Hot Science Cool Talks

UT Environmental Science Institute

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Dinosaurs in Living Color

Dr. Julia Clarke

March 25, 2011

Dinosaurs In Living Color

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Jackson School of Geosciences, UT - Austin

March 25, 2011

Illustration of early crocodile relative
Effigia © Giant Screen Films

What is a dinosaur?

“dino” comes from from the Greek word deino: fearfully great or terrible

“saur” comes from from the Greek word sauros: lizard or reptile

Illustration by © Joe Tucciarone

Illustration by © Robert Walters

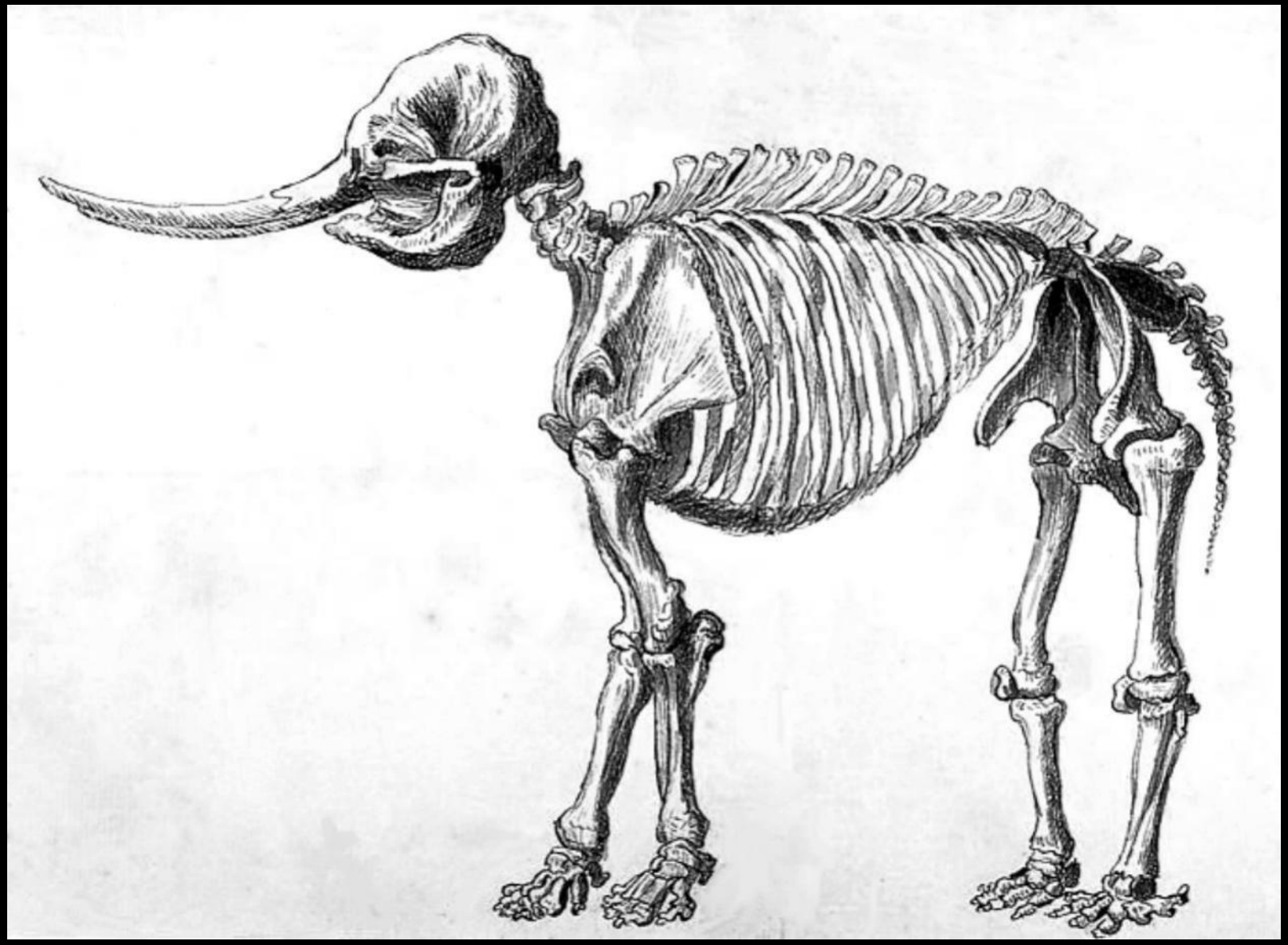
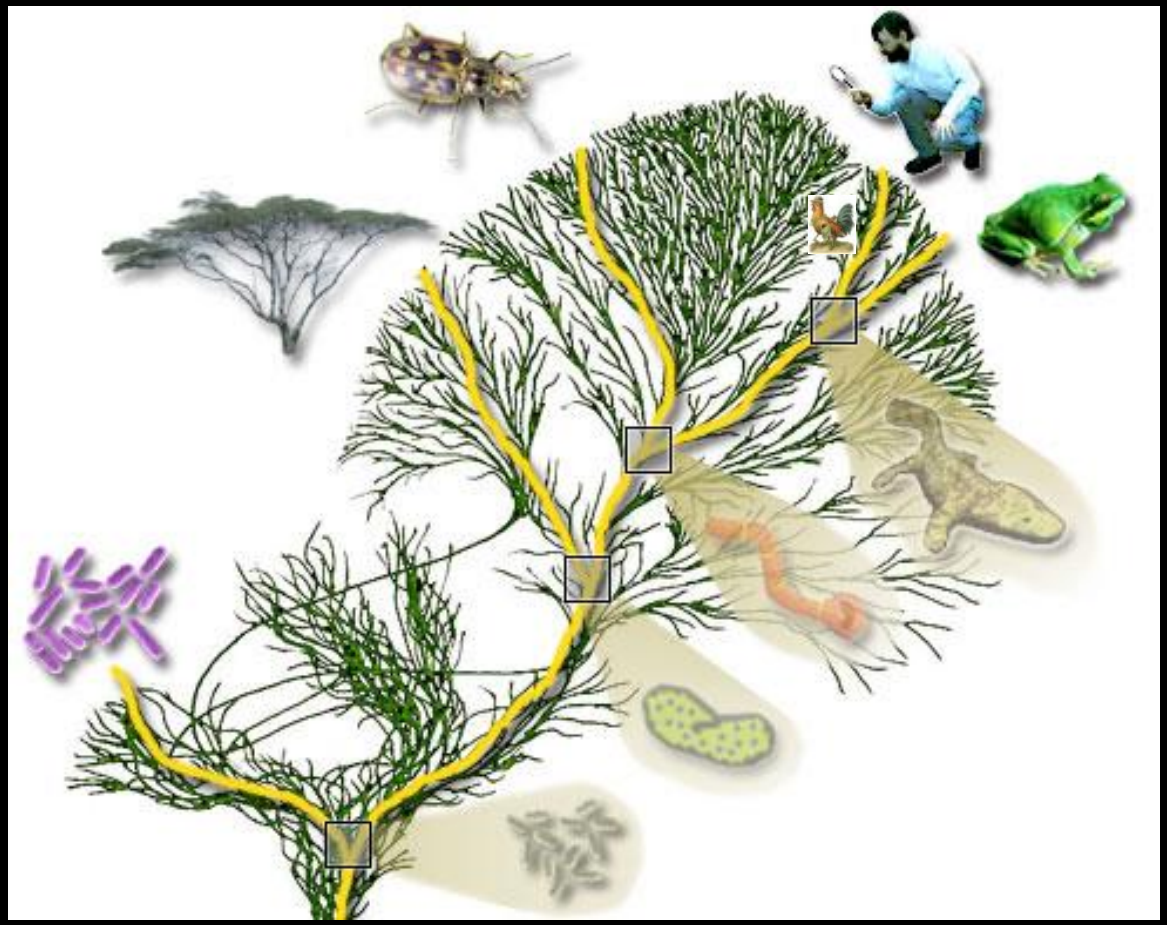


Illustration by © Joe Tucciarone

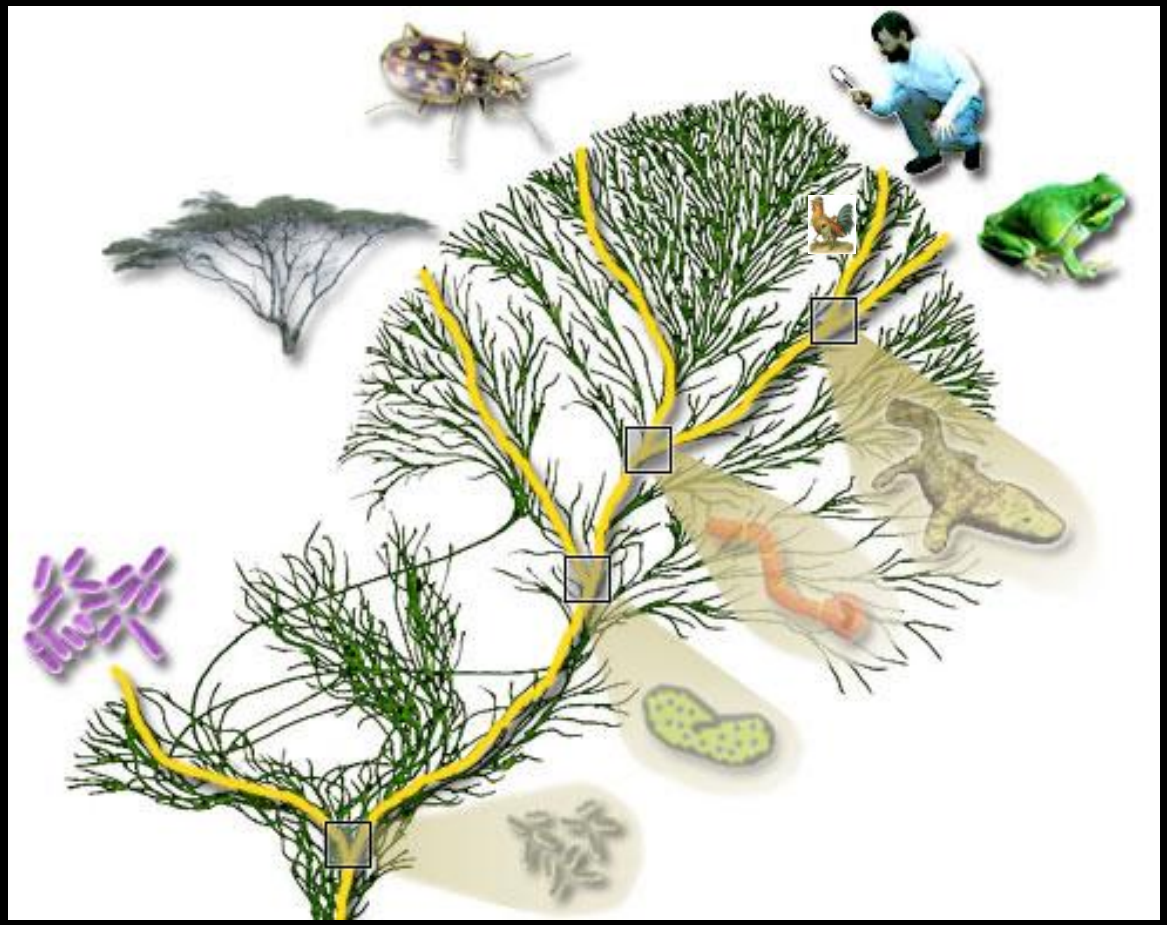
Stegosaurus
Illustration by © Joe Tucciarone

Why are some of these animals called dinosaurs and some not?

Dinosauria is a particular branch of the tree of life.



Dinosaurs are parts of a particular branch of the tree of life.
We are on another.



