The past, present and future of Jensen's Big Three sauropods

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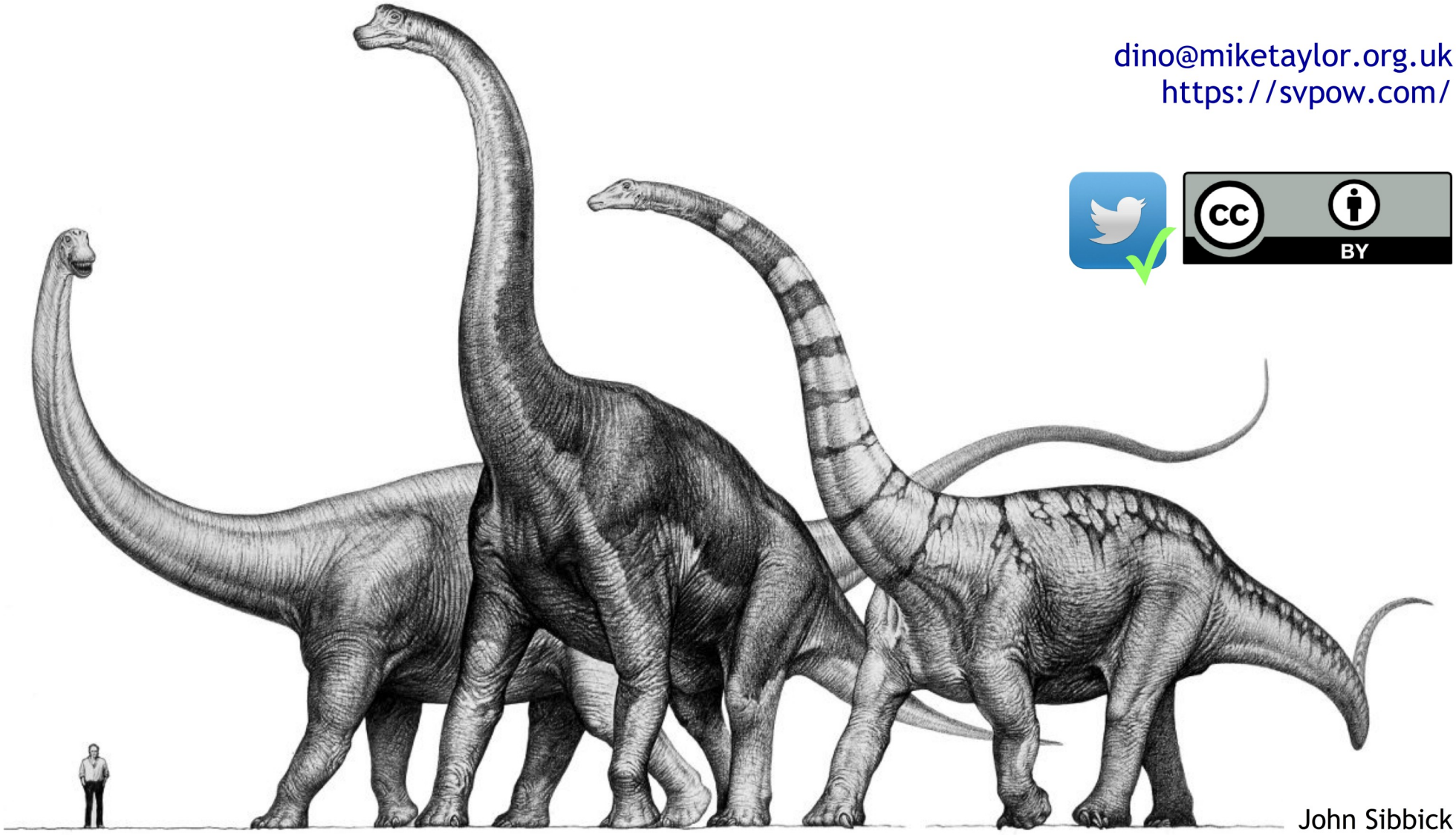

John Sibbick


BAT AWAY
BAT AWAY
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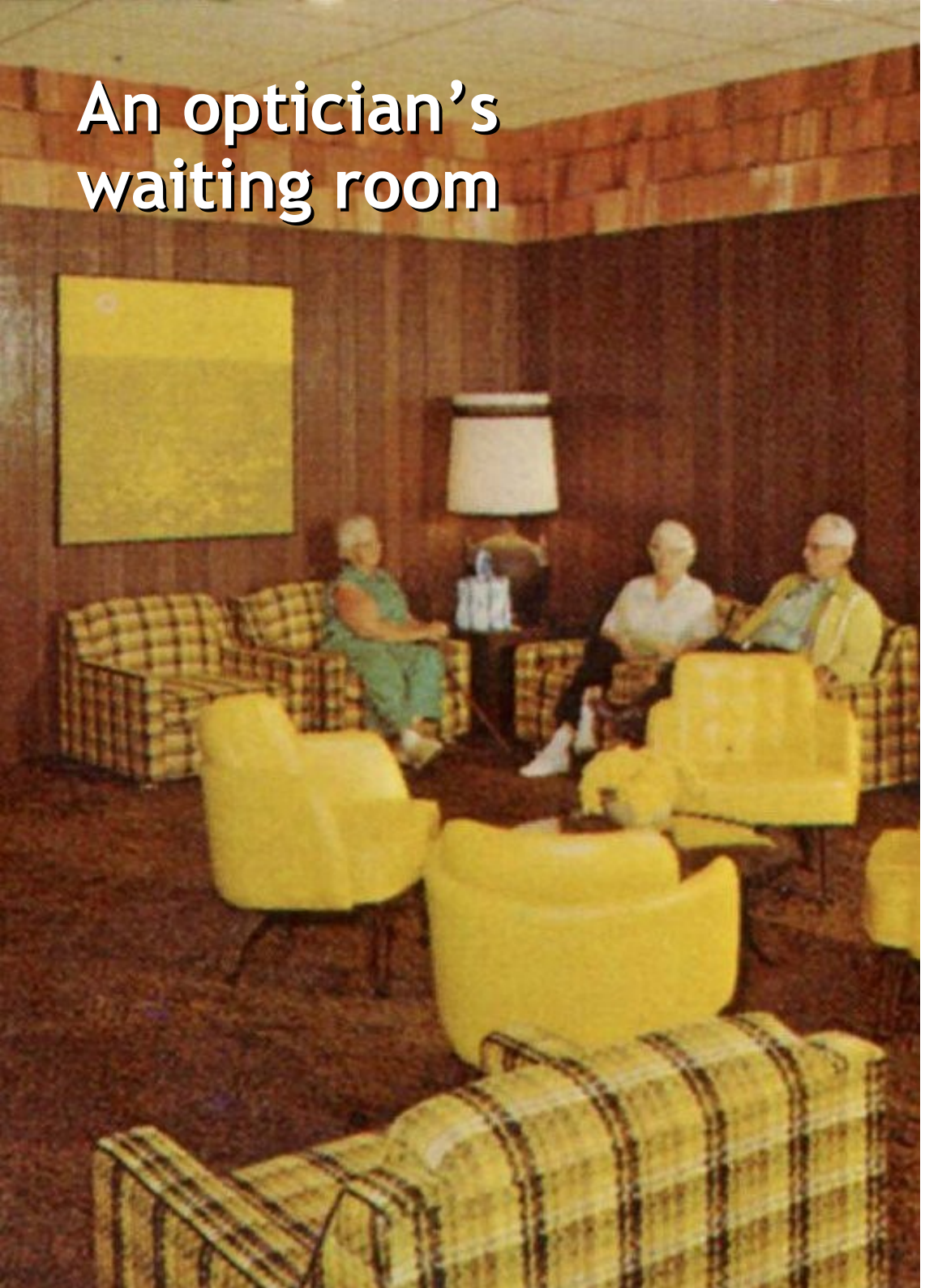
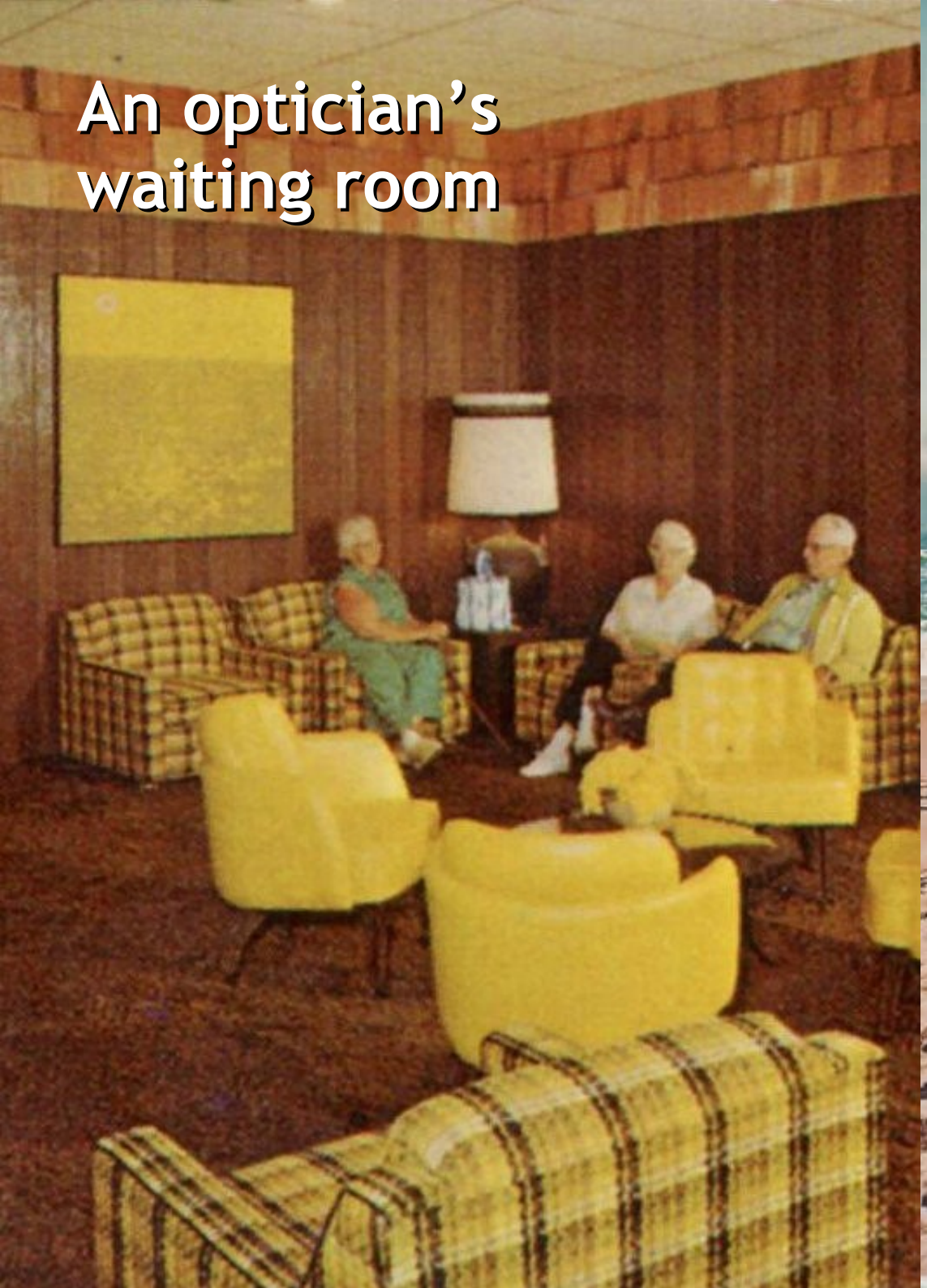

An optician’s
waiting room



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52nd year: Over 30 million copies bought monthly in 13 languages

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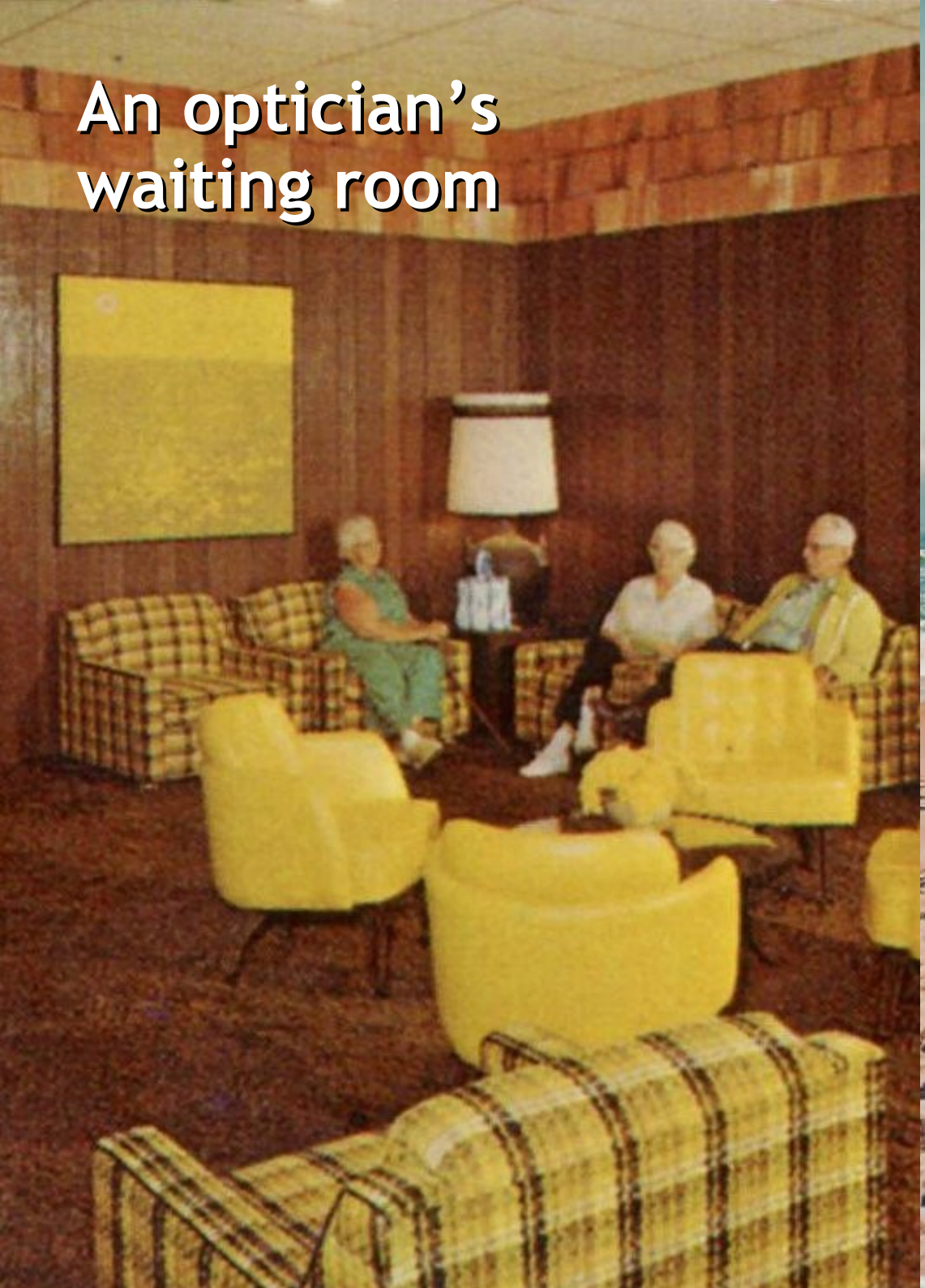

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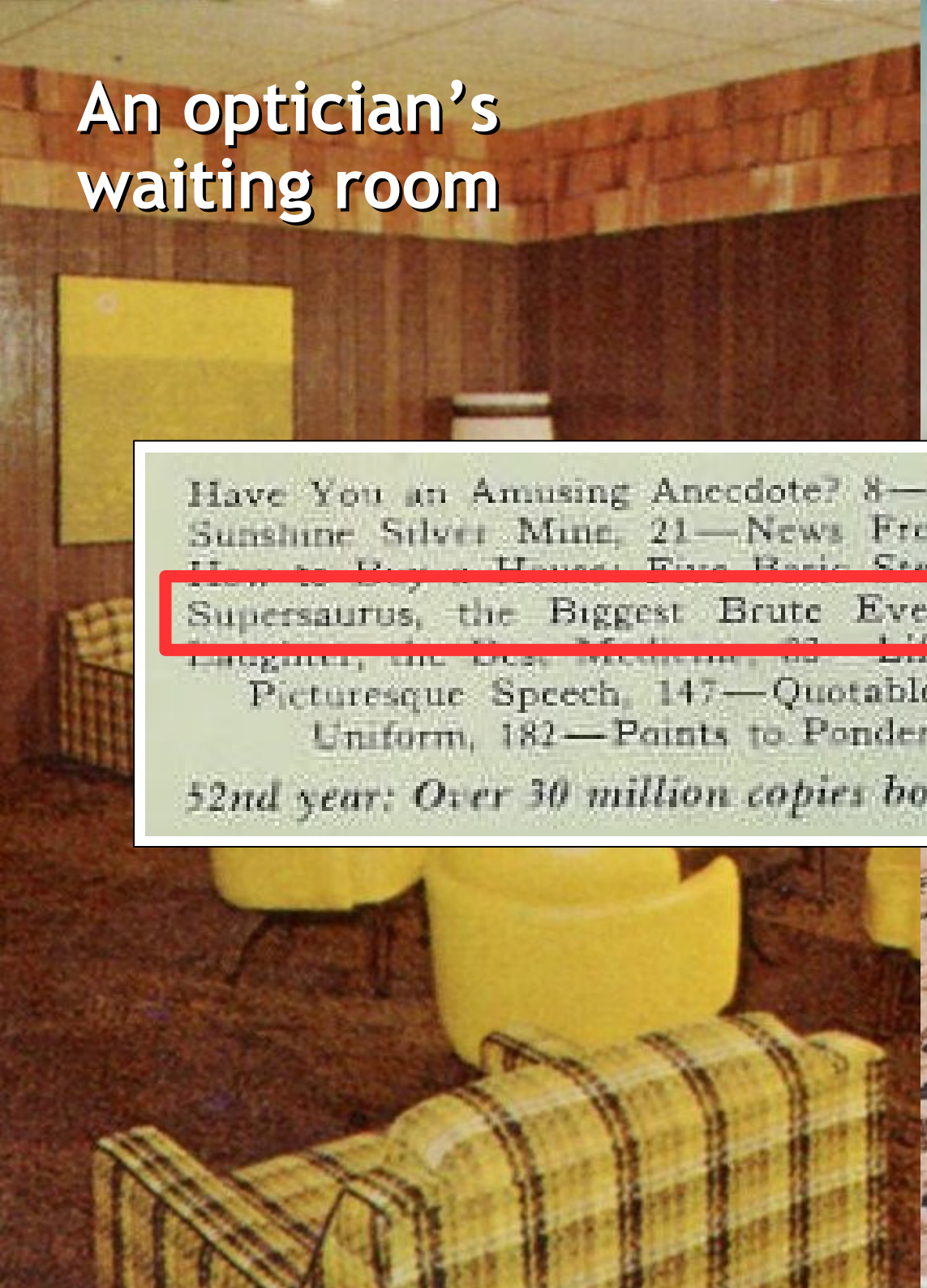

