# 3D models related to the publication: Skull sutures and cranial mechanics in the Permian reptile *Captorhinus aguti* and the evolution of the temporal region in early amniotes

Pascal Abel[1,2], Yannick Pommery[1,3], David Paul Ford[4], Daisuke Koyabu[5], Ingmar Werneburg[1,2]*

[1] *Senckenberg Centre for Human Evolution and Palaeoenvironment (SHEP), 72076 Tübingen, Germany*
[2] *Fachbereich Geowissenschaften, Eberhard-Karls-Universität, 72076 Tübingen, Germany*
[3] *Biogéosciences, Université Bourgogne Franche-Comté, 21000 Dijon, France*
[4] *Evolutionary Studies Institute, University of Witwatersrand, Johannesburg 2000, South Africa*
[5] *Research and Development Center for Precision Medicine, University of Tsukuba, Tsukuba 05-8550, Japan*
***Corresponding author**: ingmar.werneburg@senckenberg.de

**Abstract**

The present 3D Dataset contains the 3D models analyzed in: Abel P., Pommery Y., Ford D. P., Koyabu D., Werneburg I. 2022. Skull sutures and cranial mechanics in the Permian reptile *Captorhinus aguti* and the evolution of the temporal region in early amniotes. Frontiers in Ecology and Evolution. https://doi.org/10.3389/fevo.2022.841784

**Keywords:** Captorhinidae, Cranial Osteology, Eureptilia, Reptilia, Sauropsida

| Inv nr. | Description |
|---|---|
| OMNH44816 | Segmented cranial bone surfaces |

**Table 1.** Involved specimen of *Captorhinus aguti*. Collection: Sam Noble Oklahoma Museum of Natural History (OMNH), Norman, USA.

## INTRODUCTION

The clade Amniota comprises mammals, turtles, lepidosaurs, crocodylians, birds, and all their extinct relatives. Contrasting to early tetrapods and many early amniotes, extant representatives of this clade possess different sets of temporal openings (Ford and Benson 2020; Abel and Werneburg 2021) that are, among others, related to the functional integration of jaw adductor musculature (e.g., Frazzetta 1968; Tarsitano et al. 2001: Werneburg 2019; Werneburg and Abel 2022). Herein, we present 3D data on a skull (OMNH 44816; fig. 1 and table 1) of †*Captorhinus aguti* Cope 1882, an early amniote from the Permian of Oklahoma, USA, that lacks any temporal opening. The model was created by Abel et al. (2022) to study the sutures within the dermatocranium of this early amniote and discuss their implications for cranial mechanics and the evolution of temporal openings.

## METHODS

OMNH 44816 was scanned at the University of Texas High-Resolution X-ray Computed Tomography Facility (UTCT) in Austin, USA, in February 2017. The used NSI scanner worked with 180 kV and 0.15 mA. It uses an aluminum filter and a Perkin Elmer detector. The scan consists of 1897 slices and has a voxel size of 33.5 µm. Each bone was manually segmented in Avizo 8.1. 3D Meshes were created based on the renderings of the external surface of the bones and teeth. These meshes were saved as PLY-files and in MorphoDig 1.5 (Lebrun 2018).

## BIBLIOGRAPHY

Abel P., Pommery Y., Ford D. P., Koyabu D., and Werneburg I. 2022. Skull sutures and cranial mechanics in the Permian reptile *Captorhinus aguti* and the evolution of the temporal region in early amniotes. Frontiers in Ecology and Evolution. https://doi.org/10.3389/fevo.2022.841784

Abel P., Werneburg I. 2021. Morphology of the temporal skull region in tetrapods: Research history, functional explanations, and a new comprehensive classification scheme. Biological Review*s*, 96 (5), 2229–2257. https://doi.org/10.1111/brv.12751

Cope E. D. 1882. Third contribution to the history of the Vertebrata of the Permian formation of Texas. Proceedings of the American Philosophical Society 20 (112), 447–461. https://www.jstor.org/stable/982692

