. 424



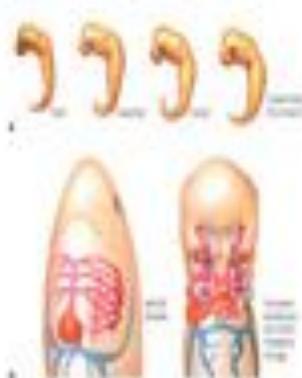
Mader (1998) p. 298,



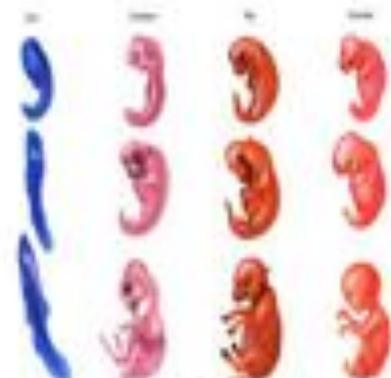
Raven and Johnson (1999) p. 416



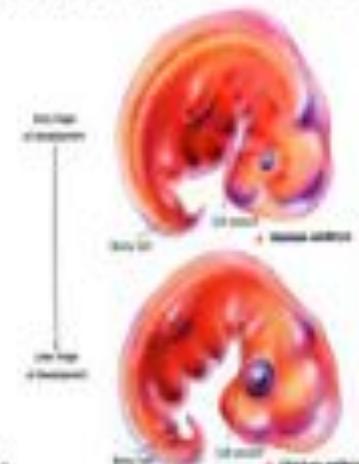
Guttman (1999) p. 718



Starr and Taggart (1998) p. 317



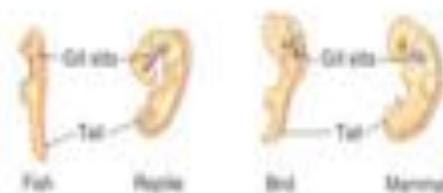
Schraer and Stolze (1999) p. 582



Johnson (1998)
p. 179



Miller and Levine
(2000) p. 283



Biggs, Kapicka and Lundgren (1998) p. 433

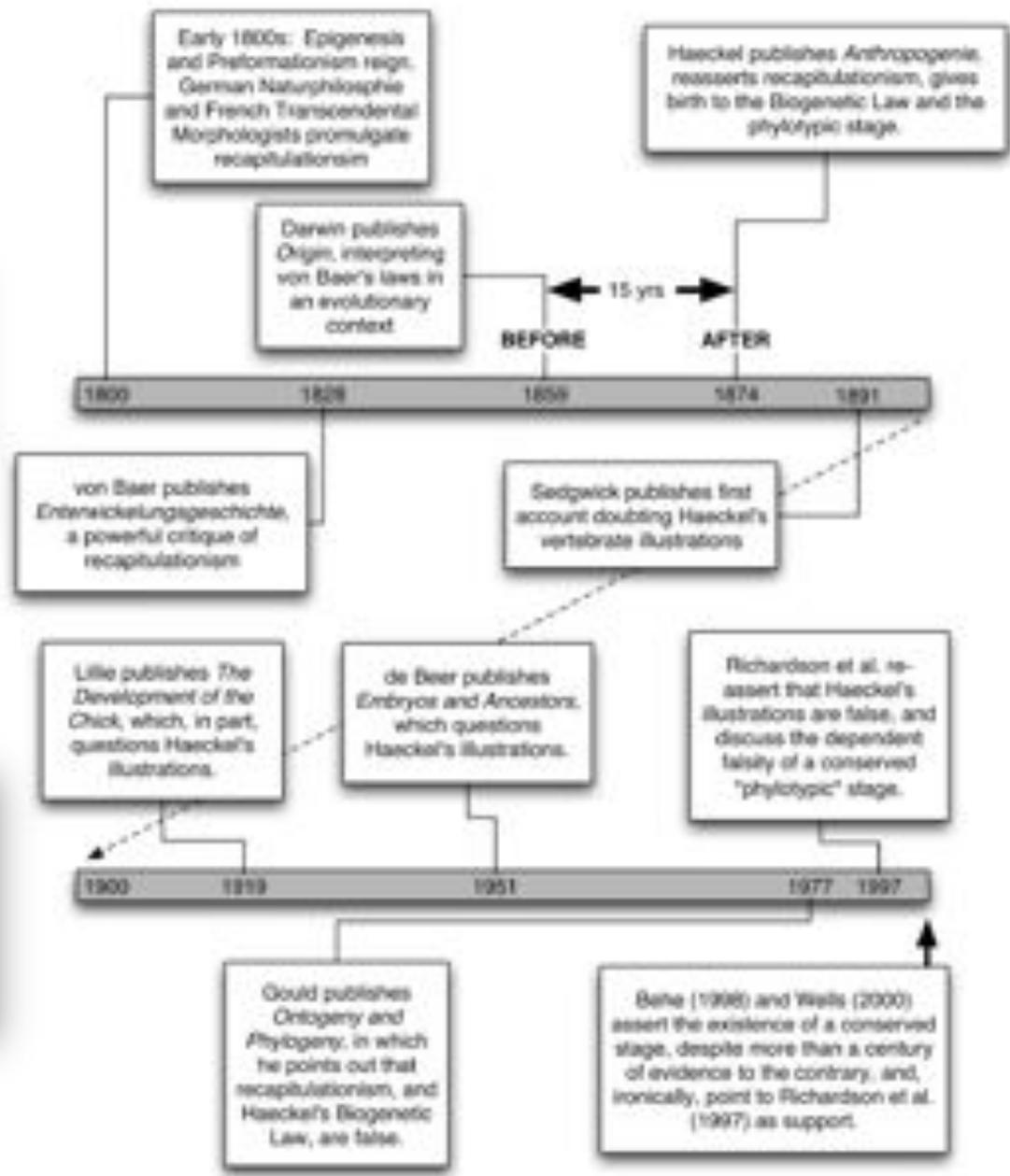
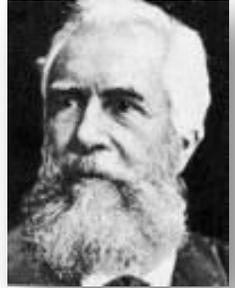
Figure 10. Embryo representations shown in the evolution chapters of textbooks reviewed by Wells (2000).

Revelation?

- ▶ Many workers (even in Haeckel's lifetime) had shown that embryos do not go through adult stages of lower forms, rather they share many common features of development.
 - For example; Adam Sedgwick in 1894, Walter Garstang in 1922, Gavin de Beer in 1958, S.J. Gould in 1977.
- ▶ What is (relatively) new is that Haeckel doctored the drawings in the first edition of *Anthropogenie*.
- ▶ Is modern evolutionary biology or even developmental biology dependent on Haeckel's drawings or the idea of recapitulation?

Who Exposed the Problem?

- ▶ “And it was [Stephen Jay] Gould who (despite having **known the truth** for over twenty years) kept his mouth shut until [Michael Behe] exposed the problem.” (Wells, p. 109)
- ▶ Gould, *Ontogeny and Phylogeny*, **1977**
 - Invalidity of Biogenetic Law and detrimental effects of accepting.
 - Does note that Wilhelm His “accused Haeckel of shocking dishonesty in repeating the same picture several times to show the similarity among vertebrates at early embryonic stages in several plates” (p. 430).
- ▶ Richardson *et al.*, *Science*, **1997**
 - Proof of fudging of photos
- ▶ Behe, *New York Times* Op Ed, 8/13/1999



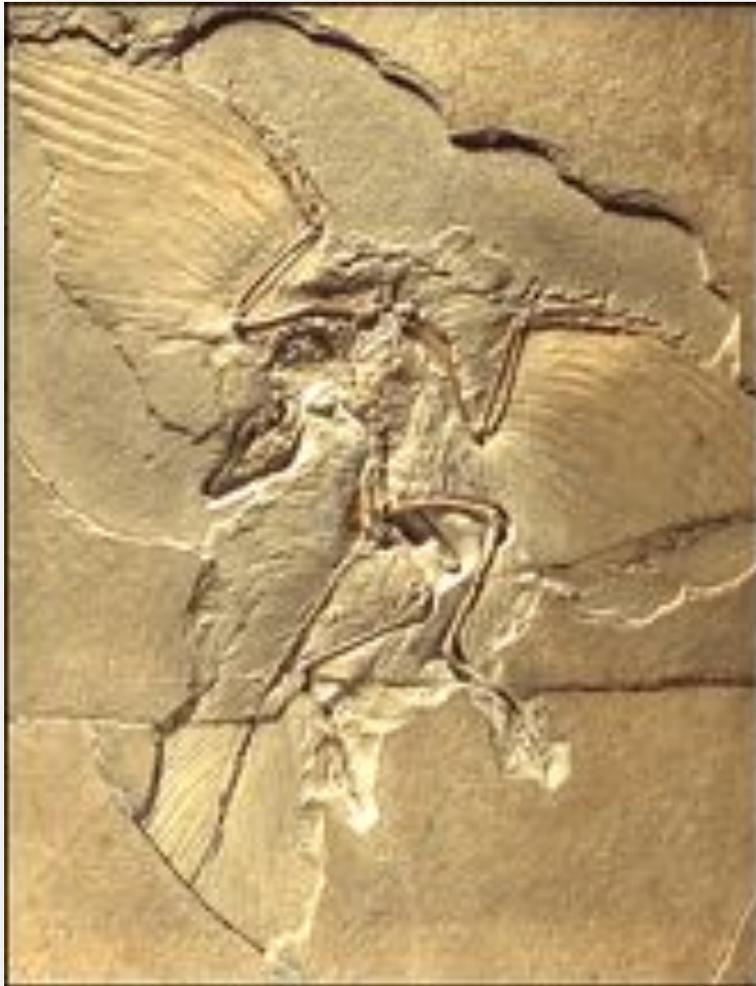
Richardson on Wells

“Our work has been used in a nationally televised debate to attack evolutionary theory, and to suggest that evolution cannot explain embryology. We strongly disagree with this viewpoint. **Data from embryology are fully consistent with Darwinian evolution.** Haeckel's famous drawings are a Creationist cause célèbre. Early versions show young embryos looking virtually identical in different vertebrate species. **On a fundamental level, Haeckel was correct:** All vertebrates develop a similar body plan (consisting of notochord, body segments, pharyngeal pouches, and so forth). **This shared developmental program reflects shared evolutionary history.** It also fits with overwhelming recent evidence that development in different animals is controlled by common genetic mechanisms.

Richardson, M. K. (1998). "Letter." *Science*, **280**(5366): 983

WARNING: The supposed dinosaur ancestors of Archaeopteryx appeared long after it, and modern birds are probably not descended from it.

Archeopteryx – not a lineal ancestor



Is *Archaeopteryx* a bird?



Archaeopteryx lacks:

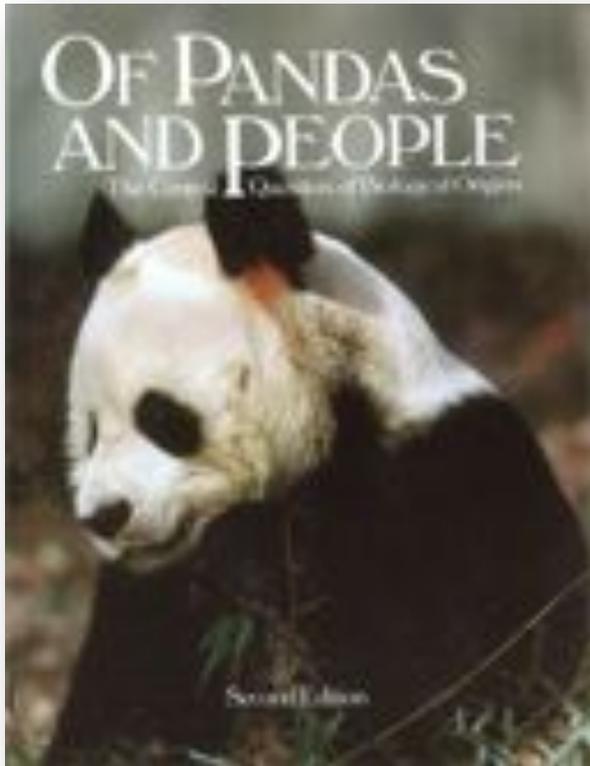


Archaeopteryx has:



- a toothless beak.
- a keeled sternum (breastbone).
- no claws on their wings.
- a pygostyle (vertebrate ending).
- flight.
- a backwards-pointing pubis.
- an enlarged sternum.
- feathers.
- a three-fingered hand.
- a furcula (wish bone).
- hollow bones.
- a long index finger.
- a bipedal gait.
- legs directly underneath the body.
- a hinge-like ankle.

From *Pandas and People*

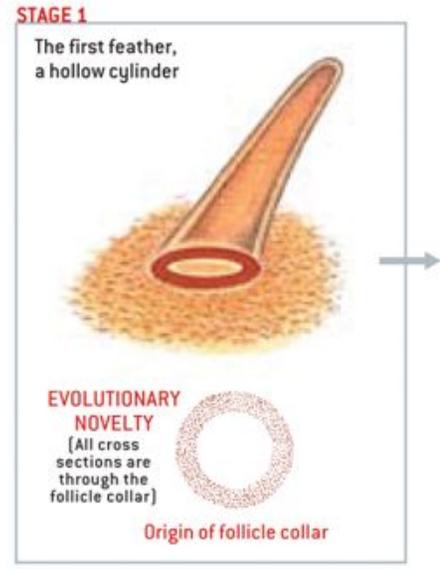
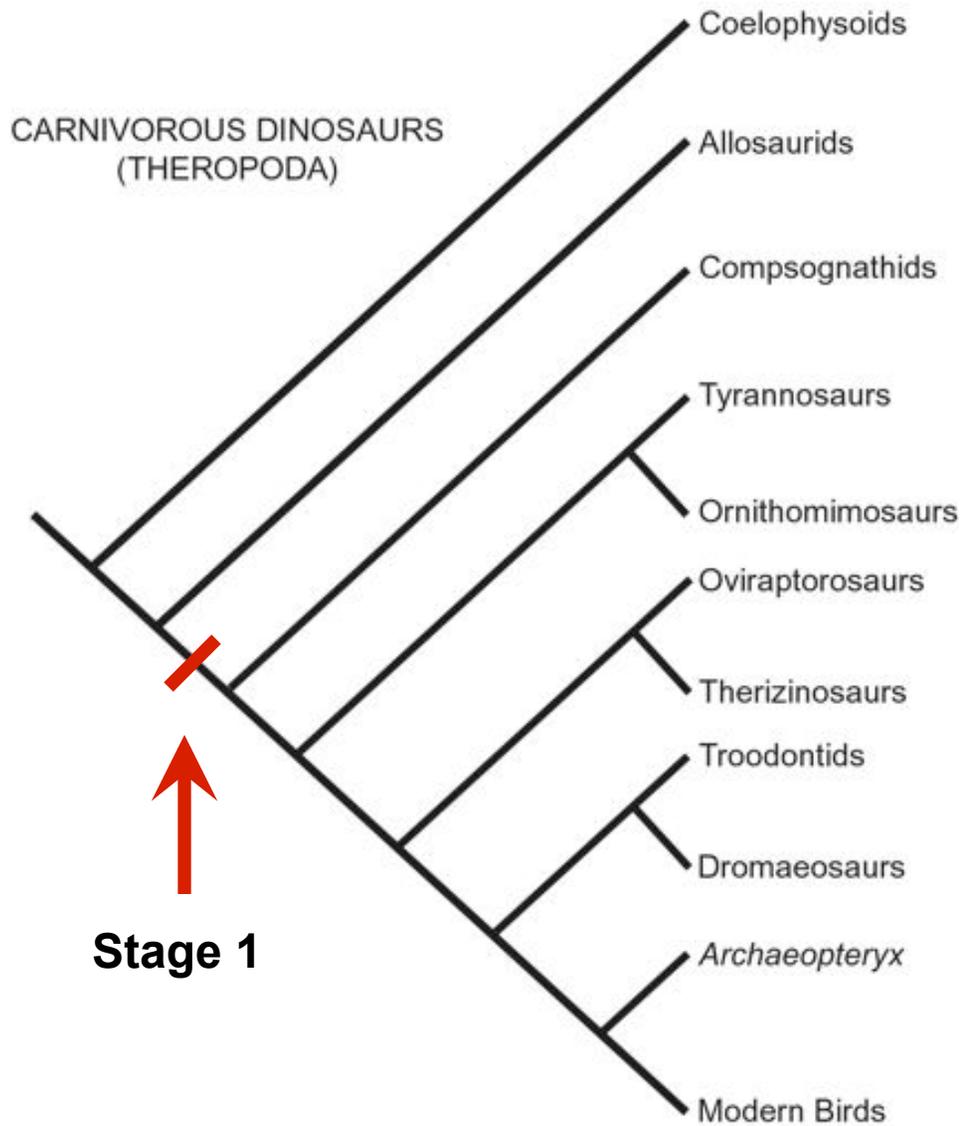