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Less than 50 ago, but the history is fading …

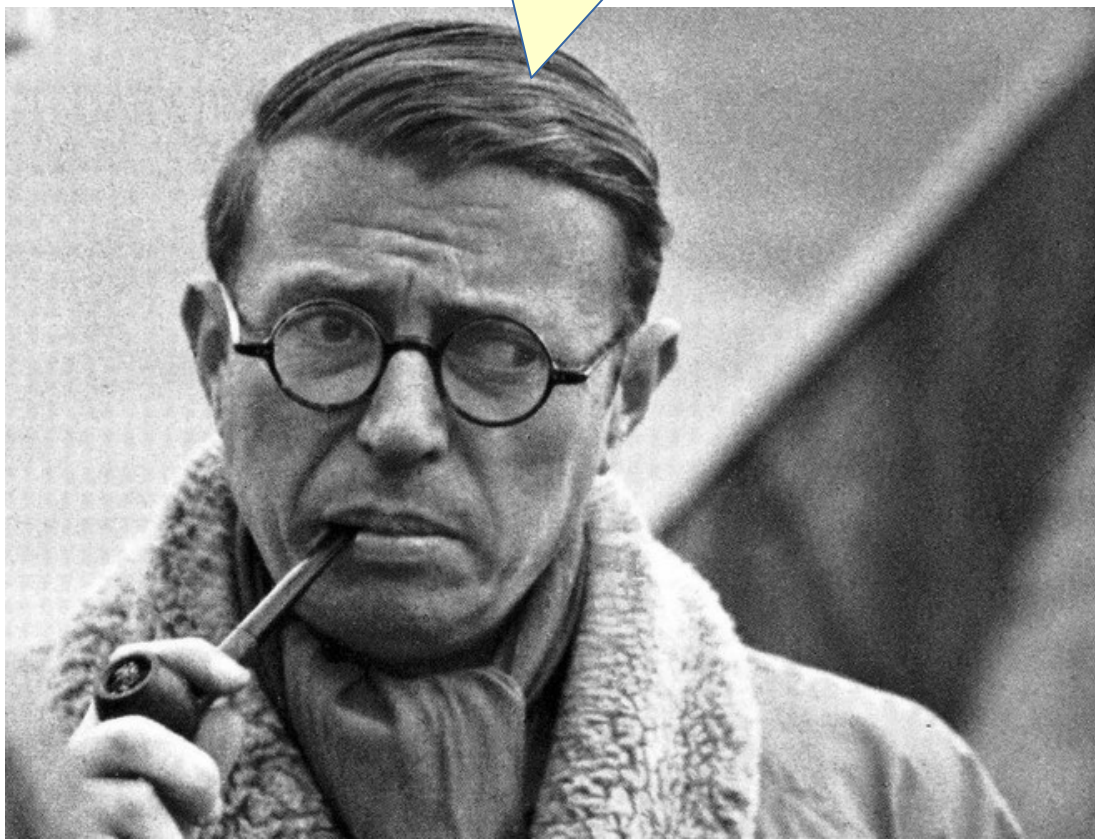
Dr. James A. (Dinosaur Jim) Jensen of Brigham Young University uses a paint brush to sweep clinging bits of earth from an ages-old bone.

You don't just pick up a dinosaur bone and slip it into your pocket. Instead you use a power crane and a truck.

George, Jean. 1973a. *Supersaurus*, the biggest brute ever. Denver Post, *Empire* Magazine. May 13, 1973.

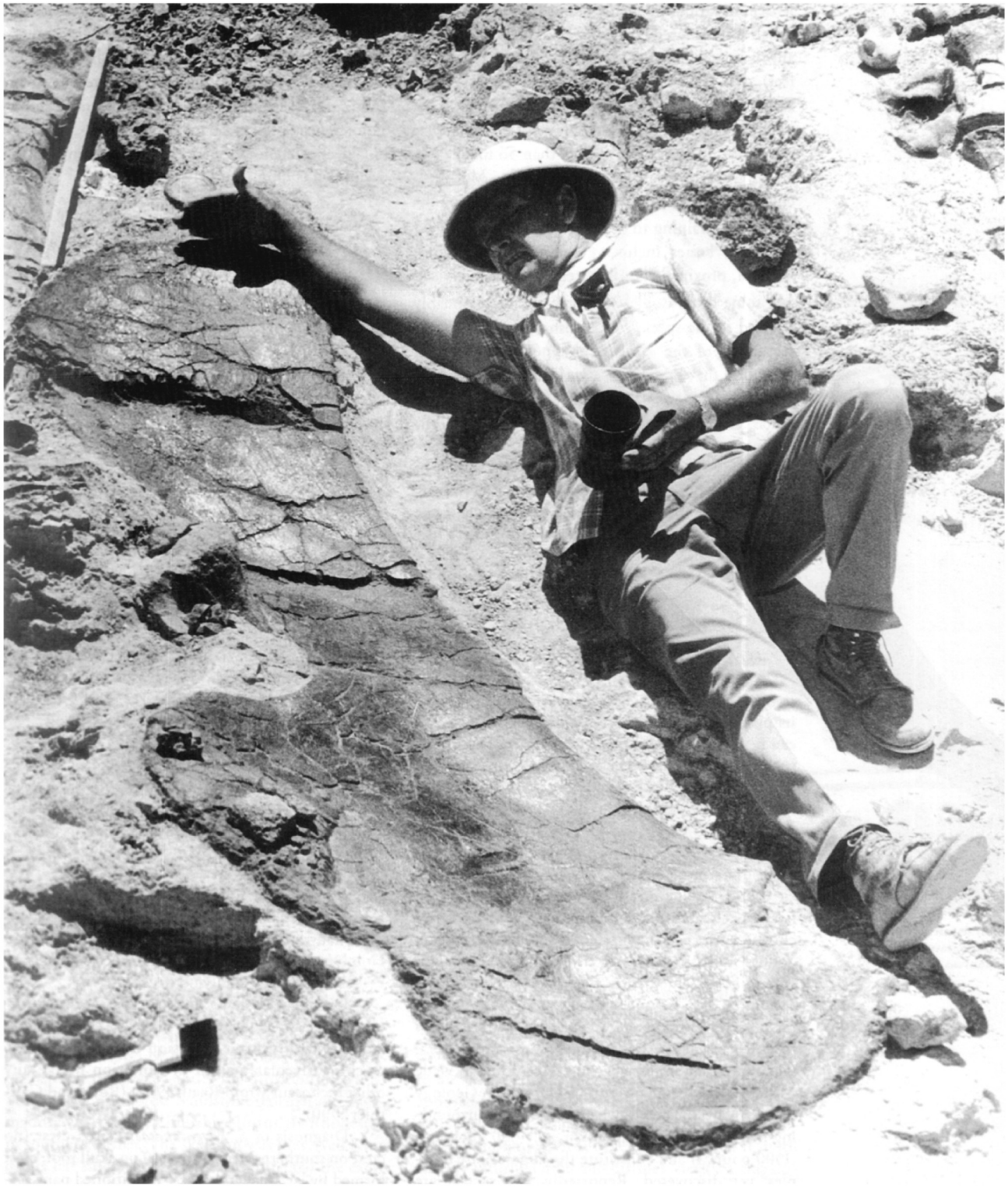
Where we're going in this talk

1. Historical context
2. Our interpretation of the bones
3. Taxonomic implications
4. Existential despair

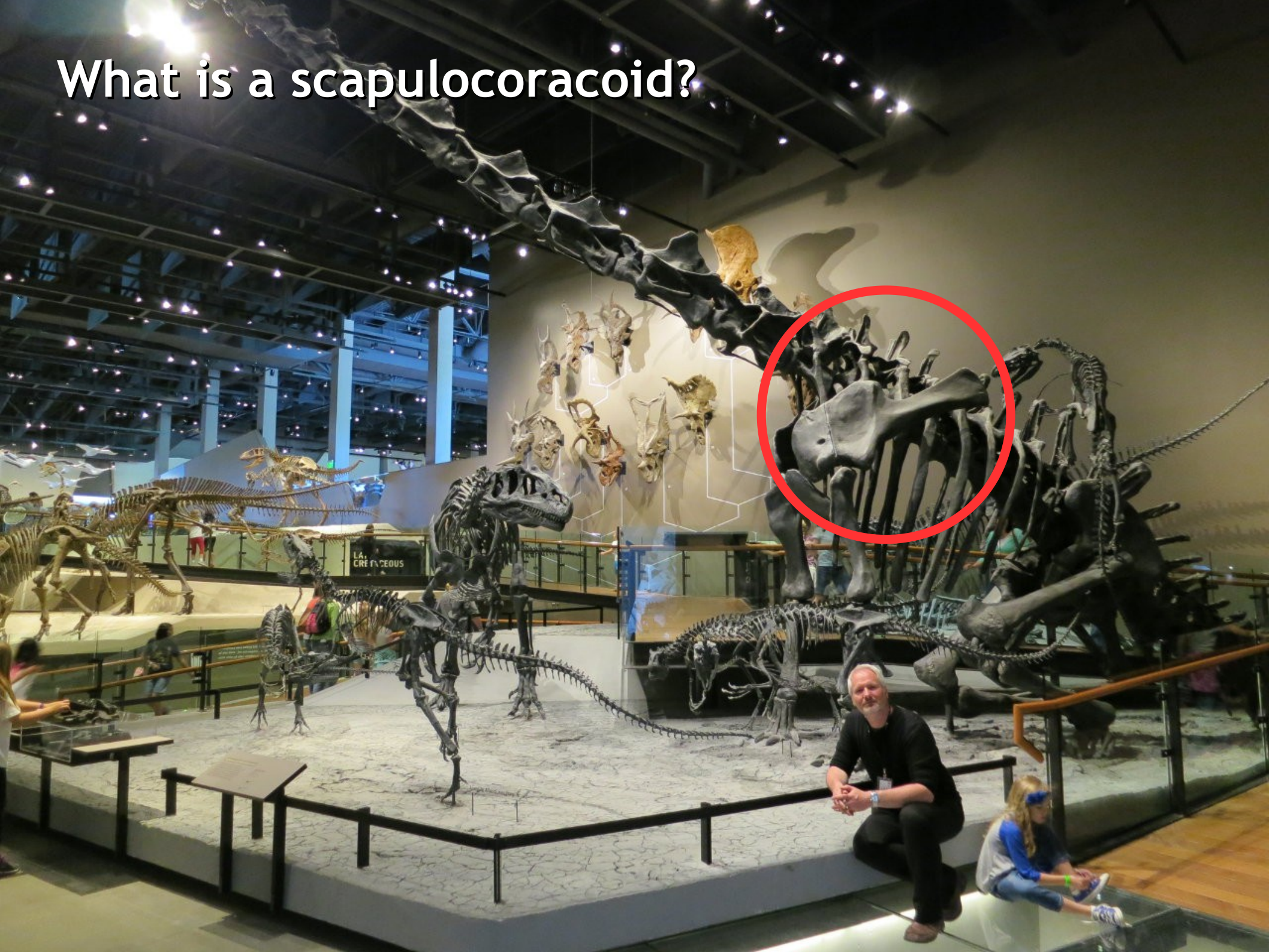


1972:
Jim Jensen at Dry Mesa Quarry Colorado

First big scapulocoracoid.



What is a scapulocoracoid?




What is a scapulocoracoid?

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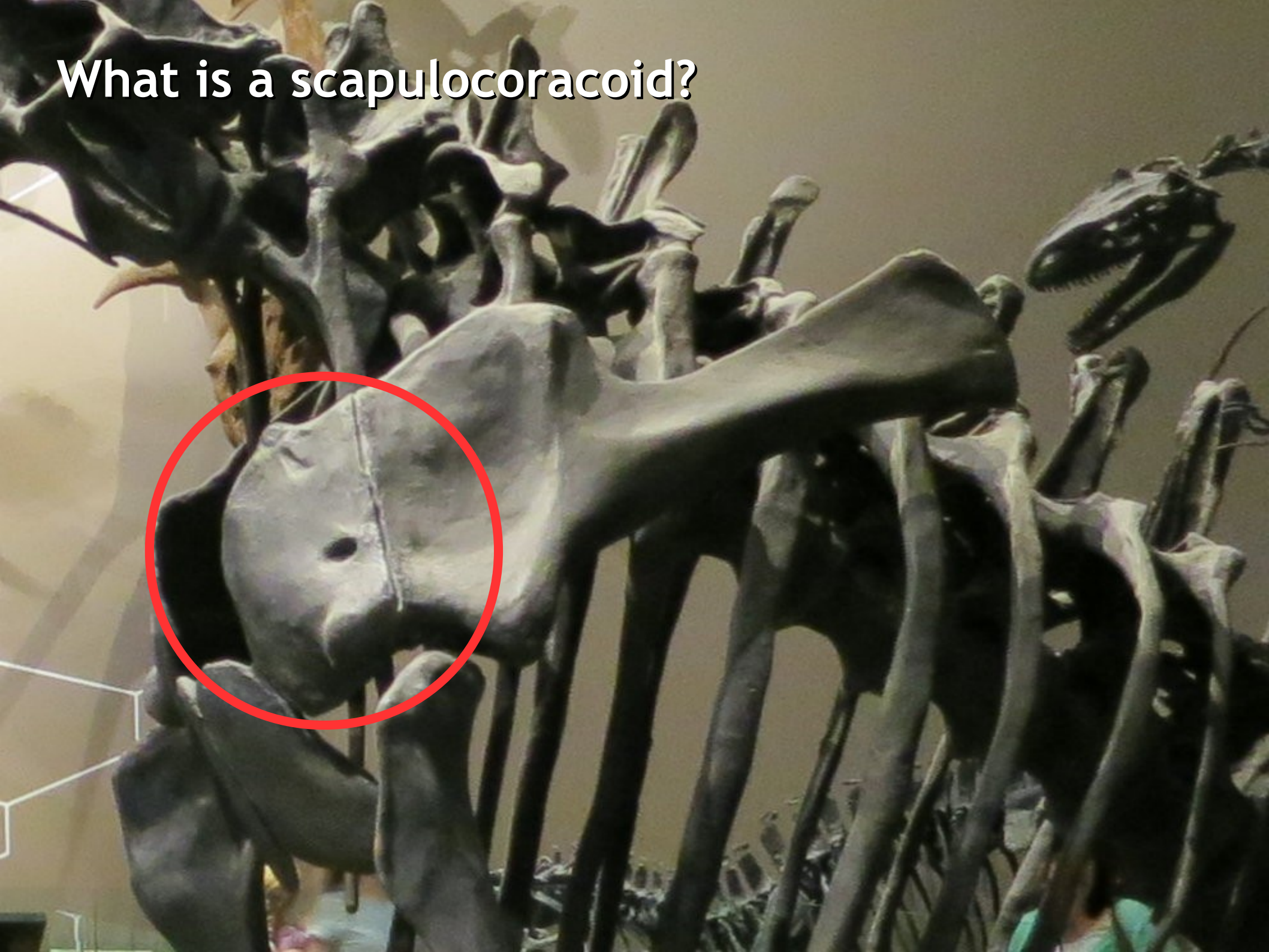

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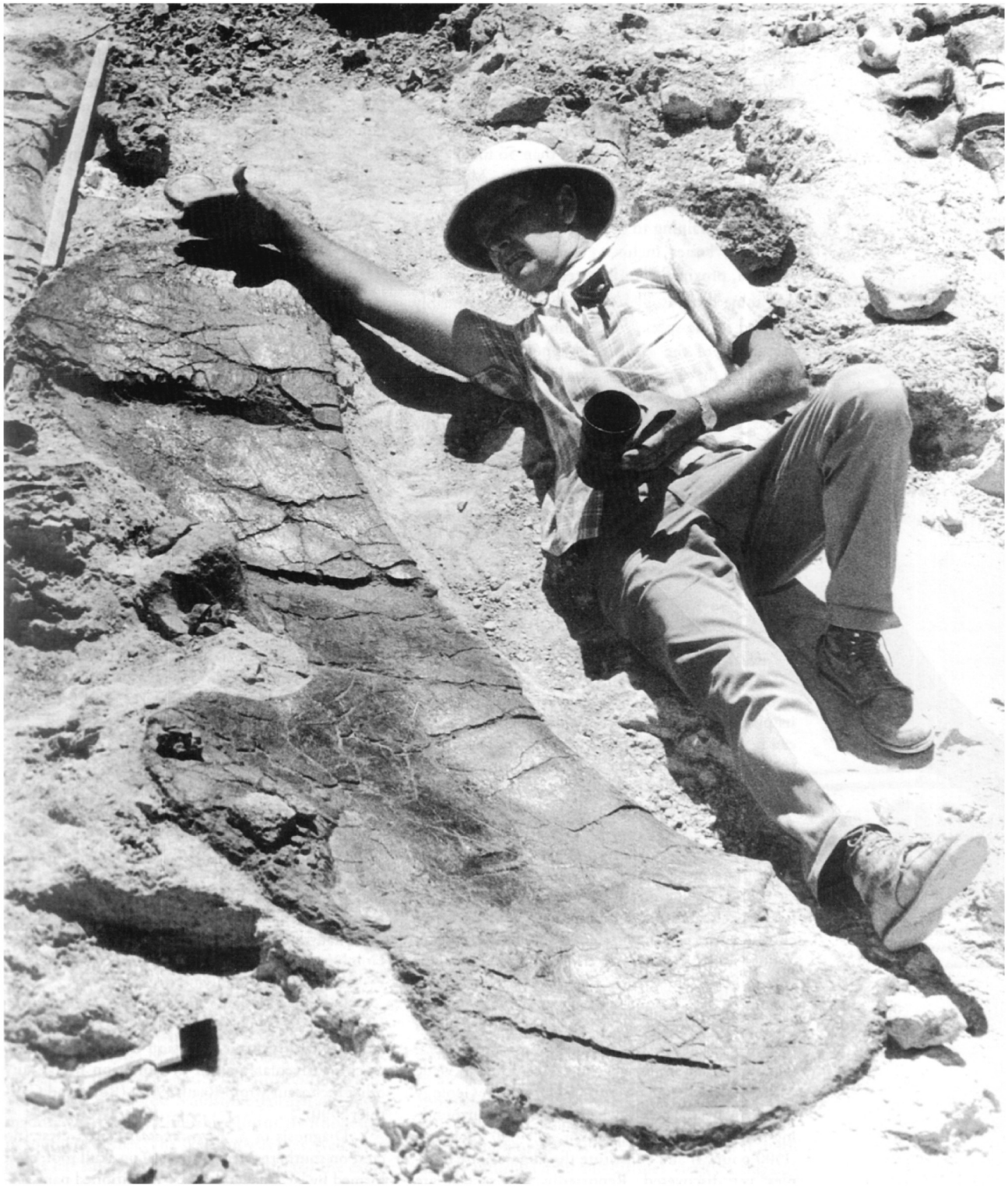


Life sized: 2.7 m (8 feet)

1973: All over the media

Time

Life

National Geographic

Reader's Digest

New York Times

A MONSTER OF MONSTERS, whose shoulder blade alone is longer than discoverer Dr. James Jensen (**right**), was unearthed at Dry Mesa quarry in Colorado. Although only this bone and several others have been found, they justify its nickname, "Supersaurus."

