Paleoart

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Learning Objectives

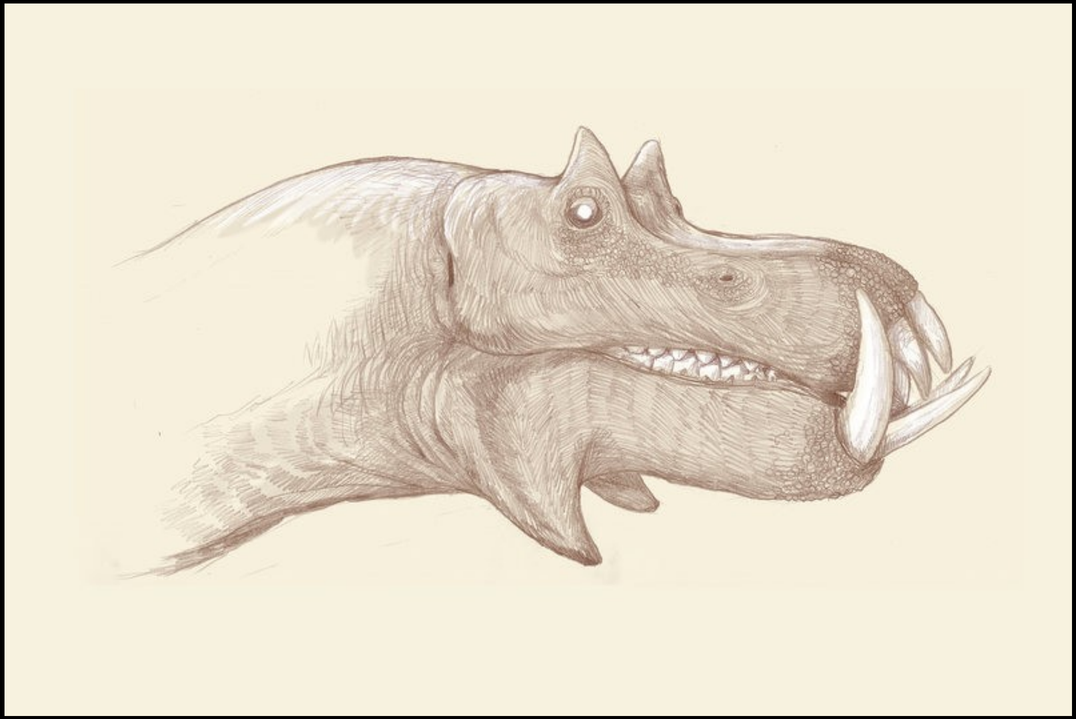
- Realize the impact reconstructions have on our thinking
- Understand difficulty of reconstructions

AquilaGib photo of Neanderthal skull discovered in 1848

Charles Knight, 1920

Atelier Daynés, 2014

Witton et al. 2014



C.M. Koseman (deliberately badly reconstructing)