- ▶ “If only we could find a fossil showing scales developing the properties of feathers ... But the fossil record gives no evidence for such changes.” (106)
- ▶ “There is no gradual series of fossils leading ... from reptiles to birds. Instead, fossil types are **fully formed and functional** when they first appear in the fossil record.” (22)



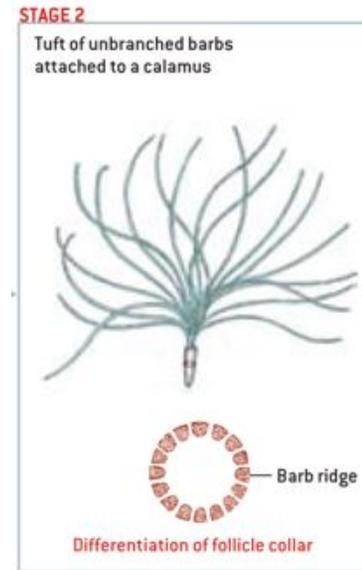
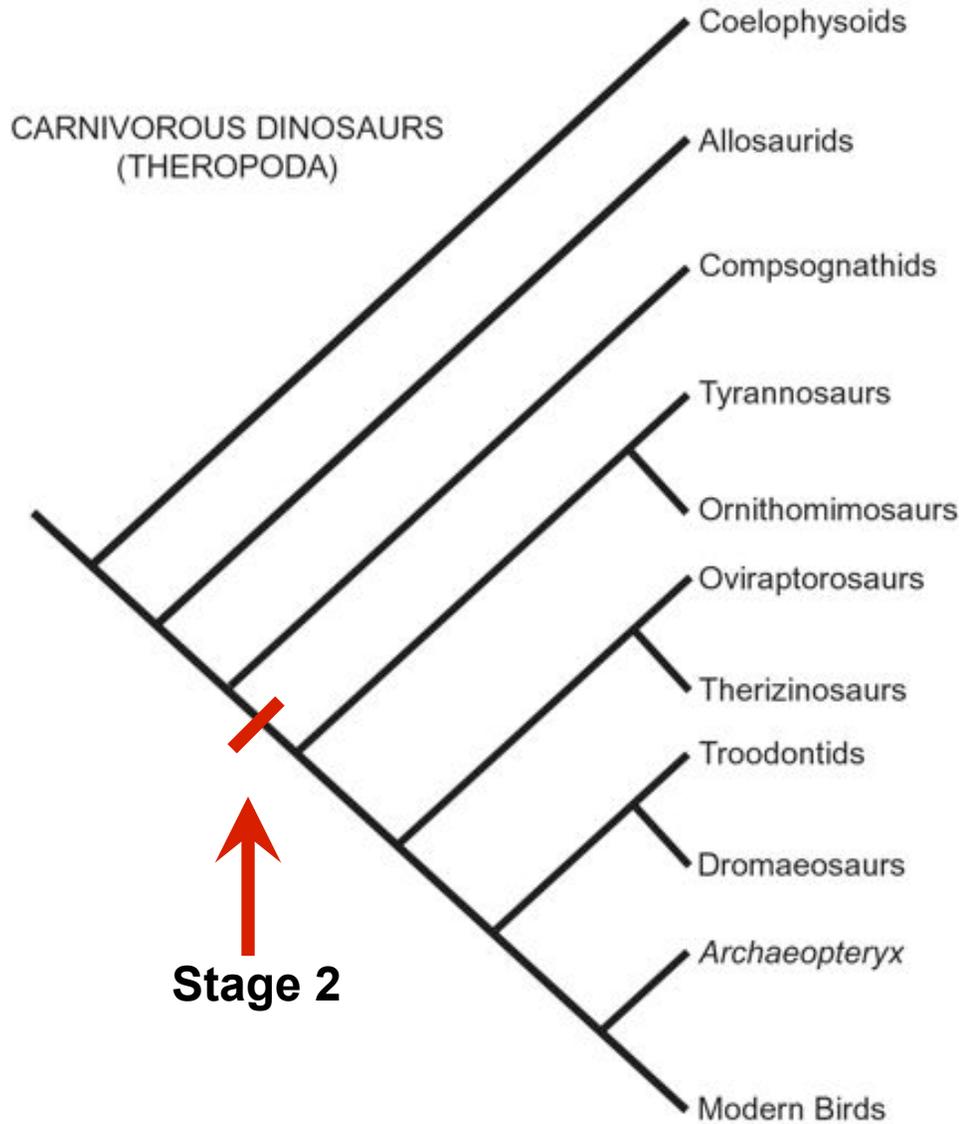
Figure 13. Some examples of feathered dinosaurs discovered in Liaoning, China.

Origin of Feathers



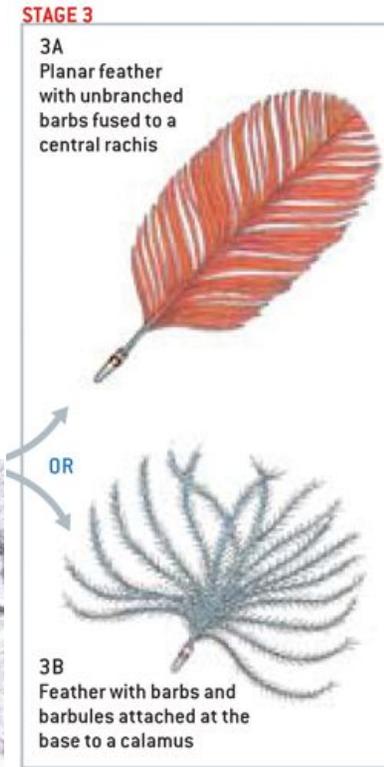
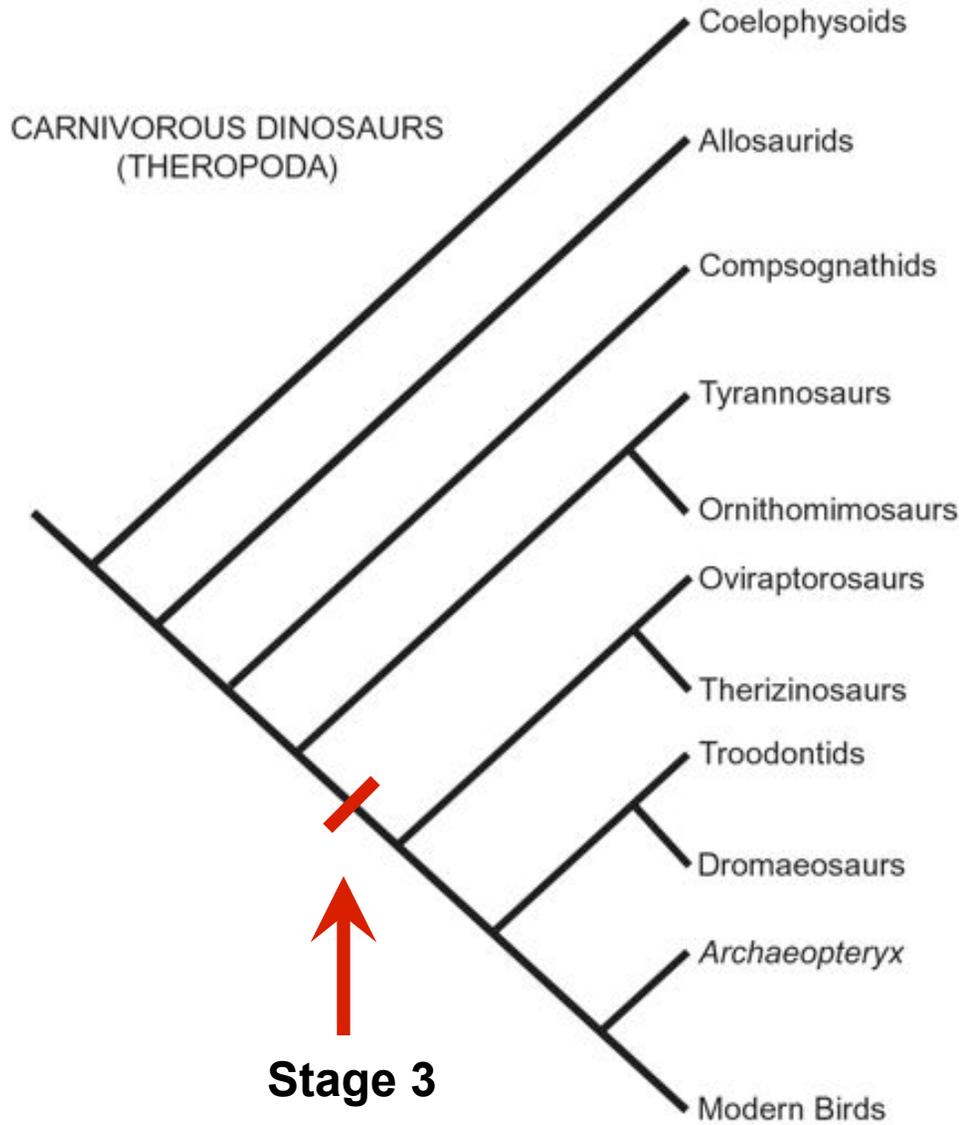
Sinosauropteryx (a compsognathid)

Origin of Feathers



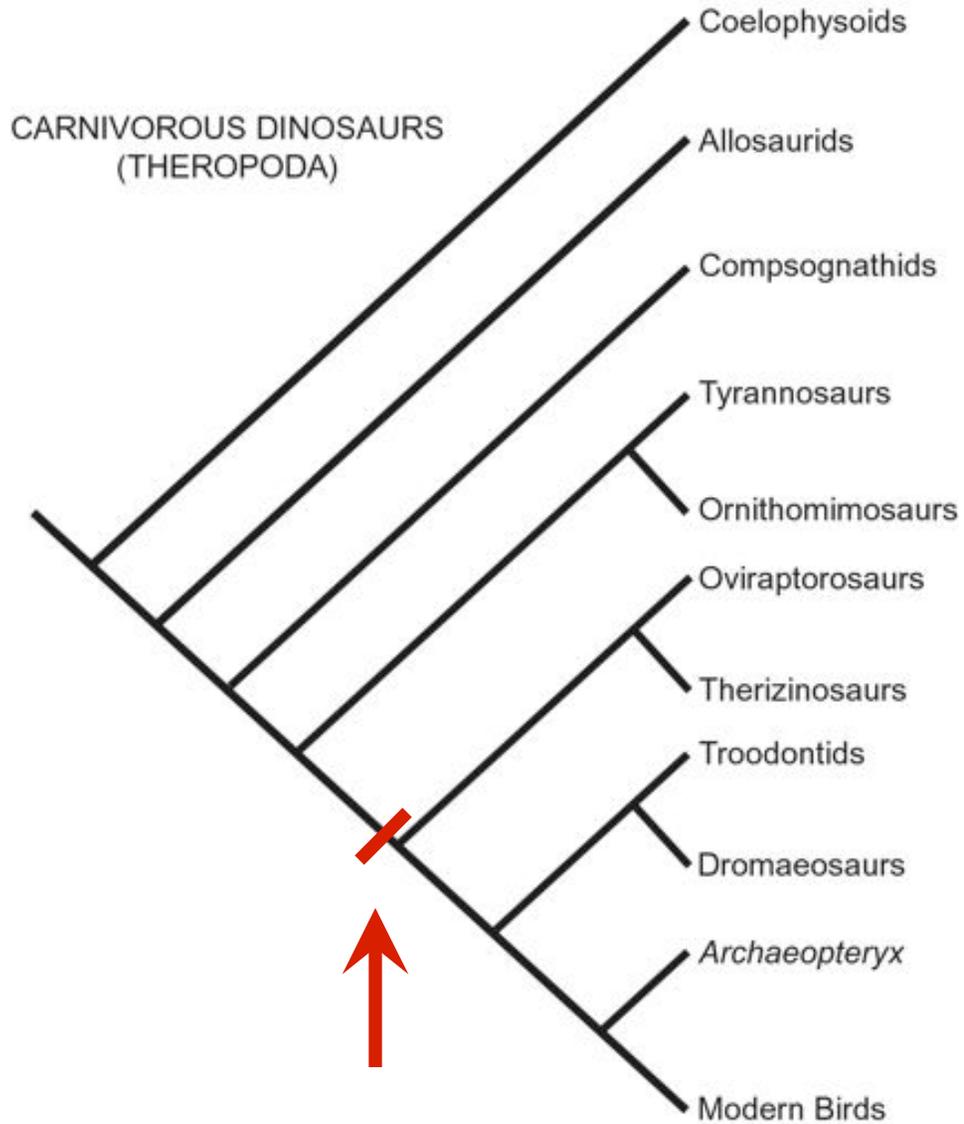
Dilong (a tyrannosauroid)