If, as seems probable, Supersaurus was a four-footed herbivore built along the lines of *Brachiosaurus*, it thus becomes the biggest of all dinosaurs, as shown in a conjectural drawing (**above**) with a *Brachiosaurus* and a man for comparison.

Supersaurus may have weighed as much as a hundred tons—equal to a herd of 15 African elephants. If so, it becomes the largest land animal of all time and outweighs most great whales.

Sunday Empire®

MAY 13, 1973

THE MAGAZINE OF THE DENVER POST • VOICE OF THE ROCKY MOUNTAIN EMPIRE®

SUPERSAURUS, *giant of the giants*

page 14

Sunday Empire®

MAY 13, 1973

THE MAGAZINE OF THE DENVER POST • VOICE OF THE ROCKY MOUNTAIN EMPIRE®

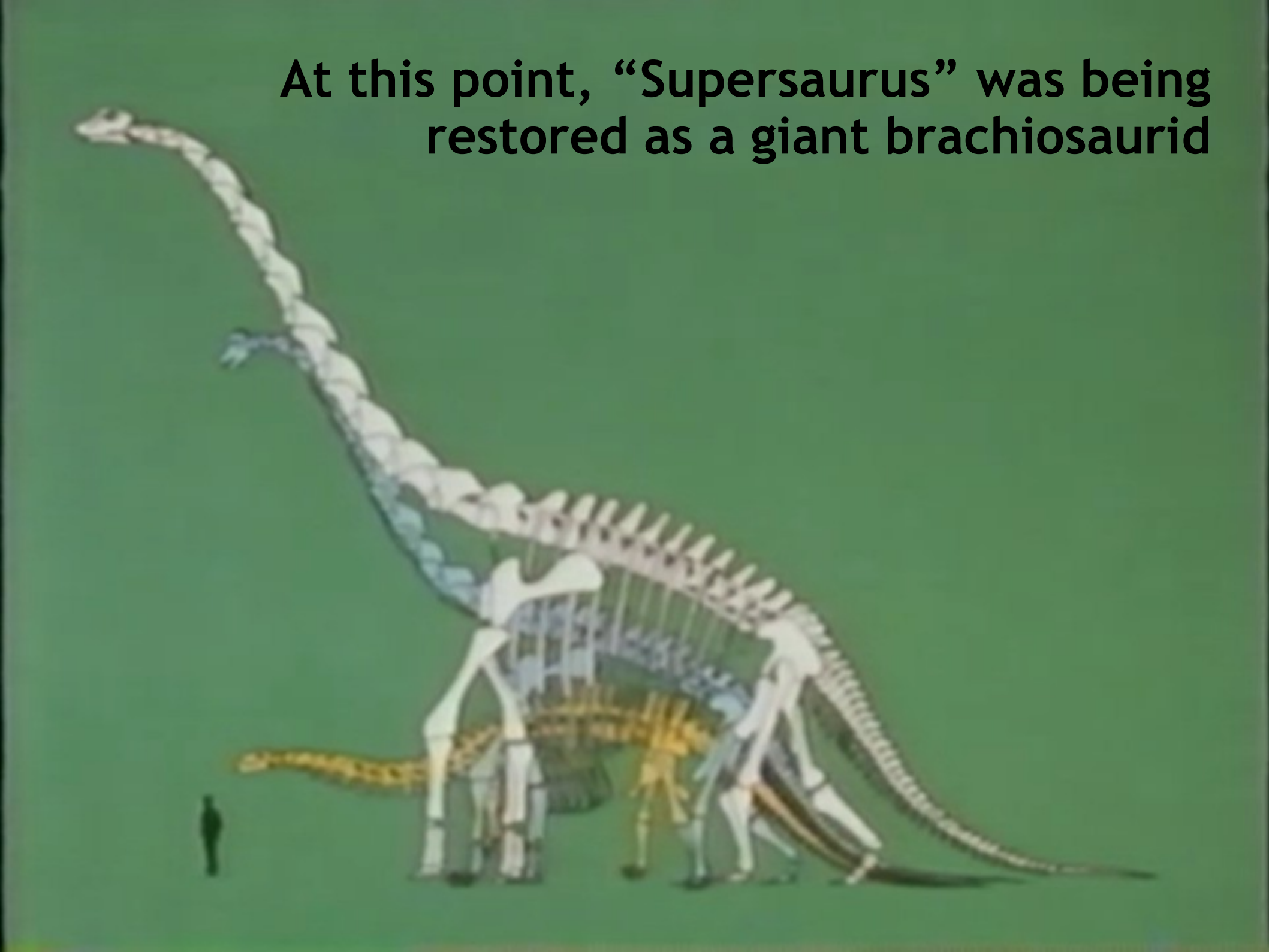
SUPERSAURUS, *giant of the giants*

page 14

Other material included a huge cervical vertebra


1973 documentary; edited down in 1976
The Great Dinosaur Discovery
BRIGHAM YOUNG UNIVERSITY MCMLXXVI

At this point, “Supersaurus” was being restored as a giant brachiosaurid



By 1978, a second scapulocoracoid had been found and excavated.

Photograph of cast at Dinosaur Journey museum.


In 1979, a third
scapulocoracoid
was found:
this one a
brachiosaurid.

Bones found of what may be largest animal Ultrasaurus ever to walk the earth

Colonist—New York Times Service

NEW YORK — A Utah paleontologist, digging in an ancient dry river bed on a windswept Colorado mesa, has found bones of the biggest dinosaur that has yet been discovered.

He found skeletal parts of a huge animal that he estimates would have been able to look into a top floor window of a building five or six stories high. It was about 50 to 60 feet tall, had a 40-foot-long neck, was about 80 feet long and probably weighed 80 tons.

Dr. James Jensen, the paleontologist, identified the relic as having come from a species of Brachiosaurus, a genus in the sauropod family of long-necked herbivorous dinosaurs. Jensen, who is curator of the Earth Sciences Museum at Brigham Young University in Provo, Utah, believes the creature may have been the largest animal that ever walked the earth

He based his conclusions on the fact that the first bone uncovered, a scapula, or shoulder blade, was nine feet long. A scapula of such huge size, he calculated, must have come from a creature with correspondingly gigantic proportions that could be extrapolated accurately by dinosaur experts.

SEVEN YEARS AGO, near the same site, the scientist had found a scapula of a different dinosaur that was nearly eight feet long. At the time, dinosaur experts agreed that that animal was probably the largest discovered.

But a few weeks ago, scrabbling around in the rocky soil of the mesa, located in a remote section of southwest Colorado, he and his crew uncovered what resembled a giant, bone-shaped dog biscuit. It was the scapula, or shoulder blade, of a dinosaur.

Quickly identifying it as having come from one of the Brachiosaurids, the largest of the dinosaur families, Jensen calculated that the length of the scapula indicated that the animal's leg bones alone must have been 20 feet tall. He also determined that the bone had come from a species of Brachiosaurus different from the type that had had the eight-foot shoulder blade.

In an telephone interview, Jensen pointed out that Brachiosaurids were the largest known dinosaurs and lived in the late Jurassic period some 140 million years ago.

They have been described by dinosaur historians as having been gentle plant-eaters that walked on four legs with their necks held upright like a giraffe's as they browsed the high limbs of trees. The tallest giraffes reach a height of about 20 feet.

JENSEN, WHO IS known as "Dinosaur Jim" to his fellow paleontologists, has again attracted scientists to a problem that has been puzzling them for years. Those who study the physiology of both living and extinct animals have long wondered how blood reaches the heads of animals so tall as dinosaurs and giraffes.

"They want to know what kind of heart a dinosaur could have had that could pump a column of blood 70 or 80 feet high," he said. "A giraffe has a four-chambered heart and we think most dinosaurs had two-chambered hearts. But I'm going to leave that problem to the paleophysiologists," he added.

Paradoxically, the huge Brachiosaurids had tiny brains that manipulated their front legs and jaws. They are believed to have had a second small brain on their spinal cord near the pelvis that provided the impulses to move their tails and rear legs. The largest assembled skeleton of one, discovered in Africa, is on display in the Berlin Museum in Germany. The animal was 42 feet tall.

Jensen's discovery, when completely assembled, would also dwarf the two large dinosaurs that are on exhibit in the fourth-floor dinosaur halls of New York's American Museum of Natural History. There, visitors are greeted with lifelike facsimiles of a plant-eating Brontosaurus that is more than 60 feet long and a smaller carnivorous Tyrannosaurus rex.

THE UTAH SCIENTIST said that his latest find had been nicknamed "ultrasaurus" but "it may take years before we can dig out all of its fossilized remains, positively classify it and christen it with a formal scientific name," he added.

In the scientific method of naming newly discovered species, the discoverer has the privilege of selecting the species name. "I don't know yet what that will be," Jensen said.

He plans to halt the painstaking work of uncovering the remainder of the dinosaur's bones by mid-August so that his team can transport the relics that have been unearthed back to his vertebrate laboratory on the Brigham Young campus 300 miles away in Provo, where they can be examined and classified.

"I think the main significance of this finding is that it may eventually help scientists find out how these animals could pump blood that high off the ground," he said. "Their heads were the highest of any animals and tremendous blood pressure must have been needed. We might someday learn something about human physiology from them."

Jensen plans to return each year to the Colorado dig, perched on a quarry-like shelf of the tree-studded mesa that lies high above the Escalante Valley on the western slope of the Rocky Mountains. Millions of years ago it was a river bed in which the bones of hundreds of ancient animals had collected.

Rhodesia rearing its head at key power summit

Colonist—New York Times Service

LONDON — About all that most Britons know about the Commonwealth is that its politicians sometimes have a class picture taken in the backyard of 10 Downing Street.

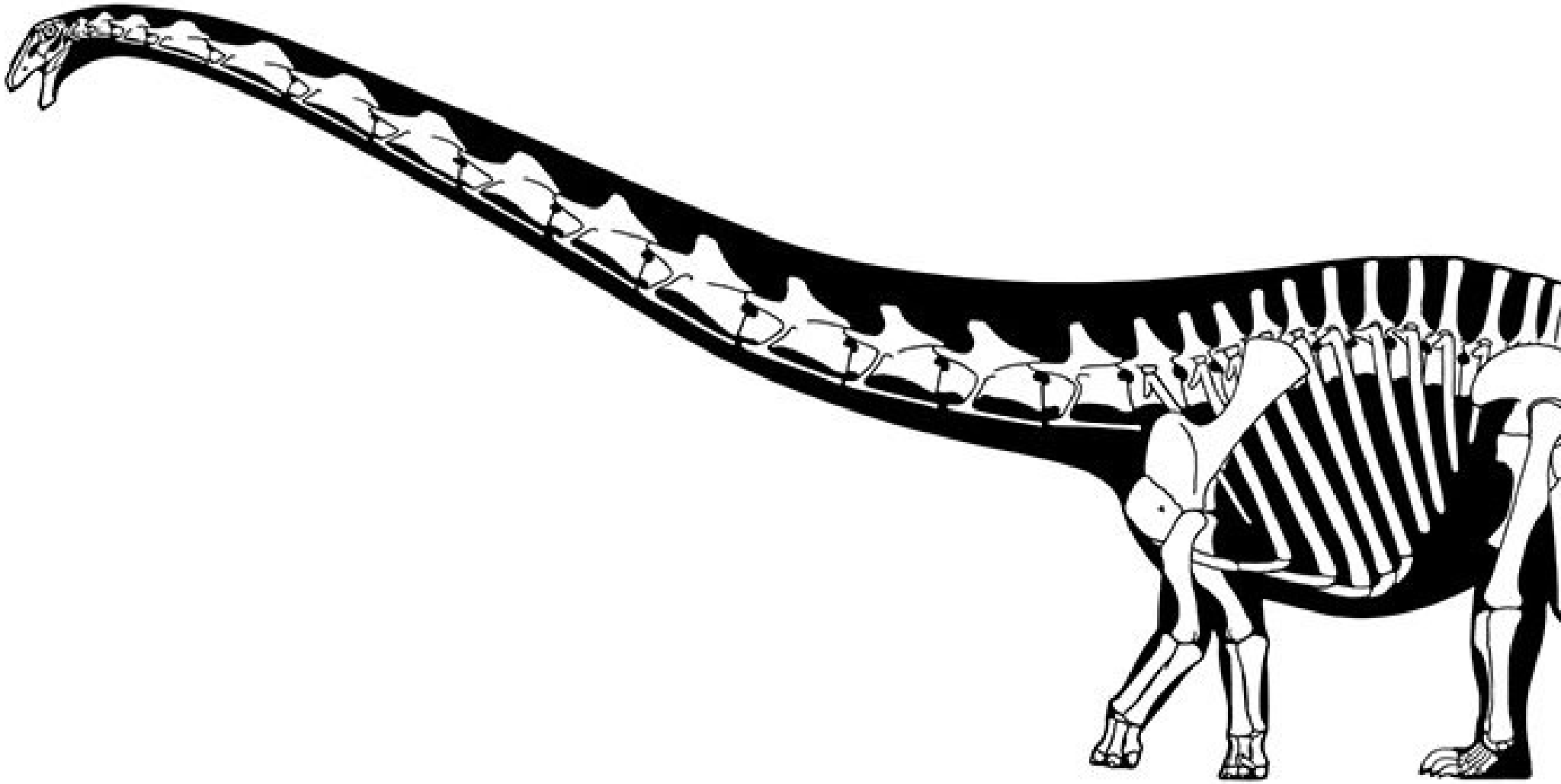
The work of Commonwealth co-operation is not something that gets much space in the newspapers. This week the class—the heads of 40 states—is meet-

This one really does seem to be brachiosaurid.

Left:
"*Ultrasaurus*" scapulocoracoid BYU 9462.

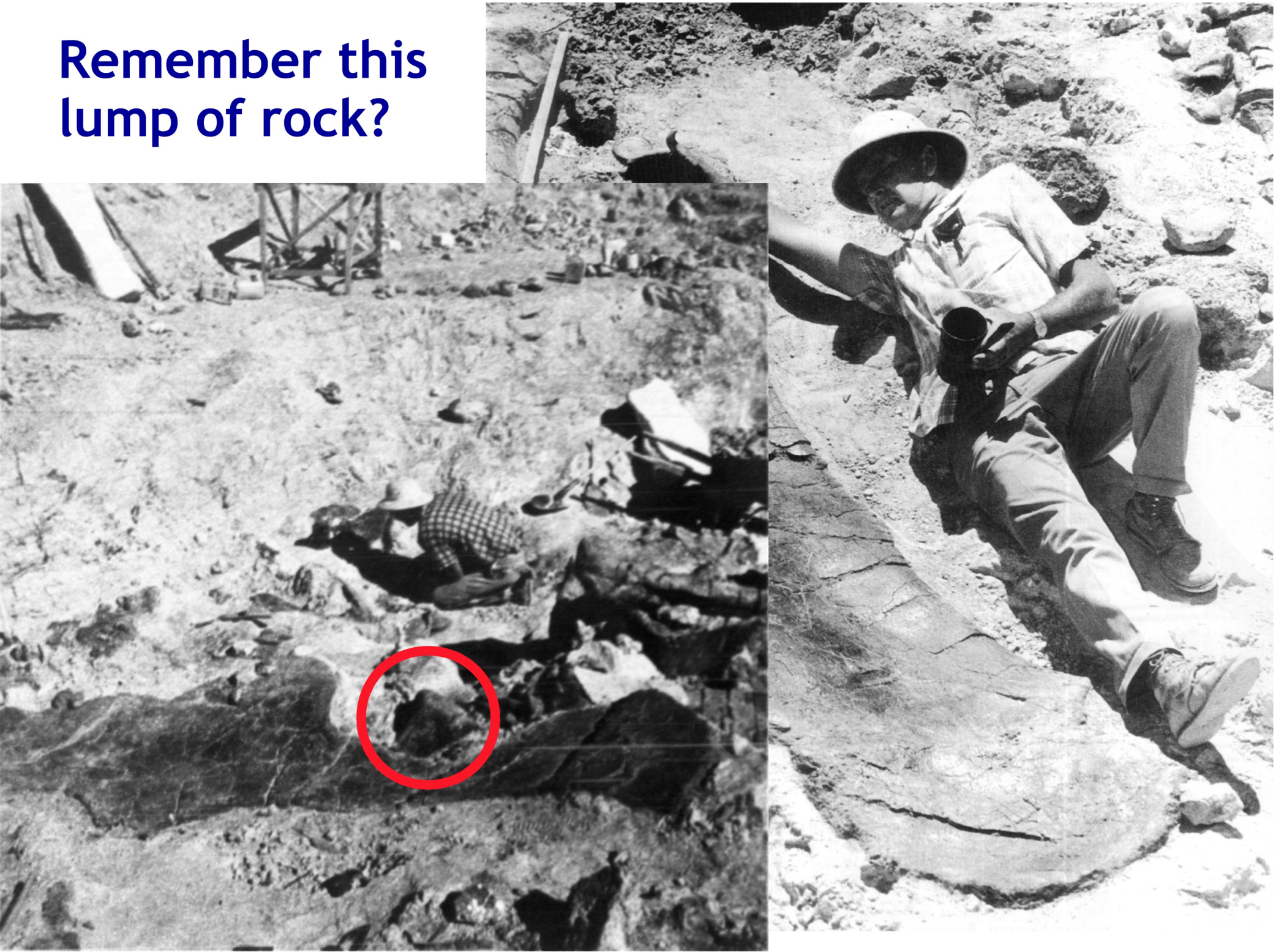
Right:
Giraffatitan brancai scapula HMN Sa 9.

By now *Supersaurus* was considered diplodocid



Remember this lump of rock?

Remember this lump of rock?