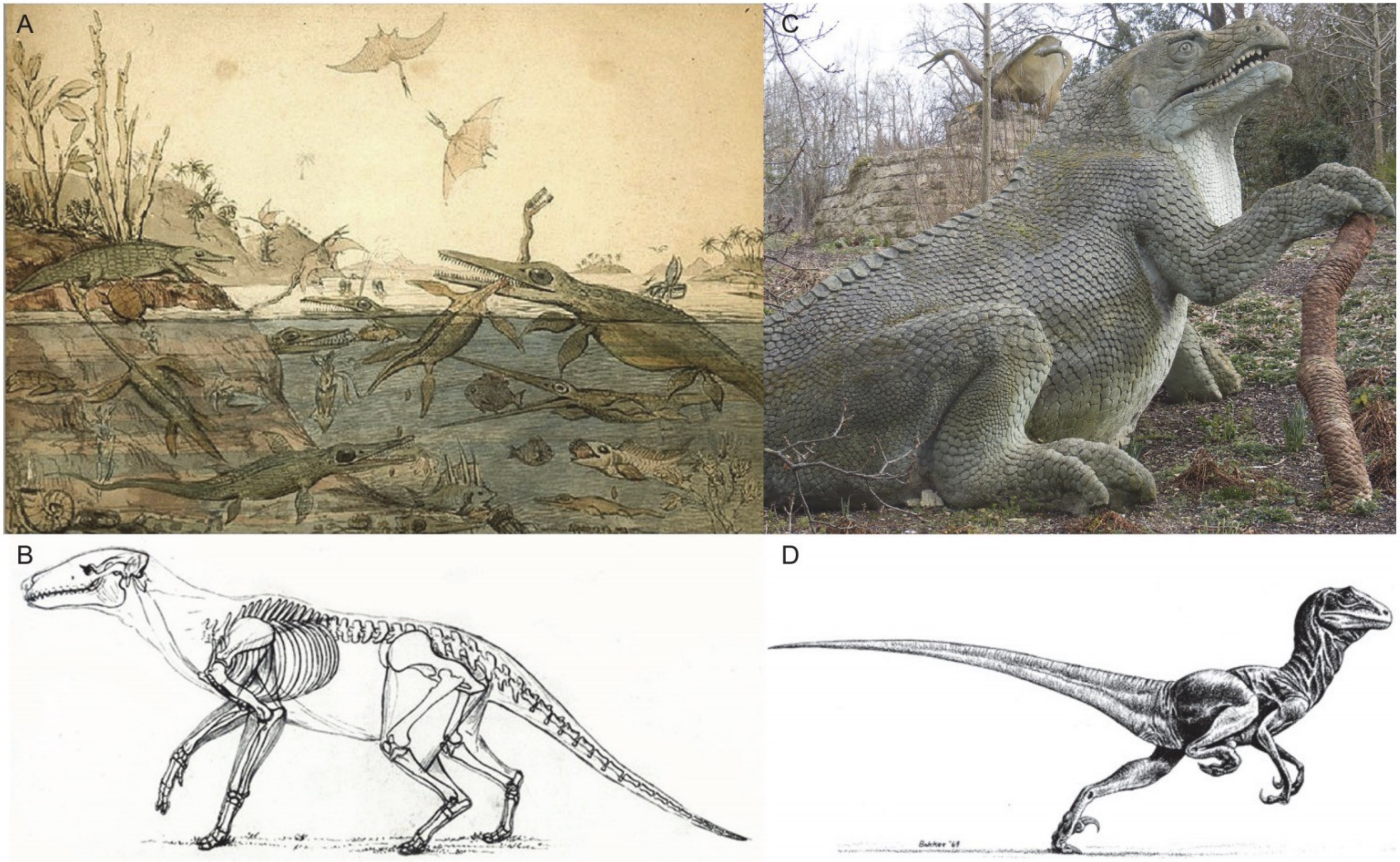


FIGURE 1. Select major works in palaeoart history. A, Henry de la Beche's 1830 Duria Antiquior, the first commercially available piece of palaeoart, as well as the oldest known composition of extinct animals within a reconstructed palaeoenvironment; B, Baron George Cuvier's 1808 musculoskeletal reconstruction of *Anoplotherium commune,* including outline of restored soft-tissues; C, Benjamin Waterhouse Hawkins' 1854 *Iguanodon* model, part of the famous Victorian prehistoric menagerie of Crystal Palace, Sydenham; D, Robert Bakker's 1969 influential restoration of *Deinonychus antirrhopus,* an illustration which symbolises the beginning of the scientific and artistic 'dinosaur renaissance'. A – B, in public domain; C, photograph by M. Witton; D, from Ostrom (1969).