Dinosauria (including birds)

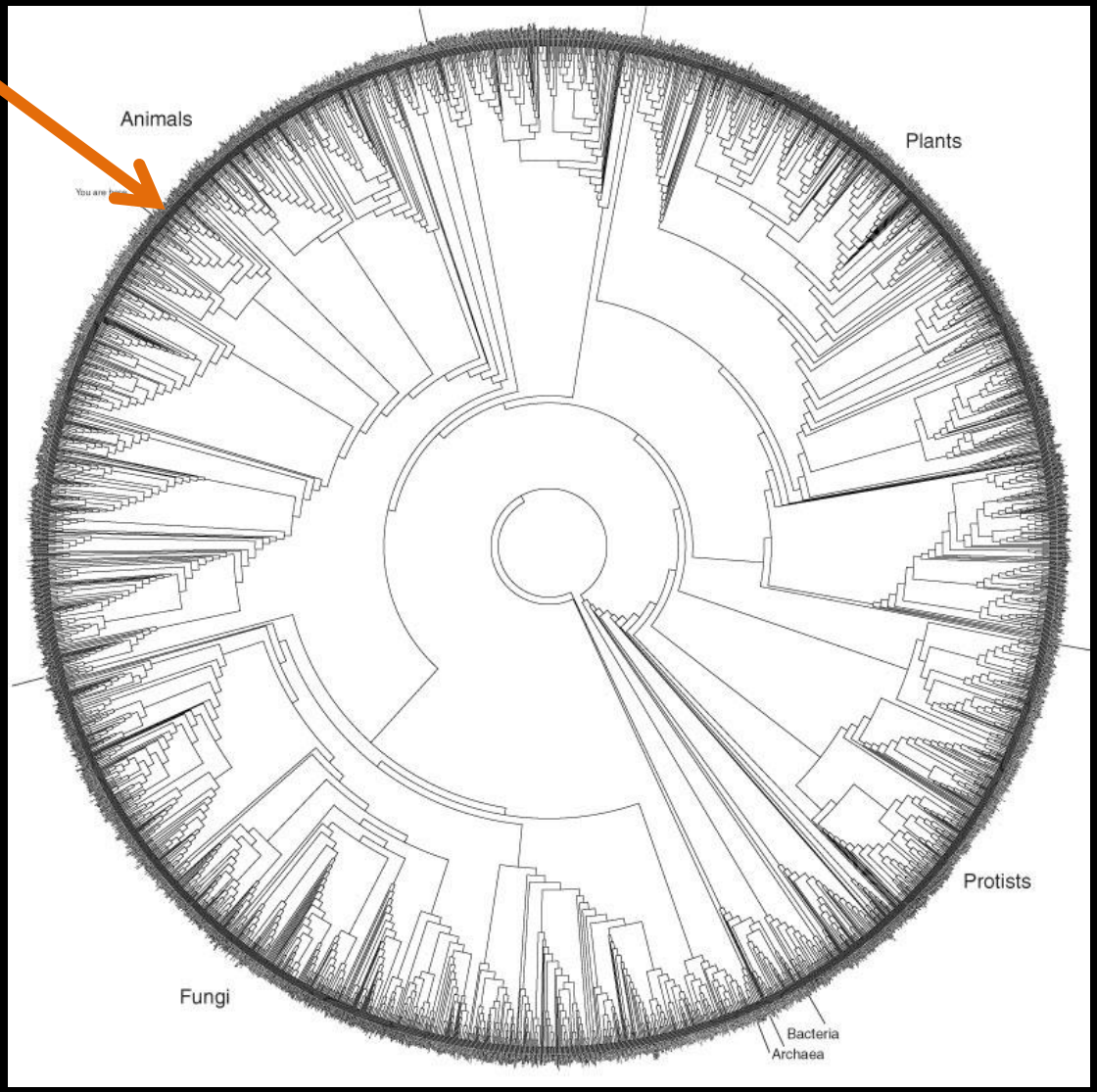


Illustration from Hillis, Zwickl and Gutell, UT- Austin

Crocodiles

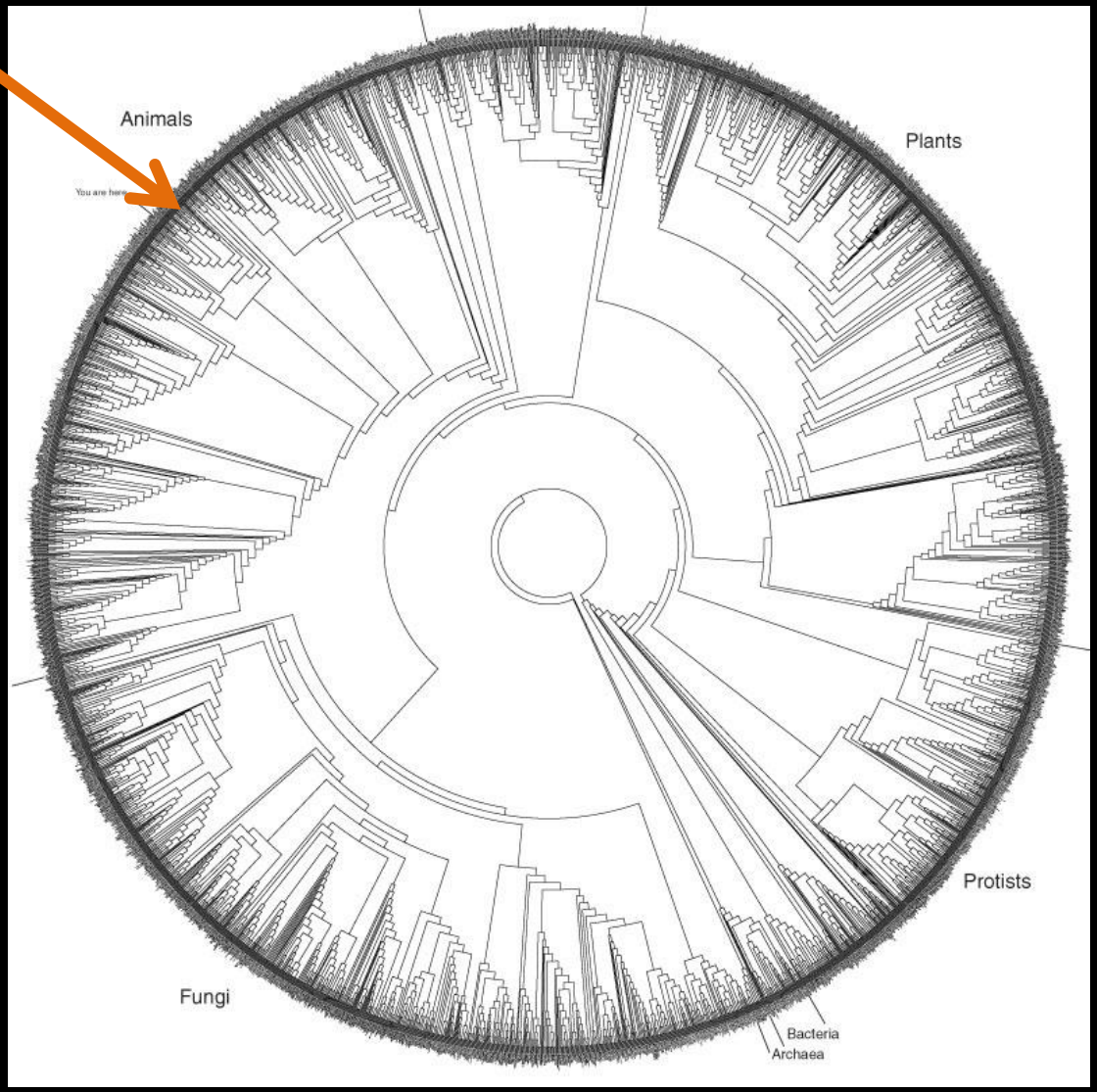
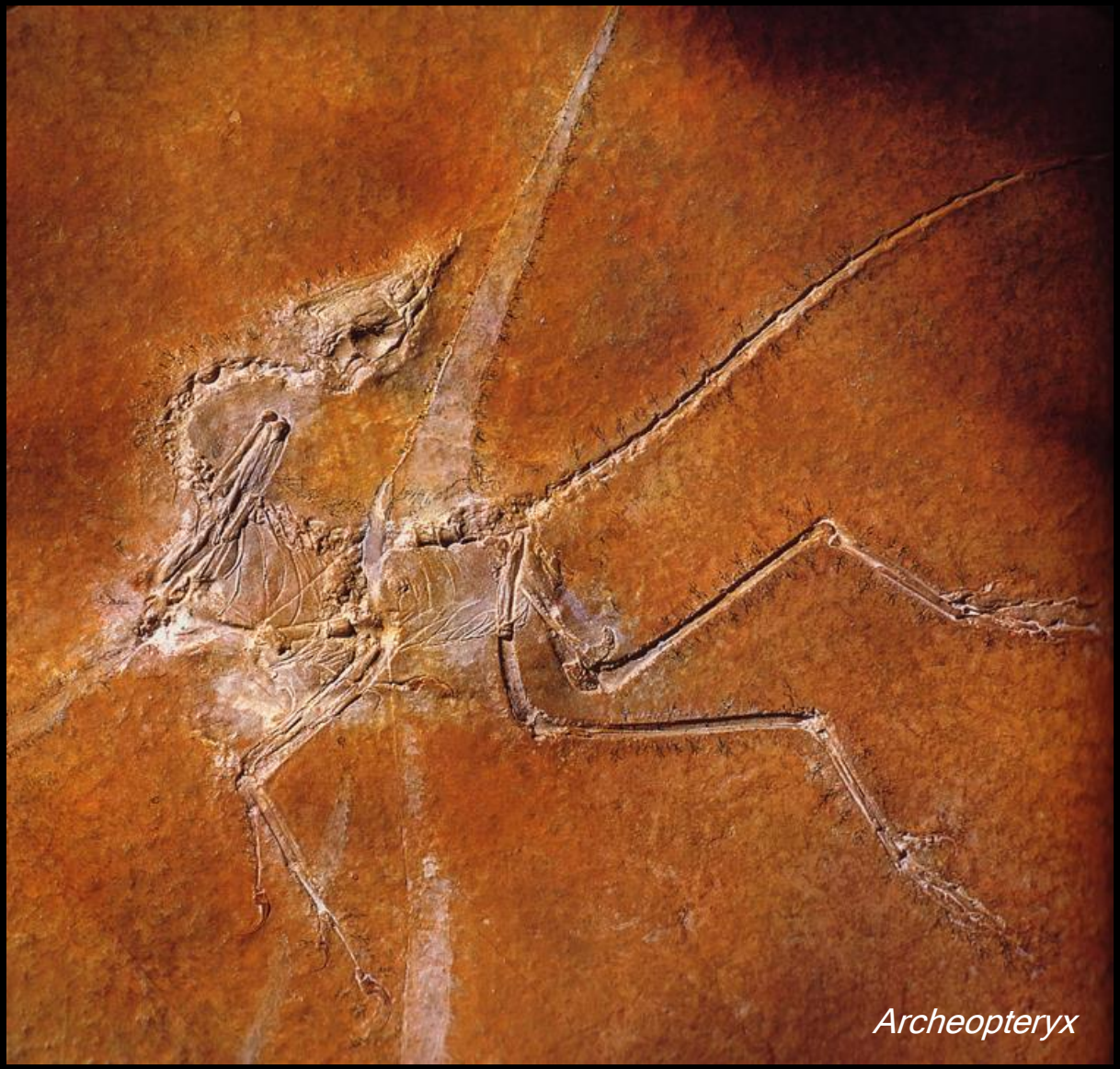
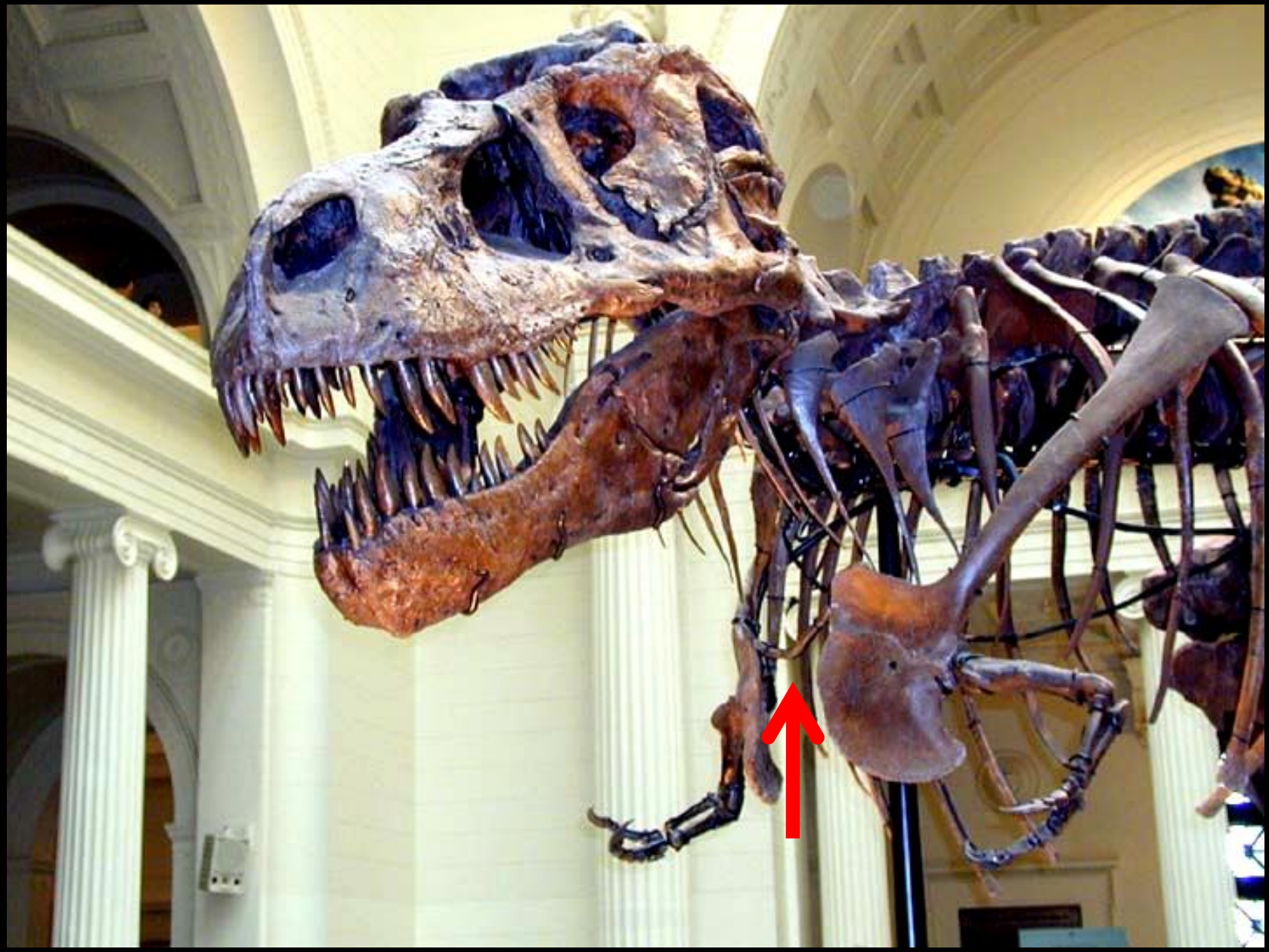