Origin of Feathers

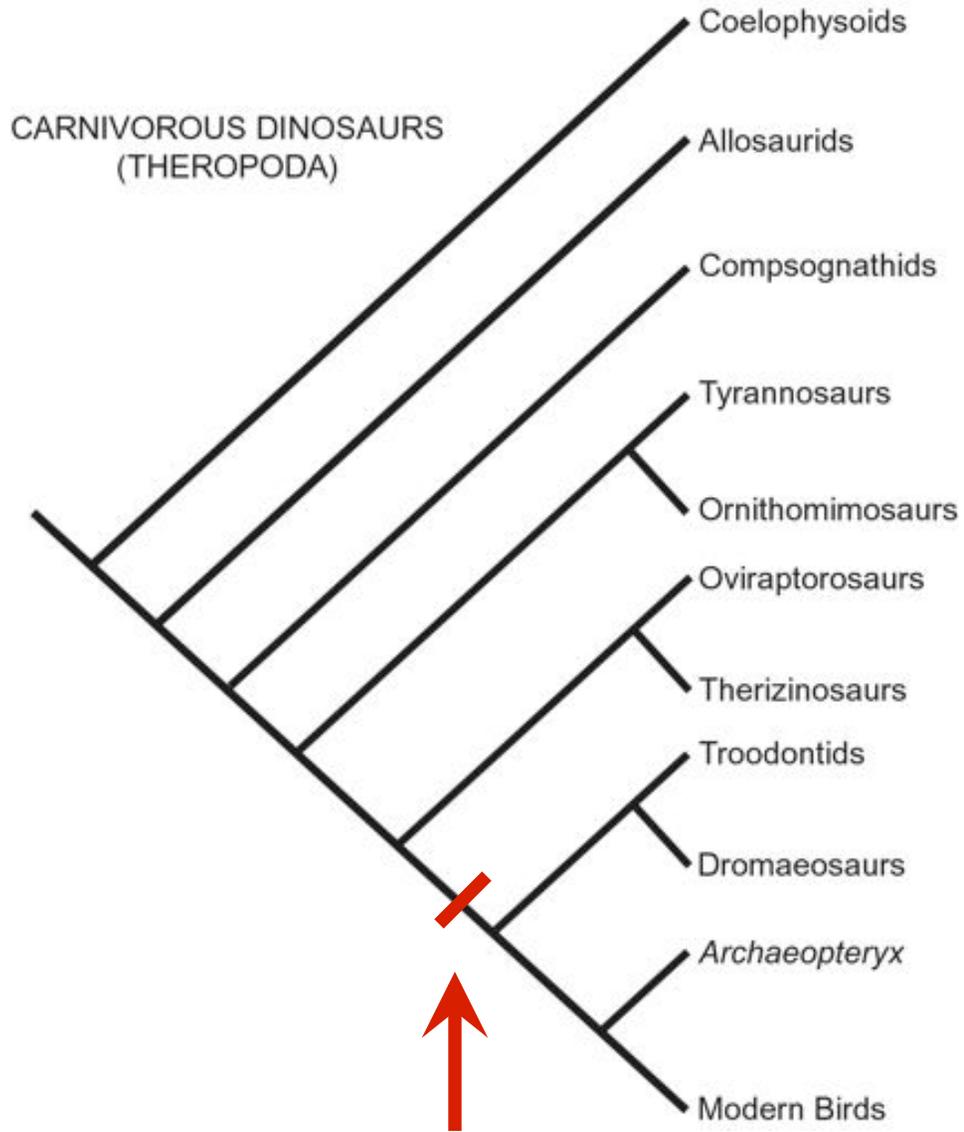


Protarchaeopteryx

Origin of Feathers

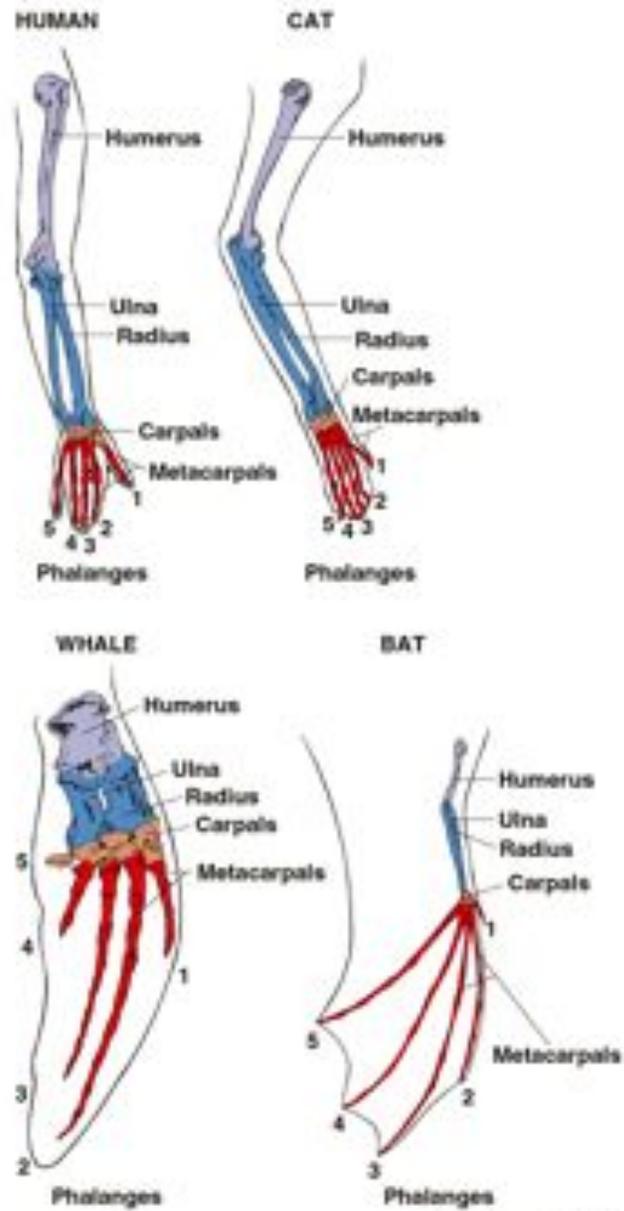


Origin of Feathers

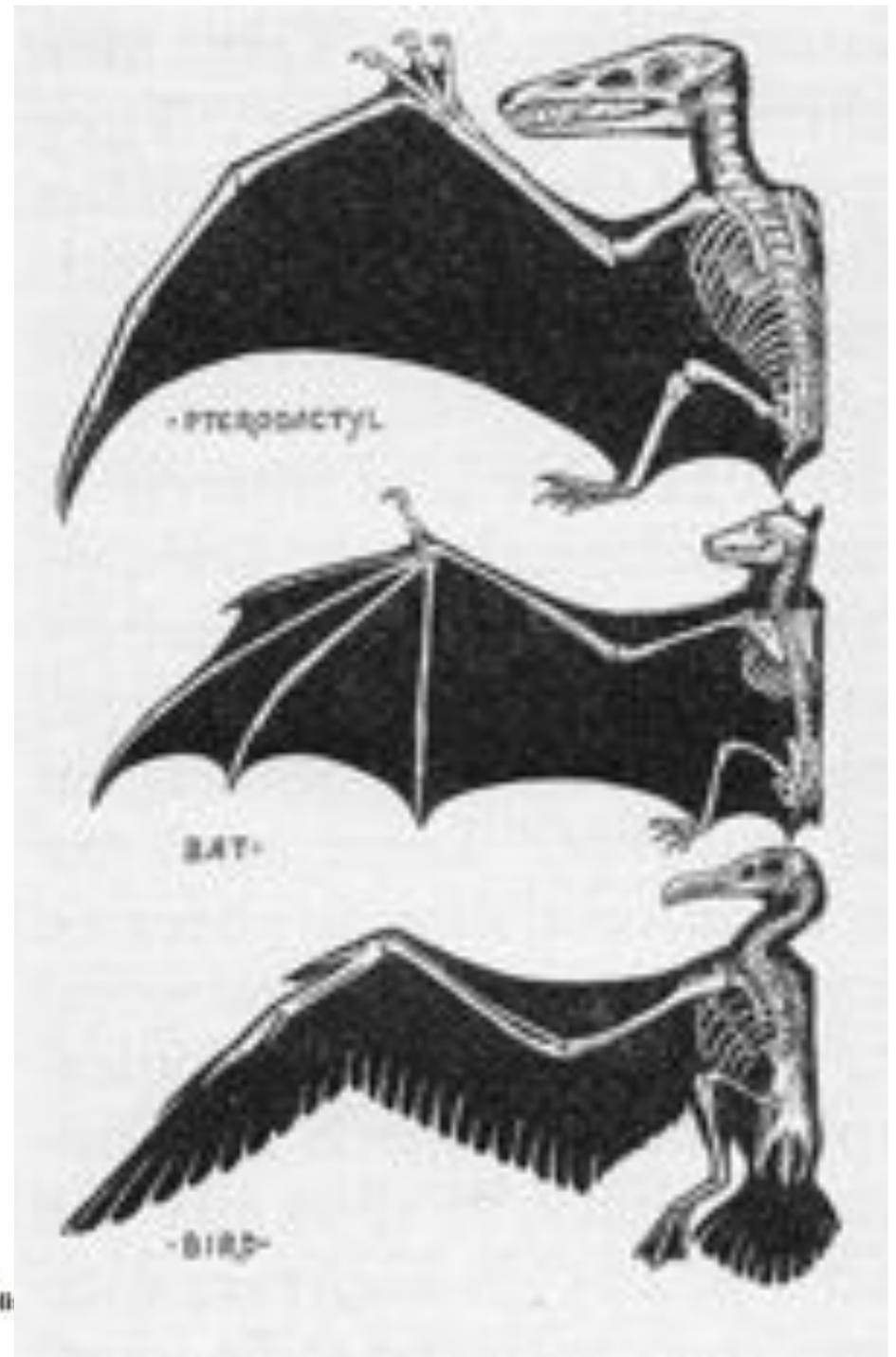


WARNING: If homology is defined as similarity due to common ancestry, it cannot be used as evidence for common ancestry; its causes are unknown.

Solomon: Biology, 5/e
Figure 17.10



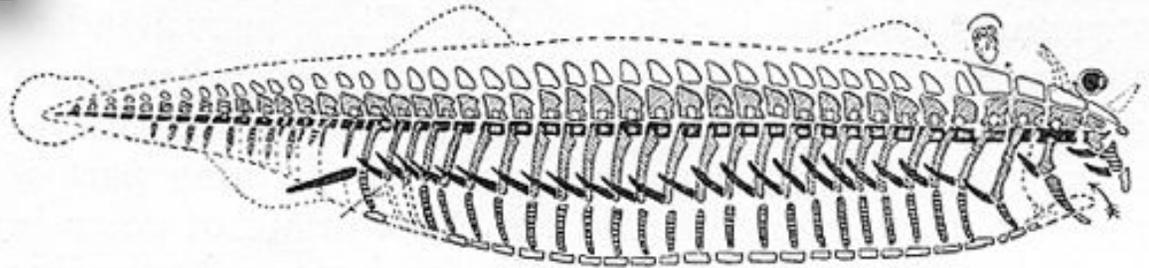
Saunders College Publi

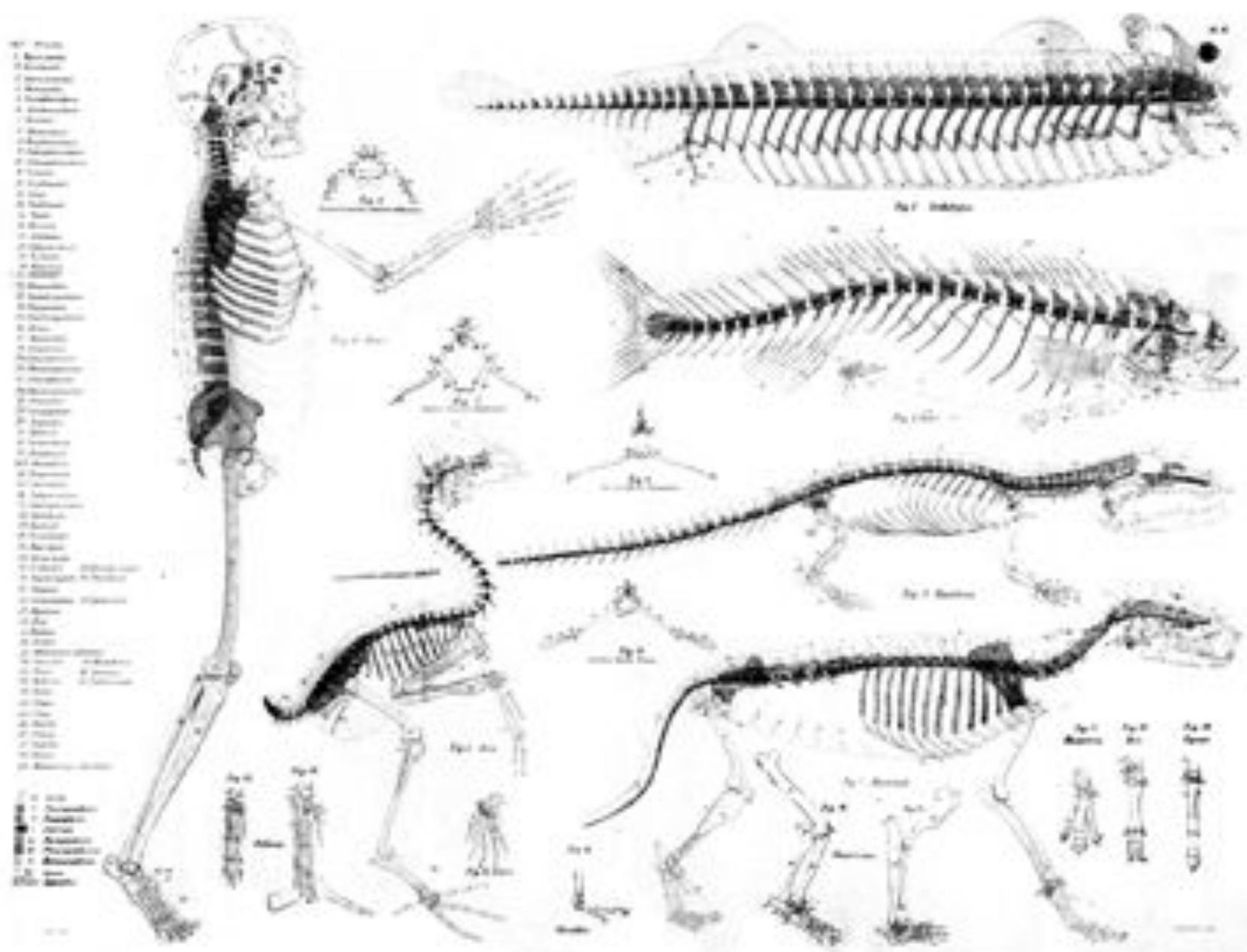


Richard Owen (1846)



- ▶ Homolog: “The same organ in different animals under every variety of form and function”
- ▶ Homology: A **causal hypothesis** accounting for homologs by reference to an *archaetype* or “common type”





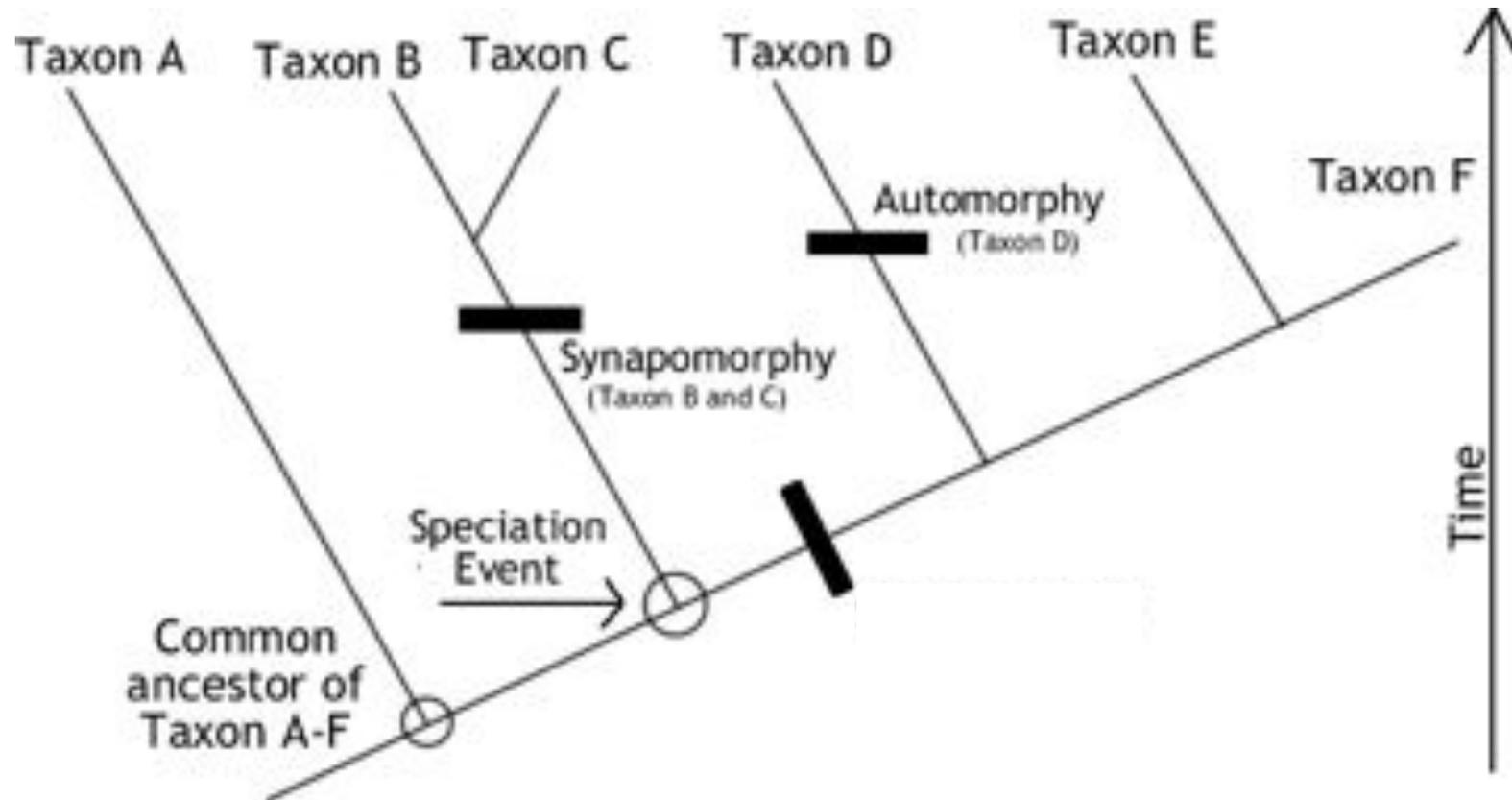
**St. George Mivart. 1870. On the use of the term “homology.”
Ann. Mag. Nat. Hist. 6 (ser. 4): 113-121.**