Witton et al. 2014

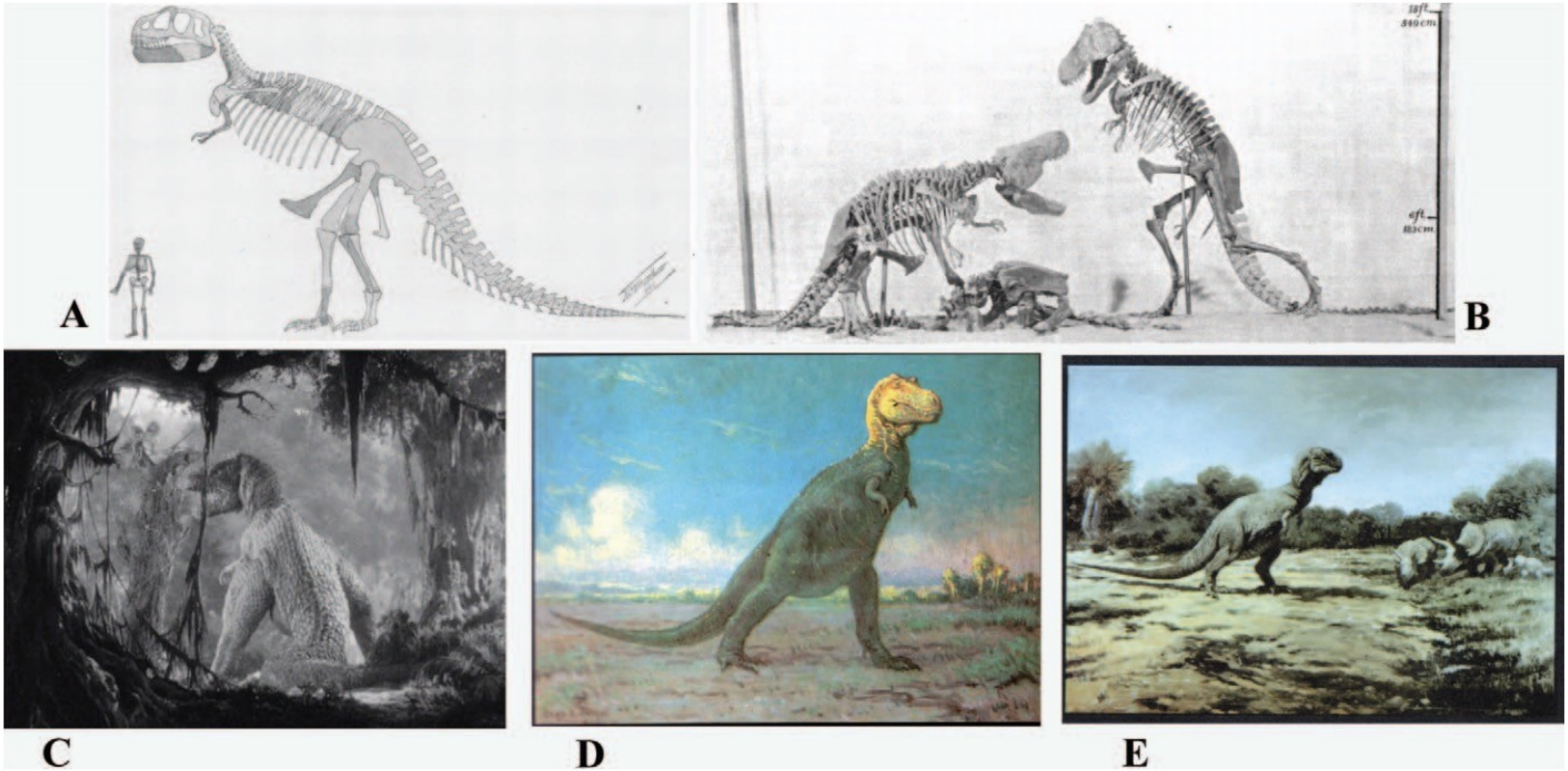


FIGURE 1: Reconstructed images of *T. rex* in the older, tail-dragging posture. (A) The original reconstruction of *T. rex*, drawn by W.D. Matthew. From Osborn (1905). (B) Model reconstruction of two *T. rex* skeletons in fighting poses. From Osborn (1913). (C) *T. rex* from the original 1933 motion picture *King Kong*. © 2012 Turner Entertainment; used by permission. (D) *T. rex* painting by Charles R. Knight (1946). Used by permission of the Natural History Museum of Los Angeles County. (E) *T. rex* painting by Charles R. Knight. Used by permission of the American Museum of Natural History.