Illustration from Hillis, Zwickl and Gutell, UT- Austin

How did we figure out the “address” of dinosaurs?

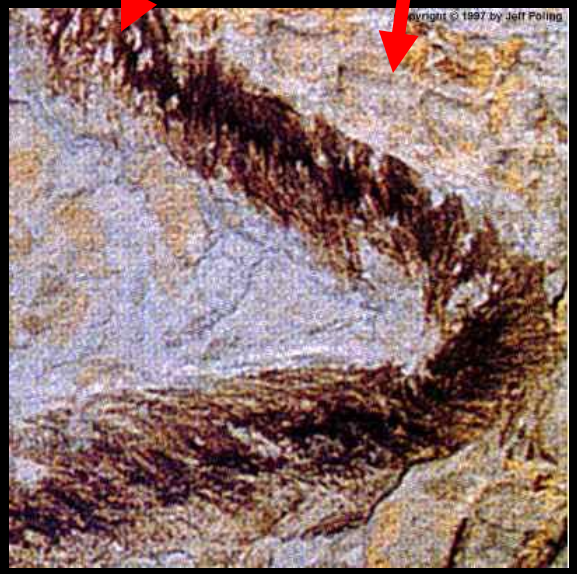

Archeopteryx




You Are Here
Aves
Avialae
Dinosauria
Pachycephalosauridae
Homalocephalidae
Stenopelix
Goyocephale
Psittacosaurus
Chaoyangsaurus
Leptoceratops
Protoceratopsidae
Montanoceratops
Turanoceratops
Centrosaurinae
Chasmosaurinae
Heterodontosauridae
Hypsilophodontidae
Muttaburrasaurus
Tenontosaurus
Dryosauridae
Camptosauridae
Probactrosaurus
Iguanodontia
Ouranosaurus
Protohadros
Hadrosaurinae
Lambeosaurinae
Scutellosaurus
Emausaurus
Scelidosaurus
Ankylosauria
Nodosauridae
Huayangosaurus
Stegosauridae
Lesothosaurus
Pisanosaurus
Prosauropoda
Vulcanodon
Shunosaurus
Barapasaurus
Omeisaurus
Dicraeosauridae
Diplodocidae
Haplocanthosaurus
Camarasauridae
Brachiosauridae
Euhelops
Titanosauria
Abelisauridae
Ceratosaurus
Elaphrosaurus
Dilophosaurus
Liliensternus
Coelophysidae
Torvosauridae
Spinosauridae
Allosauroidea
Coelurus
Sinosauropteryx
Compsognathus
Tyrannosauridae
Ornithomimidae
Scipionyx
Ornitholestes
Oviraptorosauria
Therizinosauridae
Caudipteryx
Protarchaeopteryx
Troodontidae
Dromaeosauridae
Eoraptor
Herrerasauridae

filament-like
proto-feathers

neck



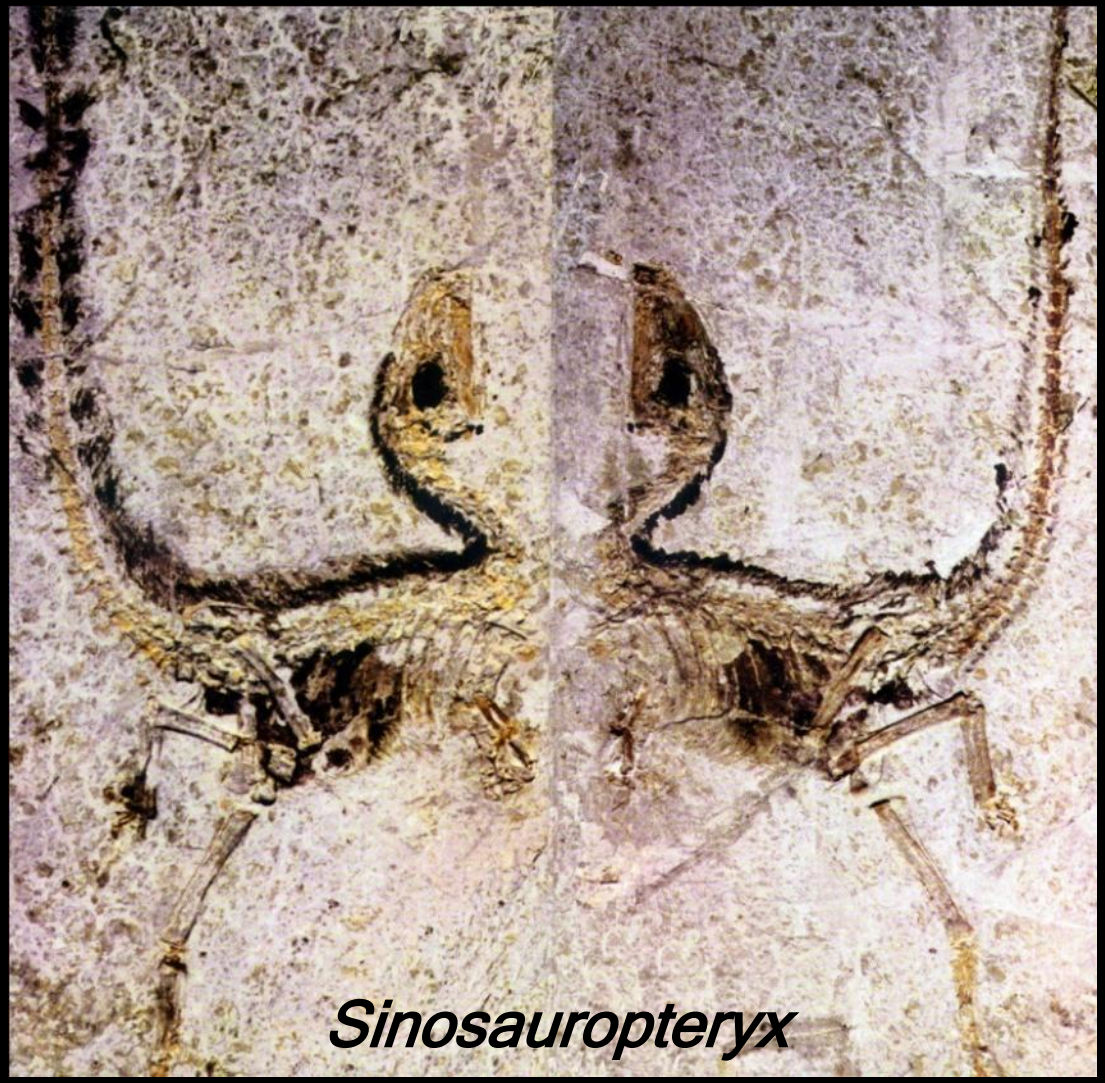
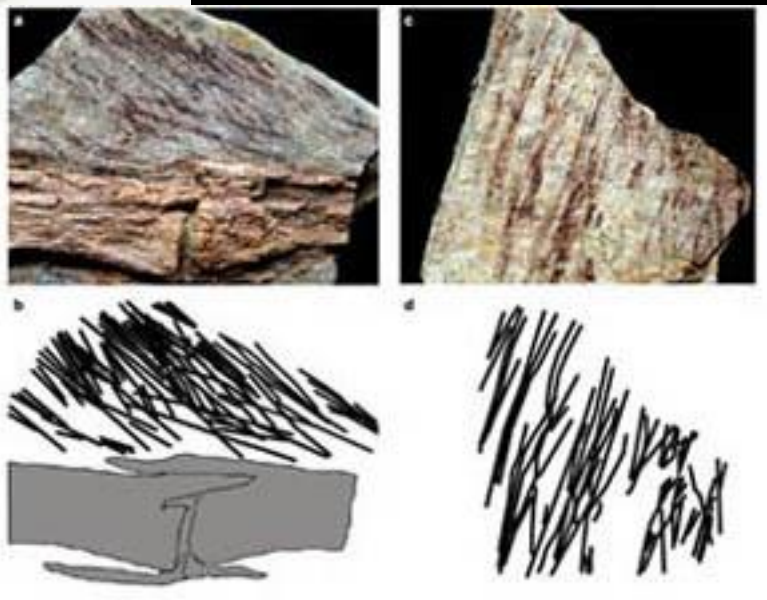
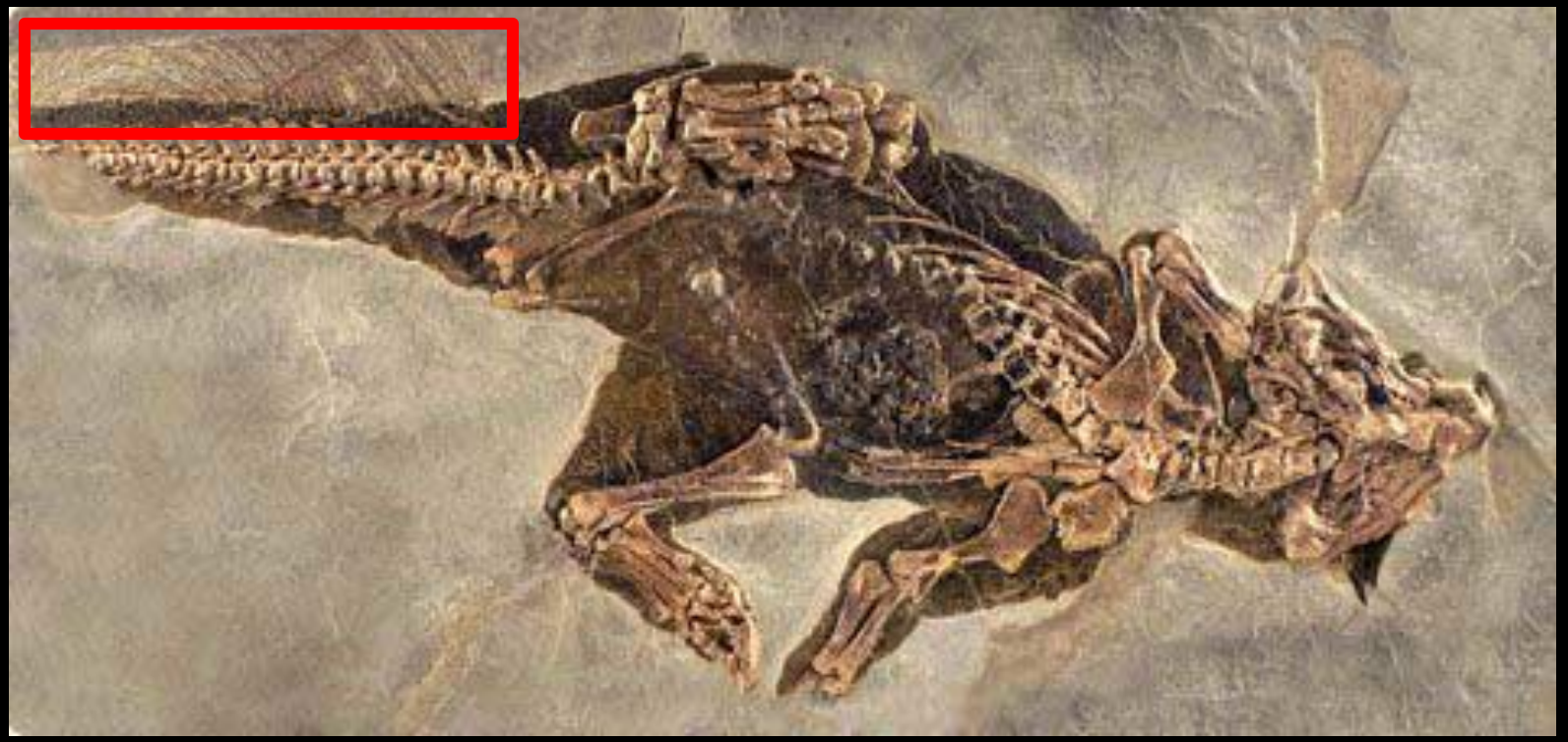


