Mouse Cranioskeletal Atlas

A collection of reference images and drawings of anatomical structures in the crania of C57BL/6J mice.

by Esra Camci @ esracamci@gmail.com esracamci.github.io

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Most of this document makes up an appendix to my Ph.D. thesis, completed in 2016 under the supervision of Tim Cox at the University of Washington and Seattle Children's Research Institute in Seattle, WA.

μCT scans were acquired with a Skyscan 1076 µCT scanner (Bruker microCT). 3D reconstructions were segmented with Analyze 9.0 where necessary and rendered in Drishti.[a]

Sketches were drawn in and images were pseudocolored using GIMP.

[a] Ajay Limaye (2012). "Drishti: a volume exploration and presentation tool". In: DOI: 10.1117/12.935640.

List of Figures

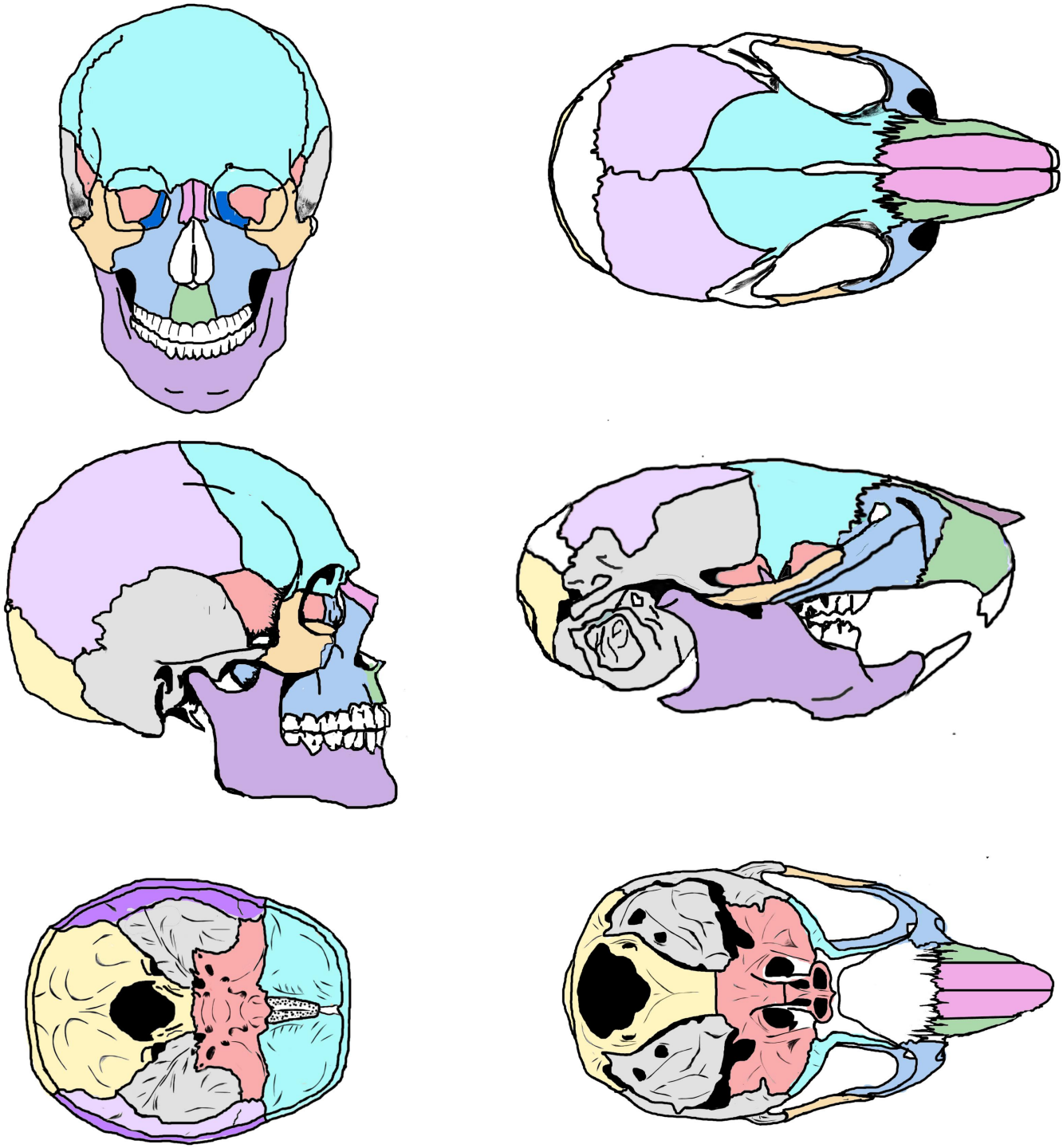


Figure 1: Homology

Craniofacial bones are conserved between humans and mice.[a]

[a]Carl Gans (1993). "Evolutionary Origin of the Vertebrate Skull". In: ed. by James Hanken and Brian K Hall; Joan T Richtsmeier, Laura L Baxter, and Roger H Reeves (2000). "Parallels of Craniofacial Maldevelopment in Down Syndrome and Ts65Dn Mice". In: *Dev Dyn* 145(August 1999), pp. 137–145.