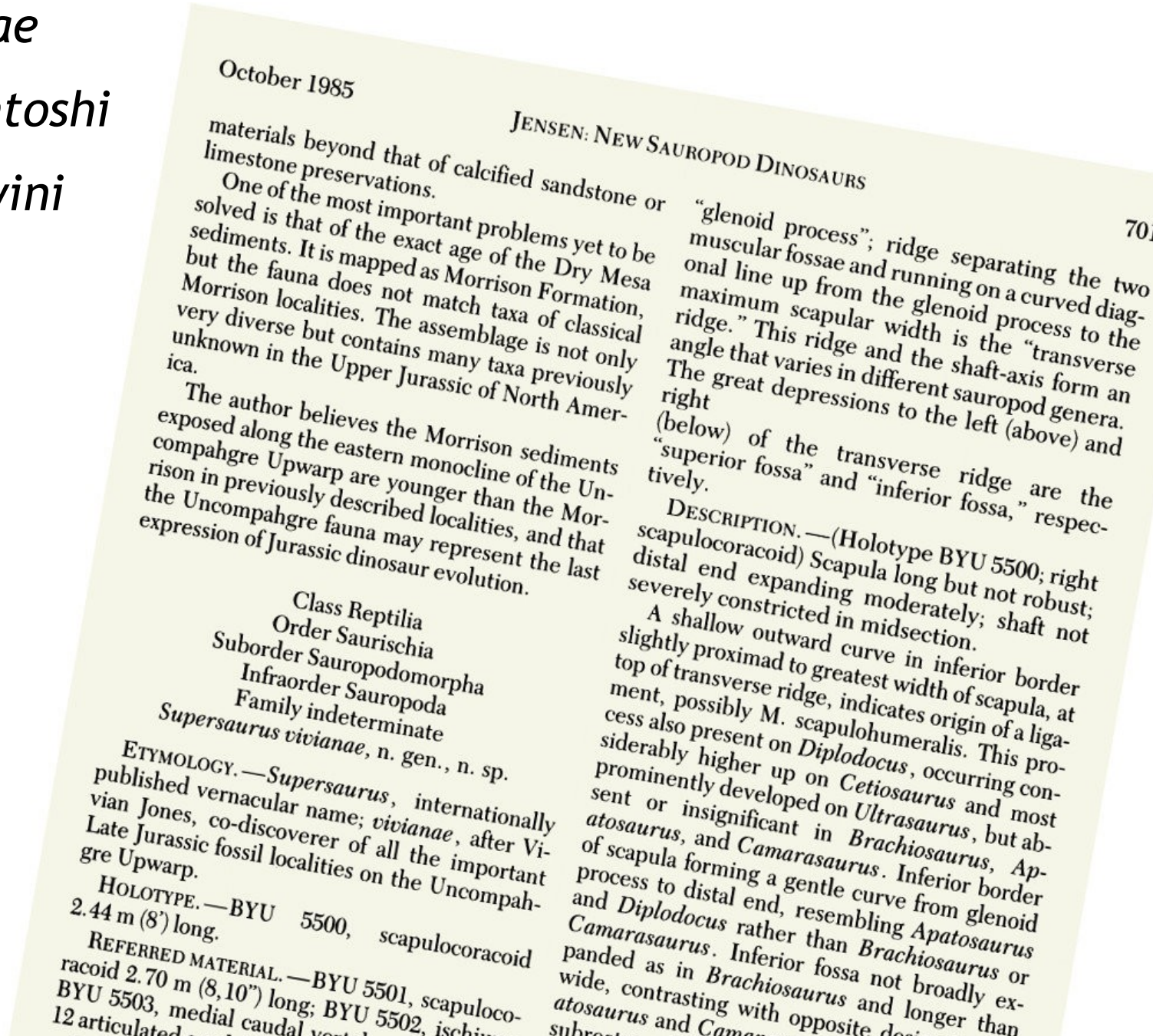
Jensen designated it as a third new sauropod *Dystylosaurus*

All three formally described in a 1985 paper

Supersaurus vivinae

Ultrasaurus macintoshi

Dystylosaurus edwini



October 1985 JENSEN: NEW SAUROPOD DINOSAURS 701

materials beyond that of calcified sandstone or limestone preservations.

One of the most important problems yet to be solved is that of the exact age of the Dry Mesa sediments. It is mapped as Morrison Formation, but the fauna does not match taxa of classical Morrison localities. The assemblage is not only very diverse but contains many taxa previously unknown in the Upper Jurassic of North America.

The author believes the Morrison sediments exposed along the eastern monocline of the Uncompahgre Upwarp are younger than the Morrison in previously described localities, and that the Uncompahgre fauna may represent the last expression of Jurassic dinosaur evolution.

Class Reptilia
Order Saurischia
Suborder Sauropodomorpha
Infraorder Sauropoda
Family indeterminate
Supersaurus vivianae, n. gen., n. sp.

ETYMOLOGY.—*Supersaurus*, internationally published vernacular name; *vivianae*, after Vivian Jones, co-discoverer of all the important Late Jurassic fossil localities on the Uncompahgre Upwarp.

HOLOTYPE.—BYU 5500, scapulocoracoid 2.44 m (8') long.

REFERRED MATERIAL.—BYU 5501, scapulocoracoid 2.70 m (8,10") long; BYU 5502, ischium; BYU 5503, medial caudal vertebra; BYU 5504, 12 articulated

"glenoid process"; ridge separating the two muscular fossae and running on a curved diagonal line up from the glenoid process to the maximum scapular width is the "transverse ridge." This ridge and the shaft-axis form an angle that varies in different sauropod genera. The great depressions to the left (above) and right (below) of the transverse ridge are the "superior fossa" and "inferior fossa," respectively.

DESCRIPTION.—(Holotype BYU 5500; right scapulocoracoid) Scapula long but not robust; distal end expanding moderately; shaft not severely constricted in midsection.

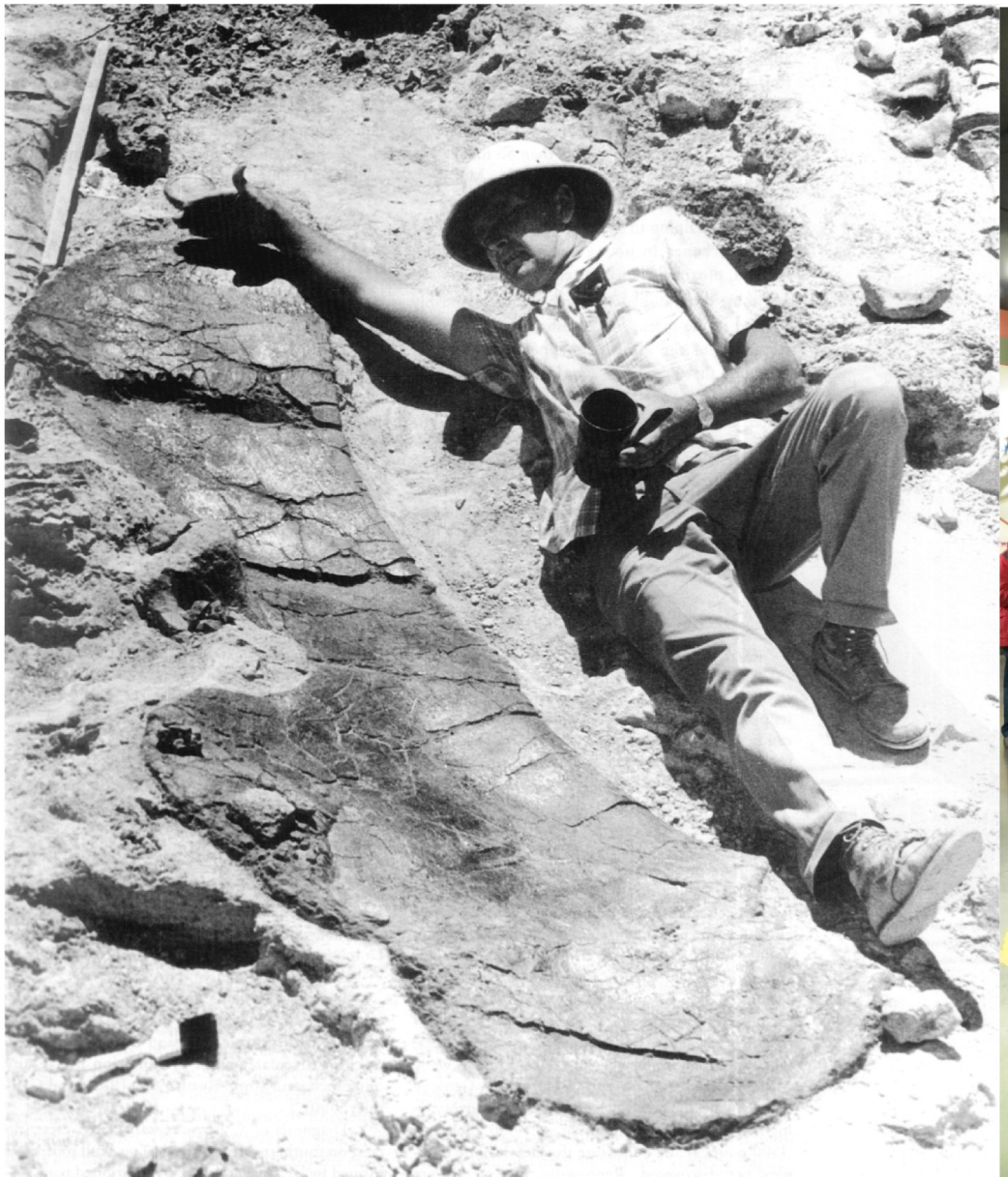
A shallow outward curve in inferior border slightly proximad to greatest width of scapula, at top of transverse ridge, indicates origin of a ligament, possibly M. scapulohumeralis. This process also present on *Diplodocus*, occurring considerably higher up on *Cetiosaurus* and most prominently developed on *Ultrasaurus*, but absent or insignificant in *Brachiosaurus*, *Apatosaurus*, and *Camarasaurus*. Inferior border of scapula forming a gentle curve from glenoid process to distal end, resembling *Apatosaurus* and *Diplodocus* rather than *Brachiosaurus* or *Camarasaurus*. Inferior fossa not broadly expanded as in *Brachiosaurus* and longer than wide, contrasting with opposite dos-
atosaurus and Cama-

Ultrasaurus macintoshi holotype

Not the scapulocoracoid, but a posterior dorsal vertebra.

Supersaurus vivinae holotype

It’s not clear whether it’s the first or second scapula.



These decisions will return to haunt us

"Ultrasaurus" had already been used by Kim 1983

The name was replaced by *Ultrasauros* Olshevsky 1991.

Curtice et al. (1996) on the *Ultrasauros* dorsal

Showed convincingly that the dorsal vertebra is not brachiosaurid but diplodocid, and referred it to *Supersaurus*.

Since this is the type, *Ultrasauros* became a junior synonym.

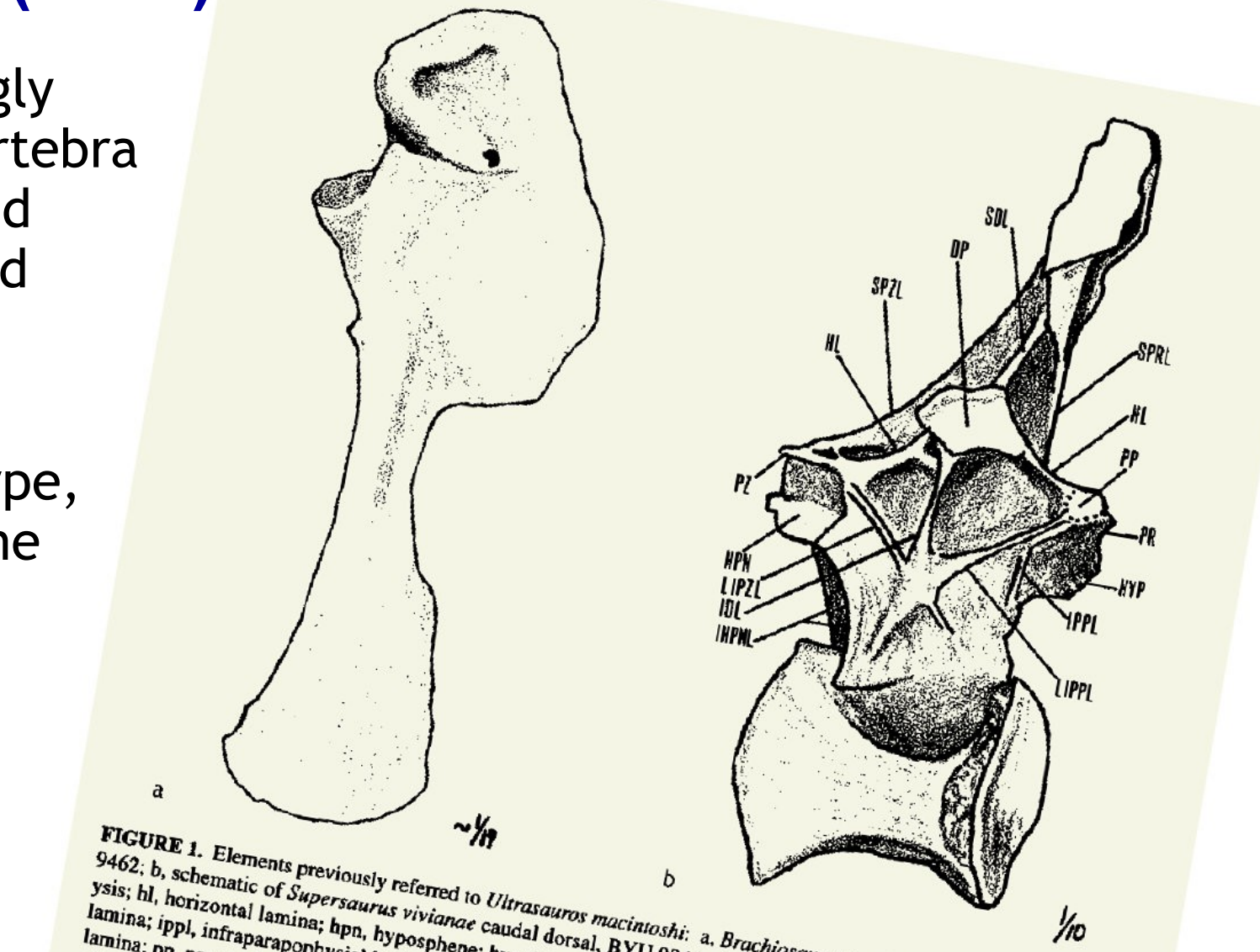


FIGURE 1. Elements previously referred to *Ultrasauros macintoshi*: a, *Brachiosaurus* sp. right scapulocoracoid, BYU 9462; b, schematic of *Supersaurus vivianae* caudal dorsal, BYU 9044, right lateral view. Abbreviations: dp, diapophysis; hl, horizontal lamina; hpn, hyposphene; hyp, hypantrum; idl, infradiapophysial lamina; ihpnl, infrahyposphenal lamina; ippl, infraparapophysial lamina; lippl, lateral infraparapophysial lamina; lipzl, lateral infrapostzygapophysial lamina; pp, parapophysis; pr, prezygapophysis; prspl, prespinal lamina; pspl, postspinal lamina; pz, postzygapophysis; sdl, supradiapophysial lamina; sprl, supraprezygapophysial lamina; spzl, suprapostzygapophysial lamina.

Diplodocid cranial dorsal neural spines are deeply bifurcate. This cleft gradually fuses caudally until its disappearance in the caudal dorsals (Figure 3). Undivided diplodocid neural spine apices are rectangular, with dorso-ventrally elongate lateral pla- side (Figures 1b, 5b, 6b). spines

(Figure 3a); thereafter the neural spine is at least as tall as the transverse breadth of (Figure 3b, 6b).

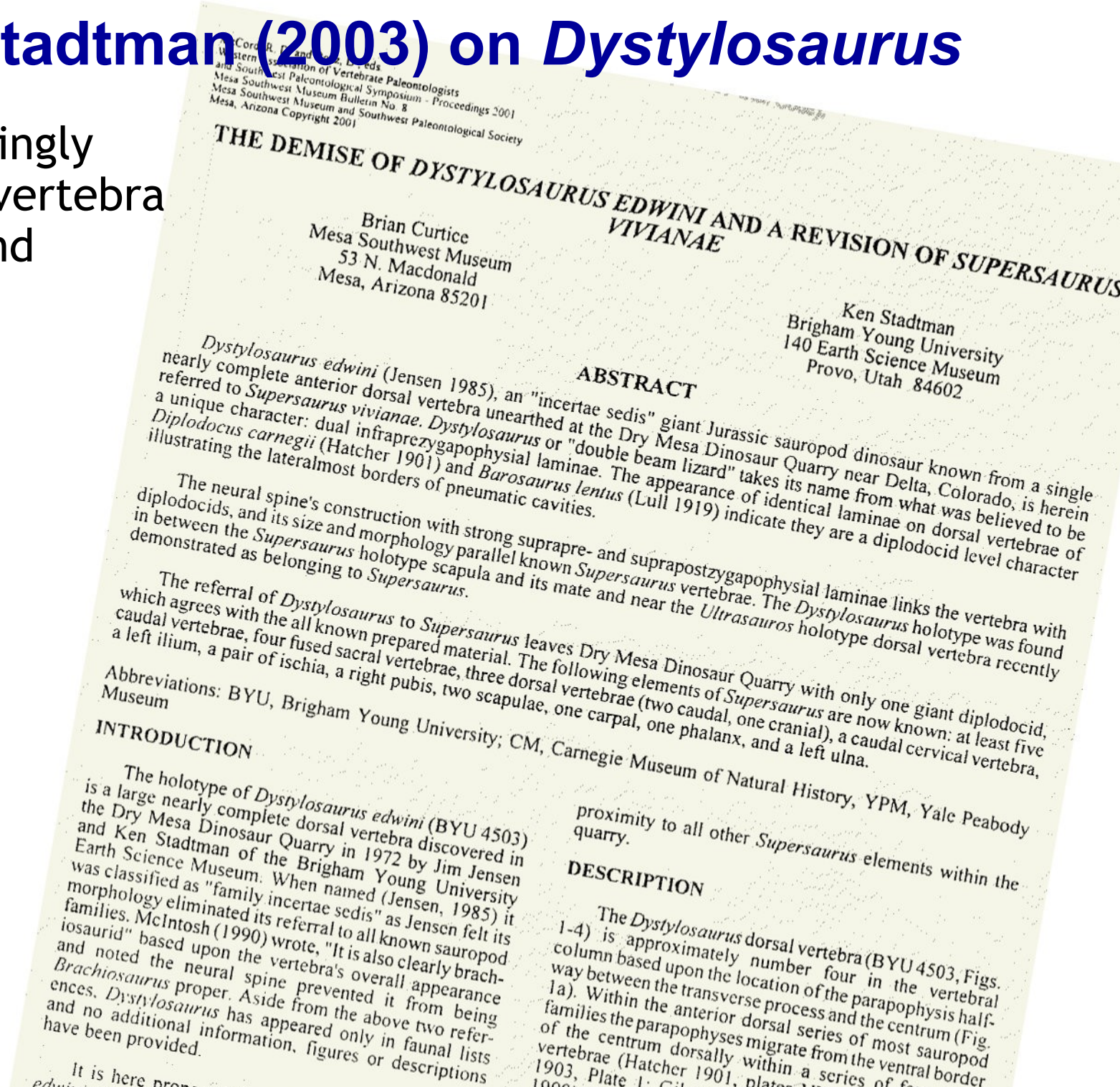

Curtice et al. (1996) on the *Ultrasauros* scap
… And referred the *Ultrasauros* scapulocoracoid to *Brachiosaurus*.