1. non-homologous analogues
2. homologous analogues
3. homogenetic homologues
4. developmental homogens
5. ancestral homogens
6. homoplastic homologues
7. homogenetic serial homologues
8. homoplastic serial homologues
9. vertical homologues
10. lateral homologues
11. antero-posterior homologues
12. radial homologues
13. homotrophic homologues
14. serial homotrophes
15. vertical homotrophes
16. lateral homotrophes
17. antero-posterior homotrophes
18. actinologous homologues
19. serial actinologues
20. secondary actinologues
21. serial secondary actinologues
22. correlated secondary actinologues
23. correlated serial secondary actinologues
24. special homologues
25. general homologues

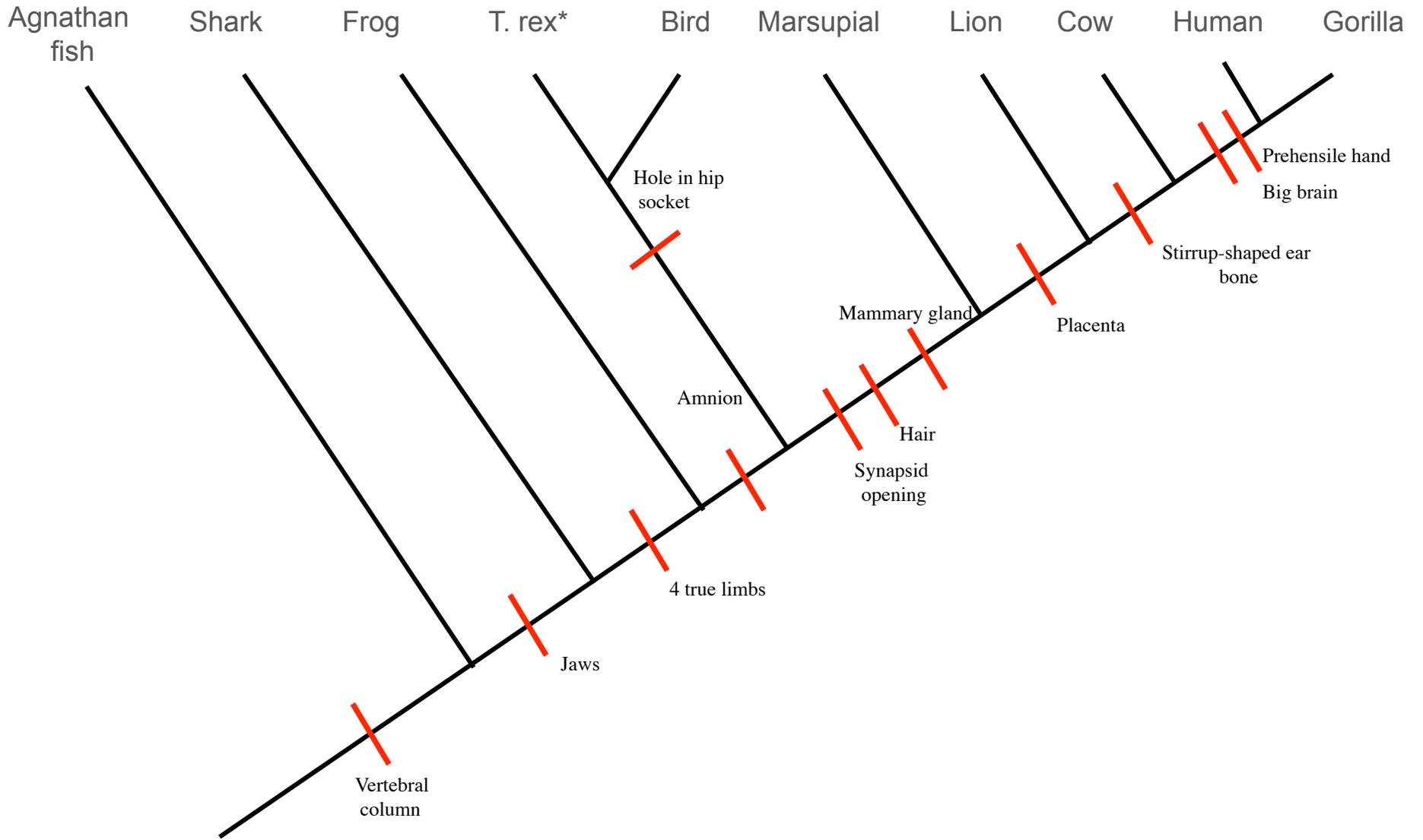
Taxic Homology

- ▶ A **causal hypothesis** accounting for homologs by common descent.
- ▶ The hypothesis is tested using **cladistic** methods which consider many characters simultaneously.
- ▶ Detected homologs are known as **synapomorphies** (shared derived characters).
- ▶ Similarity not due to common descent is **homoplasy** (homoplasts). This can be due to convergent evolution etc.

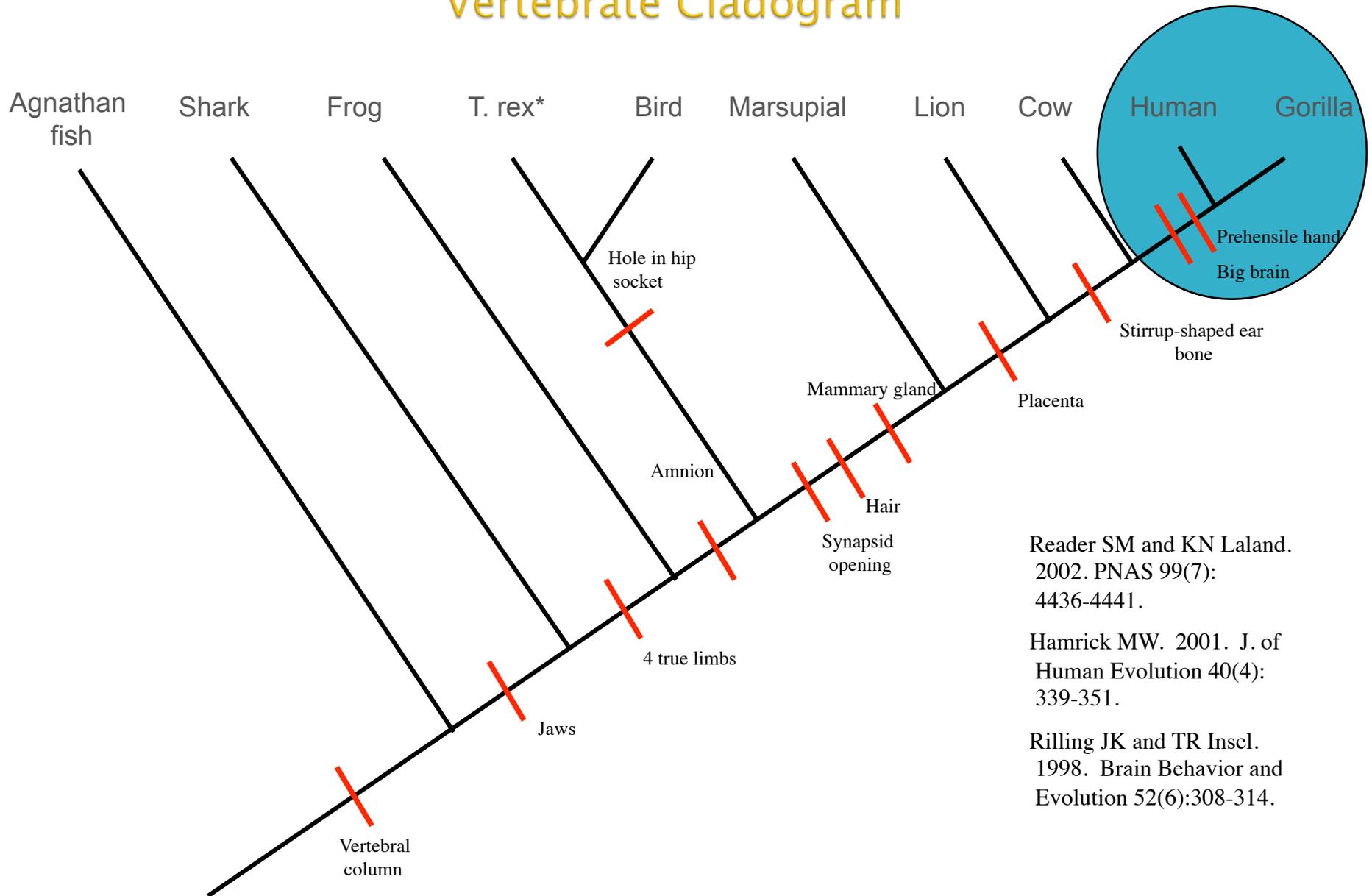
Synapomorphy



Vertebrate Cladogram



Vertebrate Cladogram

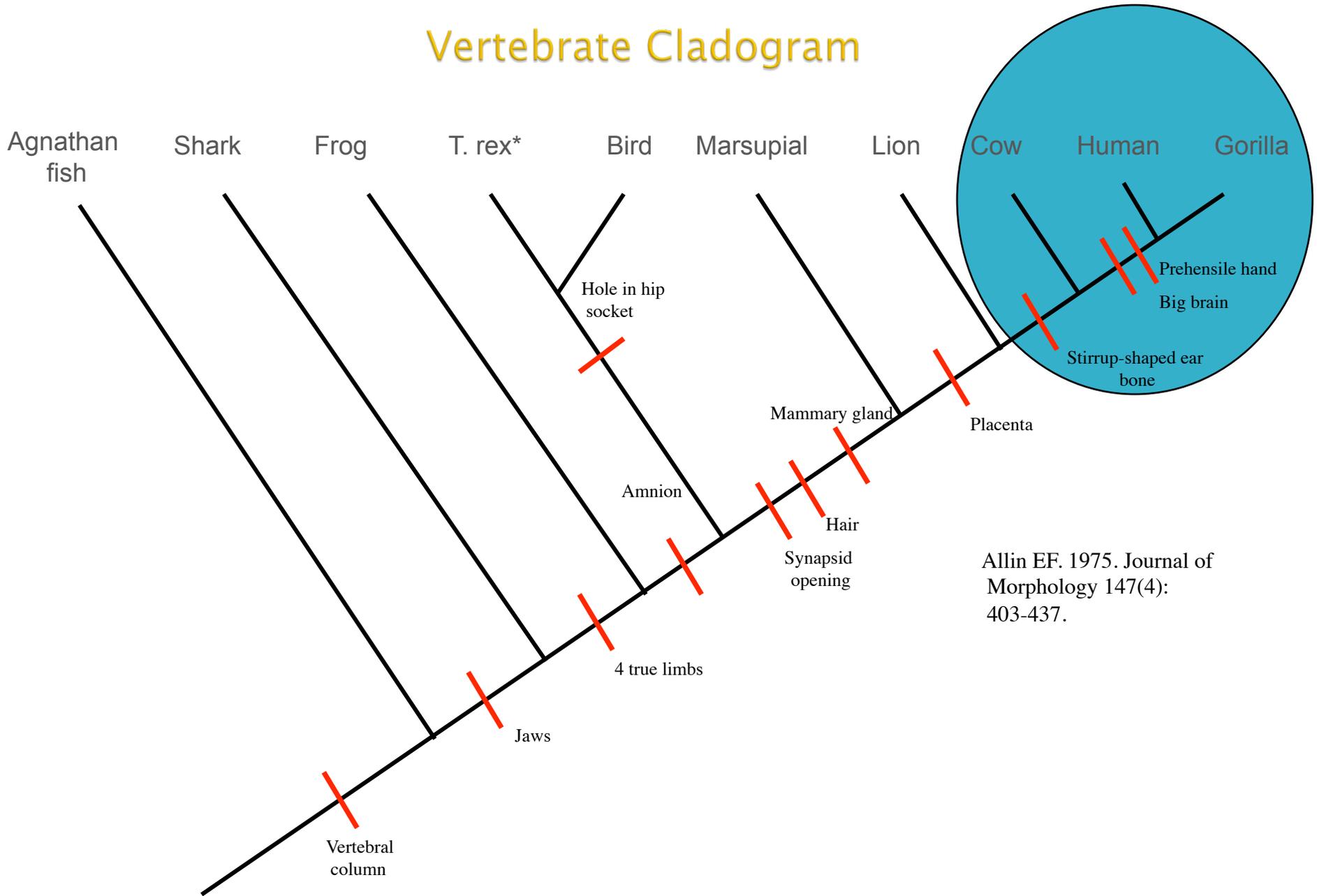


Reader SM and KN Laland.
2002. PNAS 99(7):
4436-4441.

Hamrick MW. 2001. J. of
Human Evolution 40(4):
339-351.

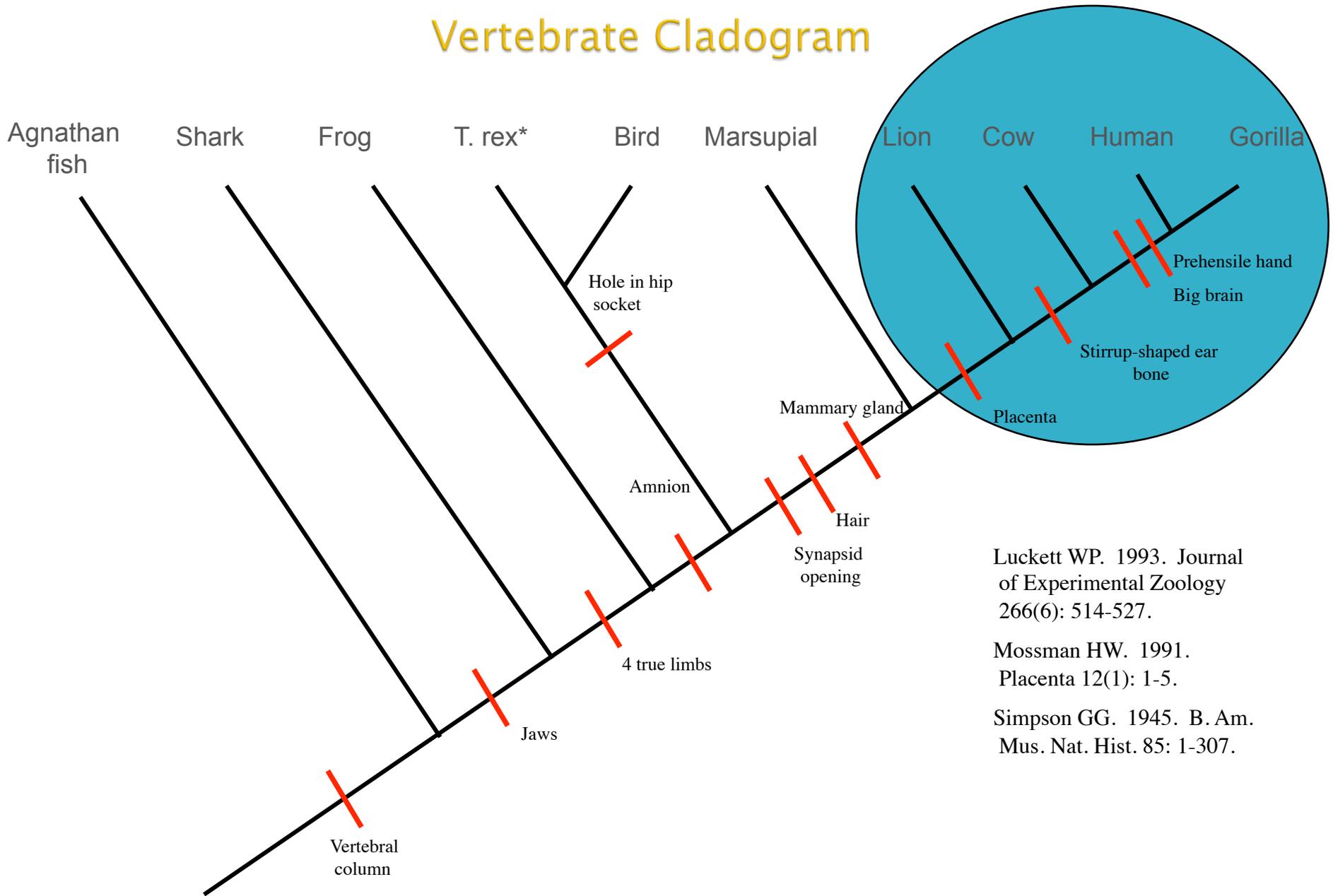
Rilling JK and TR Insel.
1998. Brain Behavior and
Evolution 52(6):308-314.