Key

Green, premaxilla
Blue, maxilla
Purple, mandible
Pink, nasal bones
Light blue, frontal bones
Yellow-orange, zygomatic
Salmon, sphenoid
Gray, temporal bones and bulla
Light purple, parietal bones
Light yellow, occipital
White, mouse interfrontaland interparietal bones

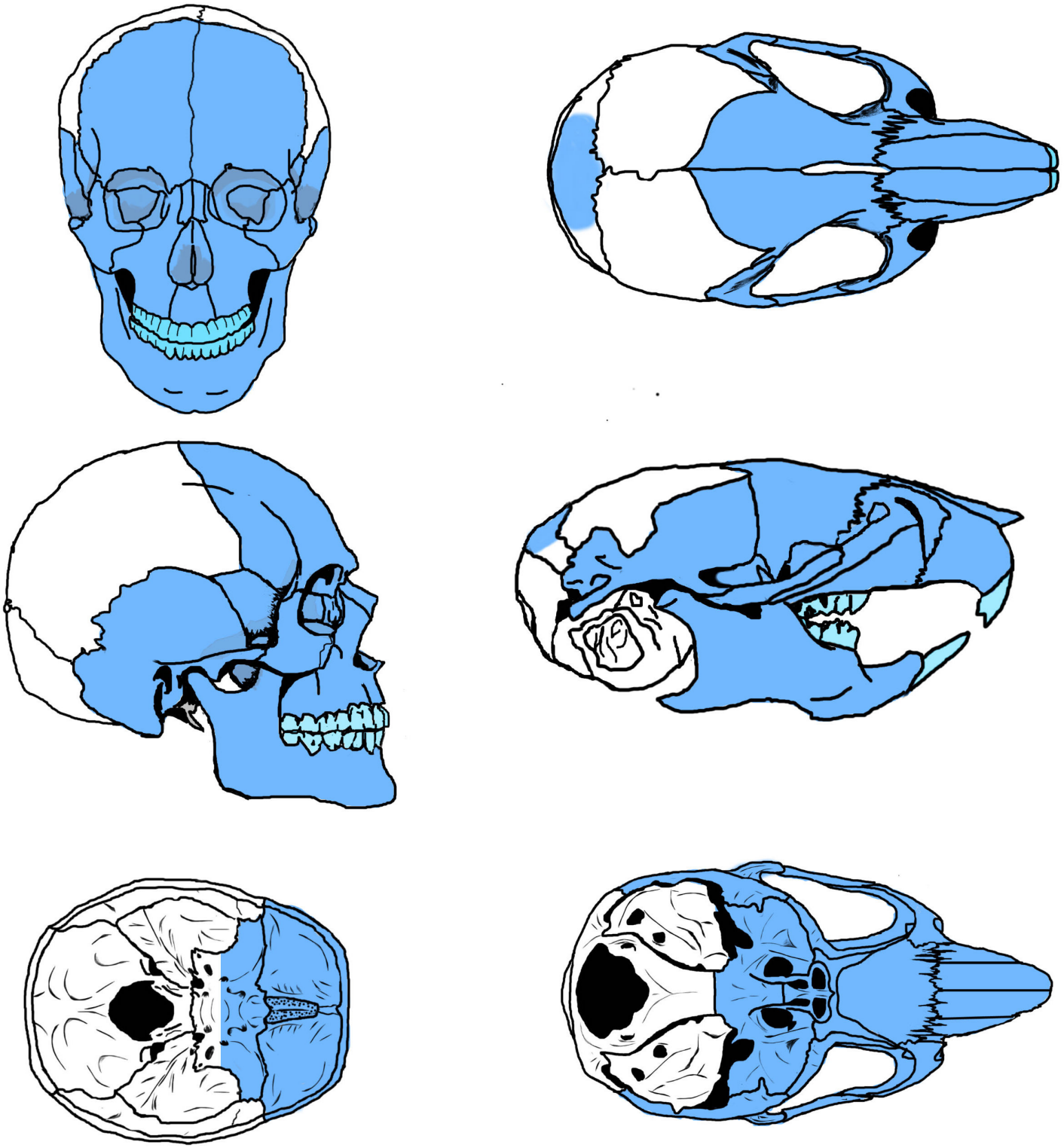


Figure 2: Bones of CNCC origin

Bones derived from cranial neural crest cells.[a]

[a] Brandeis McBratney-Owen et al. (2008). "Development and tissue origins of the mammalian cranial base". In: *Dev Biol*; Geoffrey H Sperber, Steven M Sperber, and Geoffrey D Guttman (2010). *Craniofacial Embryogenetics and Development*. 2nd. People's Medical Publishing House: Shelton, CT.