Illustration by © Portia Sloan

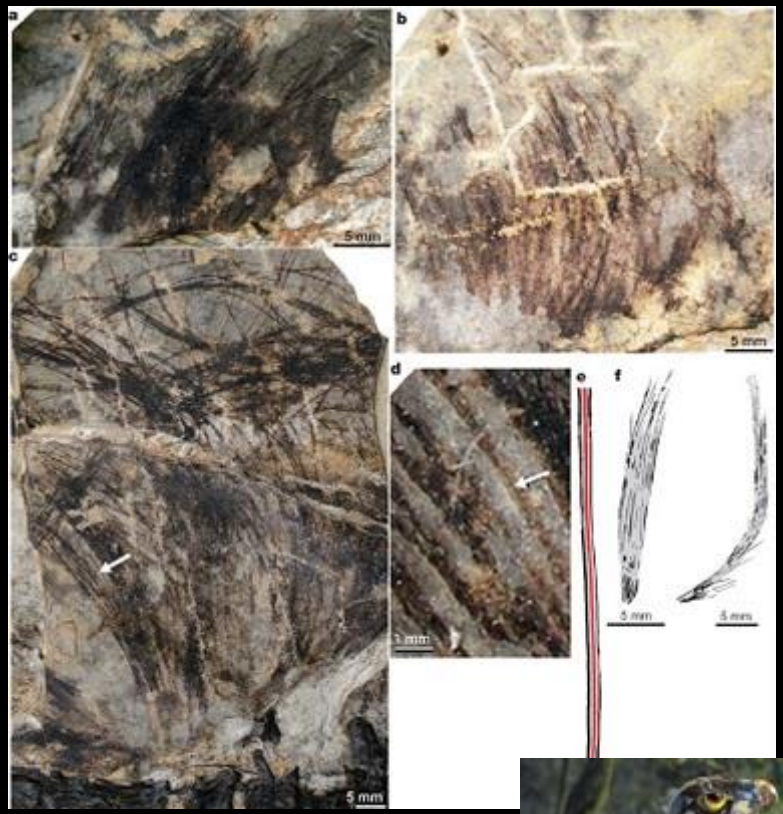
Dilong : a proto-feather covered tyrannosaurid



Xu et al., 2004



Photograph of *Psittacosaurus*; Mayr et al., 2002.



Zheng et al., 2009

Tianyulong

Illustration by © Luis Rey


V 12631
3cm

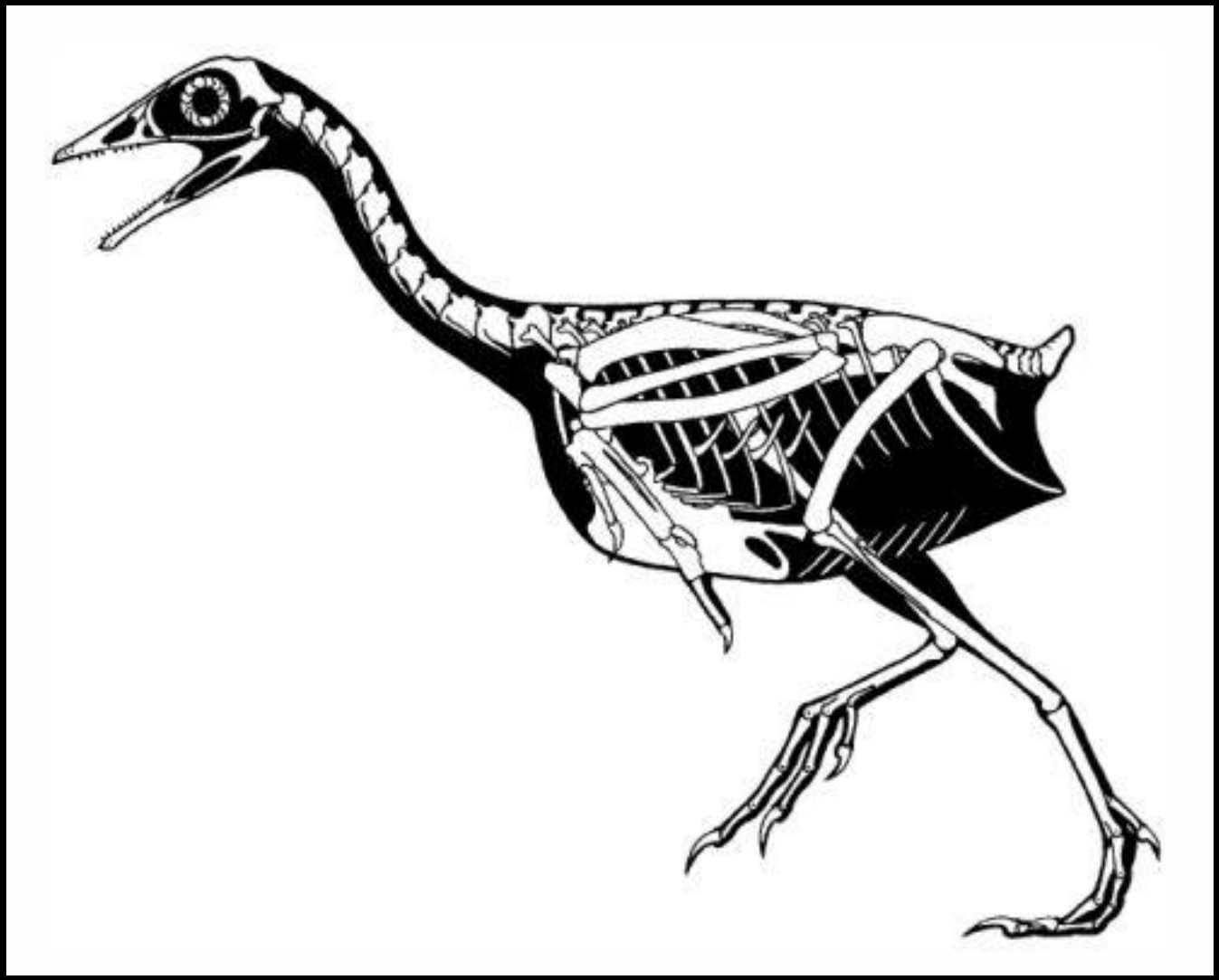
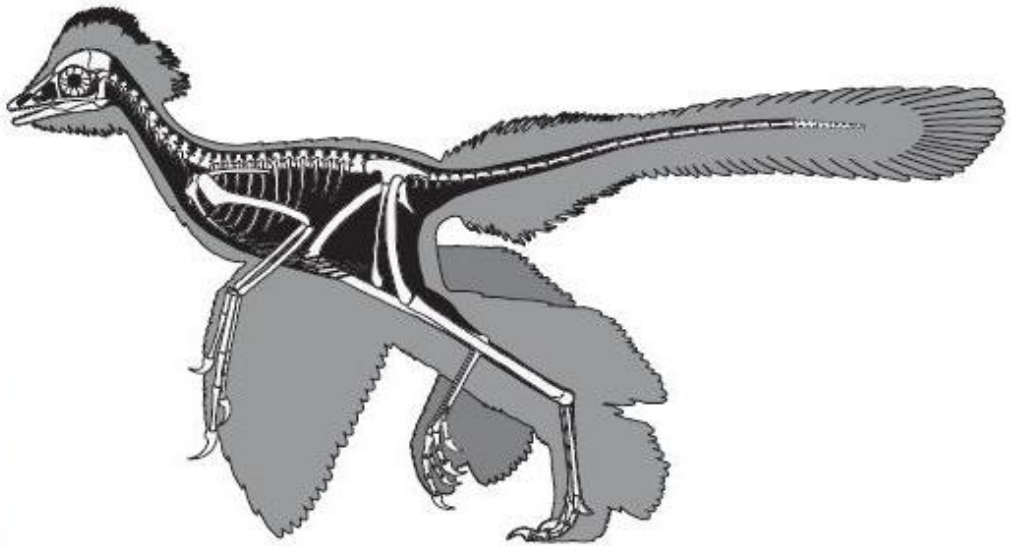


Illustration by © Gregory Paul



Anchiornis huxleyi Xu et al. (2009) based on the new specimen (Hu et al., 2009)

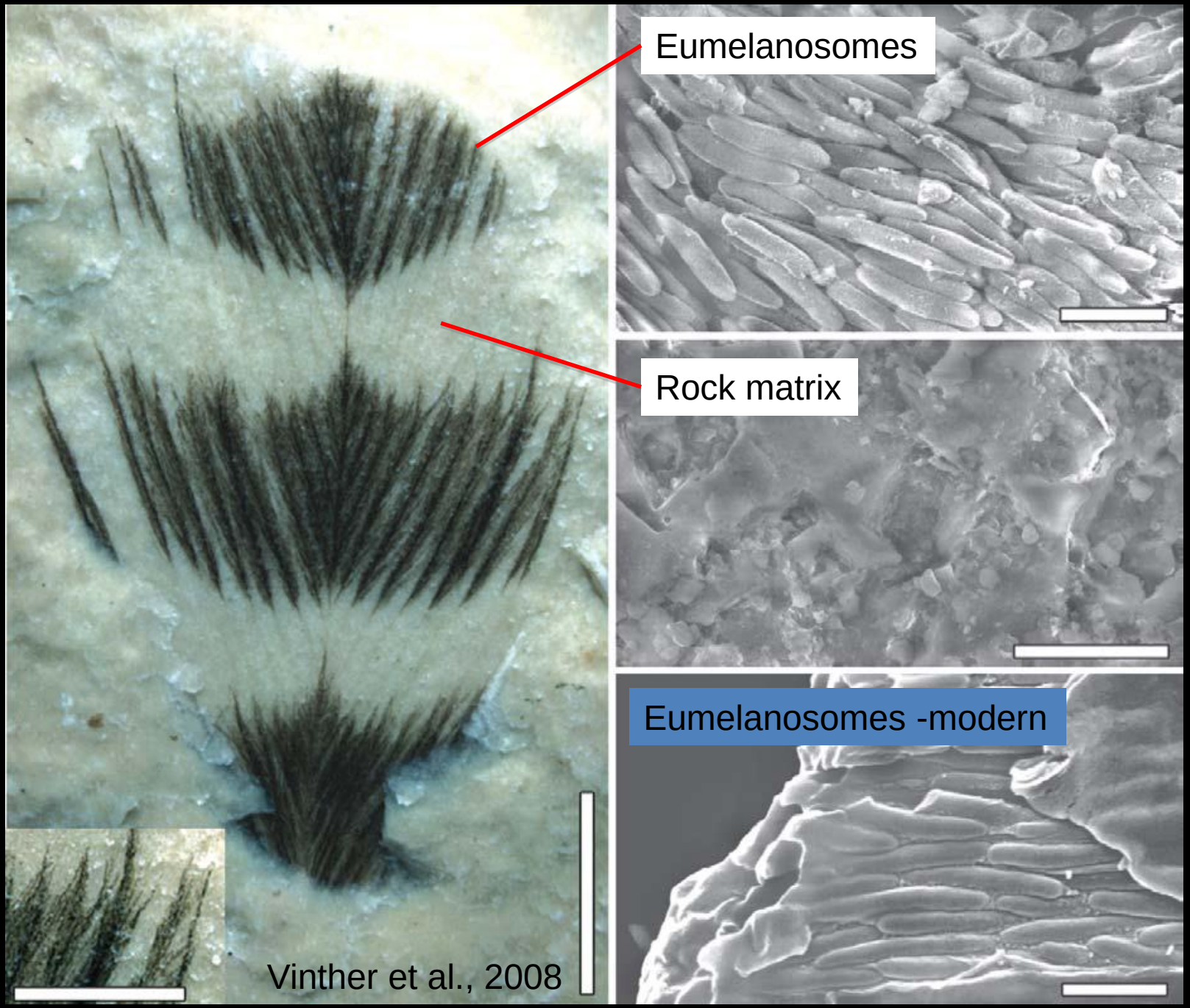
Illustration by © Luis Rey

How would you figure out the color of an extinct dinosaur?