Curtice et al. (1996) on the *Ultrasauros* scap

… And referred the *Ultrasauros* scapulocoracoid to *Brachiosaurus*.

Curtice & Stadtman (2003) on *Dystylosaurus*

Showed convincingly that the dorsal vertebra is diplodocid, and referred it to *Supersaurus*.



Mesa Southwest Museum Bulletin No. 8
Mesa Southwest Museum and Southwest Paleontological Society
Mesa, Arizona Copyright 2001

THE DEMISE OF *DYSTYLOSAURUS EDWINI* AND A REVISION OF *SUPERSAURUS VIVIANAE*

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ABSTRACT

Dystylosaurus edwini (Jensen 1985), an "incertae sedis" giant Jurassic sauropod dinosaur known from a single nearly complete anterior dorsal vertebra unearthed at the Dry Mesa Dinosaur Quarry near Delta, Colorado, is herein referred to *Supersaurus vivianae*. *Dystylosaurus* or "double beam lizard" takes its name from what was believed to be a unique character: dual infraprezygapophysial laminae. The appearance of identical laminae on dorsal vertebrae of *Diplodocus carnegii* (Hatcher 1901) and *Barosaurus lentus* (Lull 1919) indicate they are a diplodocid level character illustrating the lateralmost borders of pneumatic cavities.

The neural spine's construction with strong suprapre- and suprapostzygapophysial laminae links the vertebra with diplodocids, and its size and morphology parallel known *Supersaurus* vertebrae. The *Dystylosaurus* holotype was found in between the *Supersaurus* holotype scapula and its mate and near the *Ultrasauros* holotype dorsal vertebra recently demonstrated as belonging to *Supersaurus*.

The referral of *Dystylosaurus* to *Supersaurus* leaves Dry Mesa Dinosaur Quarry with only one giant diplodocid, which agrees with the all known prepared material. The following elements of *Supersaurus* are now known: at least five caudal vertebrae, four fused sacral vertebrae, three dorsal vertebrae (two caudal, one cranial), a caudal cervical vertebra, a left ilium, a pair of ischia, a right pubis, two scapulae, one carpal, one phalanx, and a left ulna.

Abbreviations: BYU, Brigham Young University; CM, Carnegie Museum of Natural History, YPM, Yale Peabody Museum

INTRODUCTION

The holotype of *Dystylosaurus edwini* (BYU 4503) is a large nearly complete dorsal vertebra discovered in the Dry Mesa Dinosaur Quarry in 1972 by Jim Jensen and Ken Stadtman of the Brigham Young University Earth Science Museum. When named (Jensen, 1985) it was classified as "family incertae sedis" as Jensen felt its morphology eliminated its referral to all known sauropod families. McIntosh (1990) wrote, "It is also clearly brachiosaurid" based upon the vertebra's overall appearance and noted the neural spine prevented it from being *Brachiosaurus* proper. Aside from the above two references, *Dystylosaurus* has appeared only in faunal lists and no additional information, figures or descriptions have been provided.

It is here pro

proximity to all other *Supersaurus* elements within the quarry.

DESCRIPTION

The *Dystylosaurus* dorsal vertebra (BYU 4503, Figs. 1-4) is approximately number four in the vertebral column based upon the location of the parapophysis halfway between the transverse process and the centrum (Fig. 1a). Within the anterior dorsal series of most sauropod families the parapophyses migrate from the ventral border of the centrum dorsally within a series of

vertebrae (Hatcher 1901, plate
1903, Plate 1; Gil

… and that's the story so far

- *Ultrasaurus* renamed *Ultrasauros*.
- *Ultrasauros* synonymised with *Supersaurus*.
- *Dystylosaurus* synonymised with *Supersaurus*.
- (And the *Ultrasauros* scapulocoracoid referred to *Brachiosaurus*.)

Our reinterpretation
of the big cervical

The "*Supersaurus*" cervical is a big *Barosaurus*

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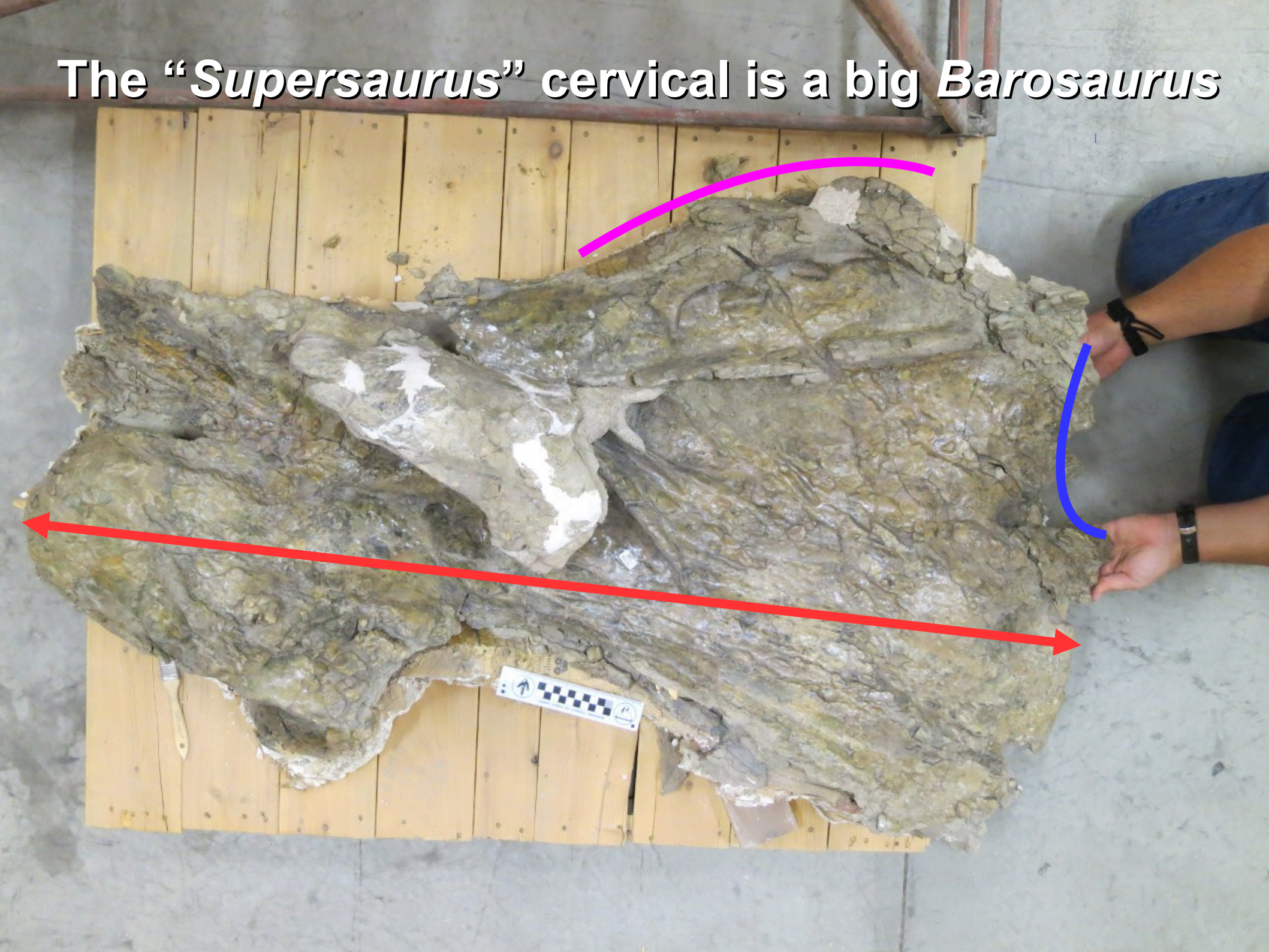
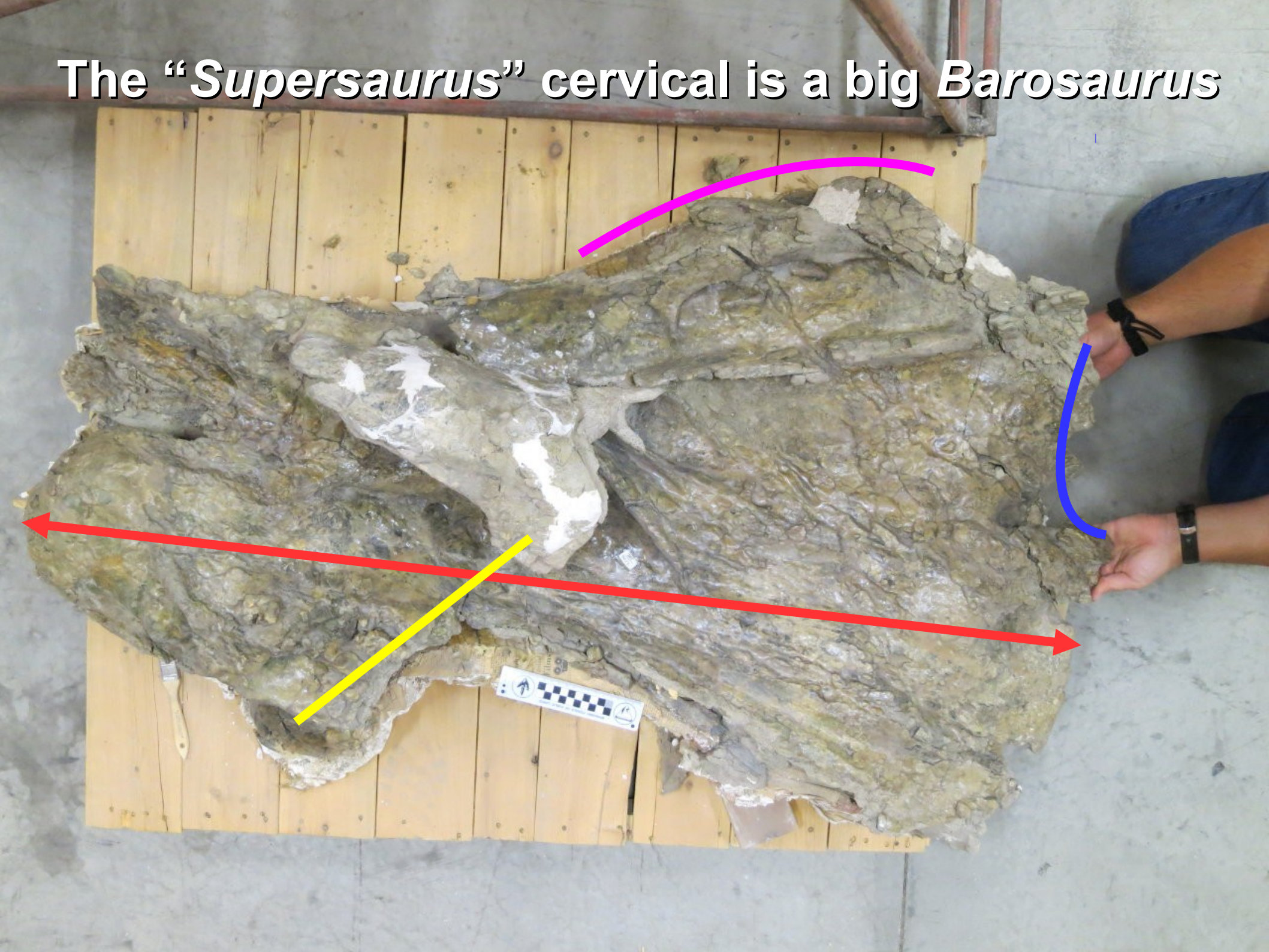
The "*Supersaurus*" cervical is a big *Barosaurus*



The "*Supersaurus*" cervical is a big *Barosaurus*



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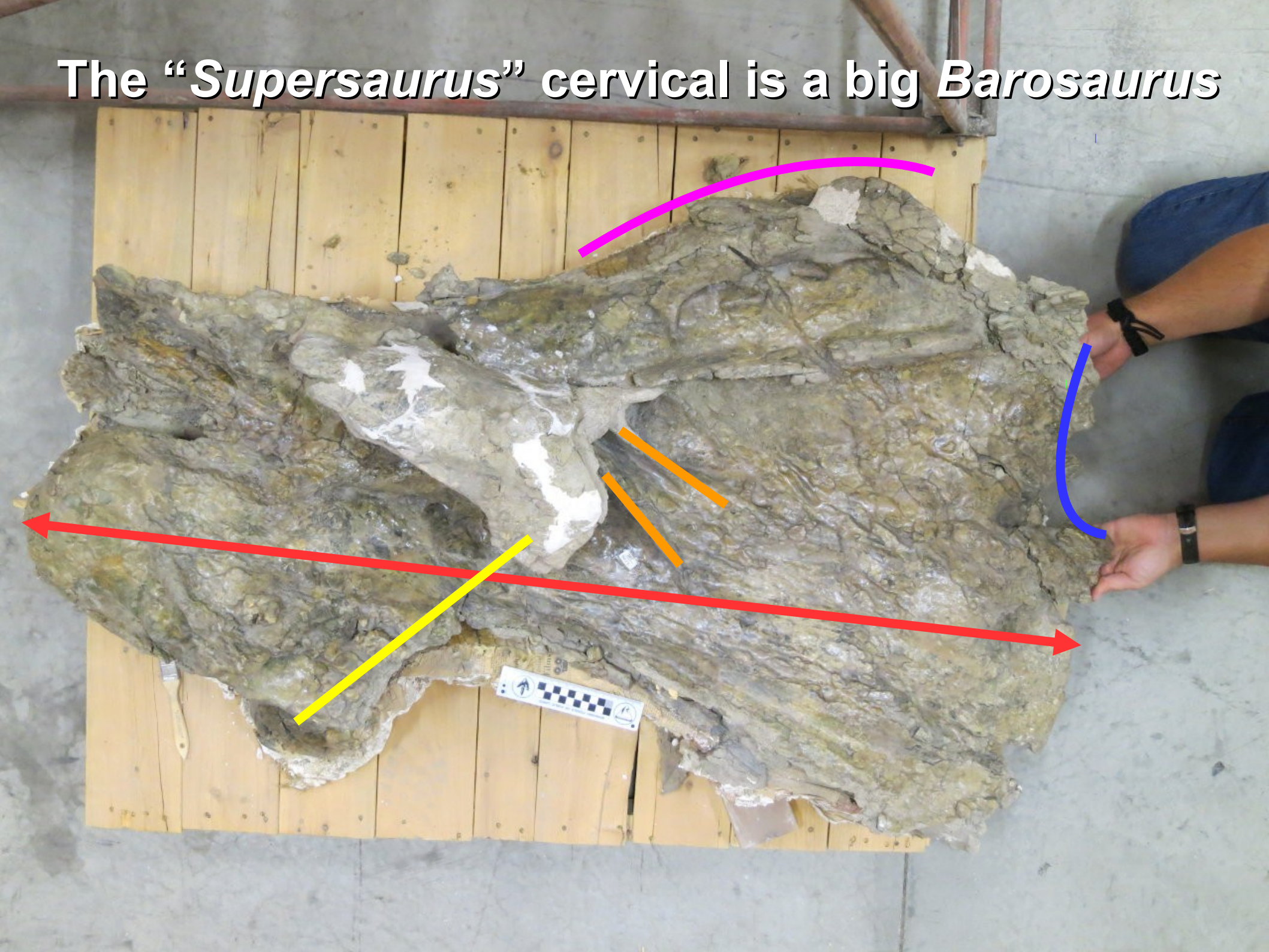
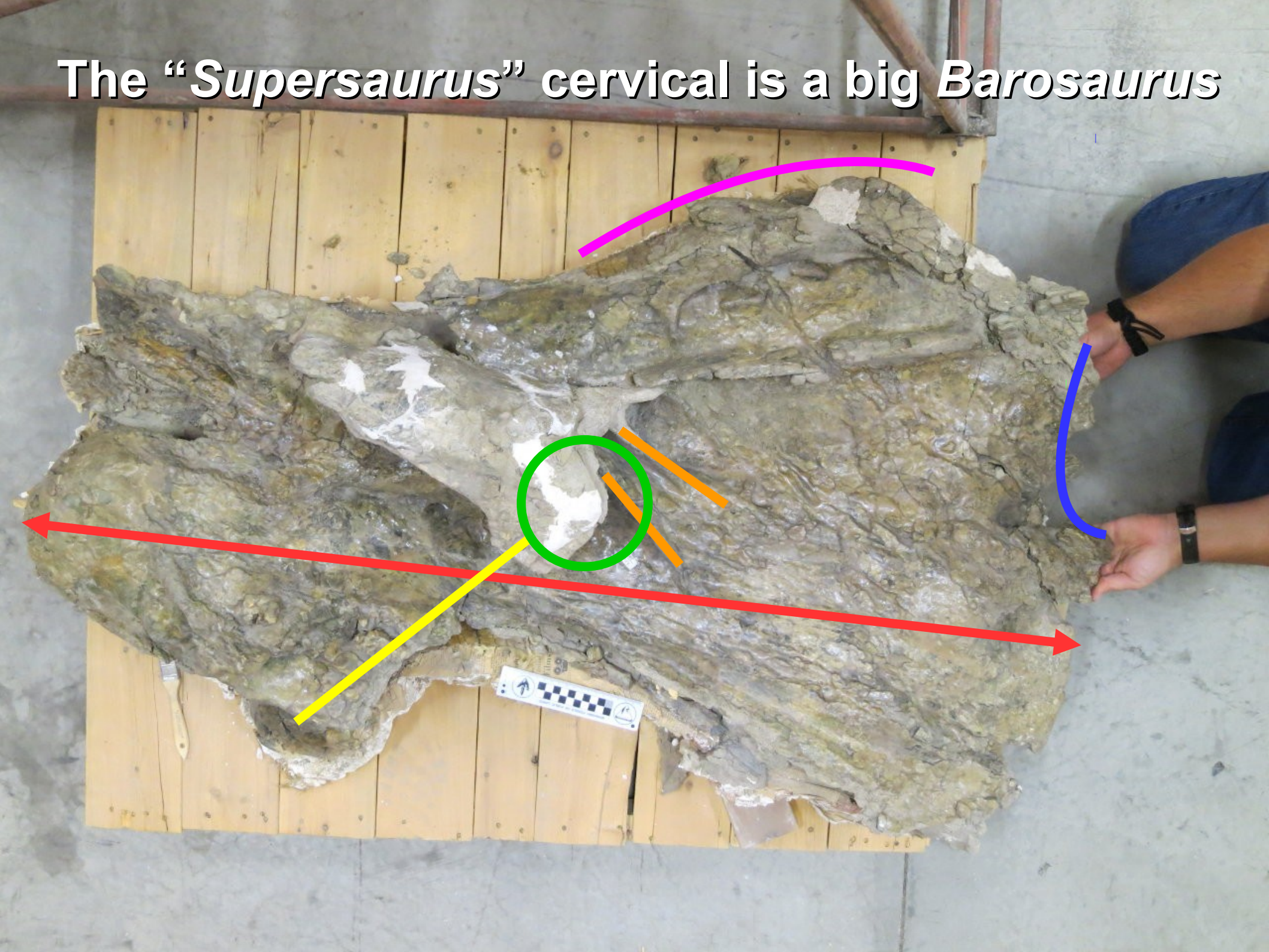