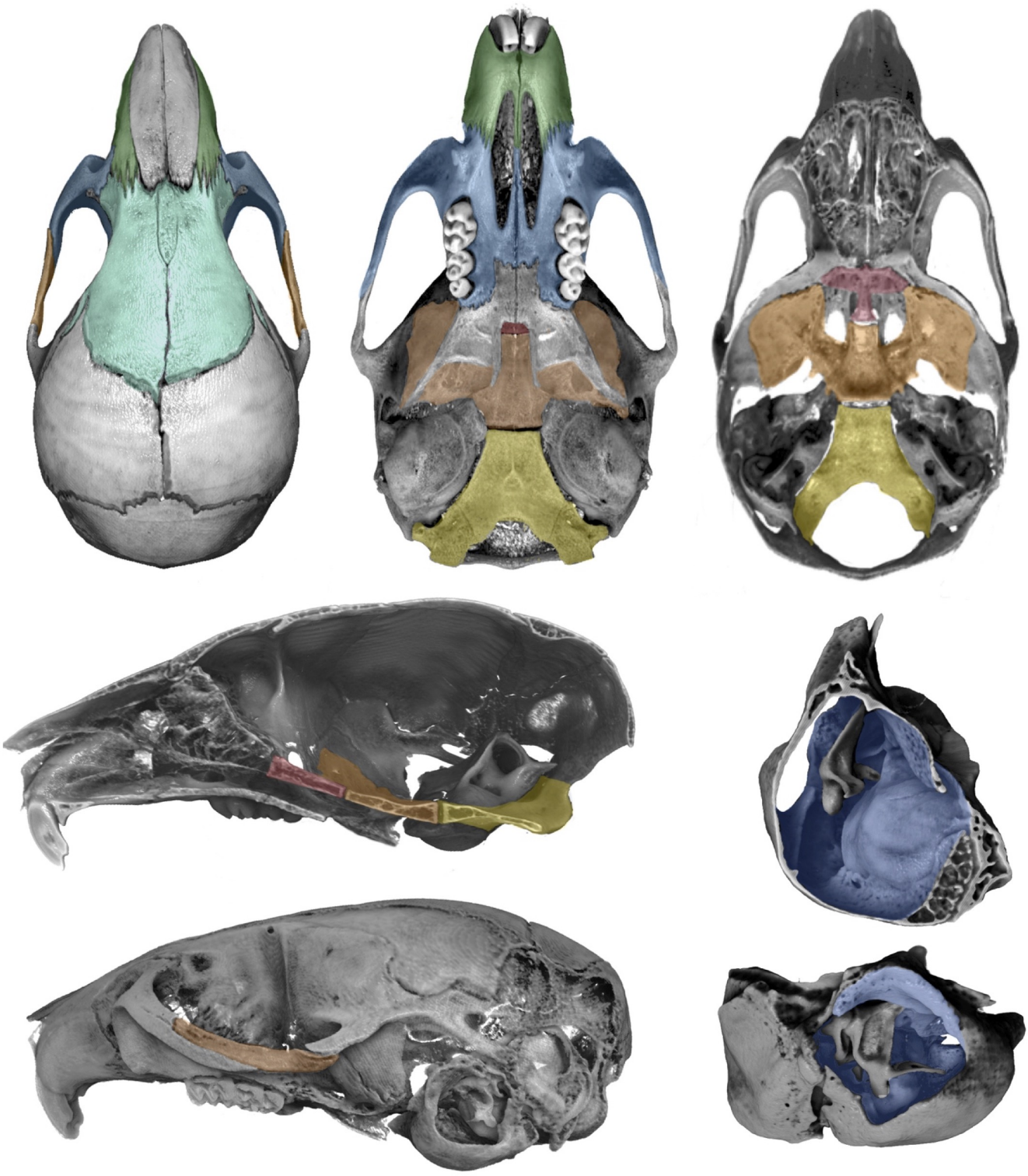


Figure 3: Cranial bones

μCT scan rendering of C57BL/6J crania at postnatal day 28.

Key

Green, premaxilla
Blue, maxilla
Light green, frontal and interfrontal bones
Red, presphenoid
Orange, basisphenoid
Yellow, basioccipital
Dark blue, middle ear
Slightly different orange, jugal bone

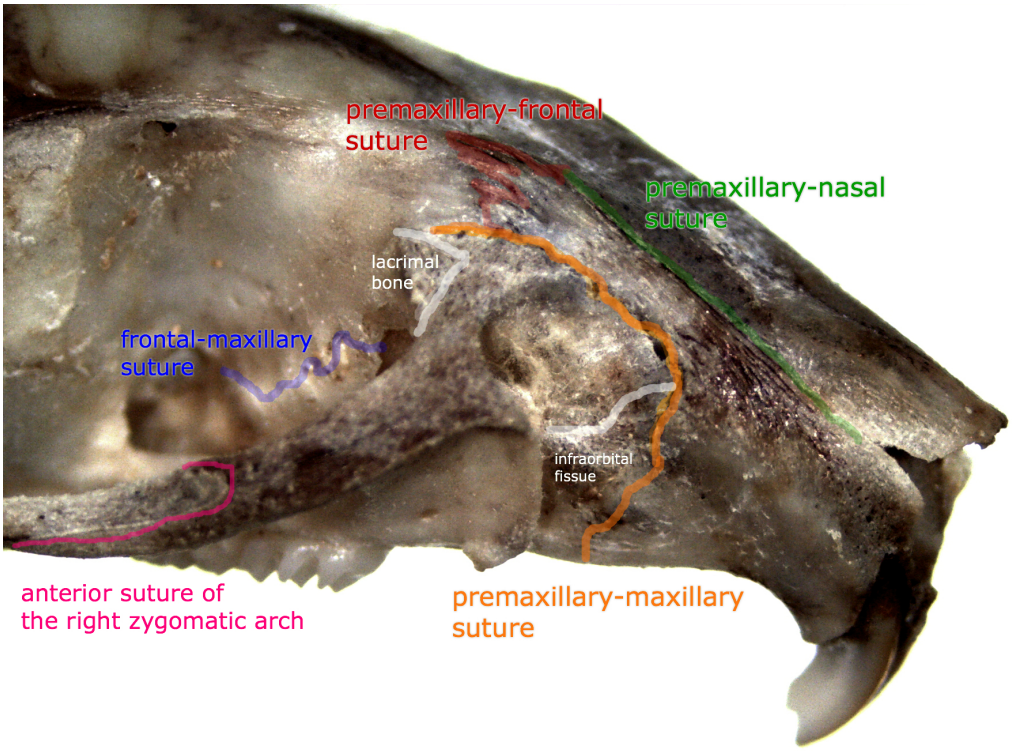


Figure 4: Facial sutures

Photograph of an adult C57BL/6J skull with labeled facial sutures.