Image from: Cornell Laboratory of Ornithology

Cretaceous feather from Brazil

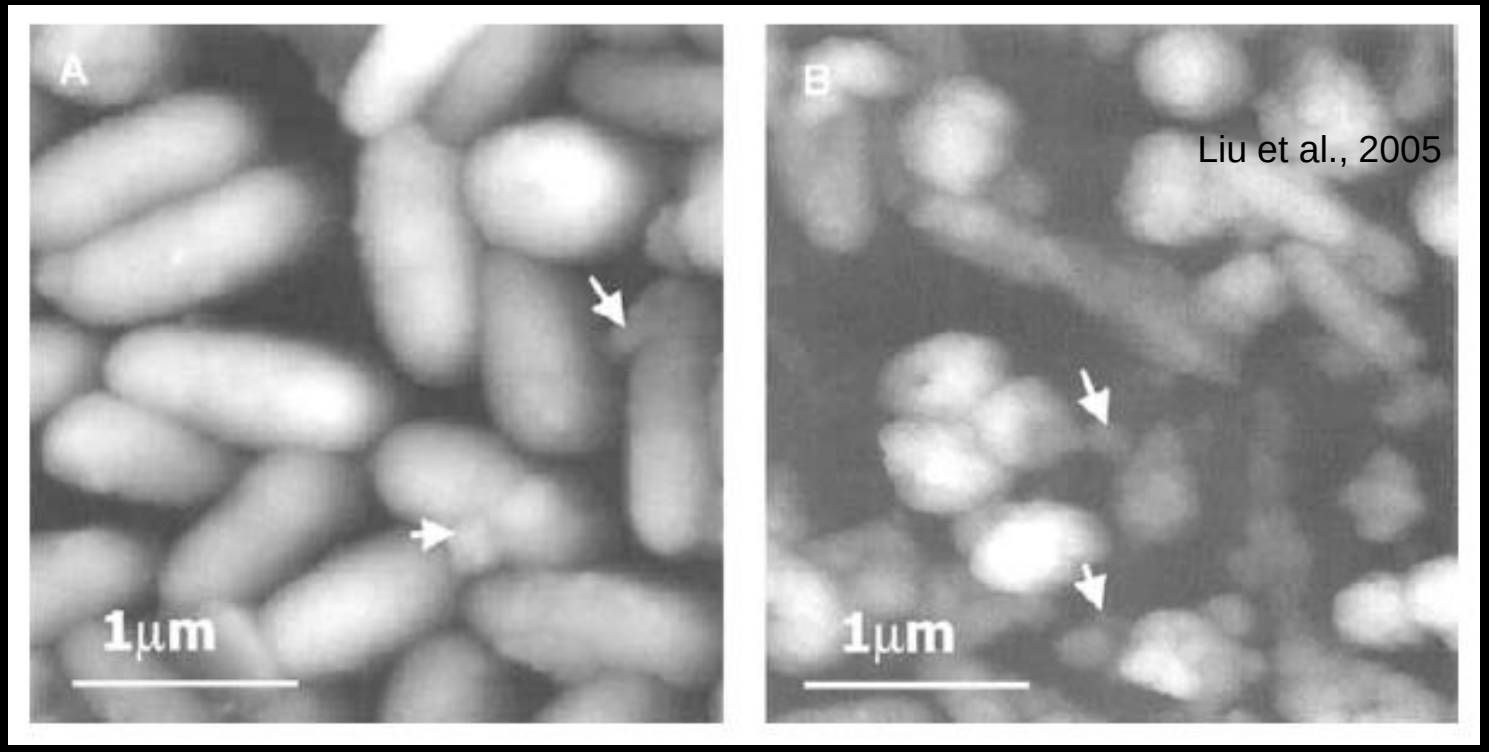
Vinther et al., 2008


Eumelanosomes
Rock matrix
Eumelanosomes -modern
Vinther et al., 2008

eumelanosomes

melanosomes absent

Melanosomes are pigment packages
the shape of which varies with the occurrence of two chemically distinct forms of melanin.