Ross et al. 2013

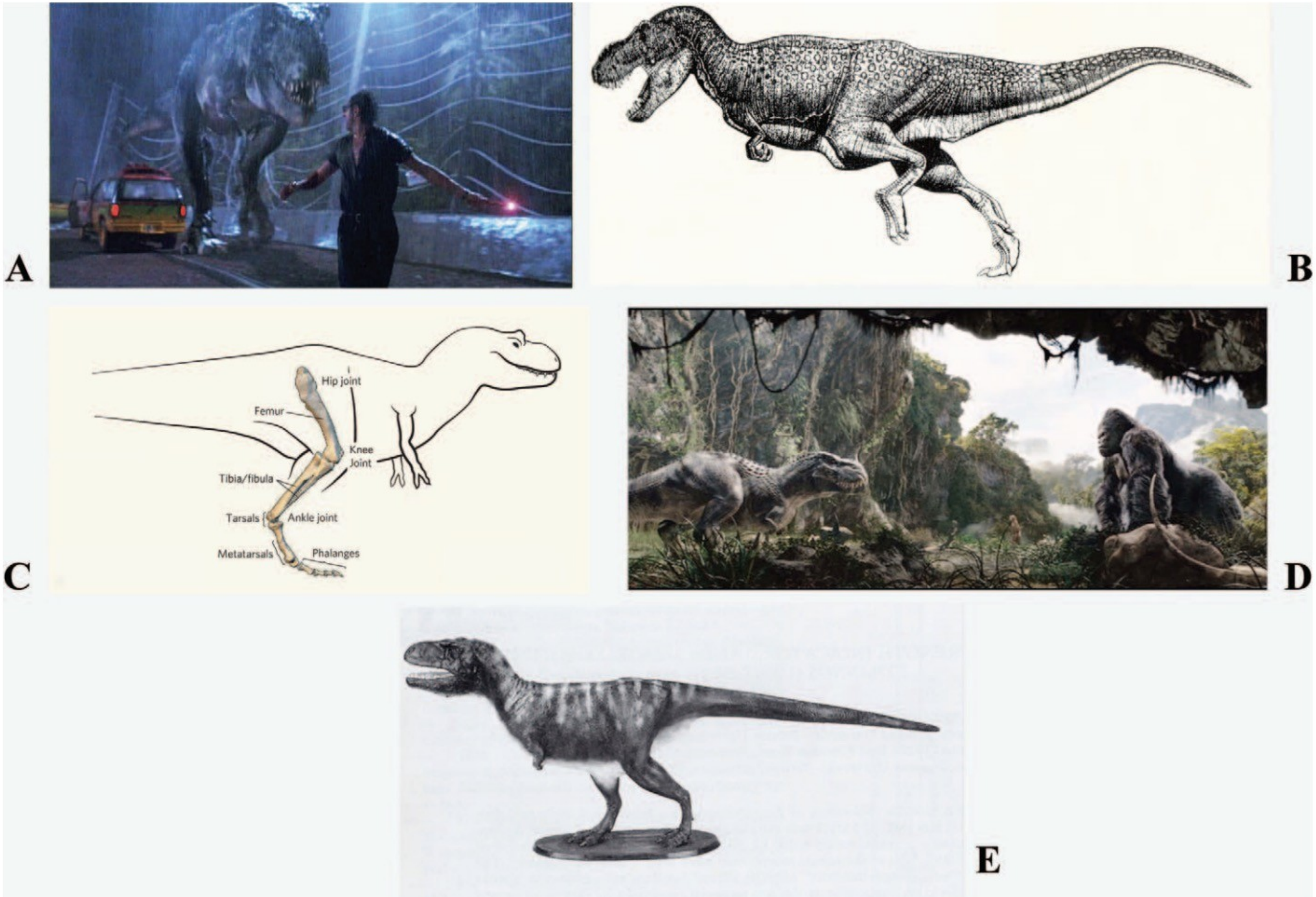


FIGURE 3: Reconstructed images of *T. rex* in the newer more horizontal posture. (A) *T. rex* as depicted in the first *Jurassic Park* film (1993). © 2012 Universal Studios; used by permission. (B) *T. rex* as depicted by artist Gregory Paul. From Paul (1988). © 2012 Gregory S. Paul; used by permission. (C) *T. rex* posture as sketched by Hutchinson and Gatesey (2006). © 2012 Nature Publishing Group; used by permission. (D) *T. rex* as depicted in the *King Kong* (2005). © 2012 Universal Studios; used by permission. (E) Reconstruction of *T. rex* by Matt Smith. From Farlow et al. (1995). Used by permission of the Society of Vertebrate Paleontology.

Ross et al. 2013

Ibrahim et al. 2014 (*Nature*) and https://www.youtube.com/watch?v=BhJ2HbnvmXI (*National Geographic)*

CT-Scanning

A Philips Brilliance iCT 256-slice multi-detector CT scanner was used to scan the specimens at the University of Chicago Medical Center. A kVp of 120-140 was used for most specimens, depending on size and density. A mAs of 175 (without dose modulation) generated the best results with a Philips YC filter (high resolution, sharp and noisy) and slice thickness of 0.67 mm. Each scan was reconstructed using Materialise Mimics v. 16.0 and individual bones were exported as .stl files. They were then imported into ZBrush to reconstruct missing pieces or as references for missing bones.