Key

Pink, anterior suture of the zygomatic
Red, premaxillary-frontal
Orange, premaxillary-maxillary
Green, premaxillary-nasal
Blue, frontal-maxillary

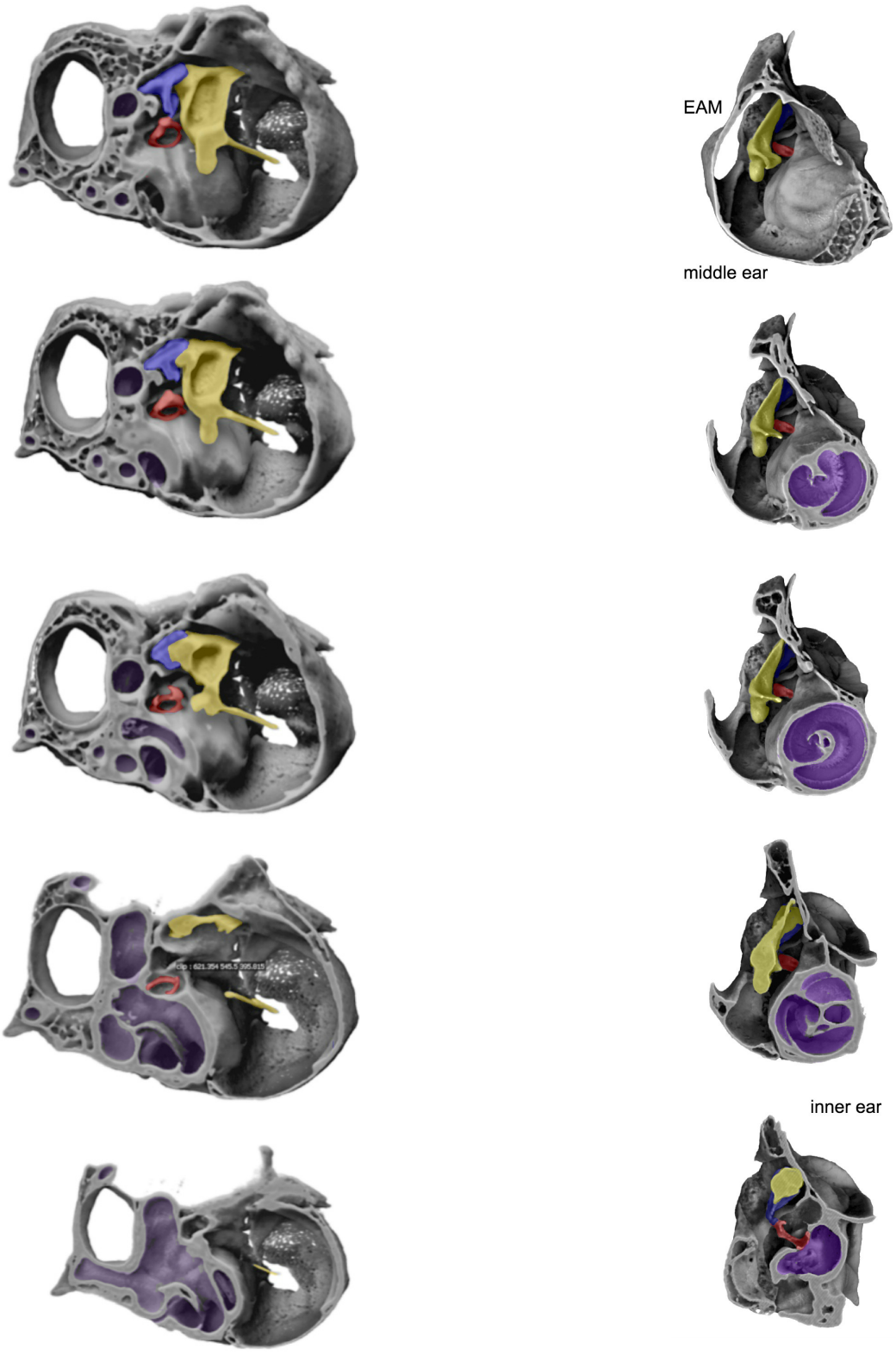


Figure 5: Tympanic bulla

Pseudosections through a disarticulated tympanic bulla, showing the position of the ossicles. μCT scan rendering from a C57BL/6J mouse older than 50 days.