Black hair

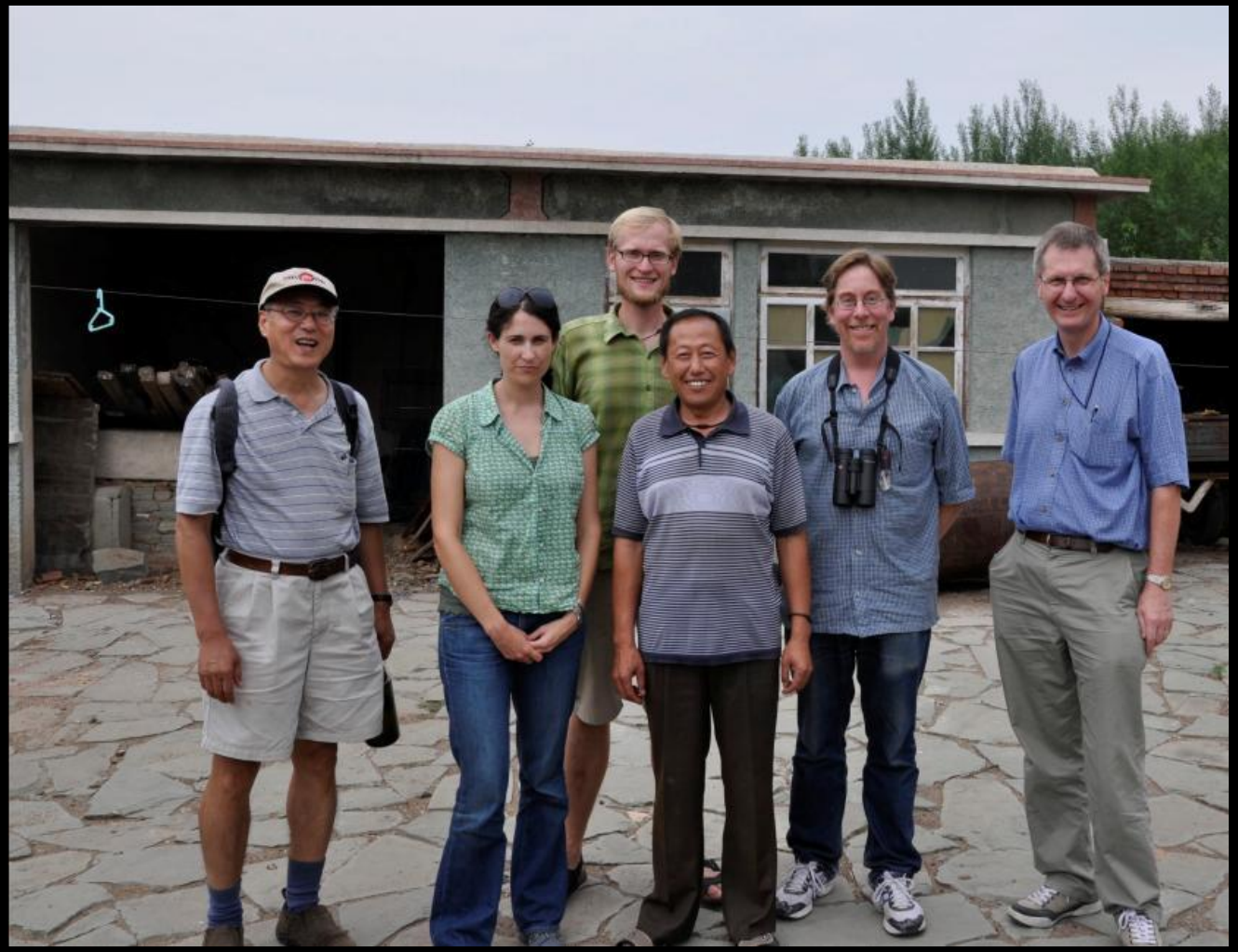
Red hair

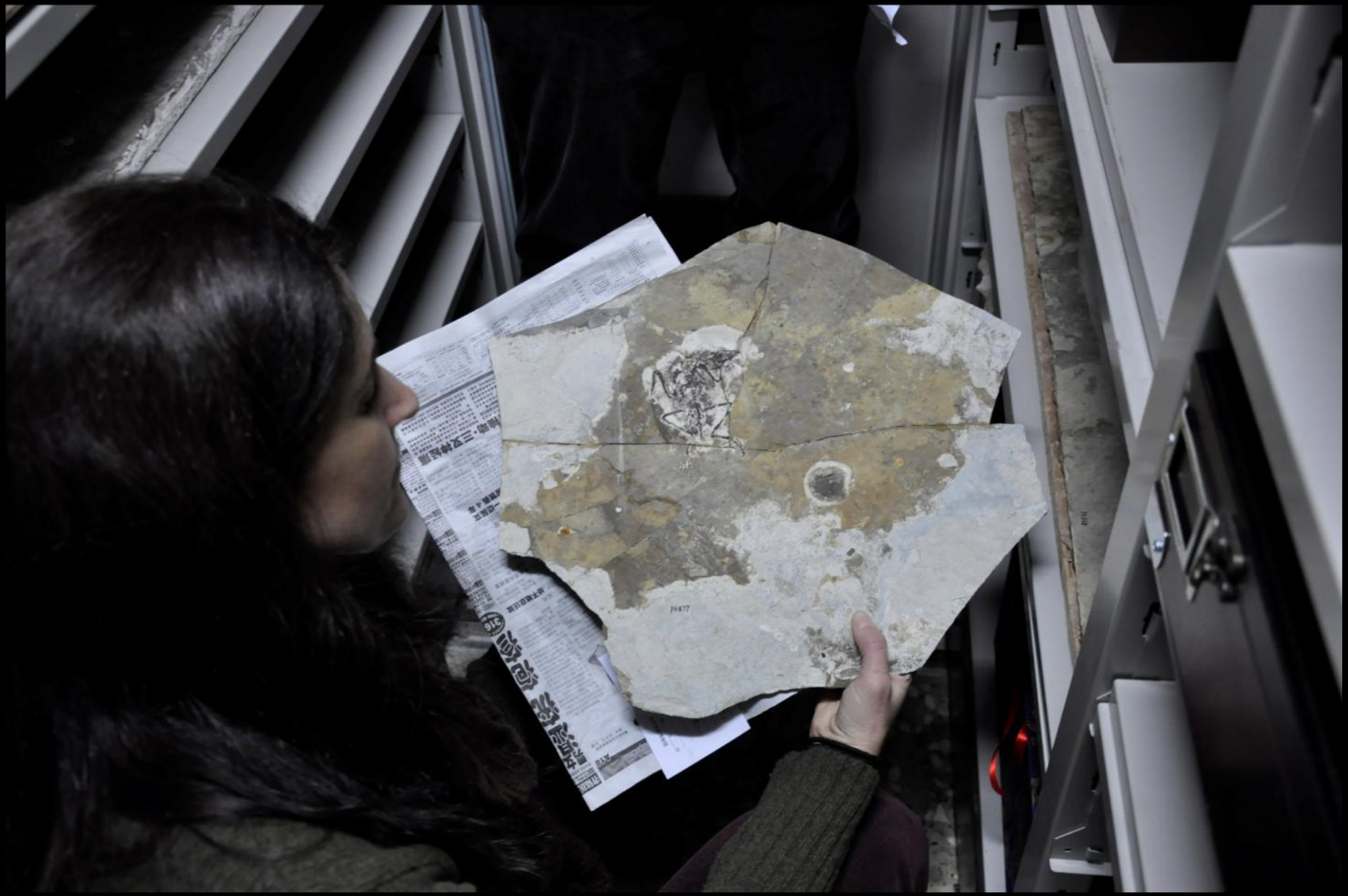
Melanin based coloration

Browns and rufous reds: phaeomelanosomes

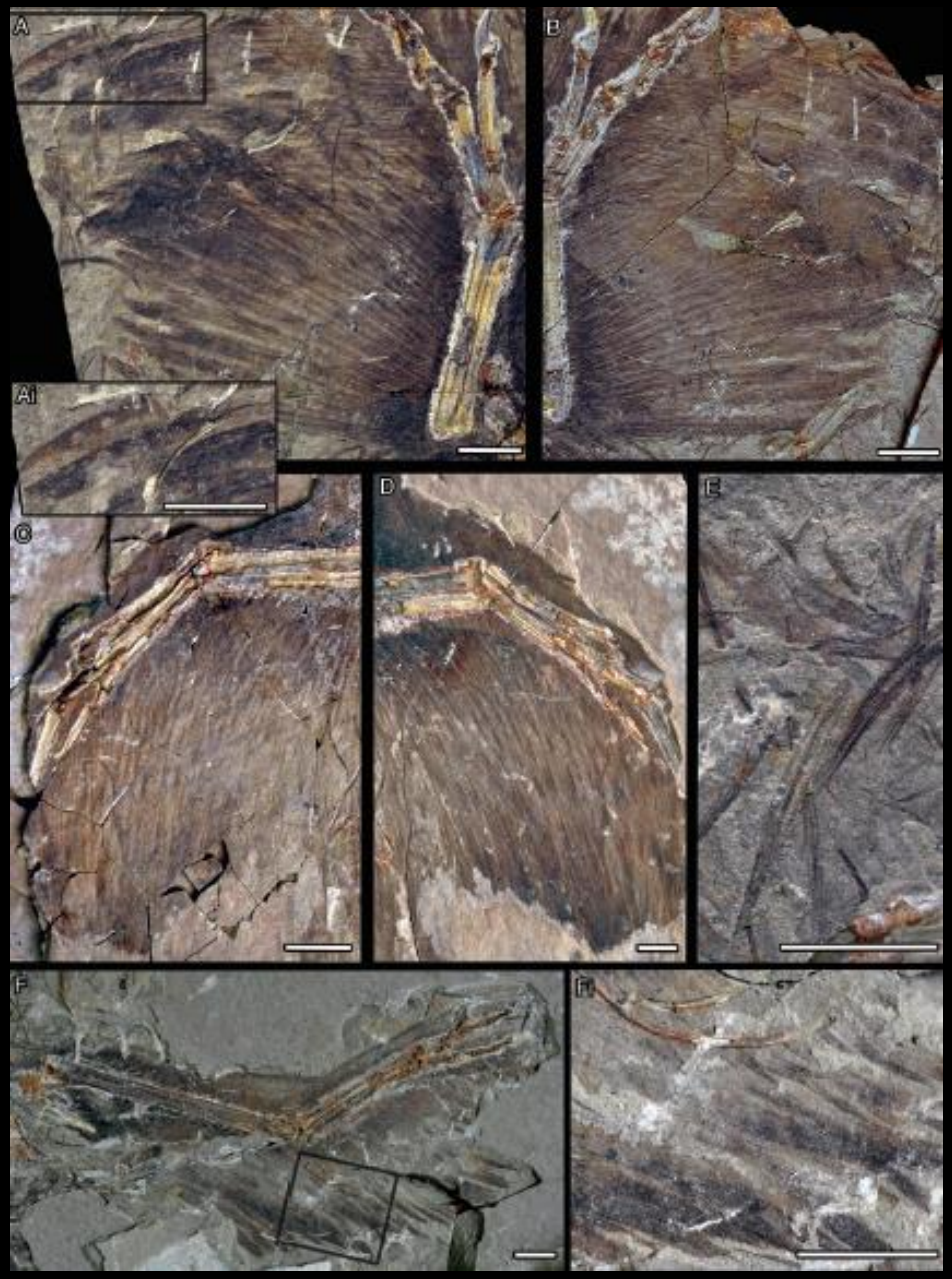
Black: eumelanosomes

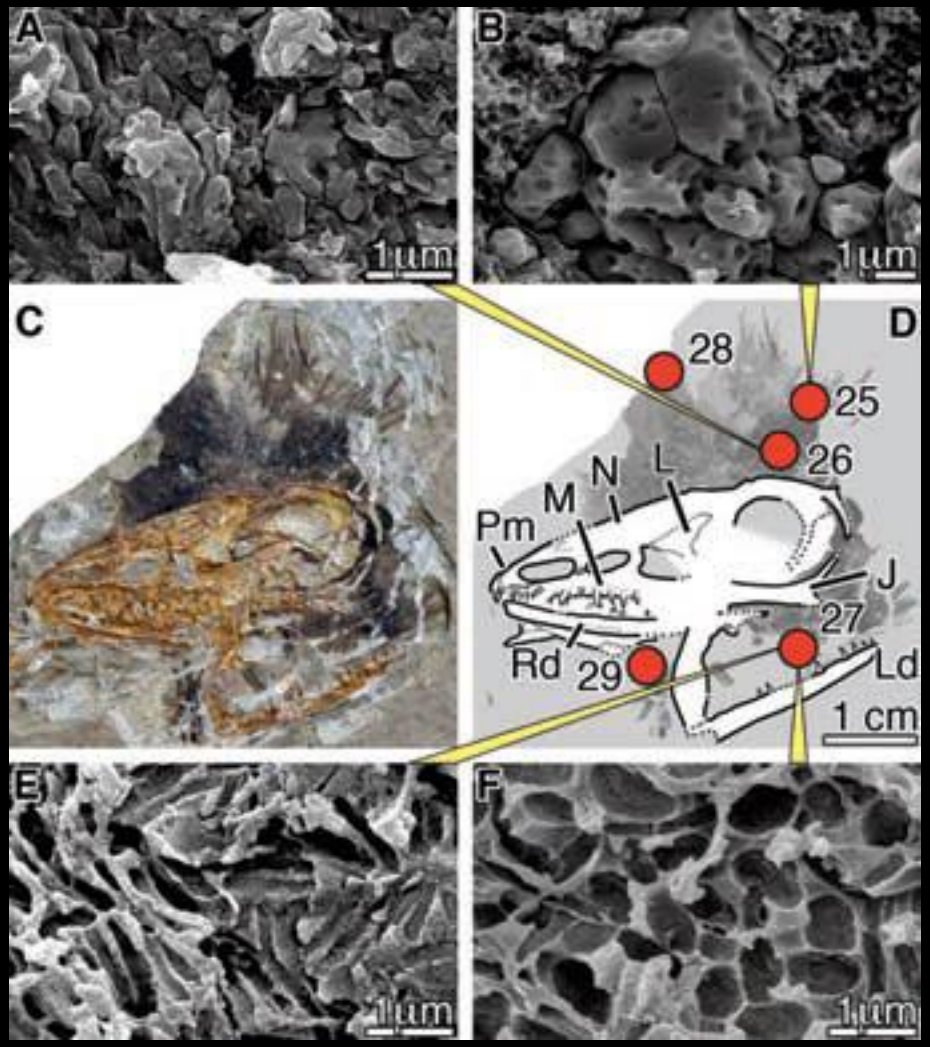
Melanosomes absent

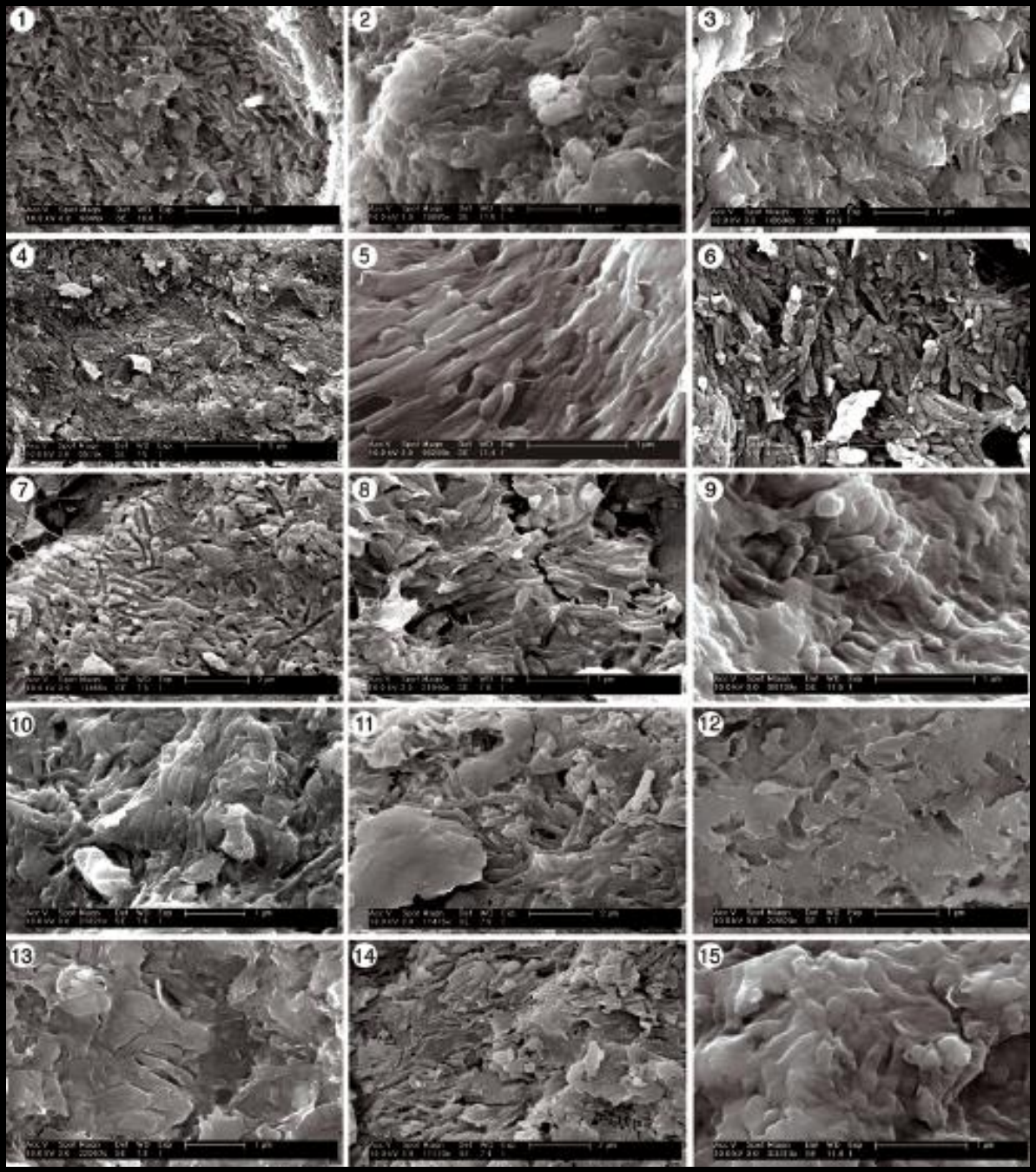




Anchiornis huxleyi – a troodontid dinosaur


A
Ai
B
C
D
E
F
Fi


A
1 µm
B
1 µm
C
D
28
25
26
N
L
M
Pm
J
27
Rd
29
Ld
1 cm
E
1 µm
F
1 µm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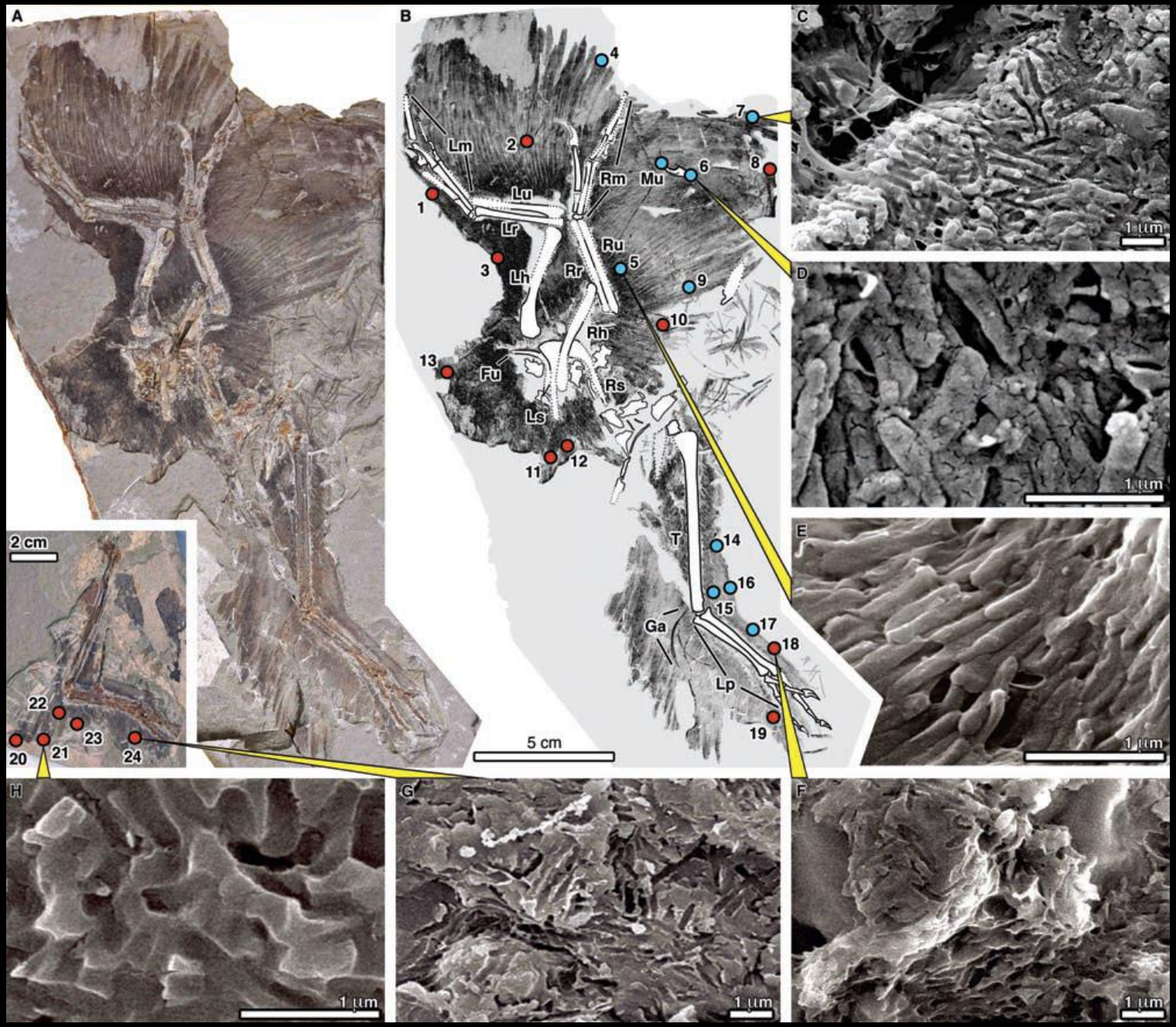
Comparisons with melanosome samples associated with red-brown, black, and gray colors in living birds