The "*Supersaurus*" cervical is a big *Barosaurus*



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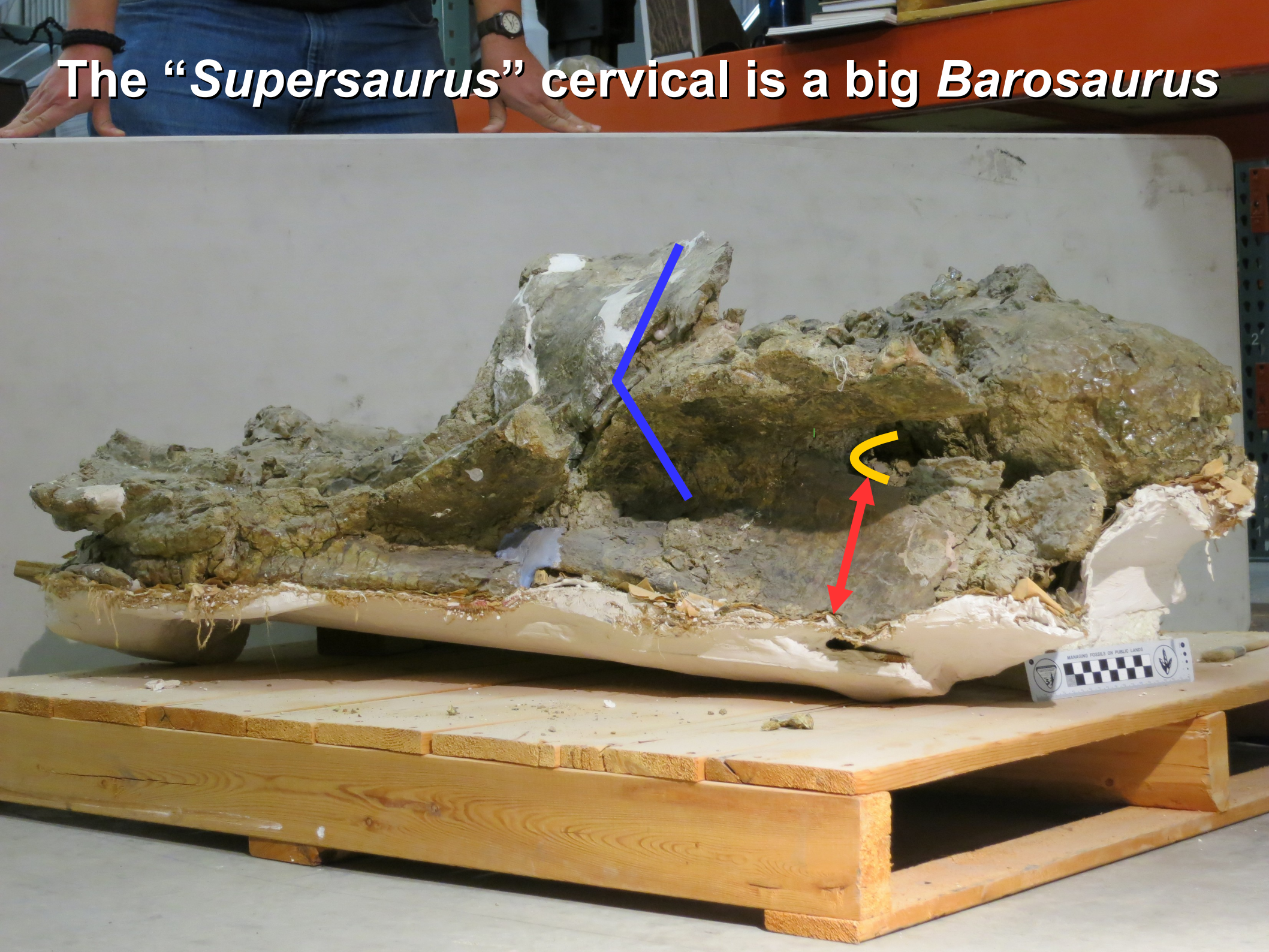


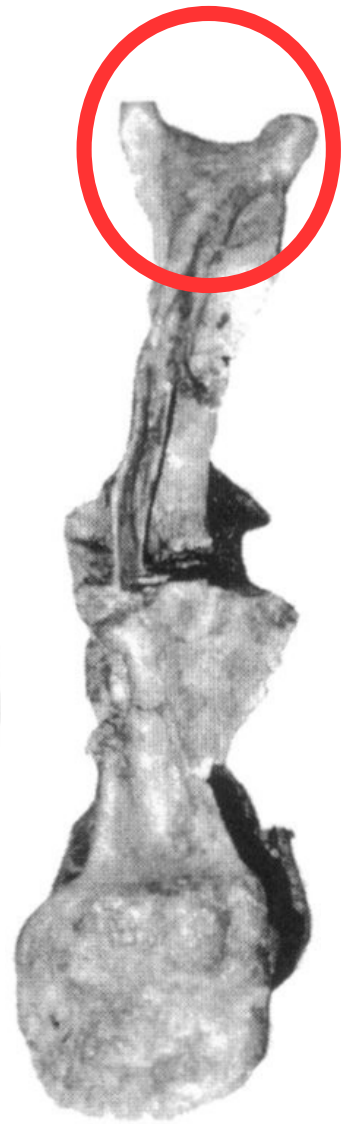

“Hinged” prezyg ramus in NAMAL *Barosaurus* cervical.


So is *Supersaurus*
merely a big *Barosaurus*?

The *Dystylosaurus* vertebra says no

Dystylosaurus D?3-4

Barosaurus D3



Barosaurus D7

So what are the options? (part 1)

1. We're wrong about the big cervical being *Barosaurus*.

So what are the options? (part 1)

~~1. We're wrong about the big cervical being *Barosaurus*.~~

2. We're wrong about *Dystylosaurus* **not** being *Barosaurus*.

So what are the options? (part 1)

~~1. We're wrong about the big cervical being *Barosaurus*.~~

~~2. We're wrong about *Dystylosaurus* **not** being *Barosaurus*.~~

3. There are two giant diplodocids in Dry Mesa Quarry.

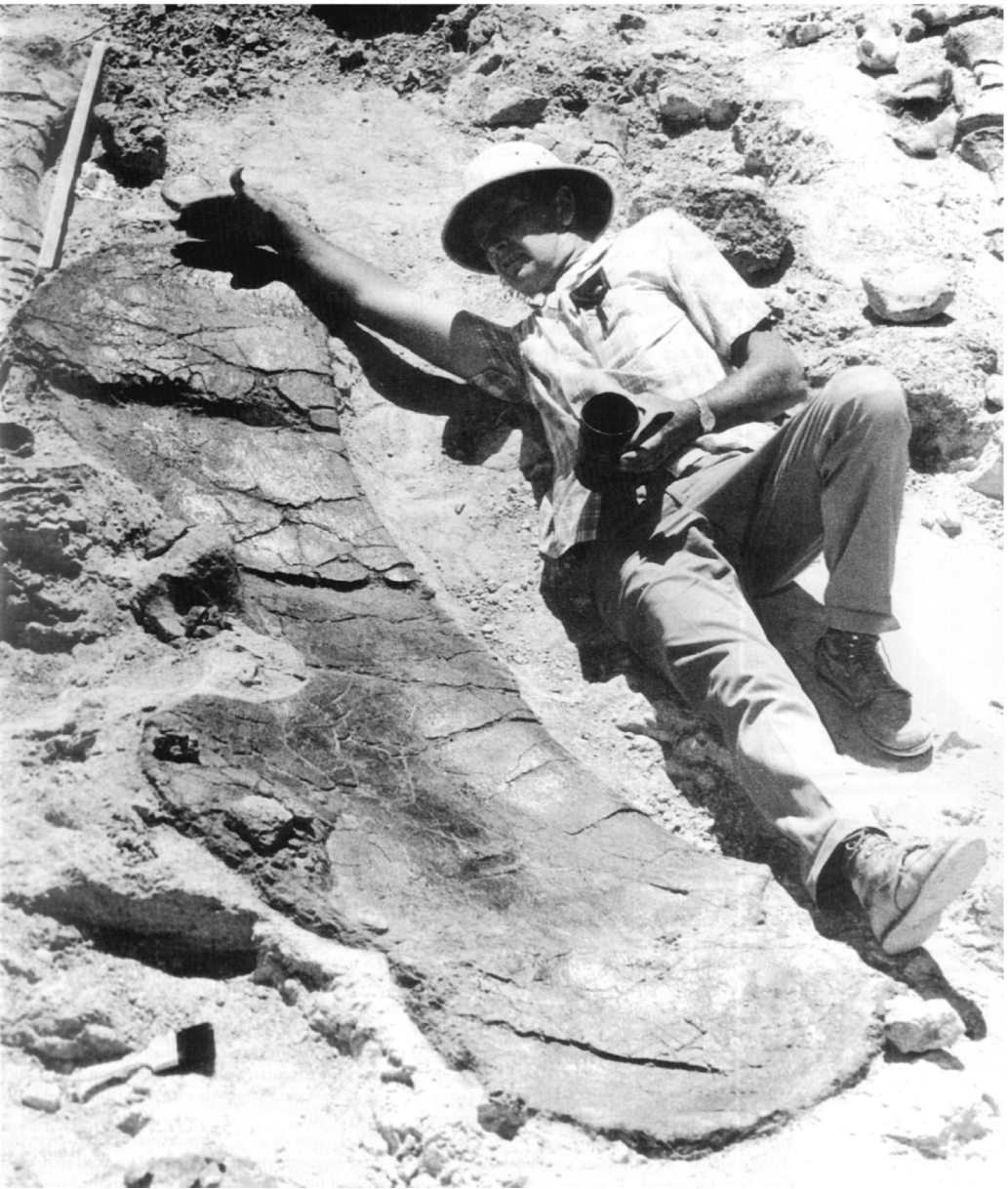
… But what are they?

What are the two Dry Mesa diplodocids?

Barosaurus is *Barosaurus*. That part is easy.

But what, if anything, is *Supersaurus*?

Must be determined by the type scapulocoracoid … which is?



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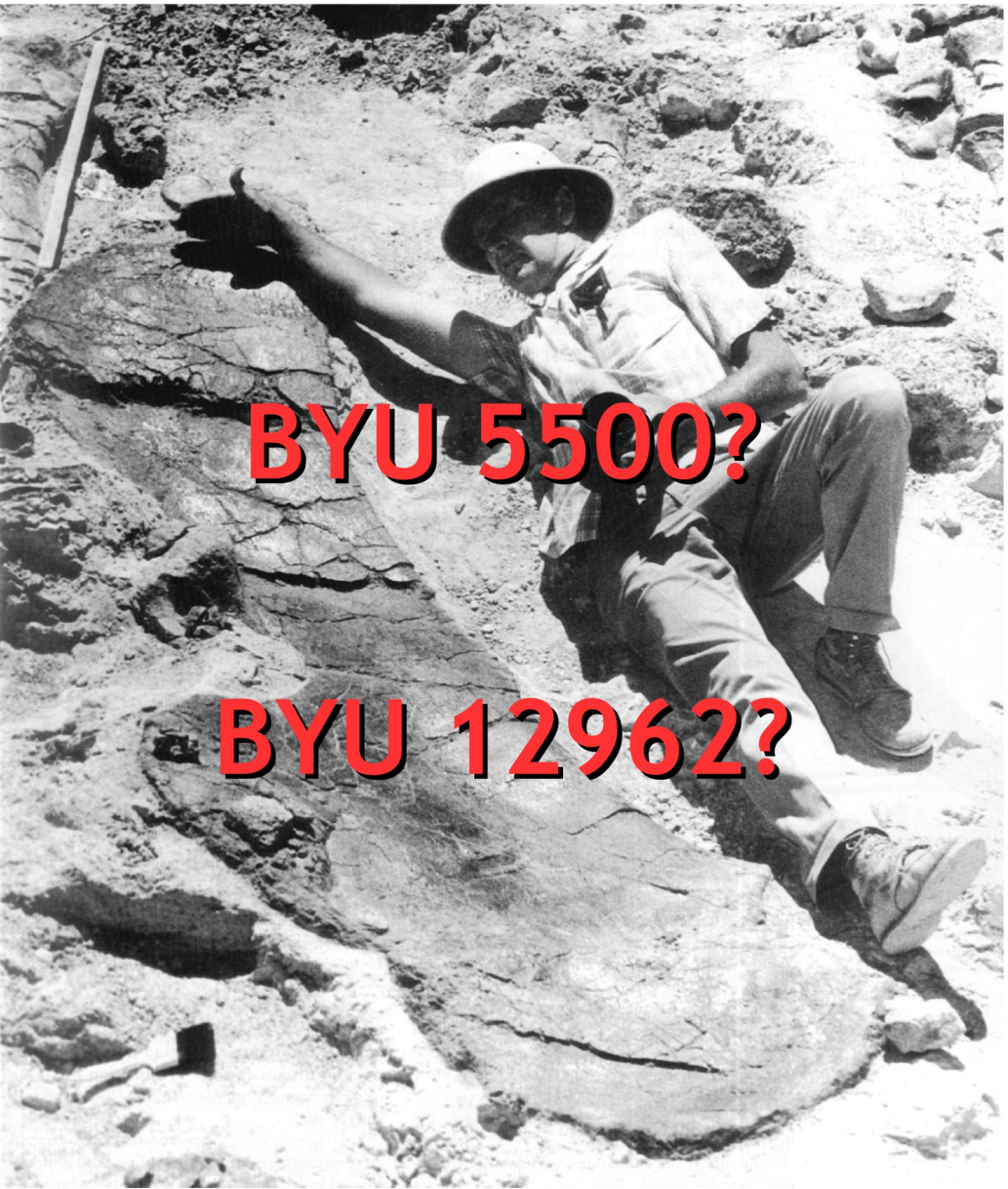

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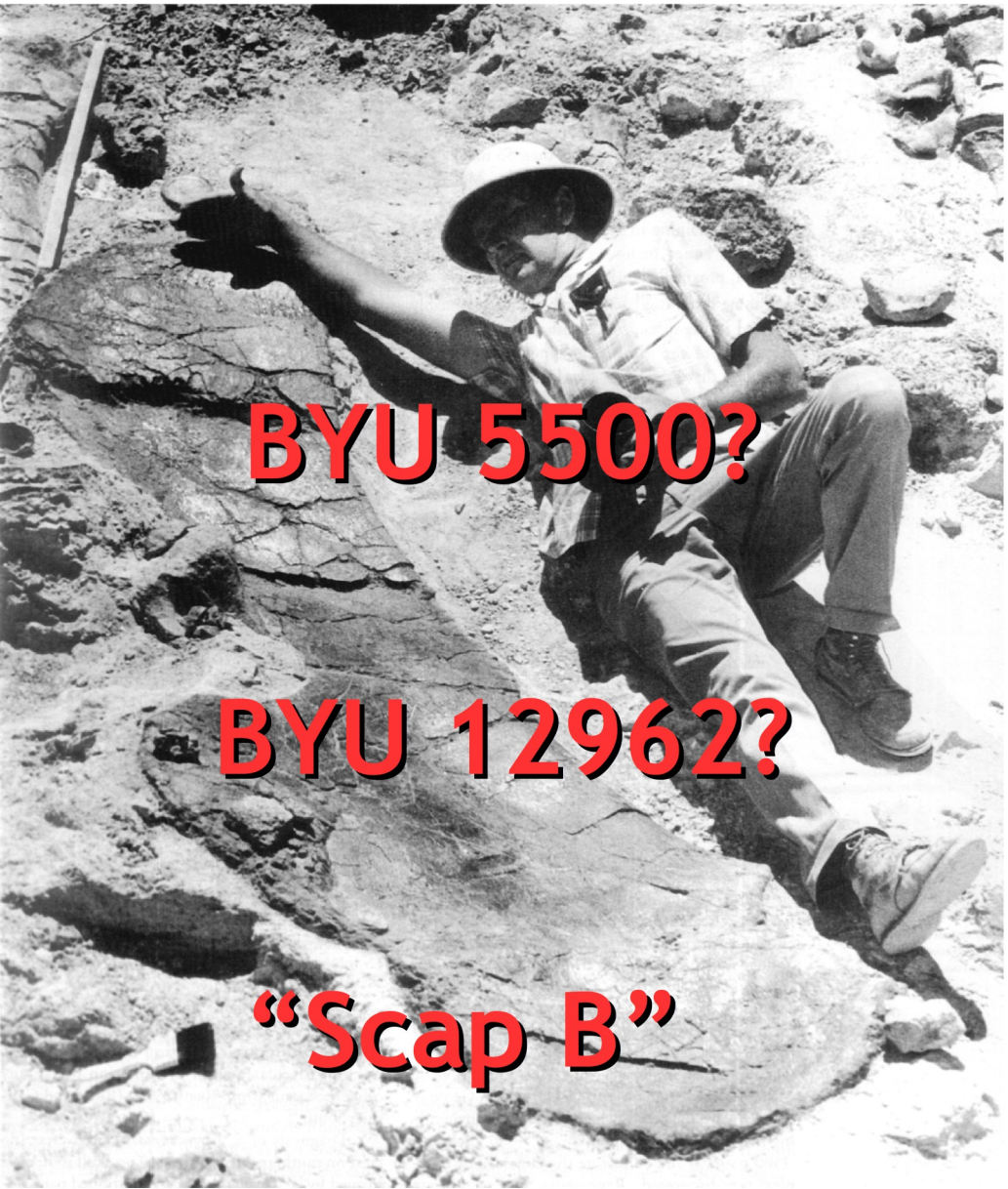

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Barosaurus
AMNH 6341.