Key
Yellow, incus
Blue, malleus
Red, stapes
Purple, inner ear

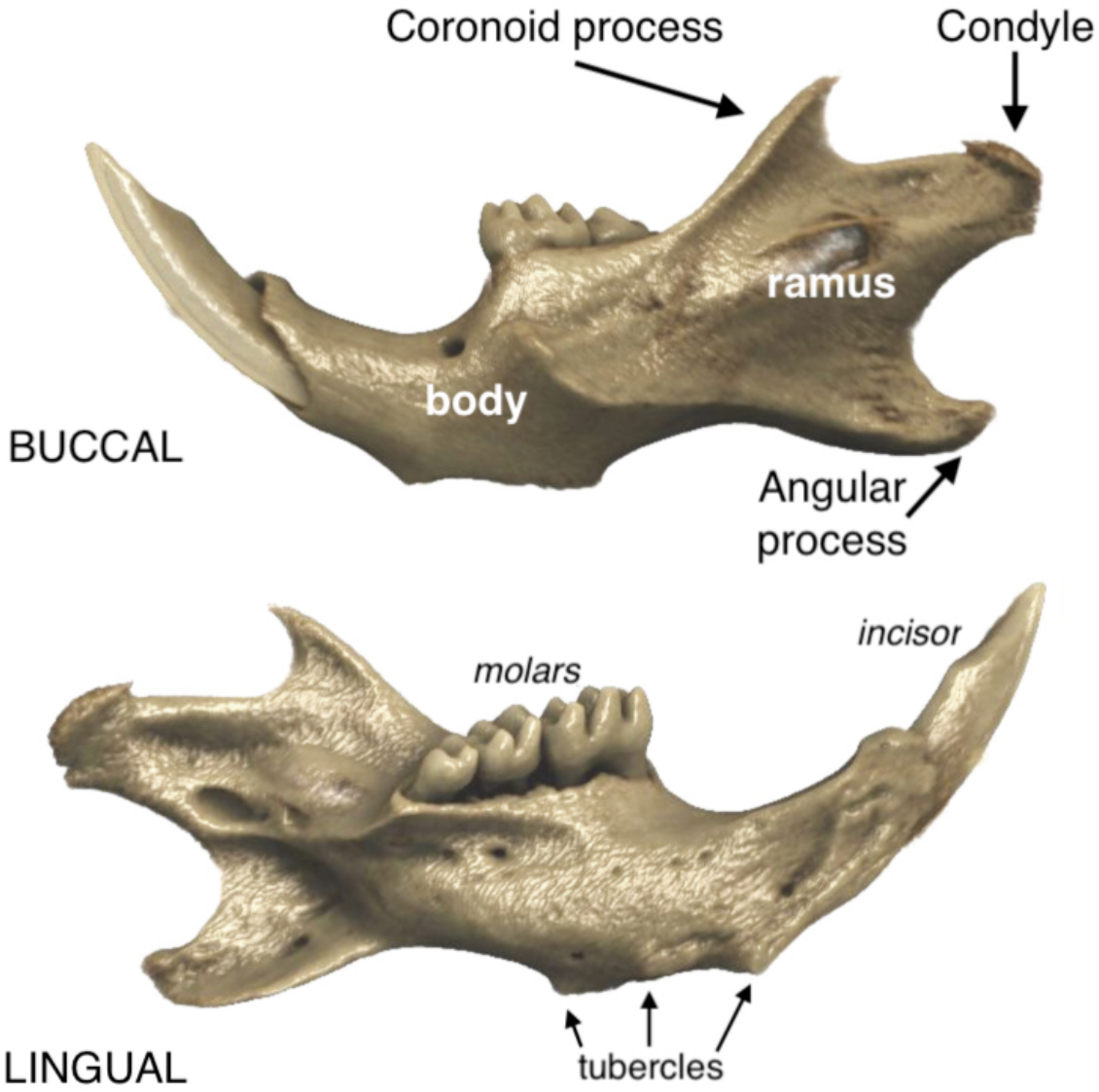


Figure 6: Hemimandible

μCT scan renderings of lingual and buccal sides of an adult mouse hemimandible.

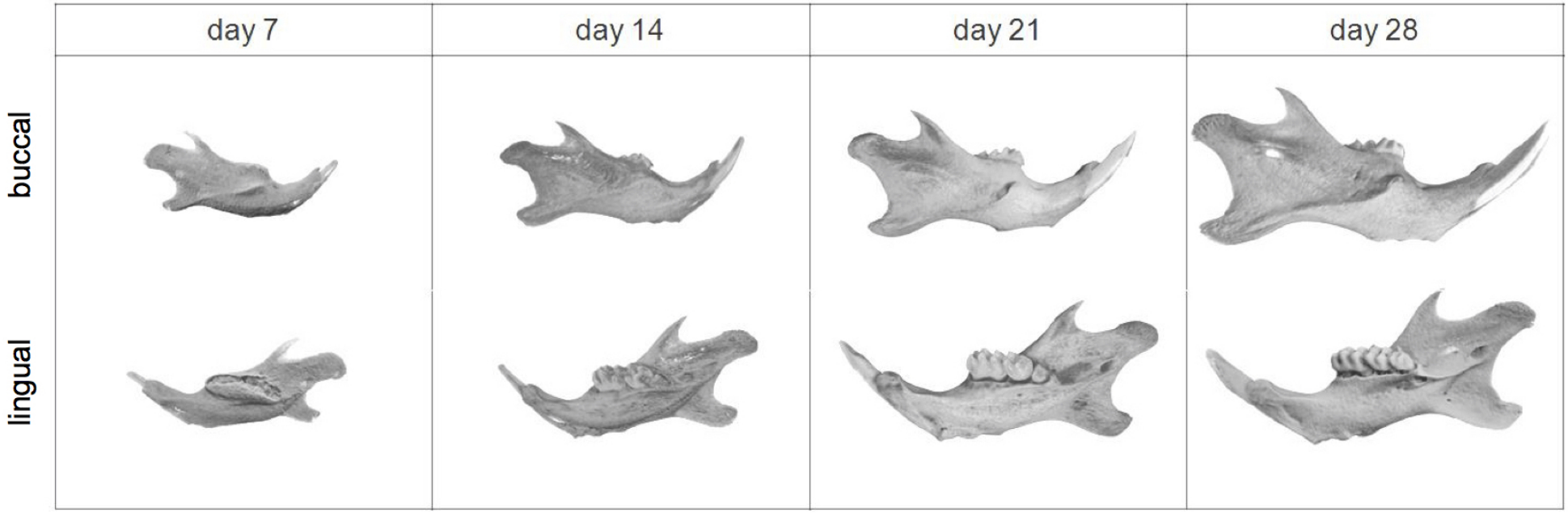


Figure 7: Hemimandibular morphology over the first month of life
μCT scan renderings of mouse hemimandibles at postnatal days 7, 14, 21 and 28.