A
B
C
D
E
F
G
H
2 cm
5 cm
1 µm
Lm
Lu
Lr
Lh
Ls
Rm
Ru
Rr
Rh
Rs
Mu
Fu
T
Ga
Lp
1
2
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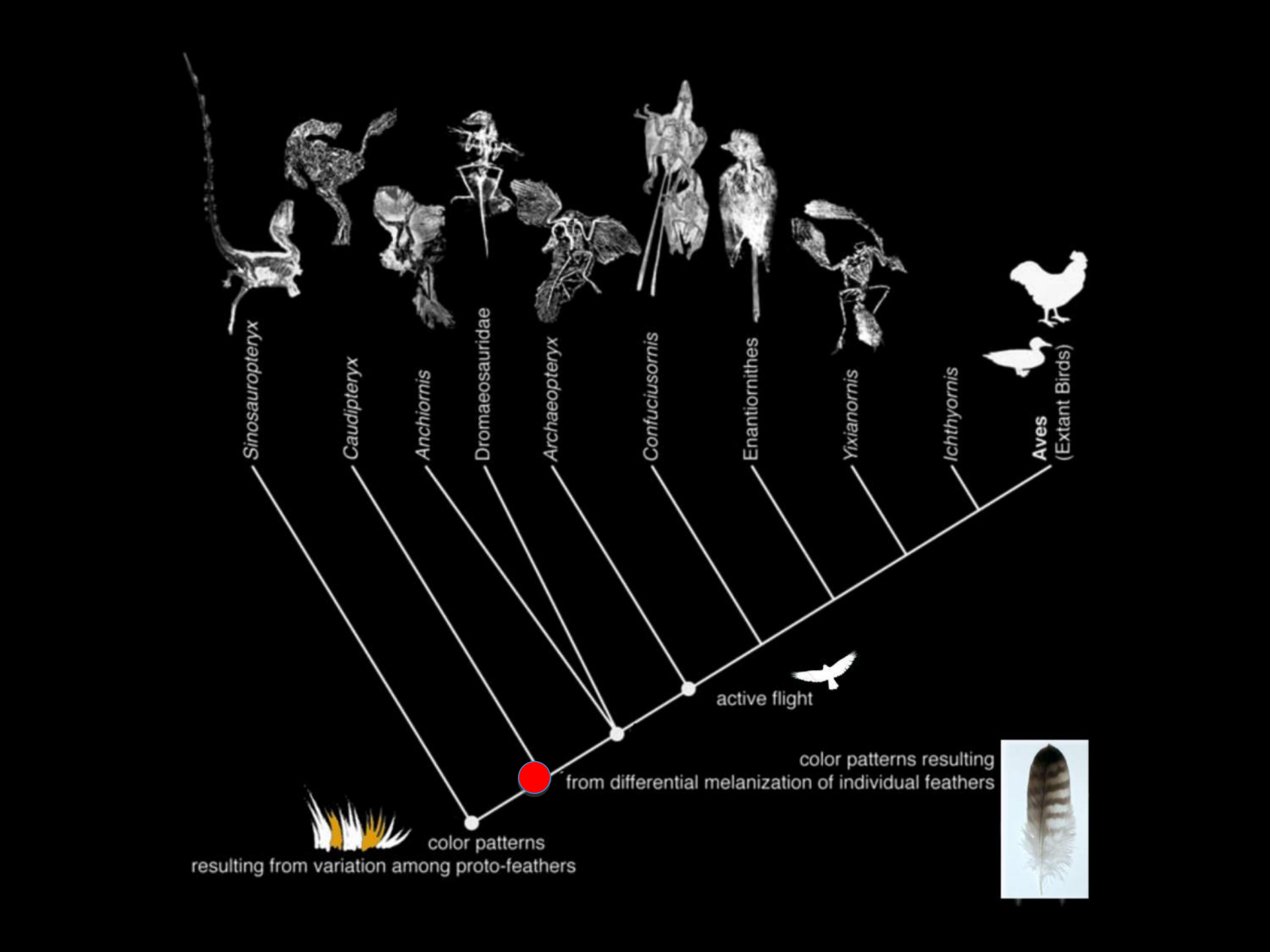
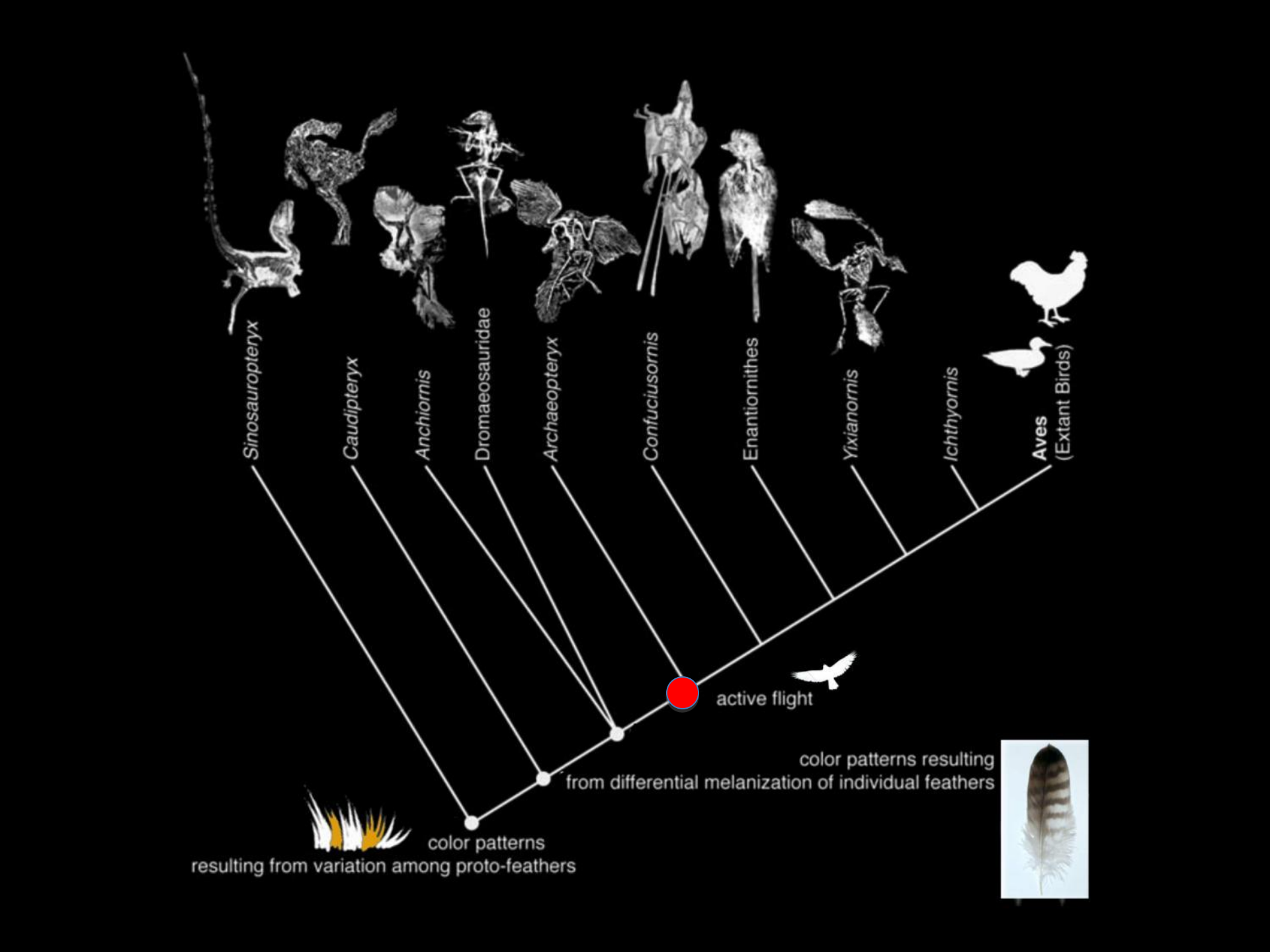
Credit: By Michael DiGiorgio/Courtesy Yale

Illustration by © Michael DiGiorgio


Sinosauropteryx
Caudipteryx
Anchiornis
Dromaeosauridae
Archaeopteryx
Confuciusornis
Enantiornithes
Yixianornis
Ichthyornis
Aves
(Extant Birds)
active flight
color patterns resulting
from differential melanization of individual feathers
color patterns
resulting from variation among proto-feathers