Vertebrate Cladogram



Allin EF. 1975. *Journal of Morphology* 147(4): 403-437.

Vertebrate Cladogram

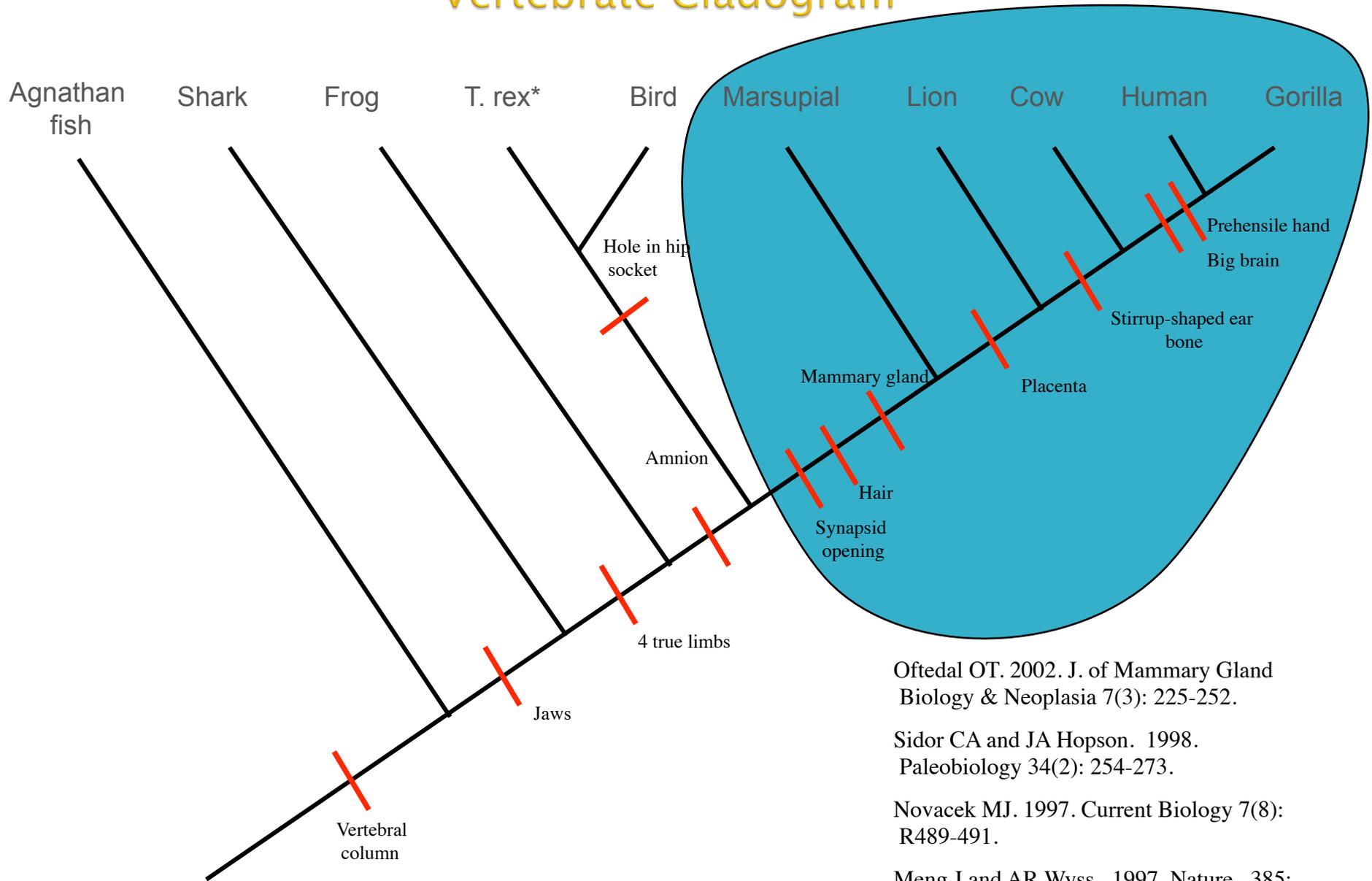


Luckett WP. 1993. *Journal of Experimental Zoology* 266(6): 514-527.

Mossman HW. 1991. *Placenta* 12(1): 1-5.

Simpson GG. 1945. *B. Am. Mus. Nat. Hist.* 85: 1-307.

Vertebrate Cladogram



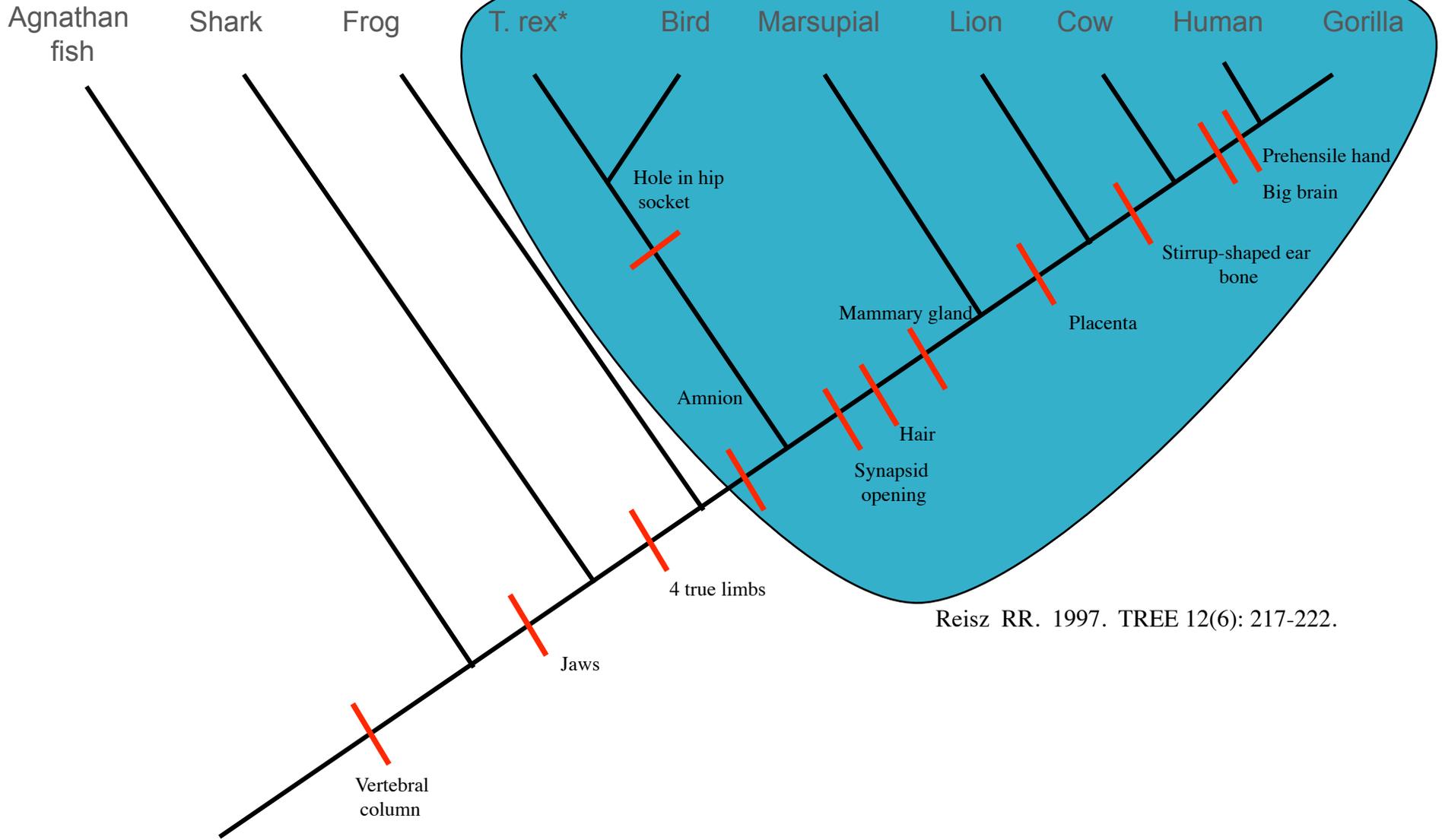
Oftedal OT. 2002. J. of Mammary Gland Biology & Neoplasia 7(3): 225-252.

Sidor CA and JA Hopson. 1998. Paleobiology 34(2): 254-273.

Novacek MJ. 1997. Current Biology 7(8): R489-491.

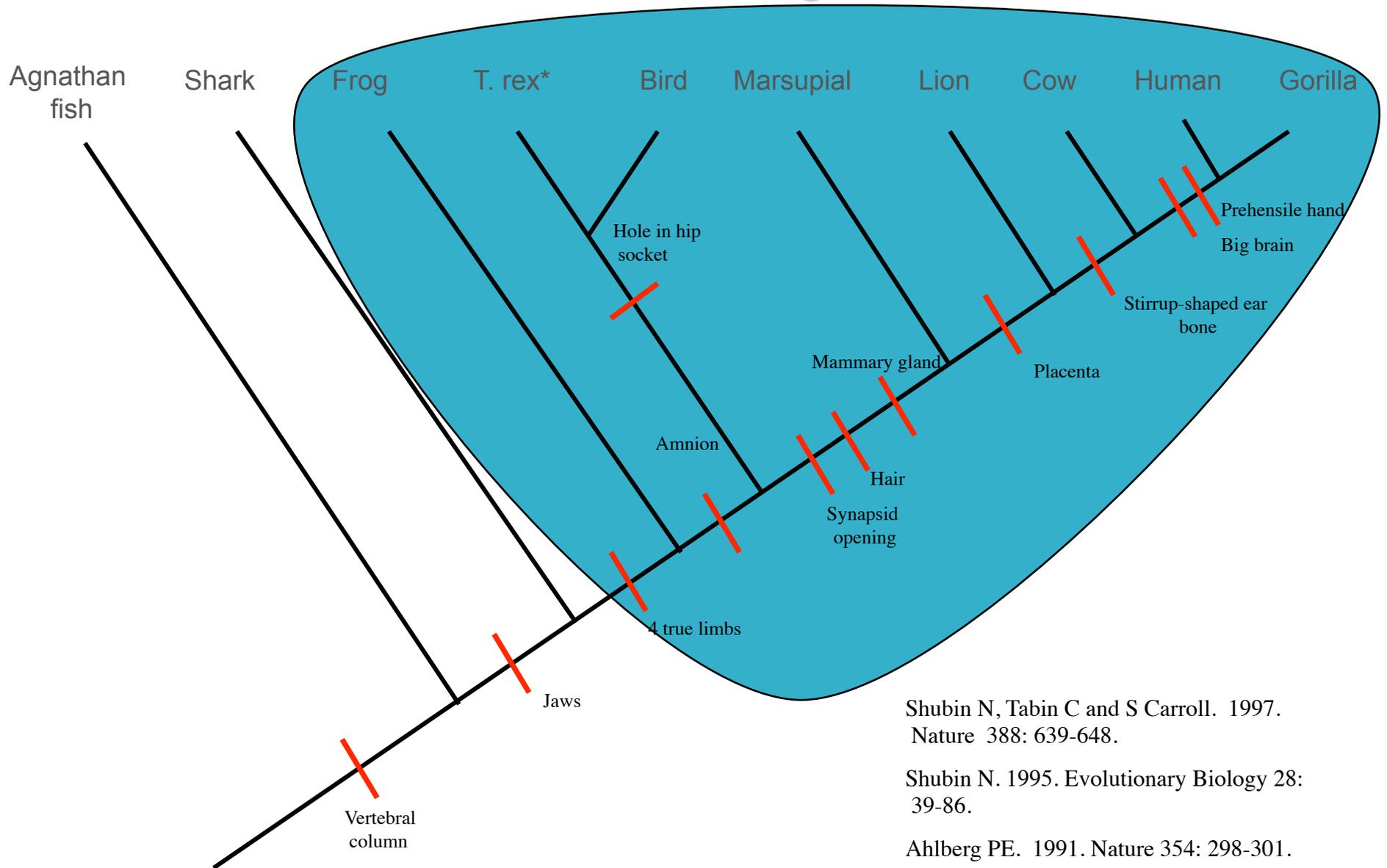
Meng J and AR Wyss. 1997. Nature. 385: 712-714.

Vertebrate Cladogram



Reisz RR. 1997. TREE 12(6): 217-222.

Vertebrate Cladogram



Shubin N, Tabin C and S Carroll. 1997.
Nature 388: 639-648.

Shubin N. 1995. Evolutionary Biology 28:
39-86.

Ahlberg PE. 1991. Nature 354: 298-301.