Flesh Rendering

The digital Spinosaurus skeleton was wrapped for flesh rendering as follows. The skeleton was positioned in a 'neutral' pose and opened in the digital sculpting program 12 ZBrush (Pixologic, Inc.). A spherical 3D mesh called "Sphere3D" was placed within the ribcage of the skeleton, and the Move, Standard, and Smooth brushes were used to stretch it from snout tip to tail tip, pulling so that it covered the underlying bones of the axial skeleton. Then a 3D mesh ("ZSphere") was placed both at the sagittal plane of the pelvis and at the sagittal plane of the pectoral girdle. Each ZSphere created a base mesh that could be pulled out along the limb bones, including the manual and pedal phalanges. The meshes were merged into a single mesh and Dynameshed to create a uniform distribution of polygons across the surface. Using the extant phylogenetic bracket with reference to crocodilians and birds, landmarks for muscle attachment were noted and the mesh was further sculpted to approximate the limb and tail muscles. The Transform: Transparent button could be toggled on and off to evaluate the soft tissue mesh in relation to the skeleton within. Variations of soft tissue thickness were easily generated by editing the mesh. The skin mesh was saved as .stl files and exported for center of mass estimation.

Ibrahim et al. 2014 (*Nature*)

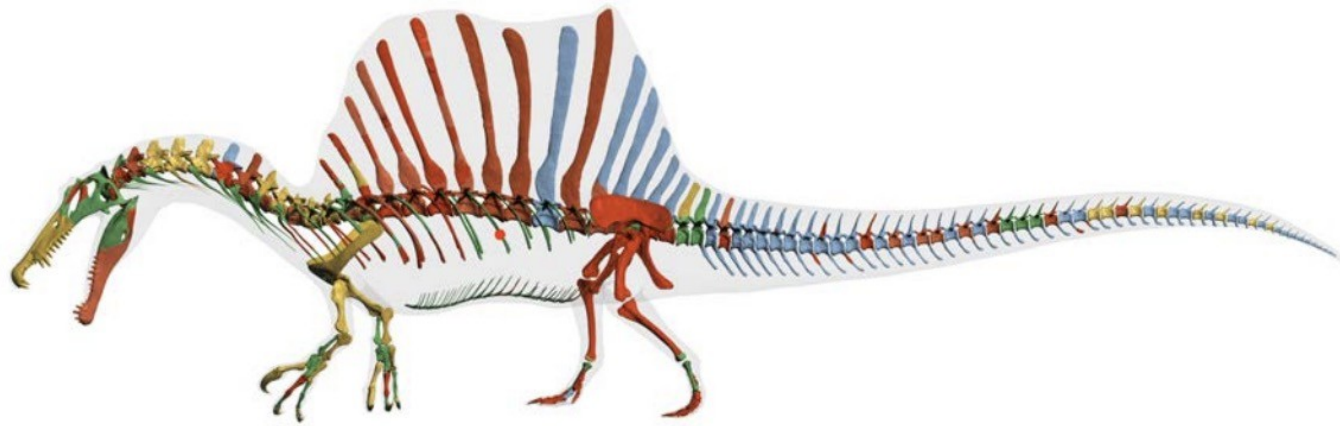
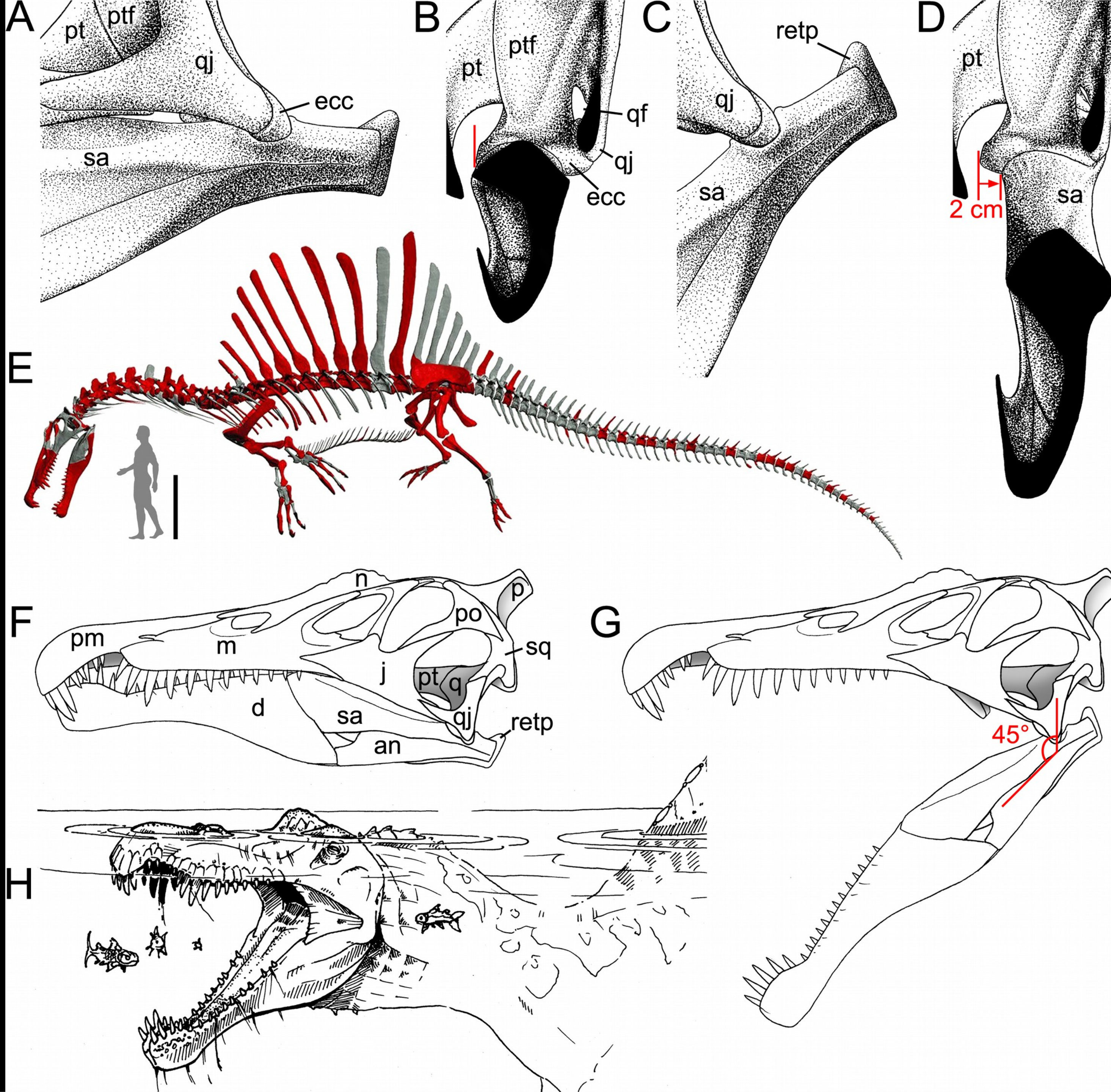
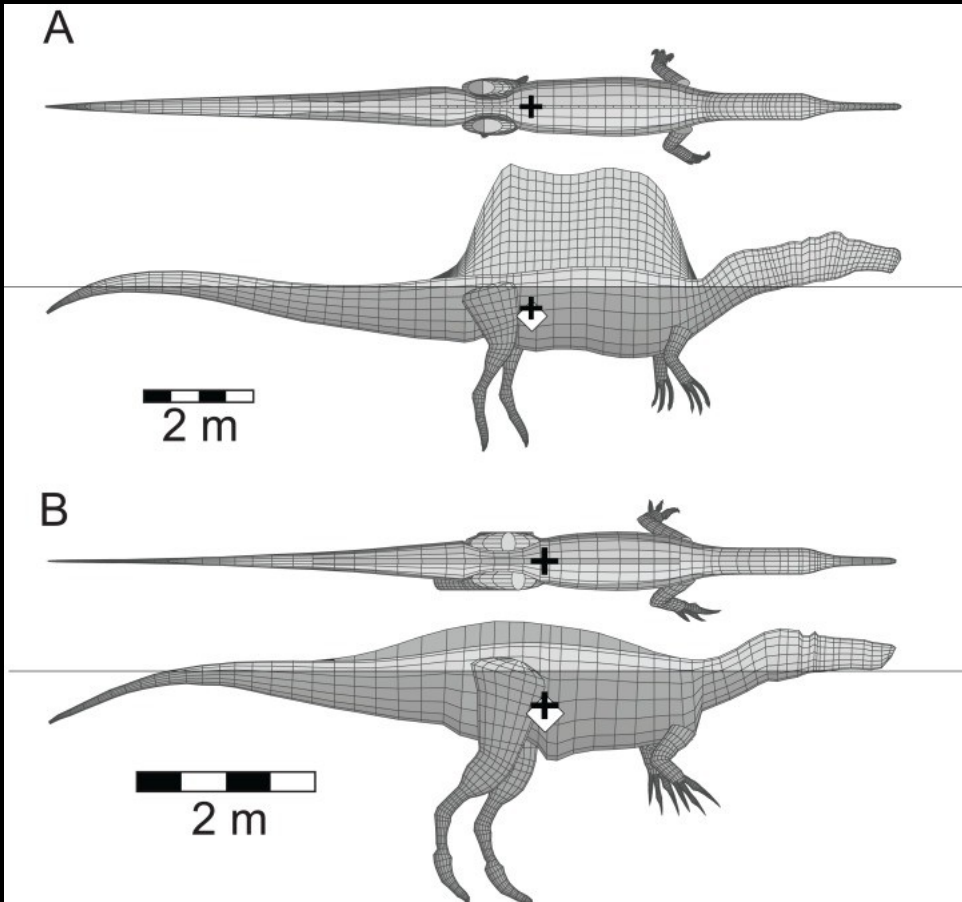