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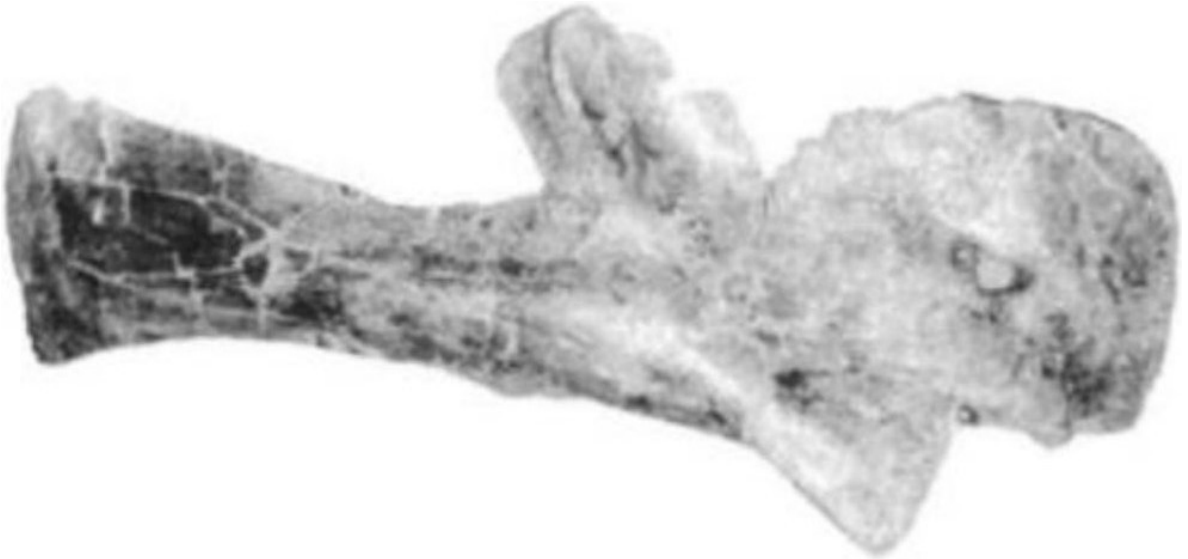

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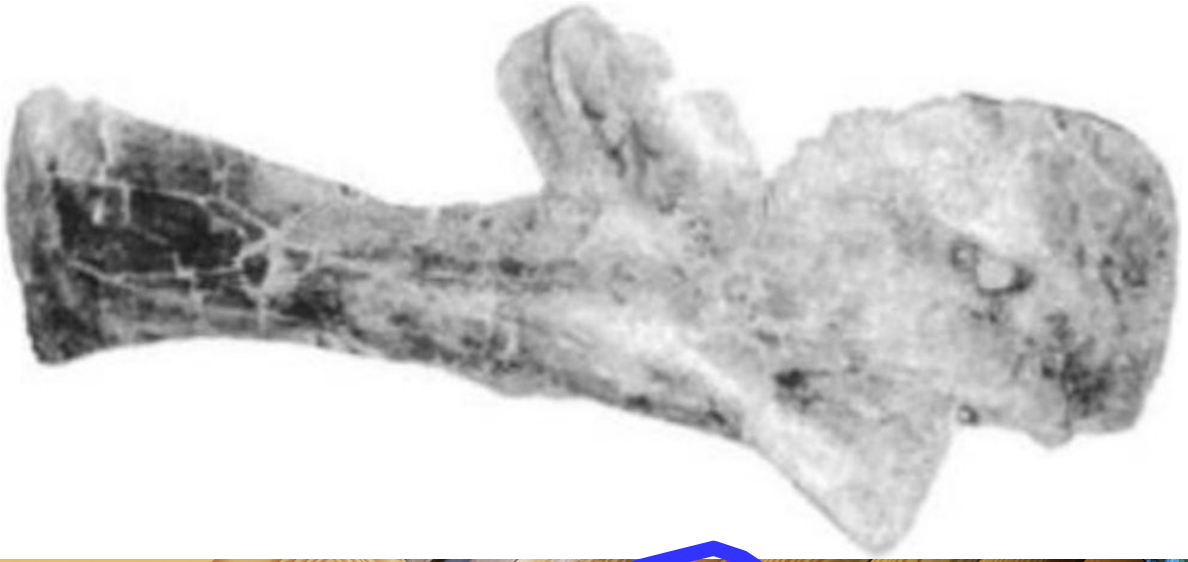
Does not closely resemble *either* of the *Supersaurus* scapulocoracoids.



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So what are the options? (part 2)

1A. Scap A is the holotype and does not belong to *Barosaurus*.
1B. Scap B is the holotype and does not belong to *Barosaurus*.

⇒ *Supersaurus* is a valid genus.
(And the *Dystylosaurus* vertebra probably belongs to it.)

So what are the options? (part 2)

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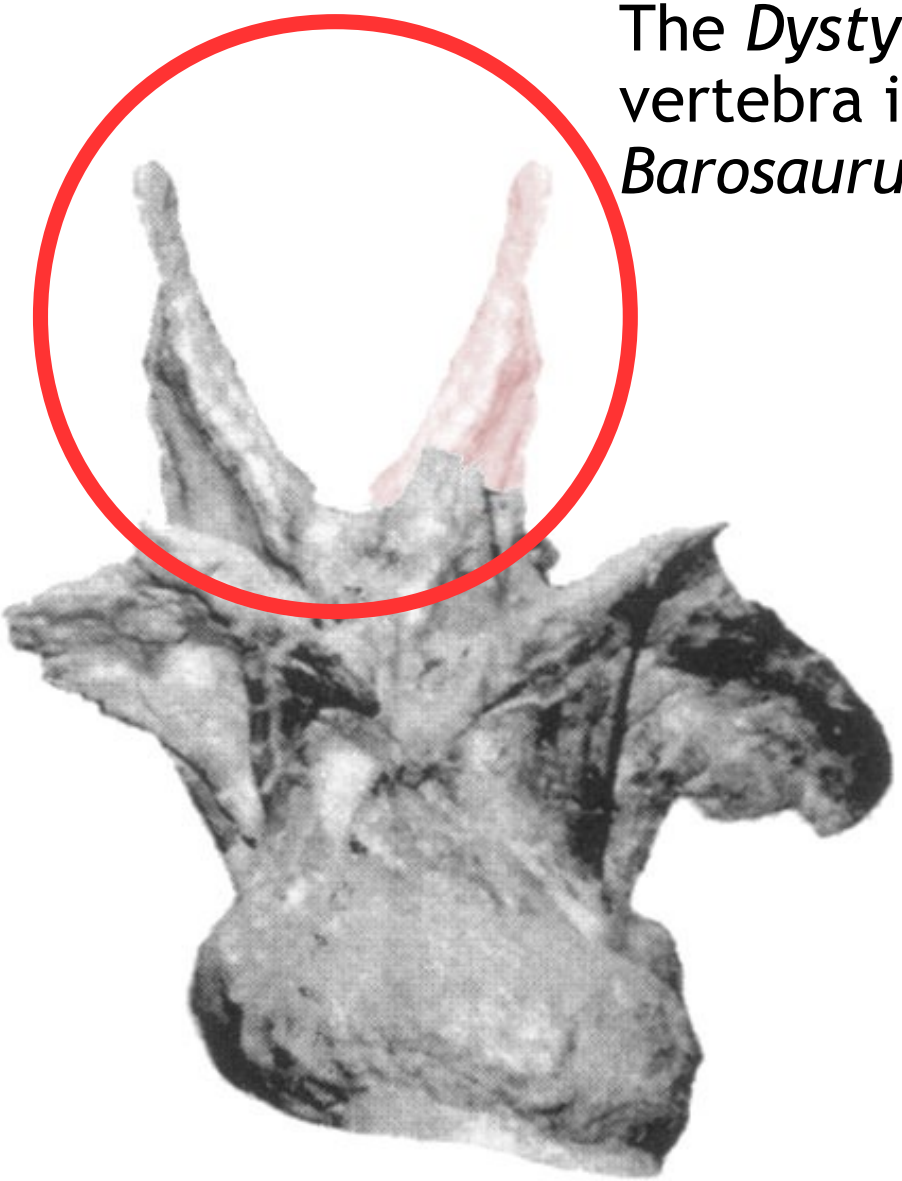
⇒ *Supersaurus* is a valid genus.
(And the *Dystylosaurus* vertebra probably belongs to it.)

2A. Scap A is the holotype and belongs to *Barosaurus*.
2B. Scap B is the holotype and belongs to *Barosaurus*.

⇒ *Supersaurus* is a synonym of *Barosaurus*.

What follows if *Supersaurus* is *Barosaurus*?

Dystylosaurus D?3-4



Barosaurus D3

The *Dystylosaurus* vertebra is not *Barosaurus*.

What follows if *Supersaurus* is *Barosaurus*?

Dystylosaurus D?3-4

The *Dystylosaurus* vertebra is not *Barosaurus*.

So the name pops back into existence.

Dystylosaurus is indeterminate

The name exists or not according to whether a completely different name (*Supersaurus*) is valid.

It’s even worse for *Ultrasauros*

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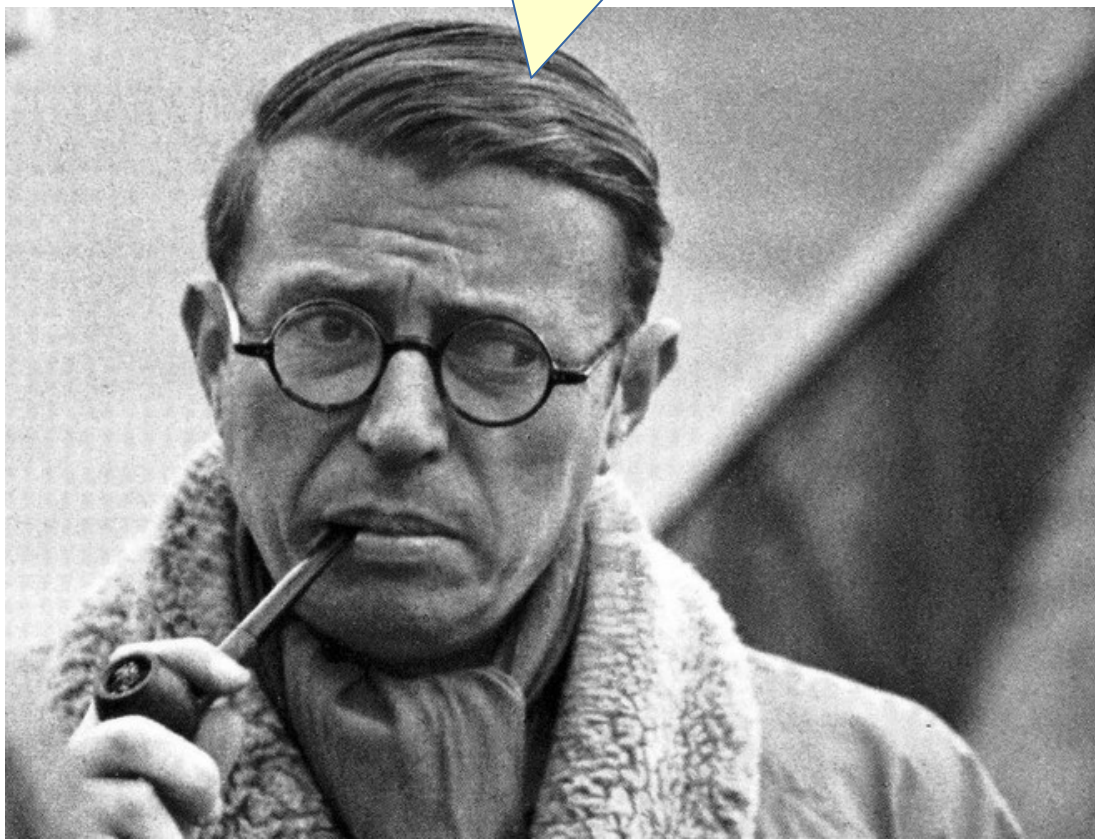
- It might be *Barosaurus* (like the cervical)
- It might be *Supersaurus*
- If *Supersaurus* is undiagnosable, it might be *Dystylosaurus*
- It could still be its own genus: *Ultrasauros*

Here’s that existential despair we promised

When Descartes said ‘Conquer yourself rather than the world’, what he meant was … that we should act without hope.



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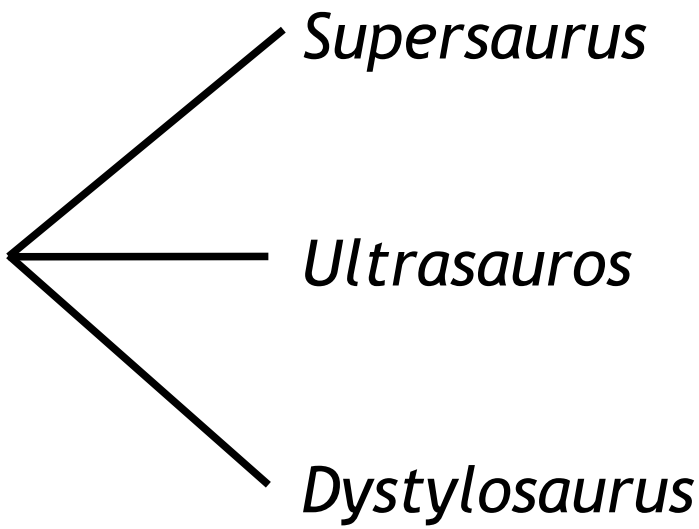
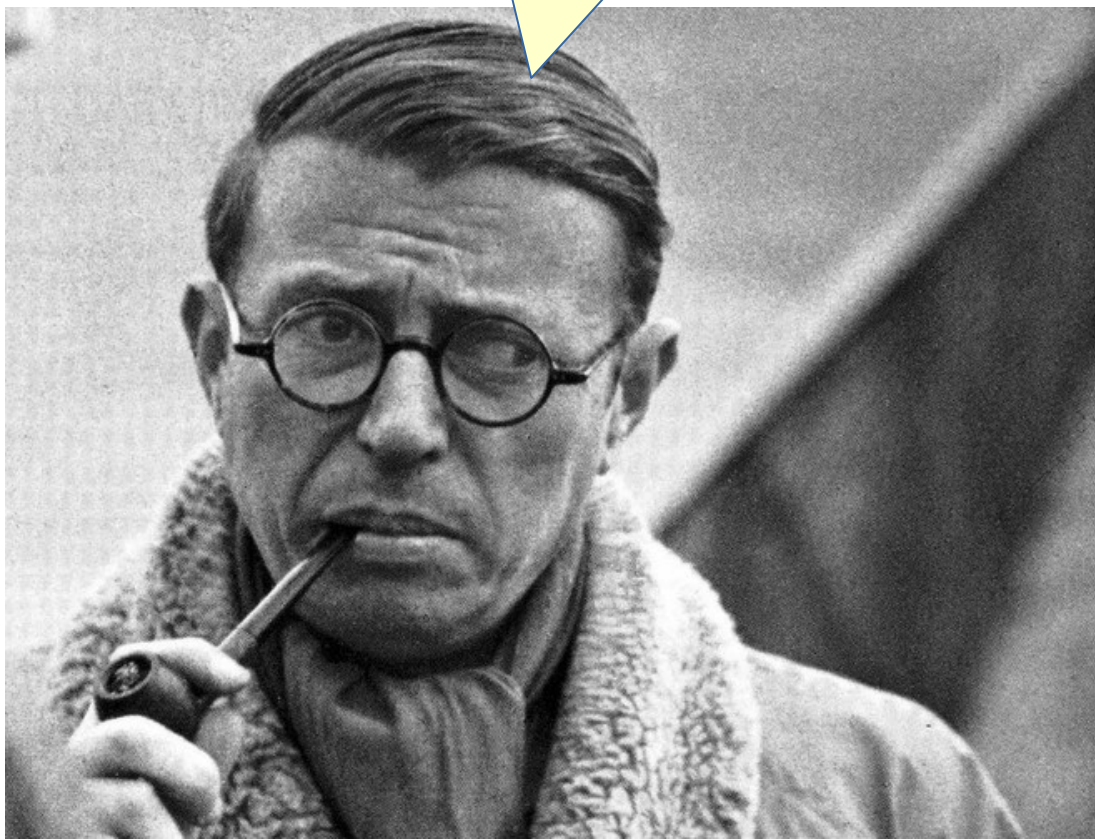
Cladogram
(Unresolved trichotomy)





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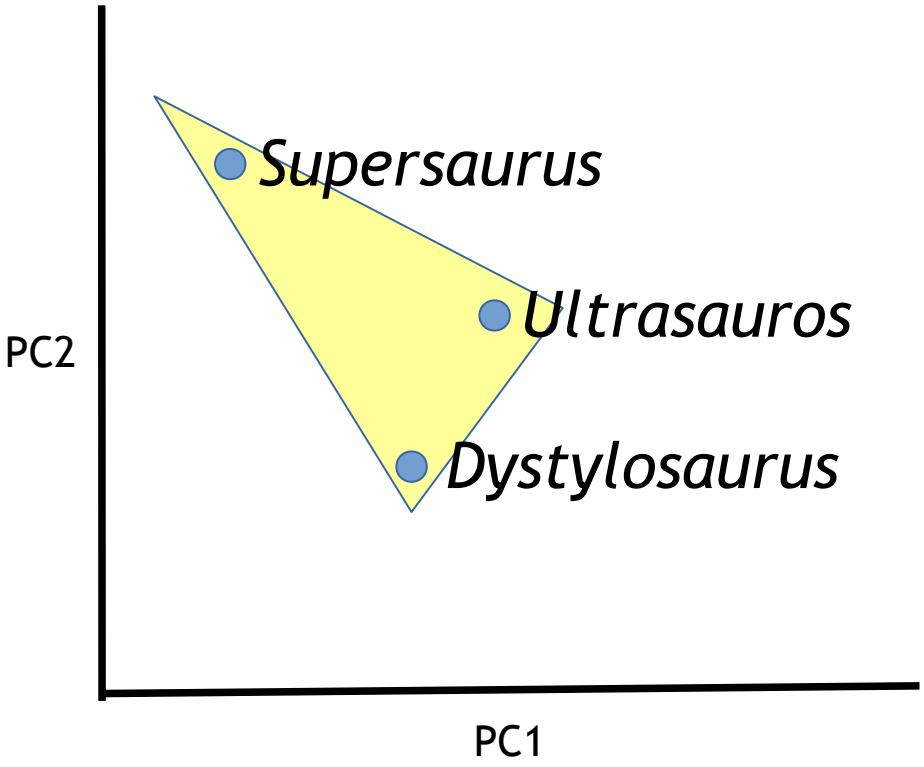
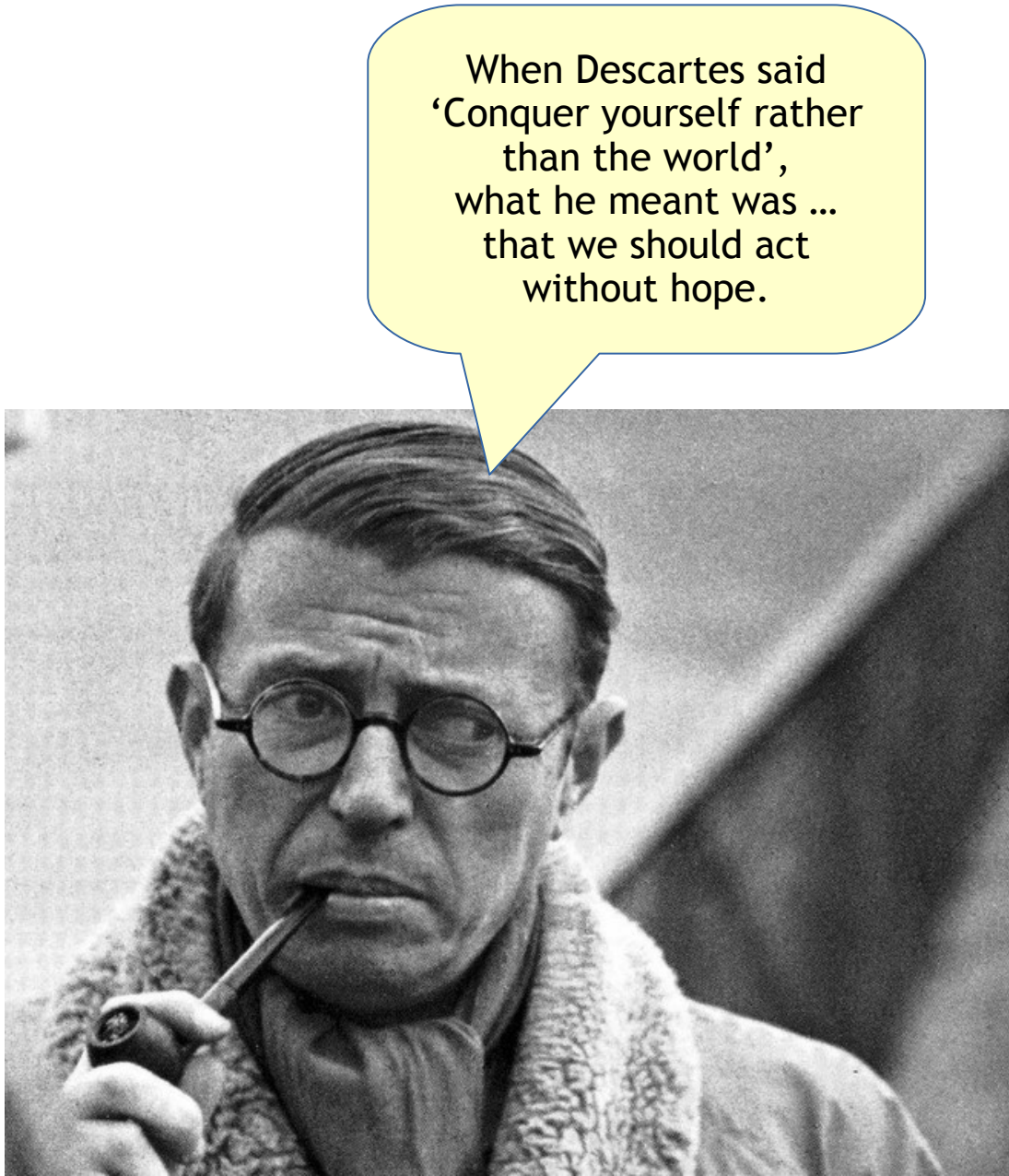
Principal Component Analysis





Conclusions

- We are in danger of losing the history
- Specimen-number assignments are confused
- We don’t know which element is the *Supersaurus* holotype
- We don’t know whether it is diagnosable
- The names *Dystylosaurus* and *Ultrasaurus* depend on it

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The way forward

- Determine which scapulocoracoid is the *Supersaurus* type
- Try to find diagnostic autapomorphies
- Discover if *Supersaurus* is valid
- …
- Profit!