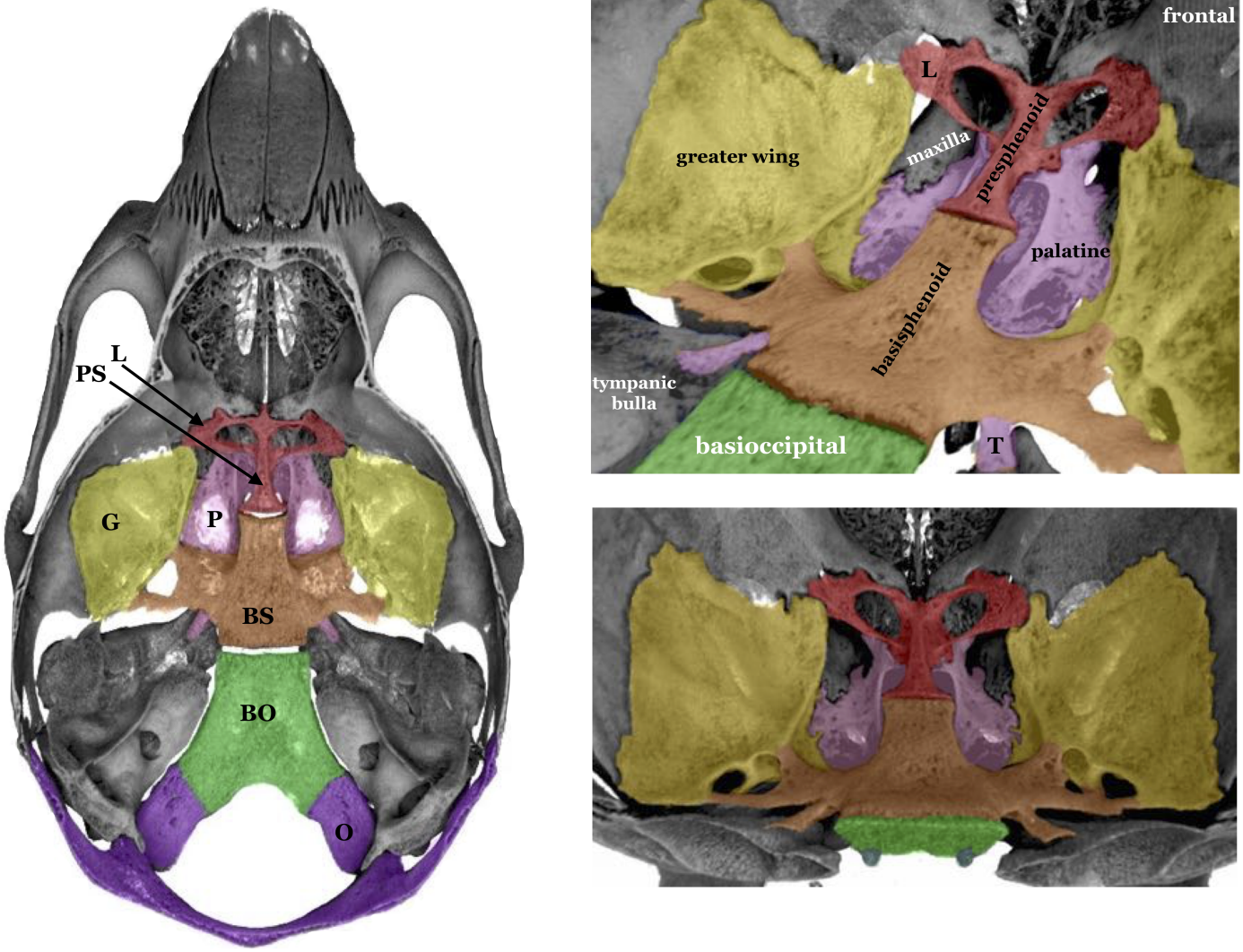


Figure 8: Cranial base anatomy

μCT scan rendering of the C57BL/6J cranial base at postnatal day 28.

key
Red, presphenoid
Orange, basisphenoid with *Yellow*, greater wing of the sphenoid
Pink, palatine
Green, basioccipital
Purple, exoccipital

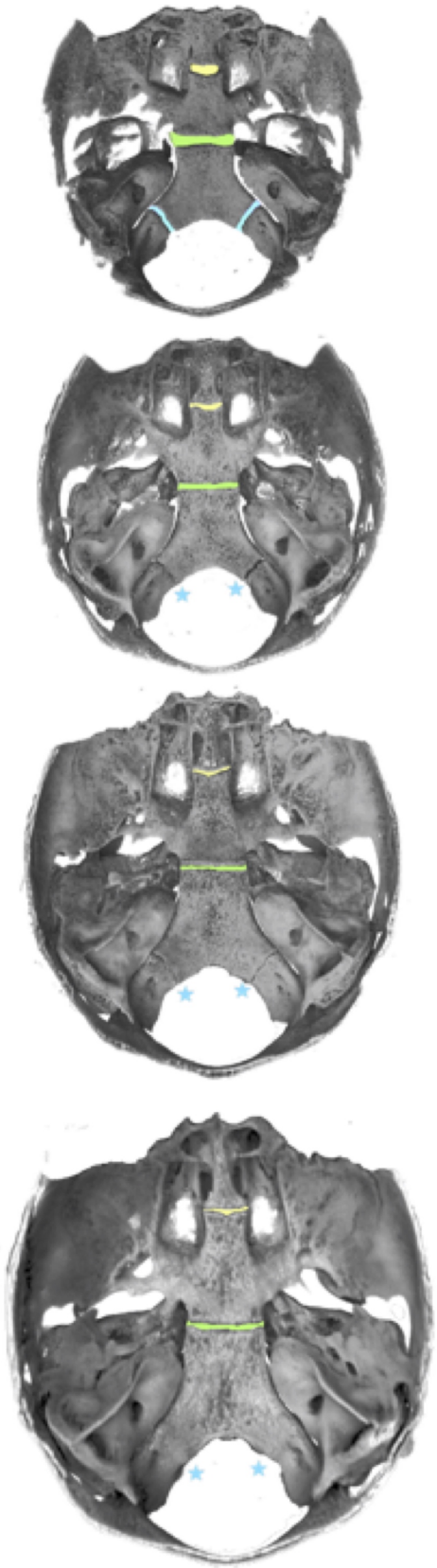


Figure 9: Cranial base morphology over the first month of life
μCT scan renderings of the C57BL/6J cranial base at postnatal days 7, 14, 21 and 28.