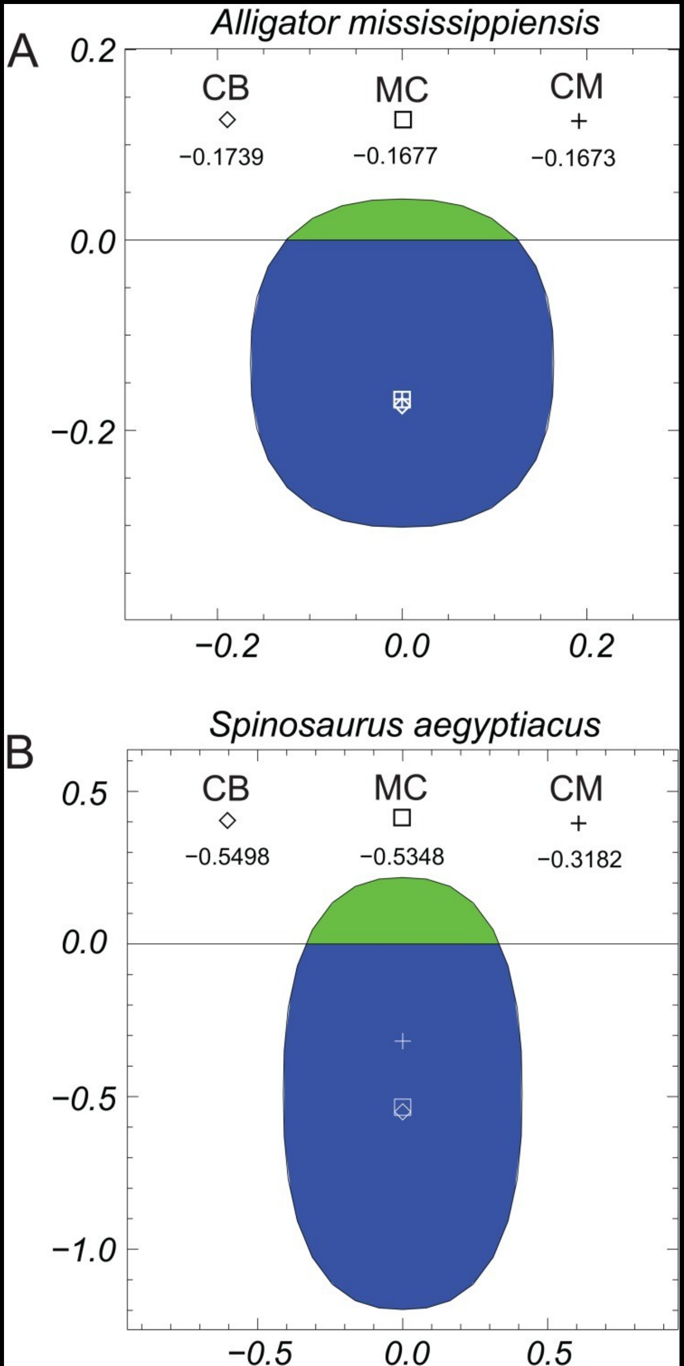
Fig. S3. Digital skeletal reconstruction and transparent flesh outline of *Spinosaurus aegyptiacus*. Color codes are used to show the origin of different parts of the digital skeletal model. Bones of the neotype and for *Suchomimus tenerensis* were CT-scanned, surfaced and size-adjusted before being added to the model. Color coding: ***red***, neotype (FSAC-KK 11888); ***orange***, Stromer's bones; ***yellow***, isolated bones from the Kem Kem; ***green***, surrogate bones modeled or taken from the spinosaurids *Suchomimus*, *Baryonyx*, *Irritator* or *Ichthyovenator*; ***blue***, inferred bones from adjacent bones. A red dot below the posterior dorsal centra shows the approximate position of the center of mass. Model created by Tyler Keillor, with technical assistance of Lauren Conroy and Erin Fitzgerald.