Vertebrate Cladogram

Agnathan fish

Shark

Frog

T. rex*

Bird

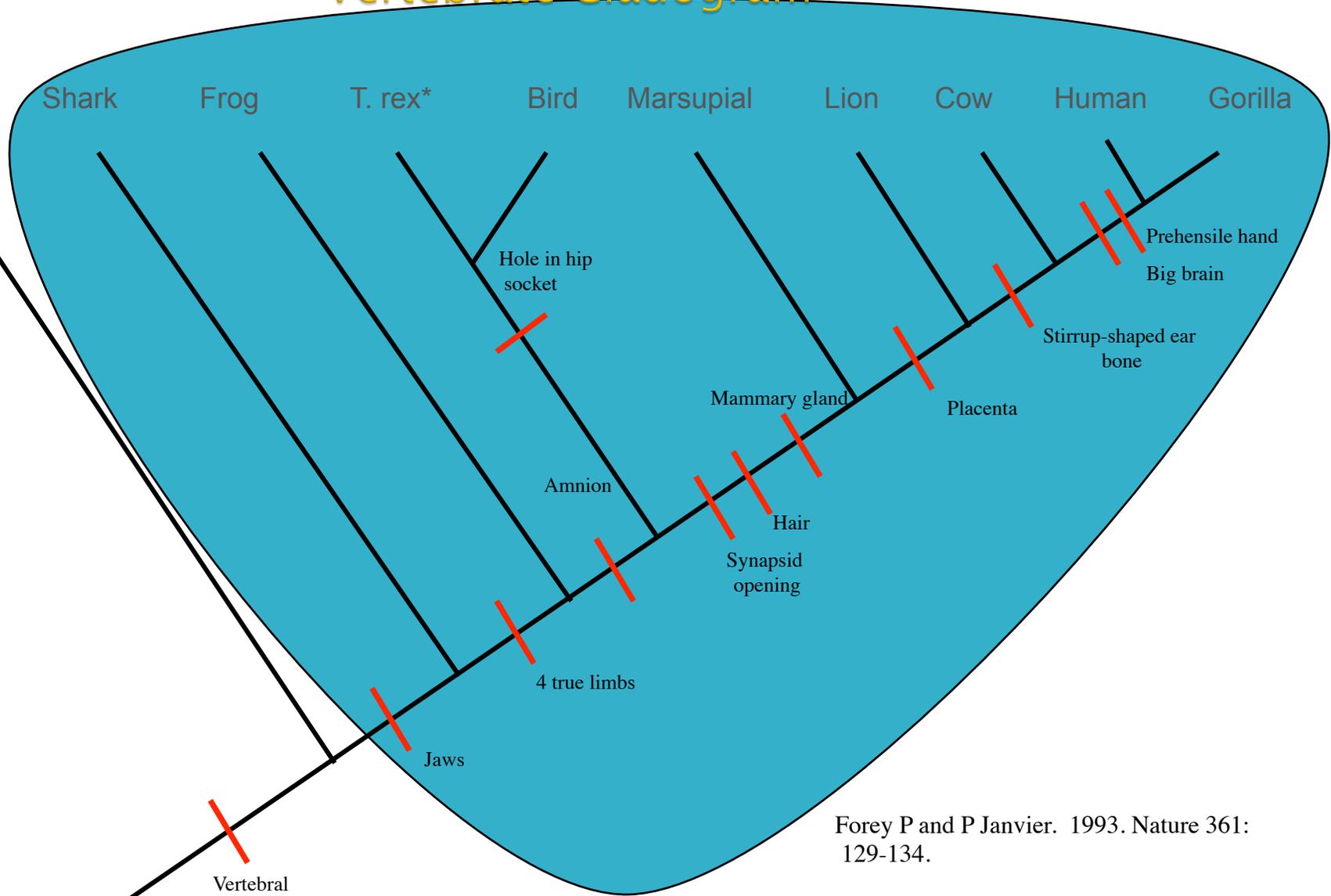
Marsupial

Lion

Cow

Human

Gorilla



Hole in hip socket

Prehensile hand
Big brain

Stirrup-shaped ear bone

Mammary gland

Placenta

Amnion

Hair

Synapsid opening

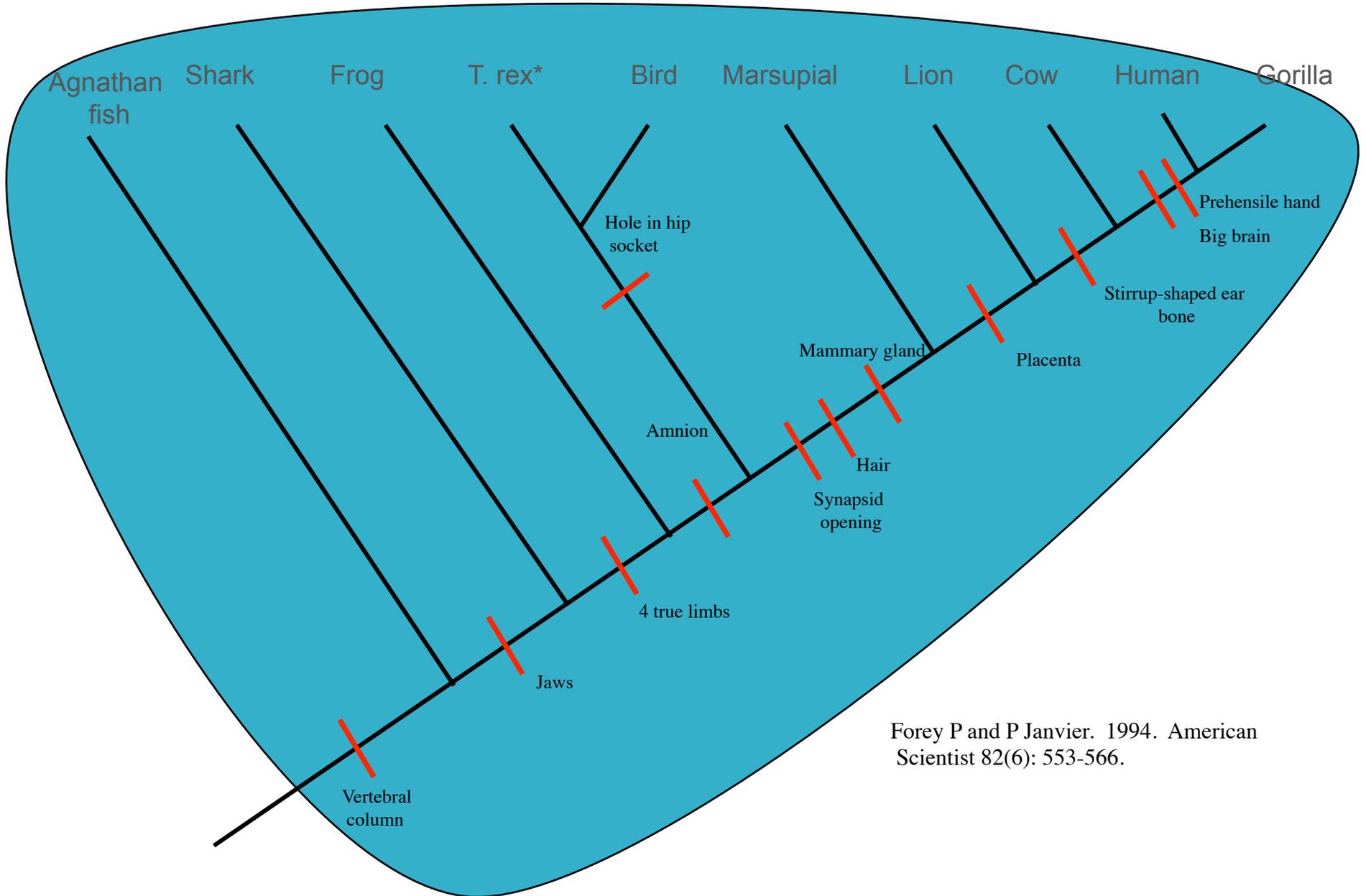
4 true limbs

Jaws

Vertebral column

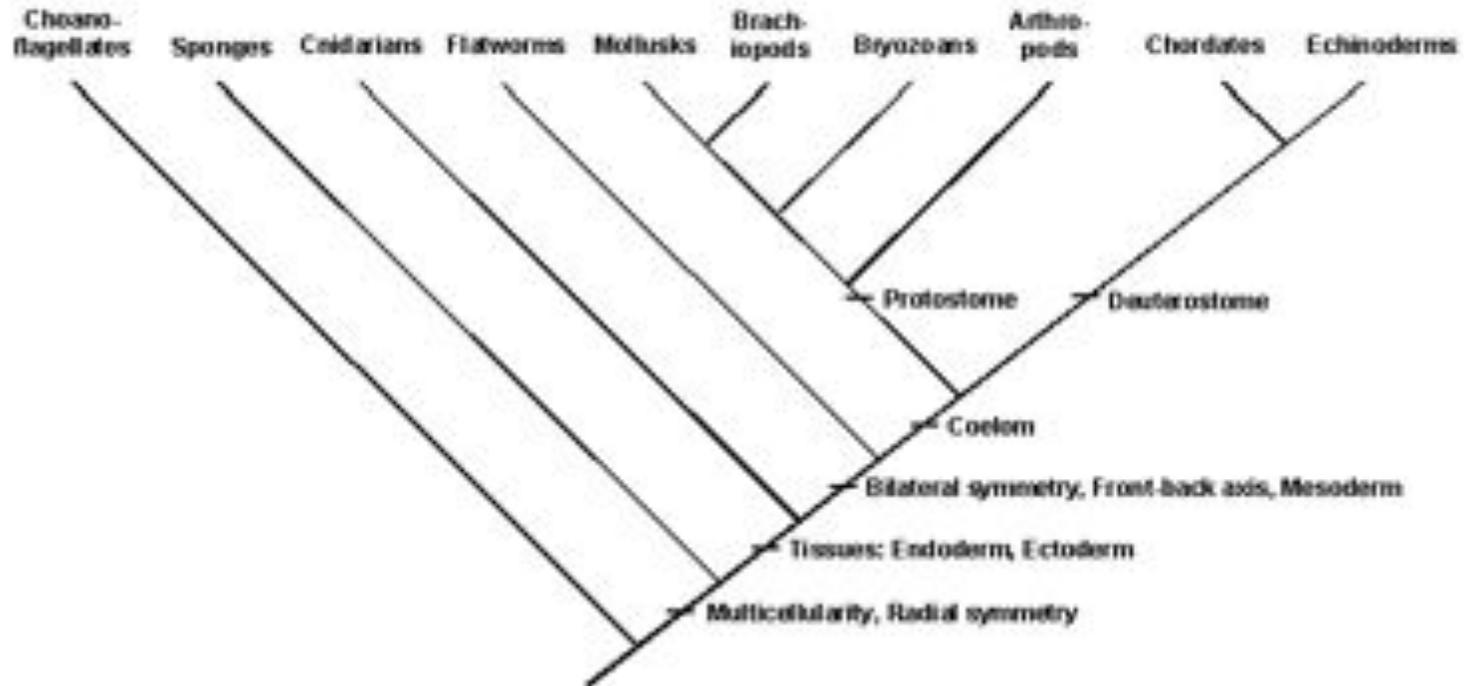
Forey P and P Janvier. 1993. Nature 361: 129-134.

Vertebrate Cladogram



Forey P and P Janvier. 1994. American Scientist 82(6): 553-566.

Metazoan Cladogram



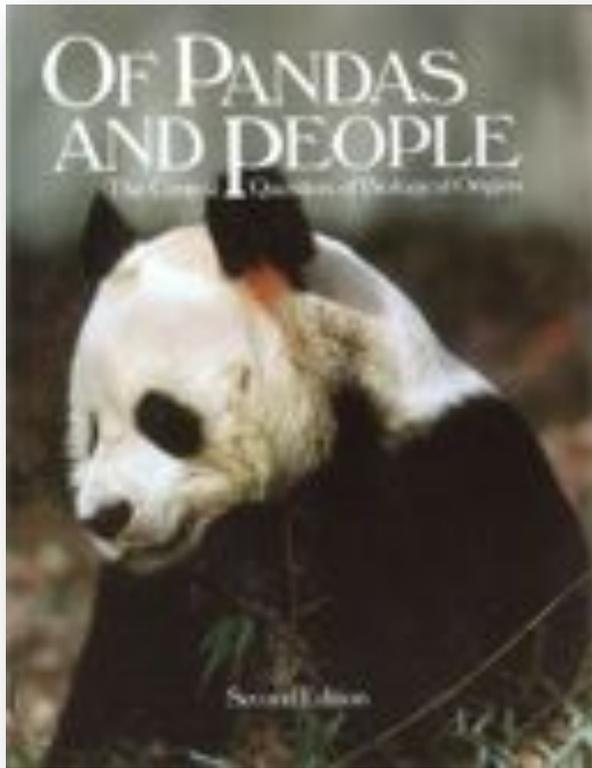
Developmental Homology

- ▶ A **causal hypothesis** accounting for homologs by shared developmental modules or shared gene regulatory networks
- ▶ This is tested using the tools of evolutionary developmental biology.
- ▶ Ideally, morphological taxic homologies are due to developmental homologies, but sometimes this isn't the case. We don't know why. The problem reflects our lack of knowledge about development rather than evidence against evolution.

Jonathan Wells

- ▶ Textbooks should explain that homologies are similarities of structure and function due not to common ancestry but to a common “archetype” (i.e. design).
- ▶ He wants to replace a testable model (taxic & developmental homology) with an untestable, transcendentalist construct which is consistent with intelligent design and baraminology.

On Similarity



“If similarity is the basis for classification, what shall we do when similarities conflict? The marsupial wolf is strikingly similar to the placental wolf in **most features**, yet it is like the kangaroo **in one significant feature** [the pouch]. Upon which similarity do we build our classification scheme?” (29)

From *Of Pandas and People*:

“Notice the skull of the North American wolf is somewhat similar to the dog's, which is **said to be** related to it, but **nearly identical** to the Tasmanian wolf, which is **allegedly** only distantly related to it.”