Key
Yellow, presphenoid synchondrosis
Green, sphenooccipital synchondrosis
Blue, basioccipital-exoccipital synchondrosis

Figure 10: Cervical vertebra
μCT scan rendering of the cervical vertebral stack of a 28 day old *sbse* mutant.

key
Red, C1 (Atlas)
Orange, C2 (Axis)
Yellow, C3
Green, C4
Blue, C5

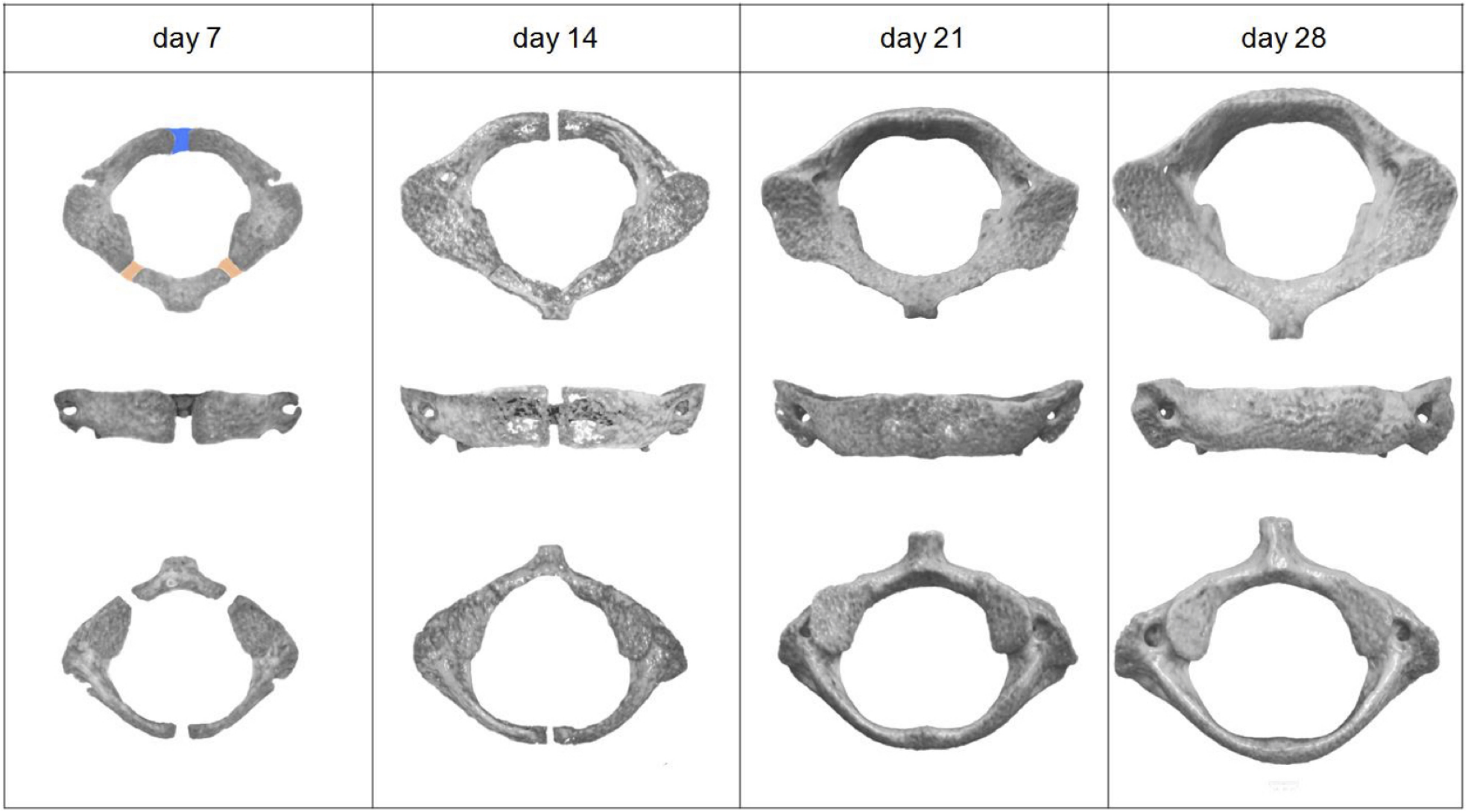


Figure 11: C1 morphology over the first month of life
μCT scan renderings of representative mouse cervical vertebra 1 (C1) at postnatal days 7, 14, 21 and 28.