Ibrahim et al. 2014 (*Nature*)

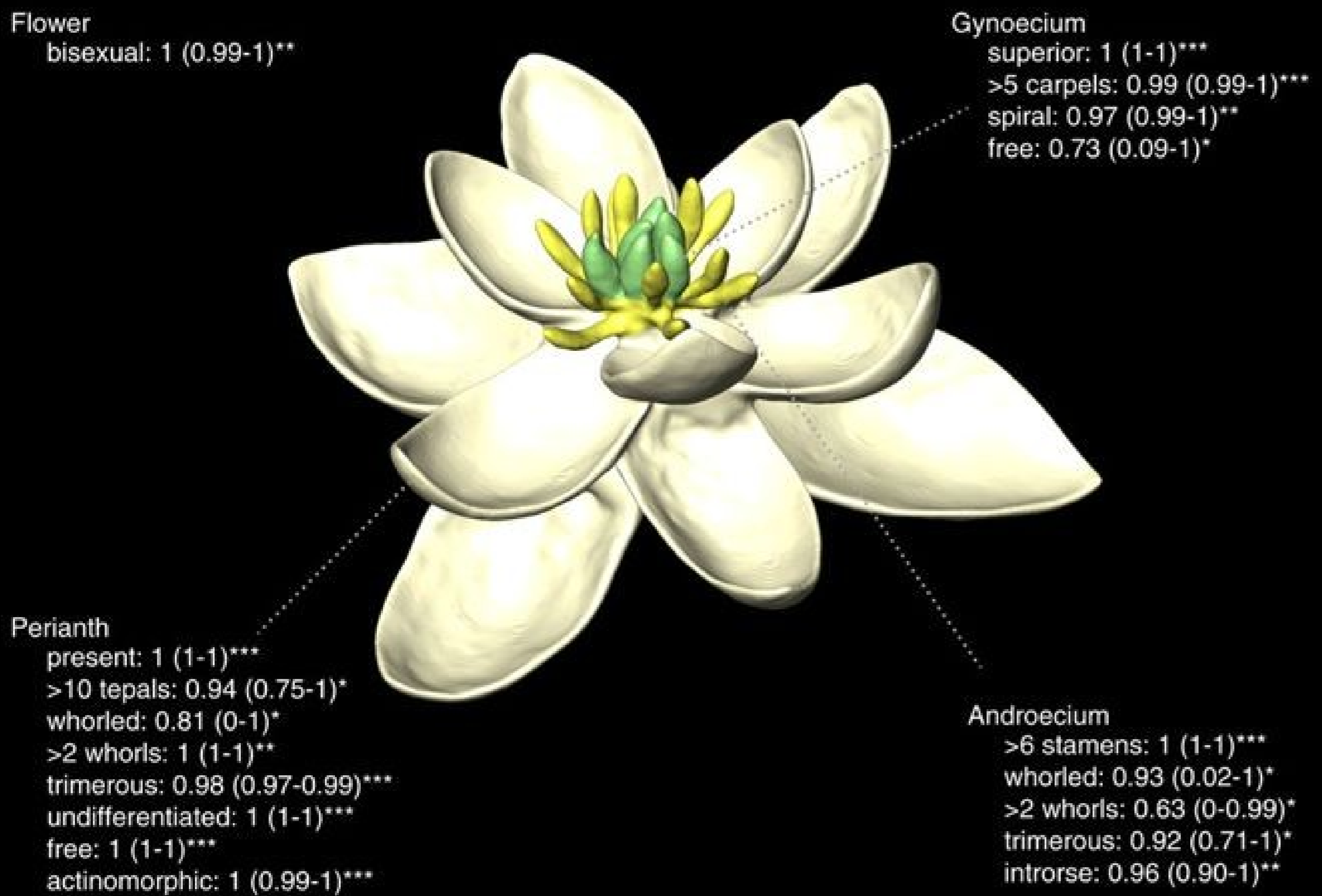


Hendrickx et al. 2016





Henderson 2018



Saquet et al. 2017

James Gurney https://www.youtube.com/watch?v=a7WjcV-Sdjg