Thylacinus cynocephalus



Canis lupus familiaris



Canis lupus



Dog



Para-occipital process present

NO

4 premolars

2 molars

Ear bulla present

NO

YES

Carnassial tooth

Cheek bone & jaw joint

N.Am. wolf

NO

4 premolars

Tooth formula

2 molars

NO

YES

Carnassial tooth

Lacrimal bone visible from side



N. Am. wolf

Para-occipital process present

NO

4 premolars

NO

2 molars

Ear bulla present

YES

Carnassial tooth

Cheek bone & jaw joint

Tasmanian wolf

YES

Tooth formula

3 premolars

YES

4 molars

NO

Lacrimal bone visible from side

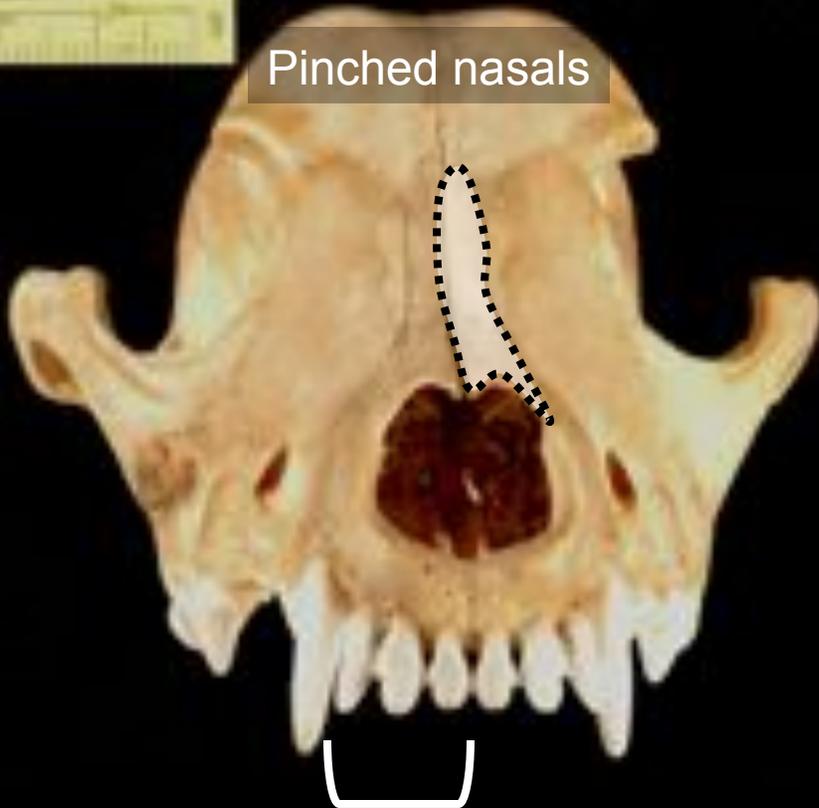


Dog

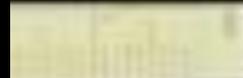
N. Am. wolf



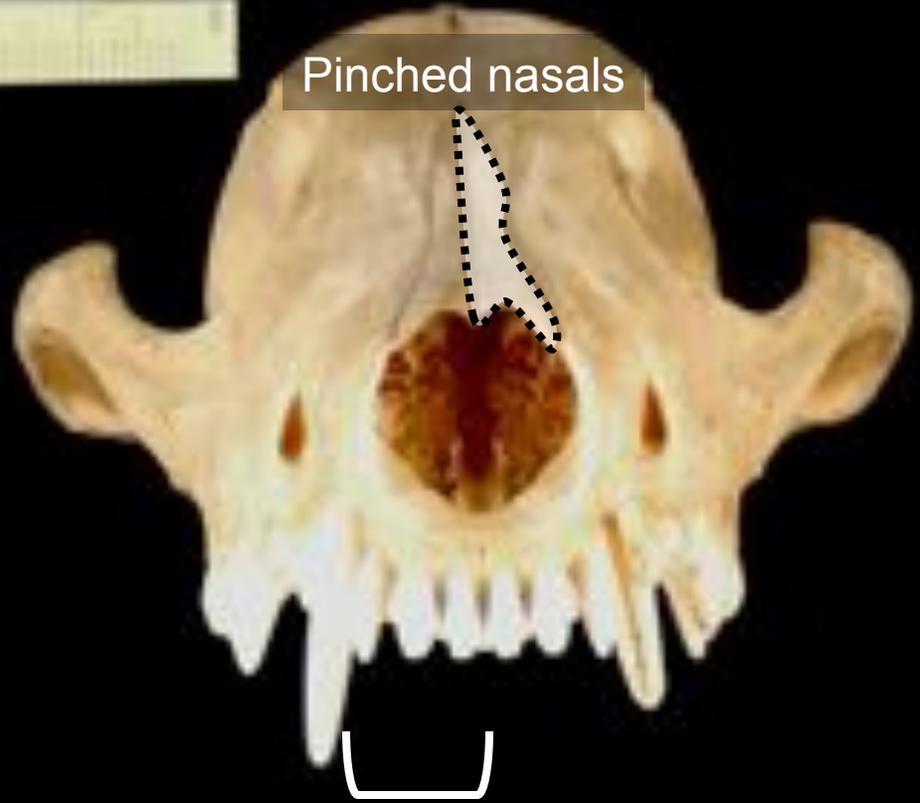
Pinched nasals



3 incisors



Pinched nasals



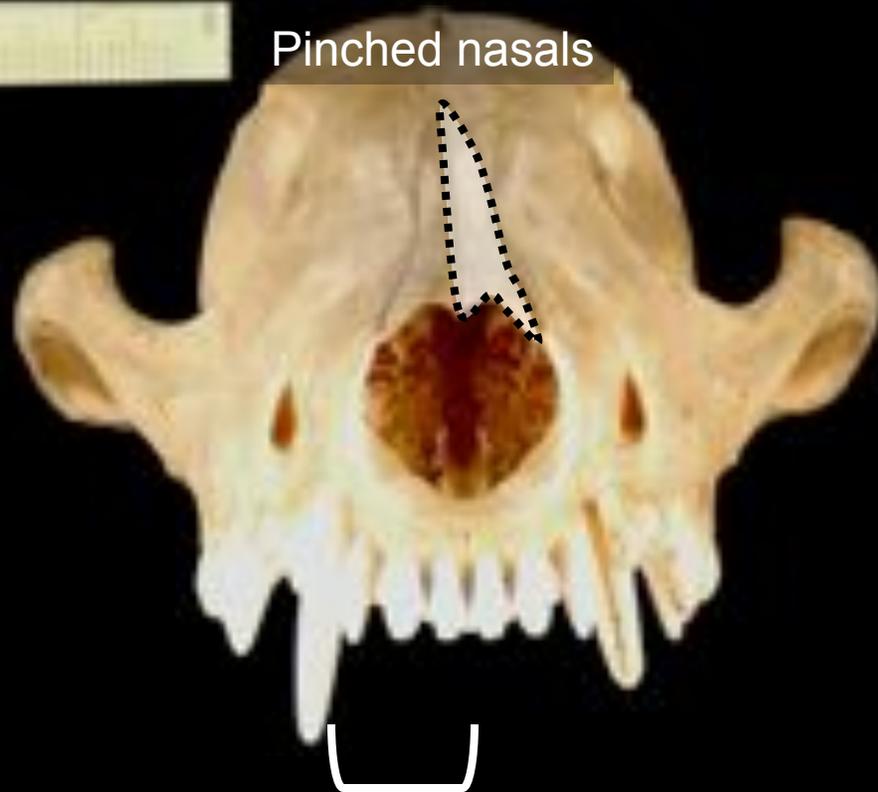
3 incisors

N. Am. wolf

Tasmanian wolf



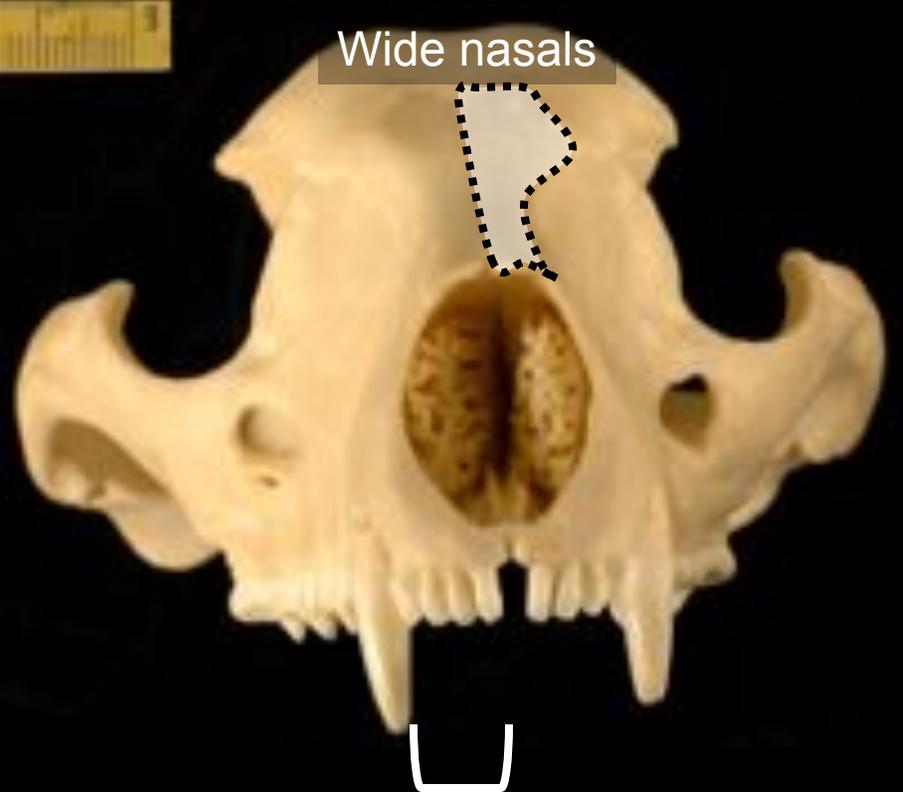
Pinched nasals



3 incisors



Wide nasals



4 incisors

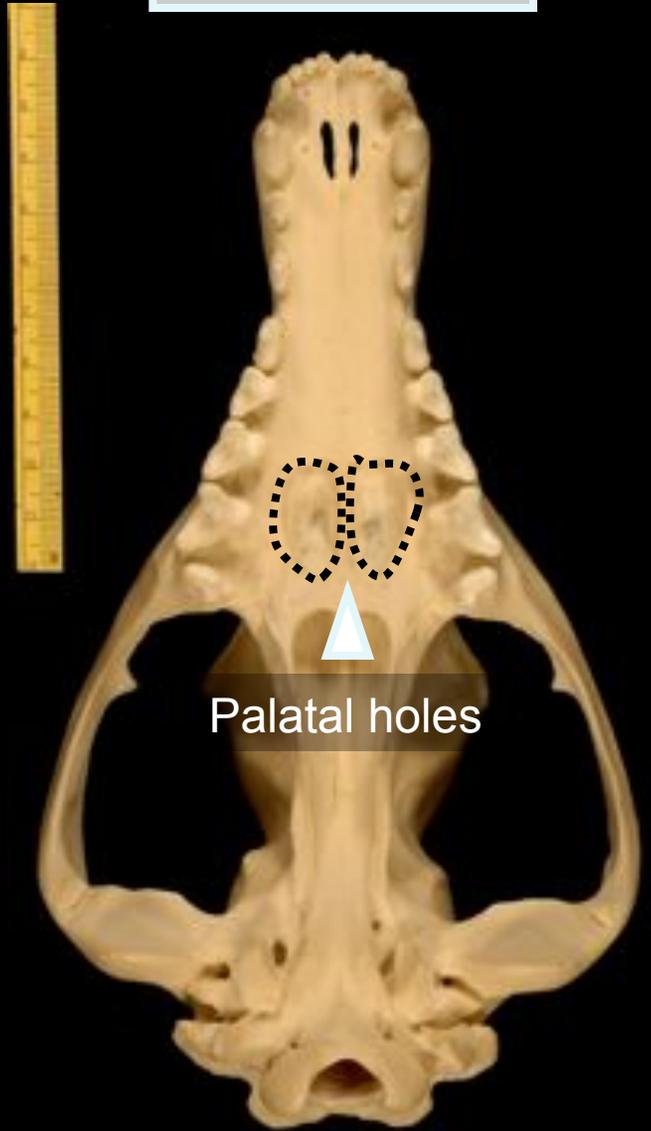
Dog

N. Am. wolf

Tasmanian wolf



No palatal holes



Palatal holes

Kangaroo

YES

Para-occipital process present

YES

4 molars

Ear bulla present

NO

Cheek bone & jaw joint

Tasmanian wolf

YES

Tooth formula

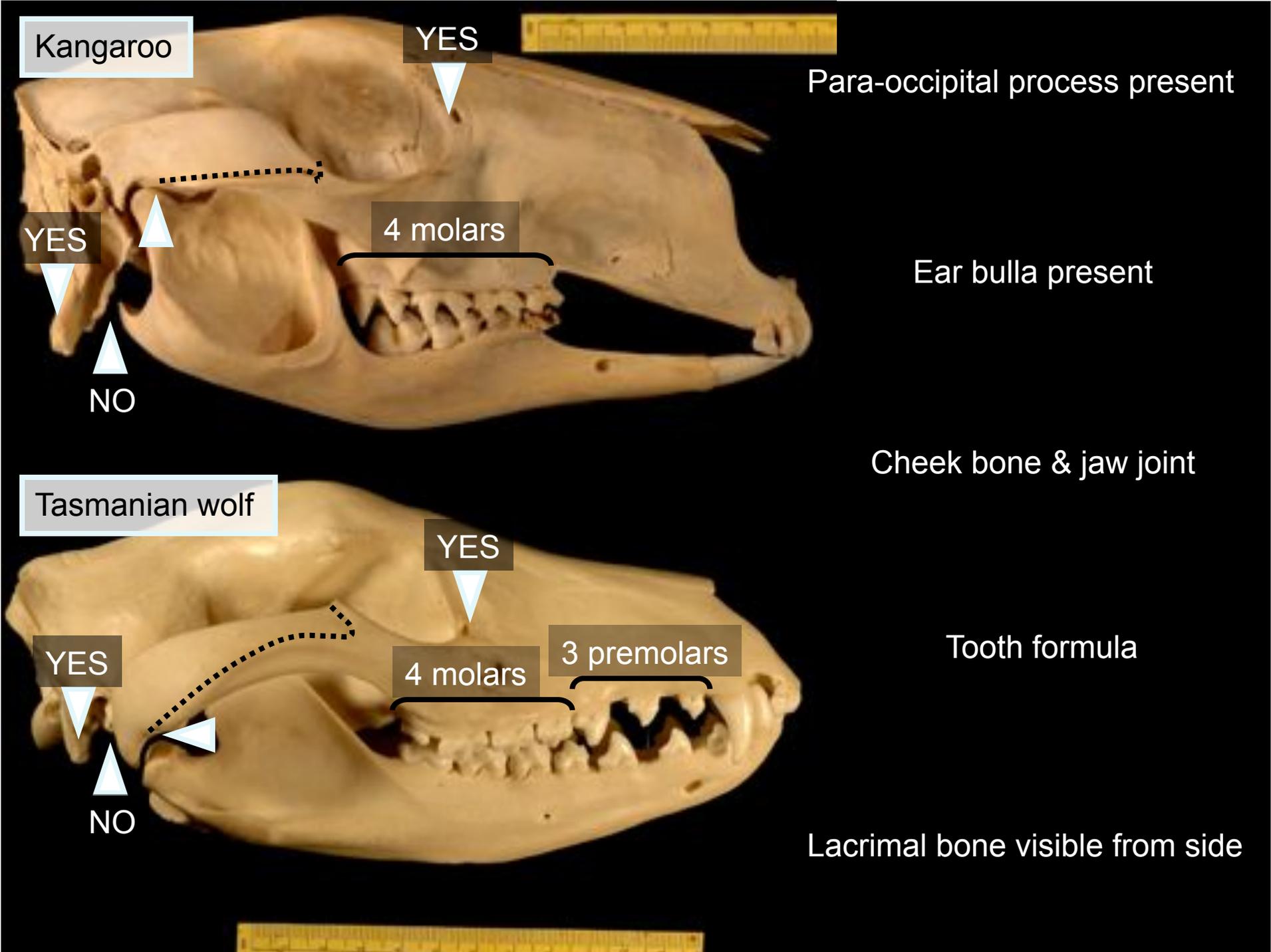
YES

4 molars

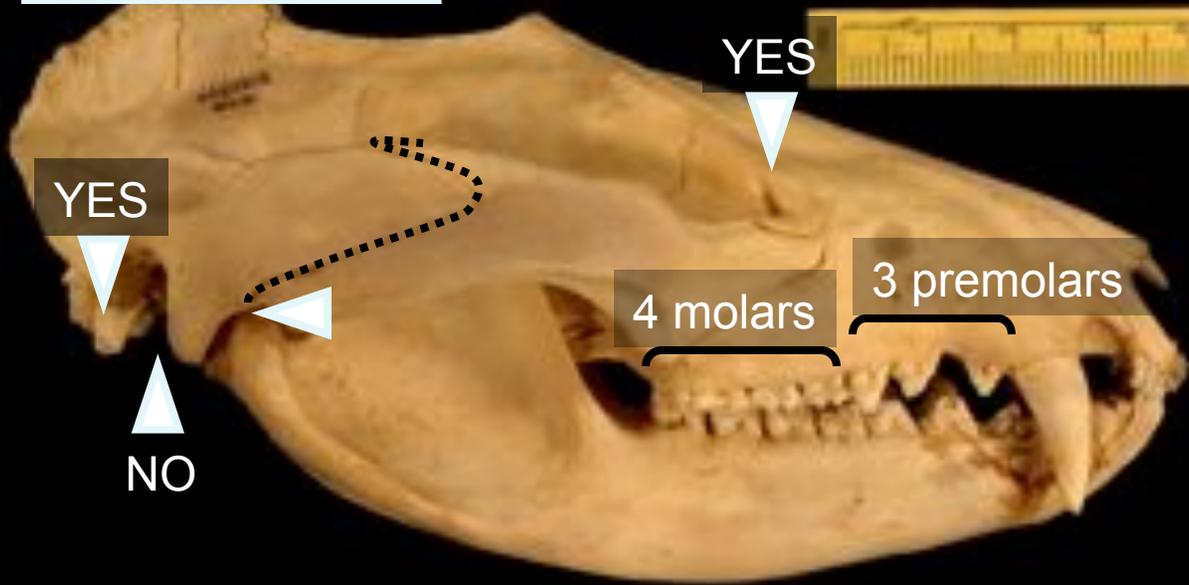
3 premolars

NO

Lacrimal bone visible from side



Virginia opossum

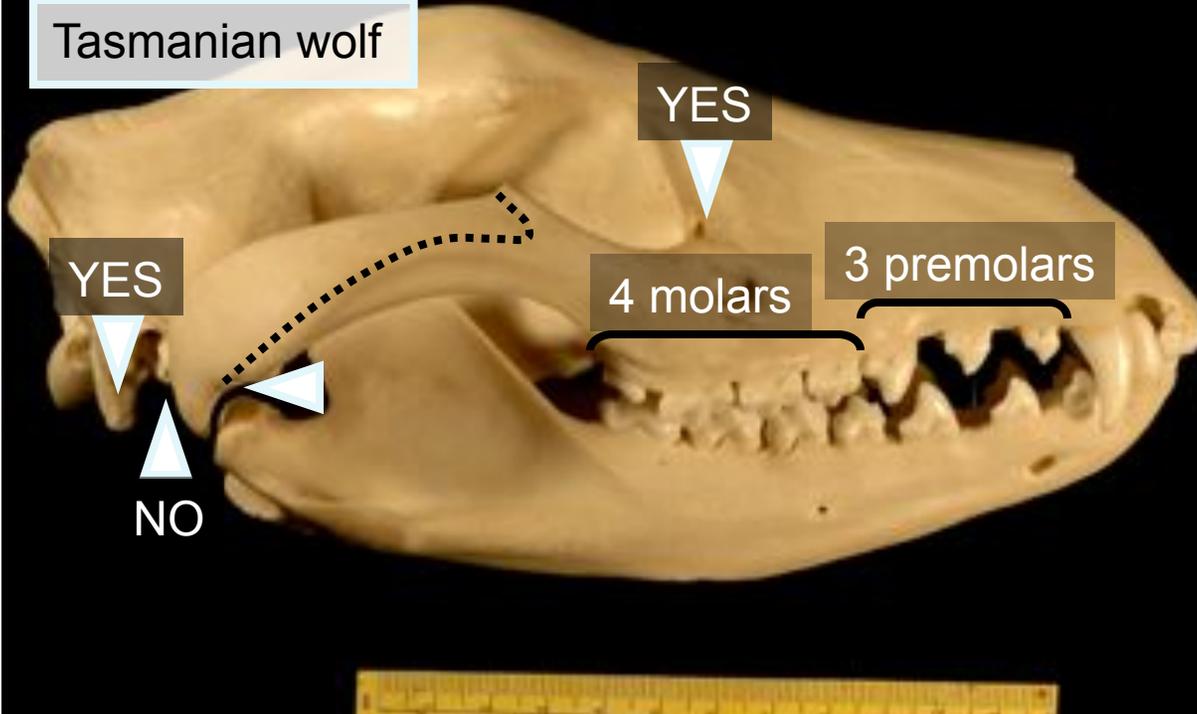


Para-occipital process present

Ear bulla present

Cheek bone & jaw joint

Tasmanian wolf



Tooth formula

Lacrimal bone visible from side

Tasmanian wolf

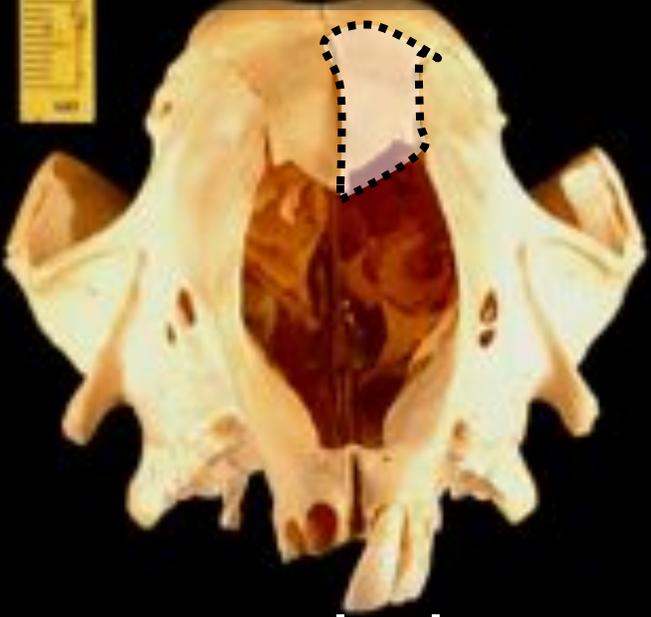
Wide nasals



4 incisors

Kangaroo

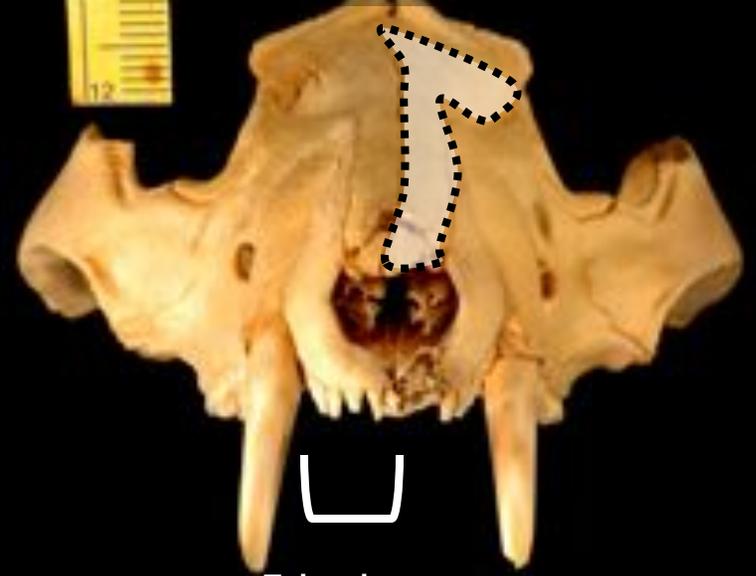
Wide nasals



3 incisors

Virginia opossum

Wide nasals

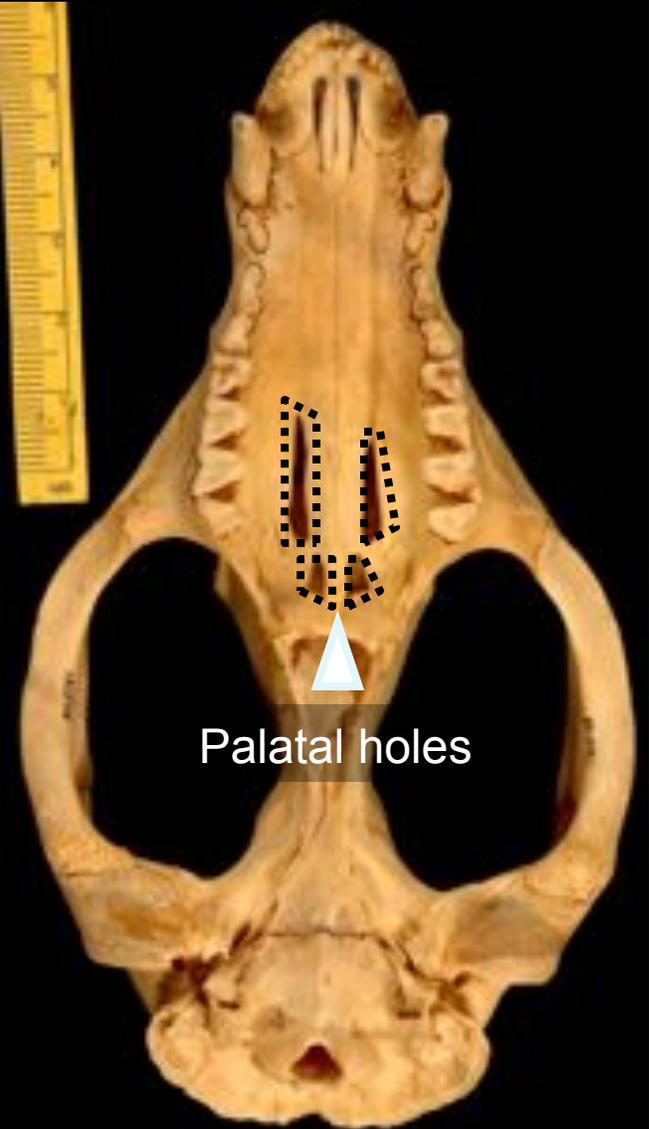
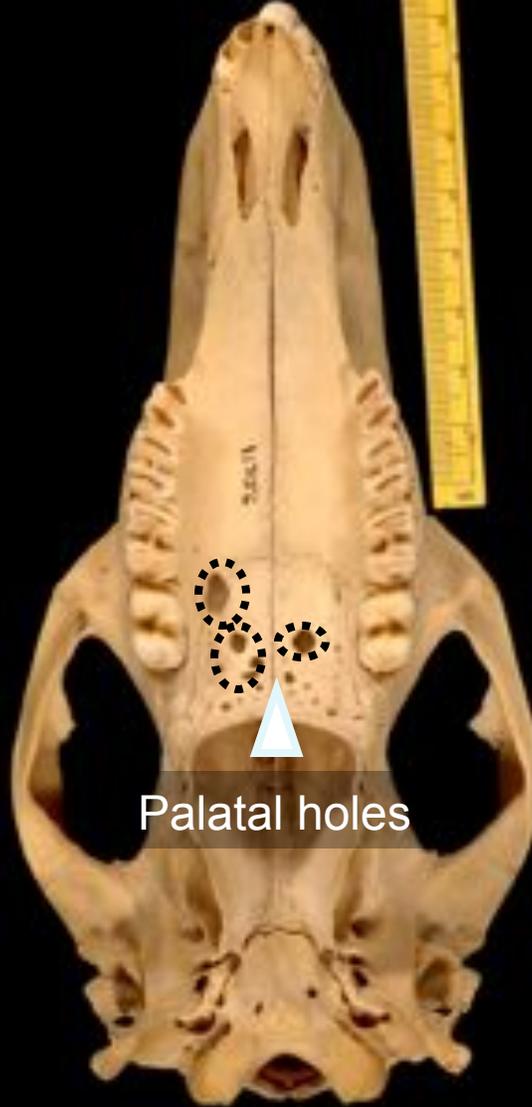
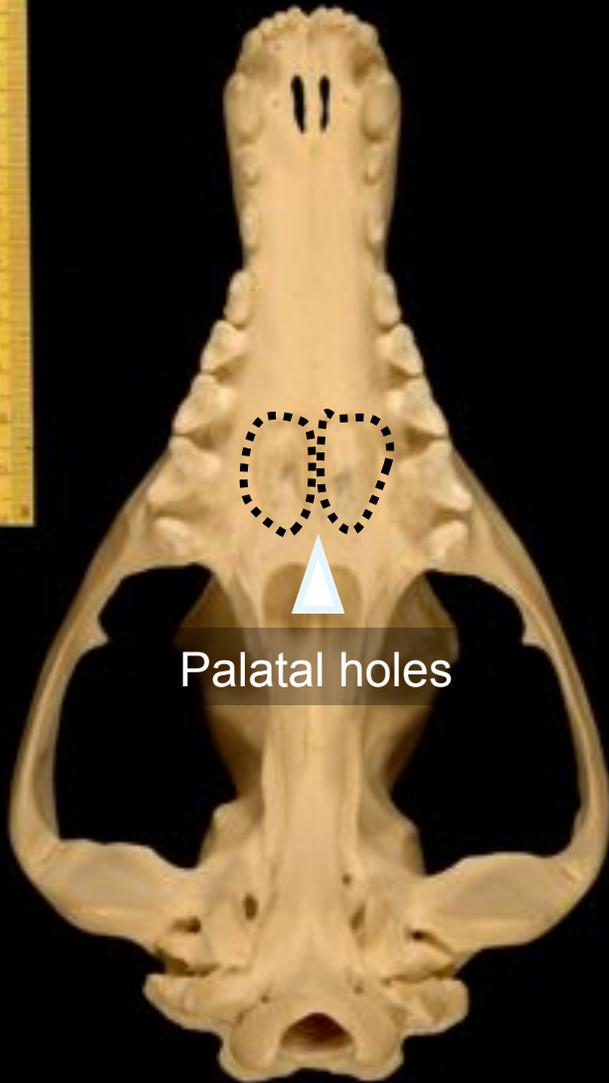


5 incisors

Tasmanian wolf

Kangaroo

Virginia opossum



Pandas and People

- ▶ “Marsupial pouches and bones are considered **homologous** because it is assumed [by “Darwinists”] that the organisms possessing them descended from a common ancestor.” (p. 124)
- ▶ “[A]nother theory is that marsupials were all designed with these reproductive structures.”

Nuclear gene sequences provide evidence for the monophyly of australidelphian marsupials

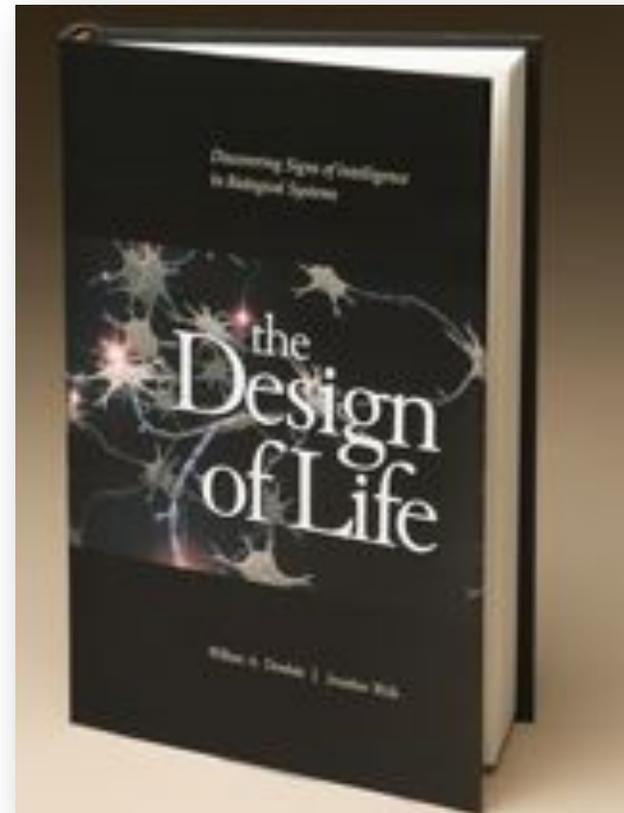
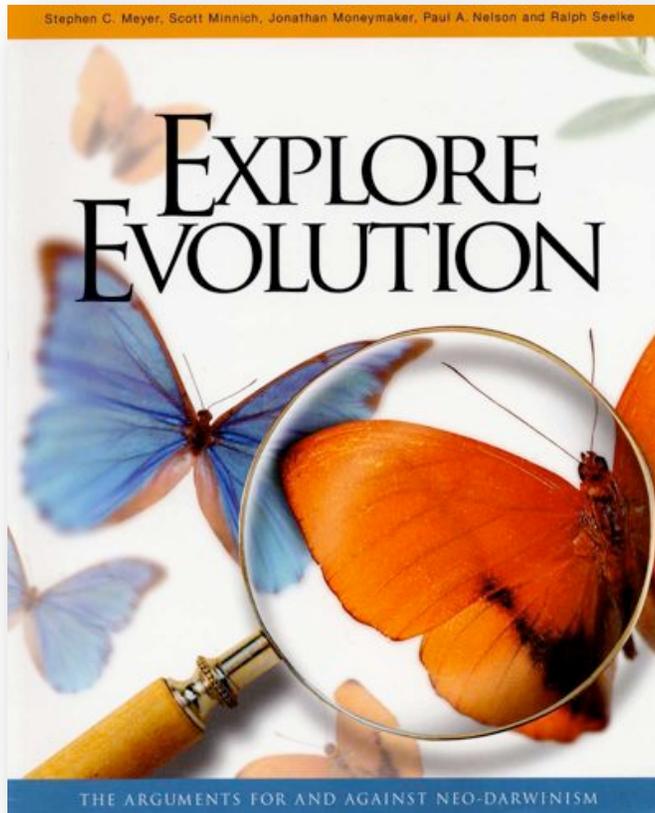
“If similarity is the basis for classification, what shall we do when similarities conflict? The marsupial wolf is strikingly similar to the placental wolf in **most features**, yet it is like the kangaroo **in one significant feature** [the pouch]. Upon which similarity do we build our classification scheme?” (*Pandas, 29*)

Not just the pouch!

1. Para-occipital process
2. Do not have ear bulla
3. Cheek bone meets jaw joint
4. General tooth formula
5. Lacrimal is visible from the side
6. Wide nasal bones
7. Holes in palatal bones
8. Reflected lamina
9. Nuclear DNA
10. Mitochondrial DNA
11. Ribosomal genes

And Yet It Continues ...