The past, present and future of Jensen's Big Three sauropods

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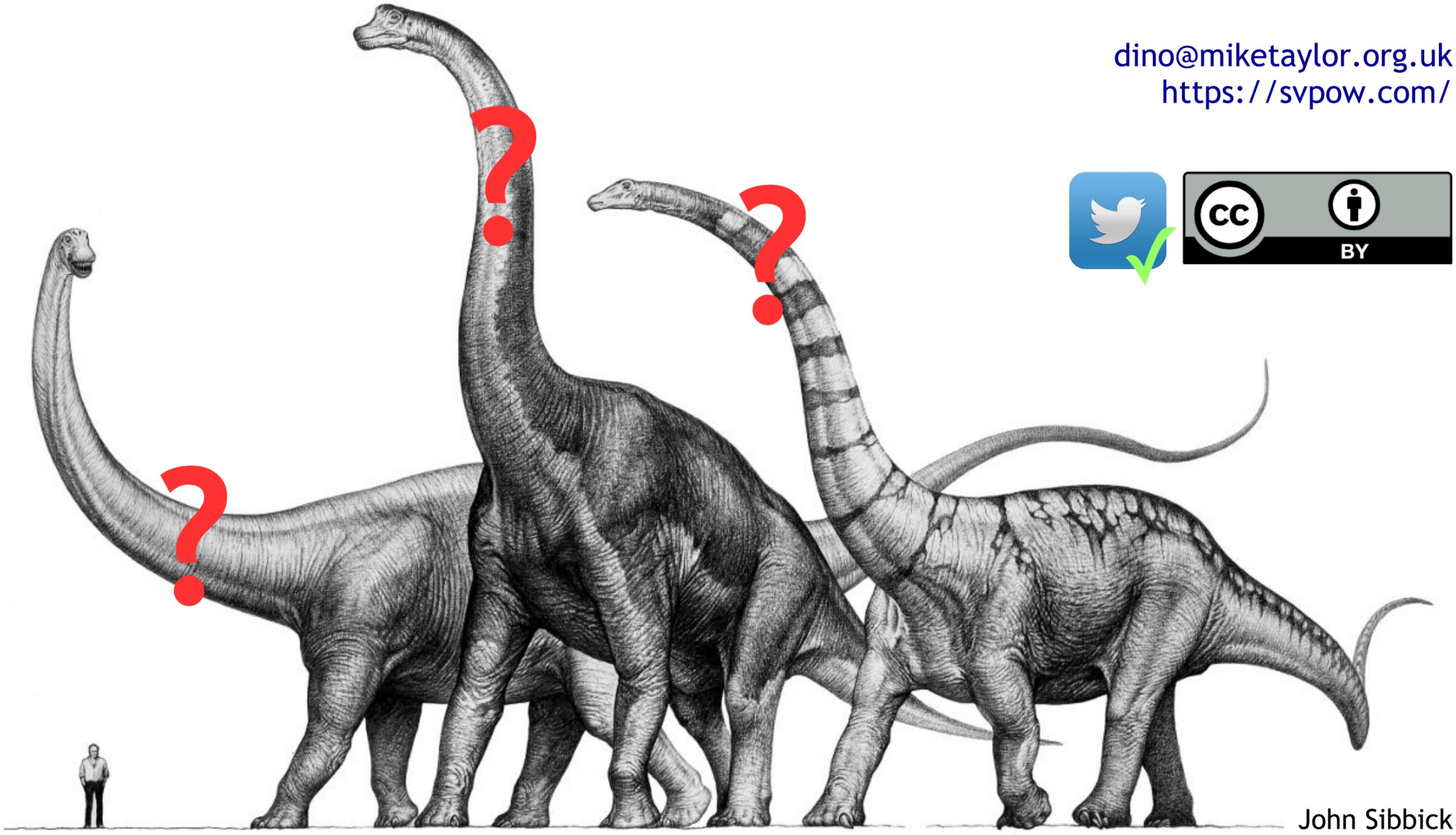

John Sibbick

Can it become the *Supersaurus* neotype?

Chapter 16: Types in the Species Group

Article 75. Neotypes.

75.1. Definition. A neotype is the name-bearing type of a nominal species-group taxon designated under conditions specified in this Article when no name-bearing type specimen (i.e. holotype, lectotype, syntype or prior neotype) is believed to be extant and an author considers that a name-bearing type is necessary to define the nominal taxon objectively. The continued existence of paratypes or paralectotypes does not in itself preclude the designation of a neotype.

An ICZN petition is possible, but who wants to do that?

Meanwhile … the *Ultrasauros* scapulocoracoid may well not be *Brachiosarus*.

Left:
"*Ultrasauros*" scapulocoracoid BYU 9462.

Right:
Giraffatitan brancai scapula HMN Sa 9.

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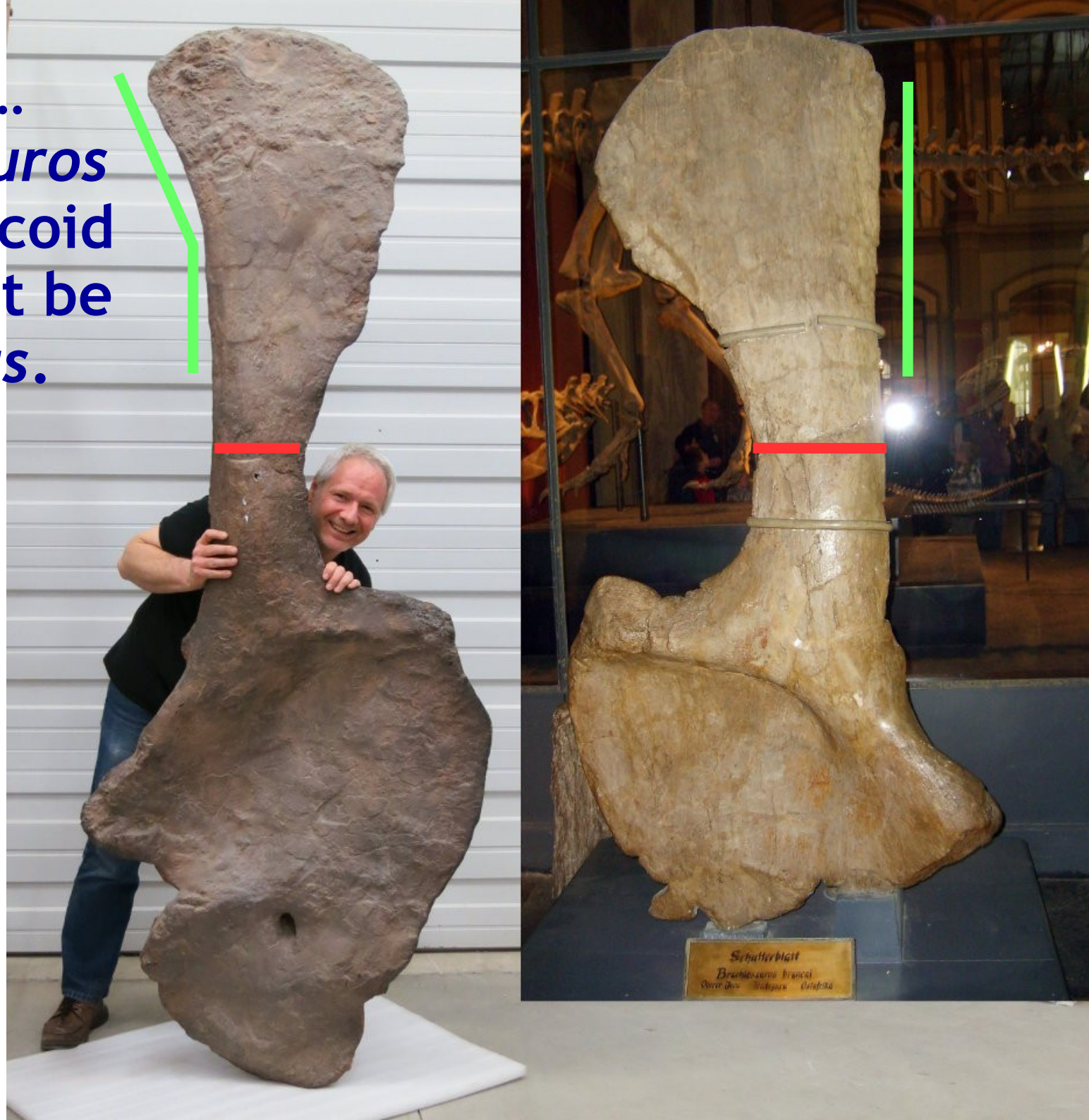

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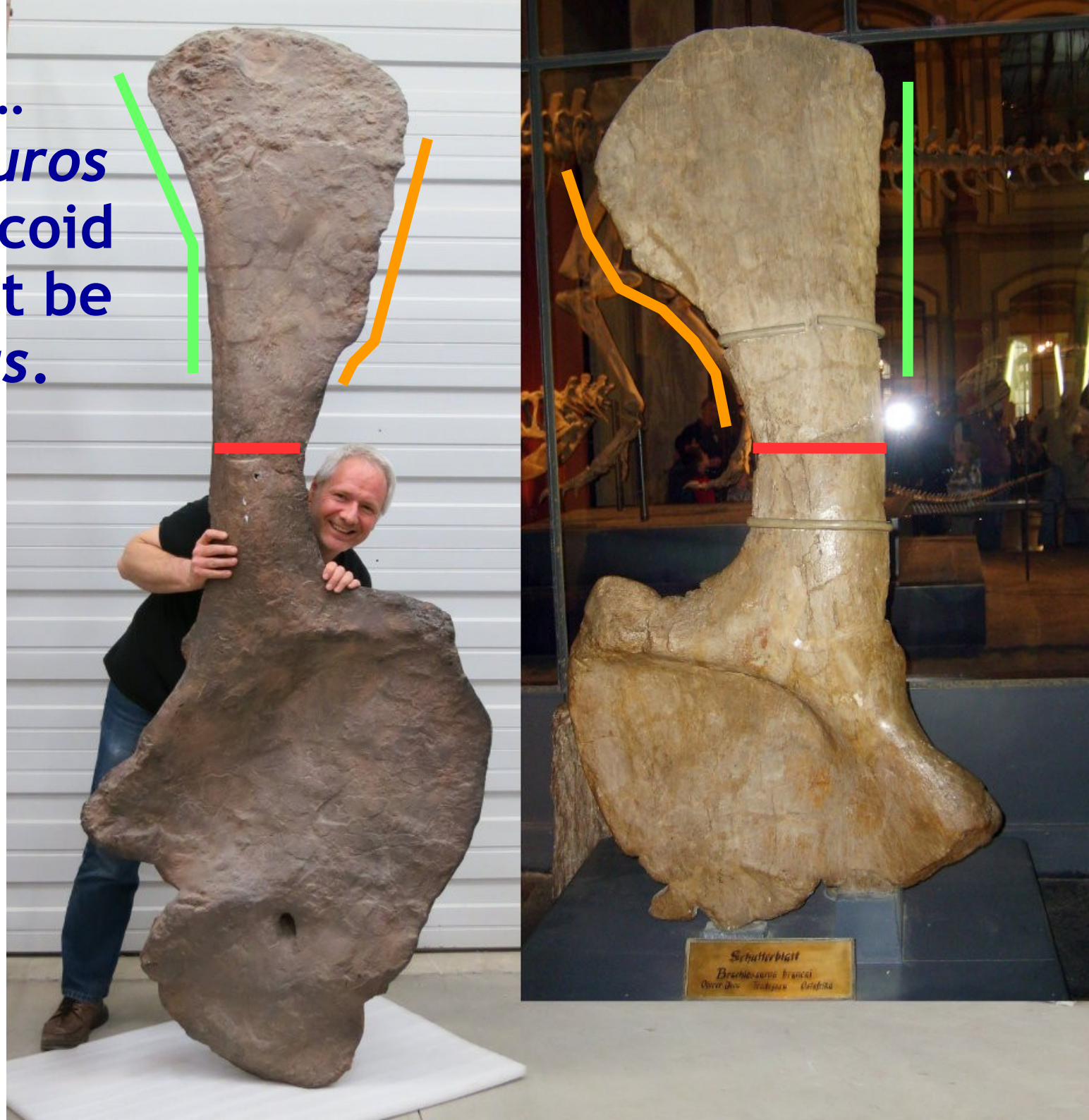

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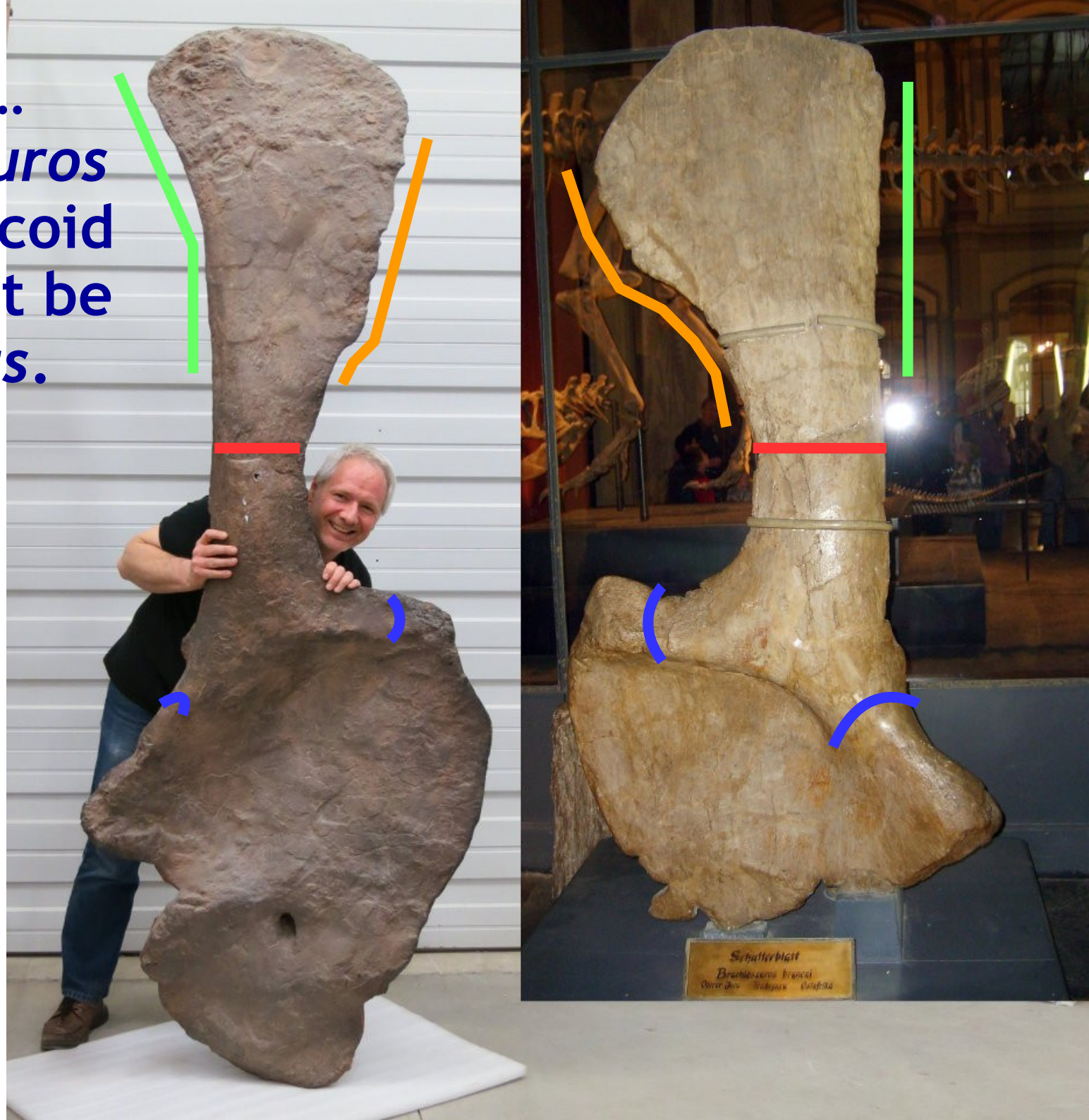

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This isn't even *Brachiosaurus*
It's *Giraffatitan*, from Africa

Right:
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HMN Sa 9.

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