Sinosauropteryx
Caudipteryx
Anchiornis
Dromaeosauridae
Archaeopteryx
Confuciusornis
Enantiornithes
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active flight
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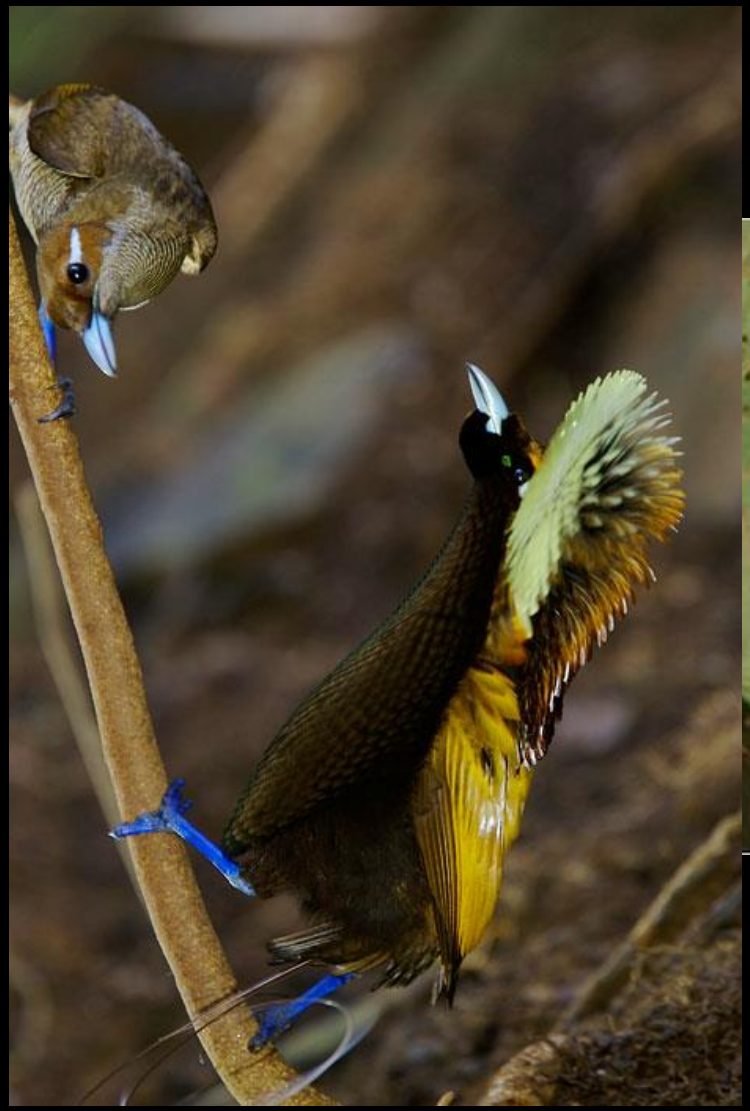
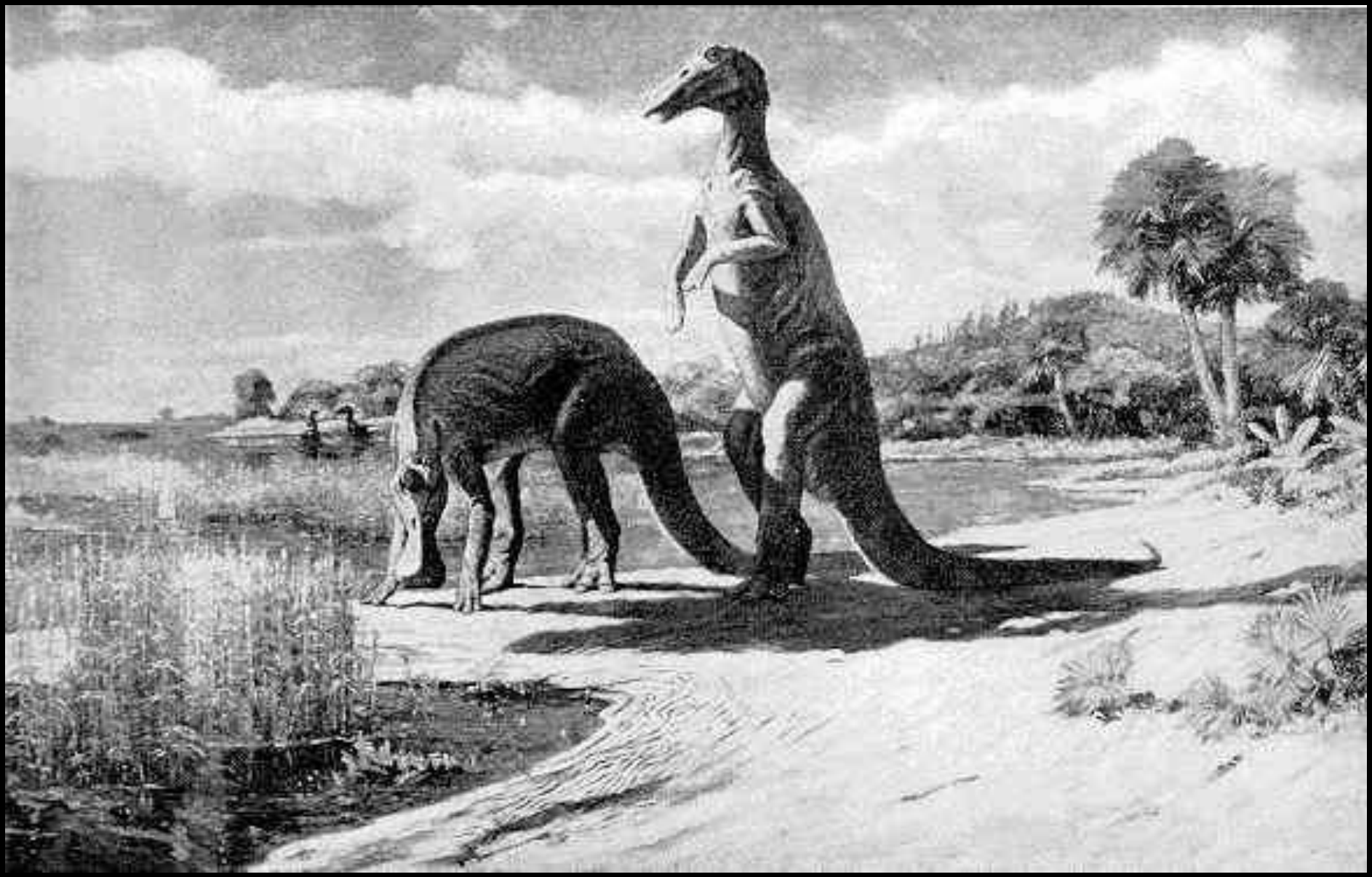


Illustration by © Zhao Chuang / Xing Lida

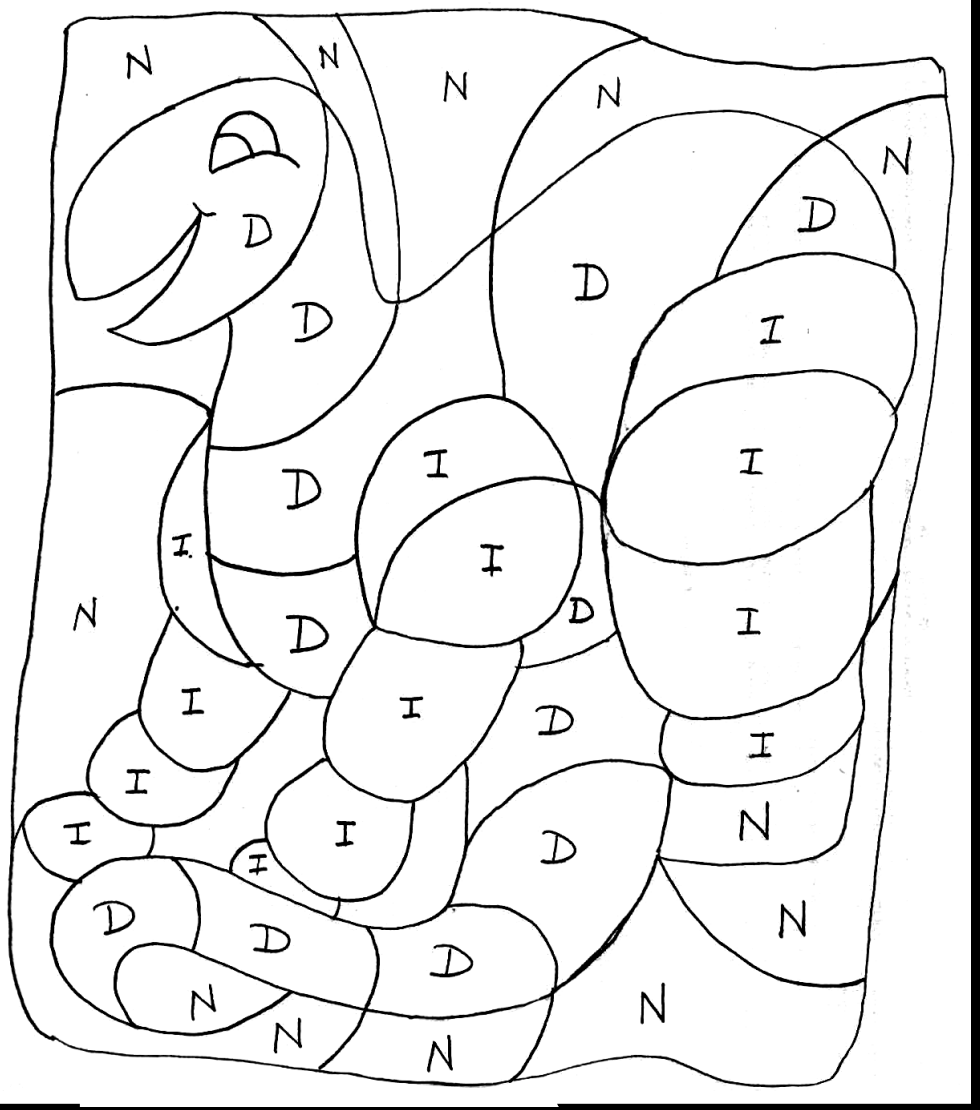
Credit: By Michael DiGiorgio/Courtesy Yale

Illustration by © Michael DiGiorgio


Nirmala Sridhar



D - Green I - Purple N - Blue



Credit: By Michael DiGiorgio/Courtesy Yale

Illustration by © Michael DiGiorgio

Giant Penguins

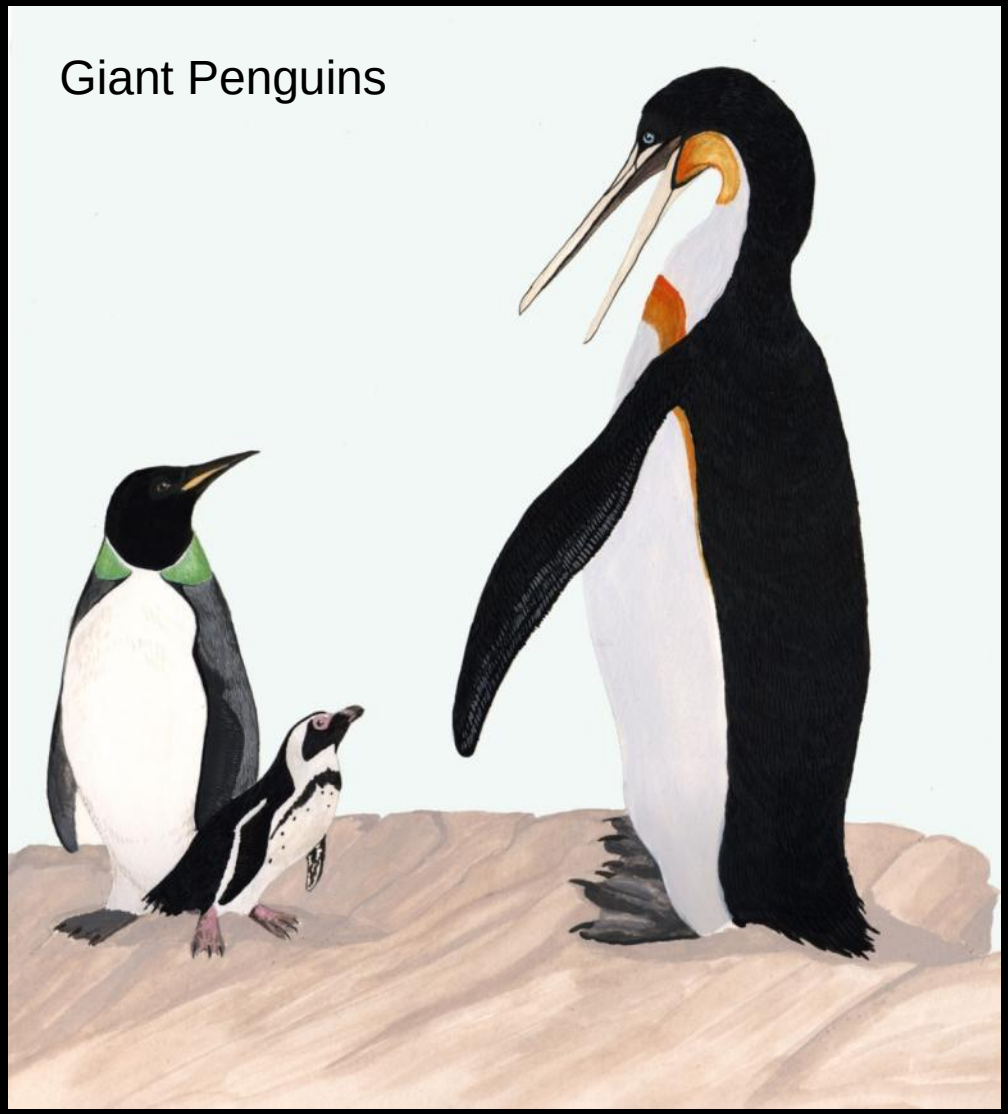


Illustration by © Kristin Lamm

Illustration by © Katie Brown, UT Austin

Thank you!

Dr. Julia Clarke

Professor Julia Clarke is a paleontologist at the Department of Geological Sciences, Jackson School of Geosciences at The University of Texas at Austin, as well as research associate with the American Museum of Natural History. Clarke is lead author of an article in the September 2010 issue in the journal Science of her research team discovery of the first fossilized penguin species found with evidence of feathers. Her research interests include vertebrate paleontology and evolution of morphology, as well as avian anatomy and evolution.