Ford D. P., Benson R. B. J. 2020. The phylogeny of early amniotes and the affinities of Parareptilia and Varanopidae. Nature Ecology and Evolution 4, 57–65. https://doi.org/10.1038/s41559-019-1047-3

Frazzetta T. H. 1968. Adaptive problems and possibilities in the temporal fenestration of tetrapod skulls. Journal of Morphology 125 (2), 145–157. https://doi.org/10.1002/jmor.1051250203
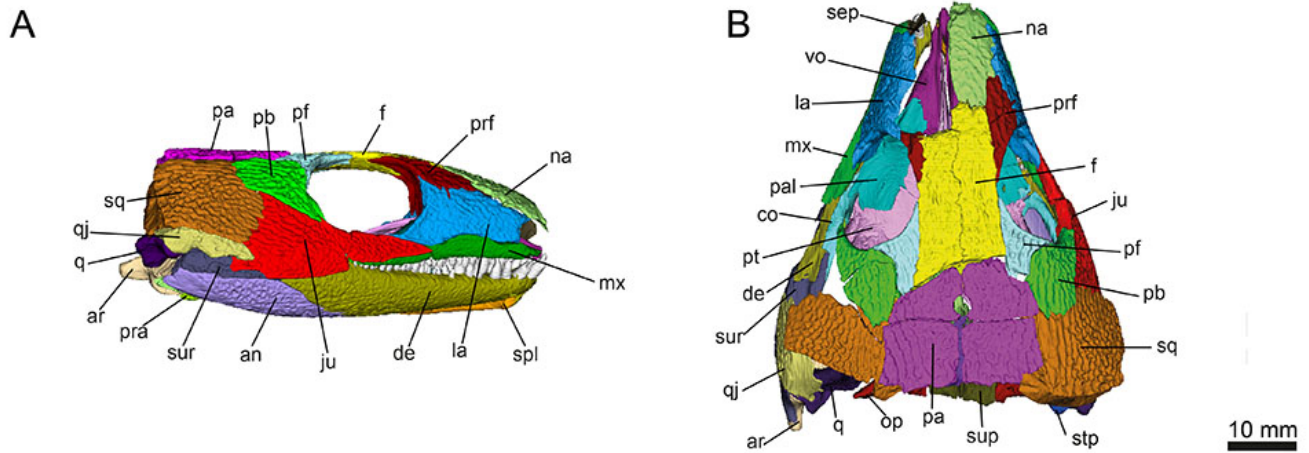
**Figure 1.** 3D model generated from the scan of OMNH 44816 in right lateral (A) and dorsal view (B). Abbreviations: **an**, angular; **ar**, articular; **co**, coronoid; **de**, dentary; **f**, frontal; **ju**, jugal; **la**, lacrimal; **mx**, maxilla; **na**, nasal; **op**, opisthotic; **pa**, parietal; **pal**, palatine; **pb**, postorbital; **pf**, postfrontal; **pra**, prearticular; **prf**, prefrontal; **pt**, pterygoid; **q**, quadrate; **qj**, quadratojugal; **sep**, septomaxilla; **spl**, splenial; **sq**, squamosal; **stp**, stapes; **sup**, supraoccipital; **sur**, surangular; **vo**, vomer.

Lebrun R. 2018. MorphoDig, an open-source 3D freeware dedicated to biology, in: The 5th International Palaeontological Congress. (Paris). https://morphomuseum.com/morphodig

Tarsitano S. F., Oelofsen B., Frey E., Riess J. 2001. The origin of temporal fenestrae. South African Journal of Science 97 (7-8), 334–336. https://hdl.handle.net/10520/EJC97338

Werneburg I. 2019. Morphofunctional categories and ontogenetic origin of temporal skull openings in amniotes. Frontiers in Earth Science, Section Paleontology 7(13), 1-7, https://doi.org/10.3389/feart.2019.00013

Werneburg I., Abel P. 2022. Modelling skull network integrity at the dawn of amniote diversification with considerations on functional morphology and fossil jaw muscle reconstructions. Frontiers in Ecology and Evolution. Sections Paleontology + Evolutionary Developmental Biology 9, 799637. https://doi.org/10.3389/fevo.2021.799637