[I]n skeletal structure, the North American wolf and the now-extinct Tasmanian wolf are very close ... In some features, such as their jaws and dentition, these wolves are nearly indistinguishable. Yet the two animals differ fundamentally in their early development. Despite the striking similarities in the adults, taxonomists focus on this difference and therefore classify the two in widely different categories. [p. 115]... **The Tasmanian wolf is strikingly similar to the North American wolf in most features. Yet the Tasmanian wolf is a marsupial and hence similar in this one significant feature to the kangaroo. Upon which similar features do we therefore build our classification scheme?** [*Design of Life*, 2007 p. 117; c.f. *Pandas*, p. 29]



Why Icons of Evolution matters

Ohio L10H23

“Critical Analysis of Evolution”

- ▶ “Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory. (The intent of this indicator does not mandate the teaching or testing of intelligent design.)”
- ▶ Examine the “nine aspects used to support and challenge **macroevolution.**”
 1. Anaerobic early atmosphere
 2. Darwin’s tree of life
 3. DNA/RNA (Molecular genetics)
 4. Embryology
 5. Endosymbiotic theory
 6. Fossil formation through gradualism
 7. Miller and Urey’s experiment
 8. Natural selection of antibiotic resistant bacteria
 9. Natural selection of Peppered moths

Sample Challenge Answer:

Darwin's Tree of Life

The Cambrian explosion conflicts with Darwin's tree of life because there was a sudden appearance or an "explosion" of major and complex phyla fossils at the Cambrian level with virtually no fossils (with the exception of some sponge embryos) in the pre Cambrian level. With the Cambrian explosion at the base, Darwin's tree would be shaped differently.

Sample Challenge Answer:

Embryology

Embryos of animals do not go through all of the developmental stages of their ancestors. Therefore, embryonic characteristics are not reliable indicators of evolutionary relationships. Ernst Haeckel's work inaccurately portrayed a variety of animal embryos passing through the same developmental changes.

Sample Challenge Answer:

Peppered Moths

The Peppered moths (scientifically known as *Biston betularia*) do not rest on tree trunks, therefore bringing the legitimacy of this study into question. Using this example to support an evolutionary event may be inappropriate. However, if the experiment was factual, it demonstrated that the moths with the darker pigmentation increased in frequency (microevolution) as a result of the environmental change. However, the experiment does not demonstrate that the moths evolved into a different species (macroevolution).

In Summary

- ▶ None of the “icons” are used as “evidences” *for* evolution.
- ▶ Wells is the one who “significantly distorts the evidence” even within his nominal area of expertise.
- ▶ This is the material that ID supporters want taught when they call for teaching “the controversy” or the “strengths and weaknesses” of “Darwinism”.