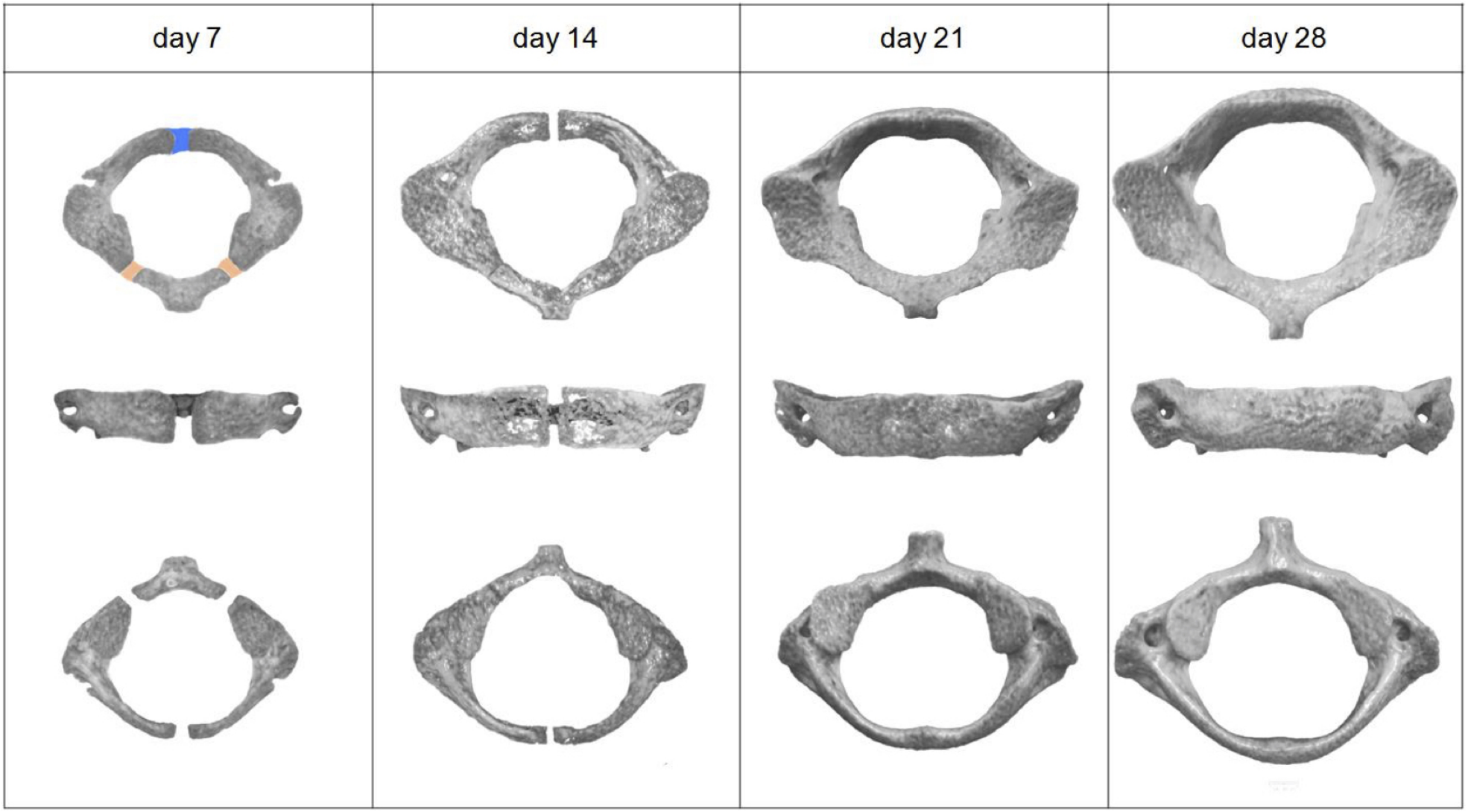


Figure 12: C2 morphology over the first month of life
μCT scan renderings representative of mouse cervical vertebra 2 (C2) at postnatal days 7, 14, 21 and 28.

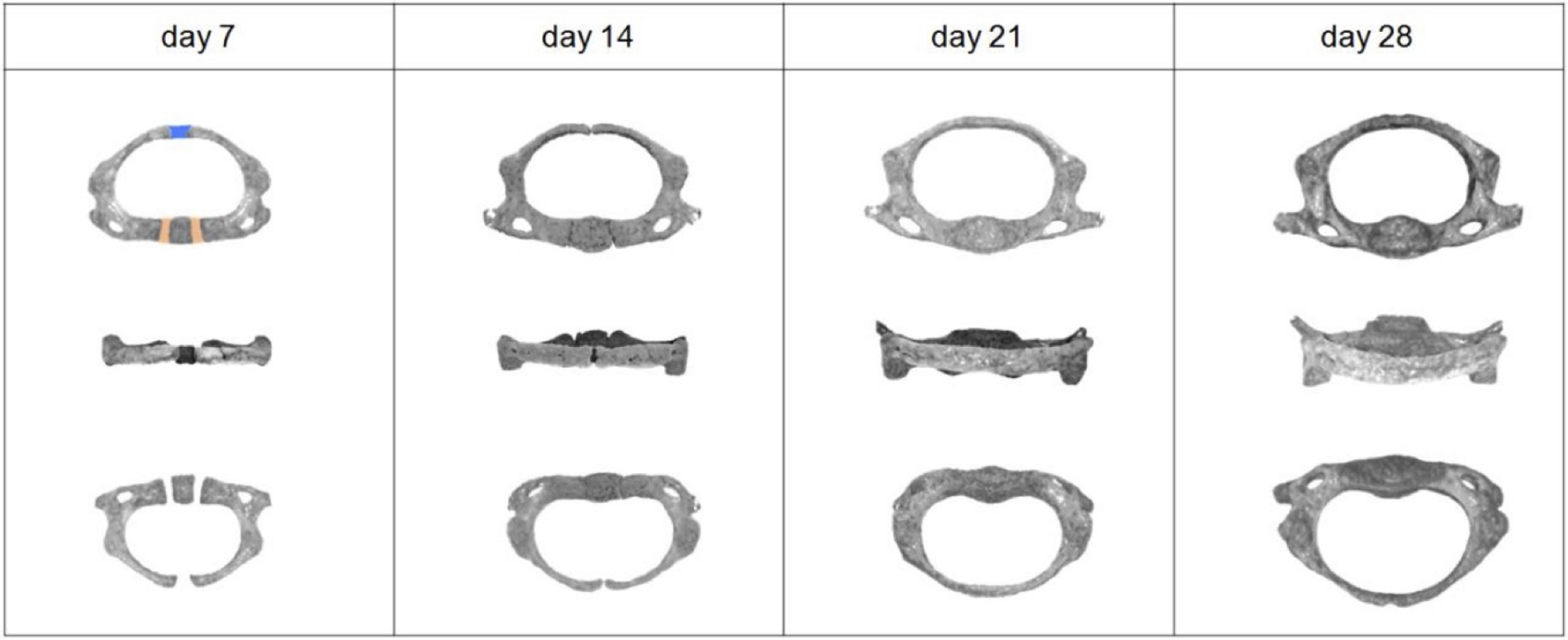
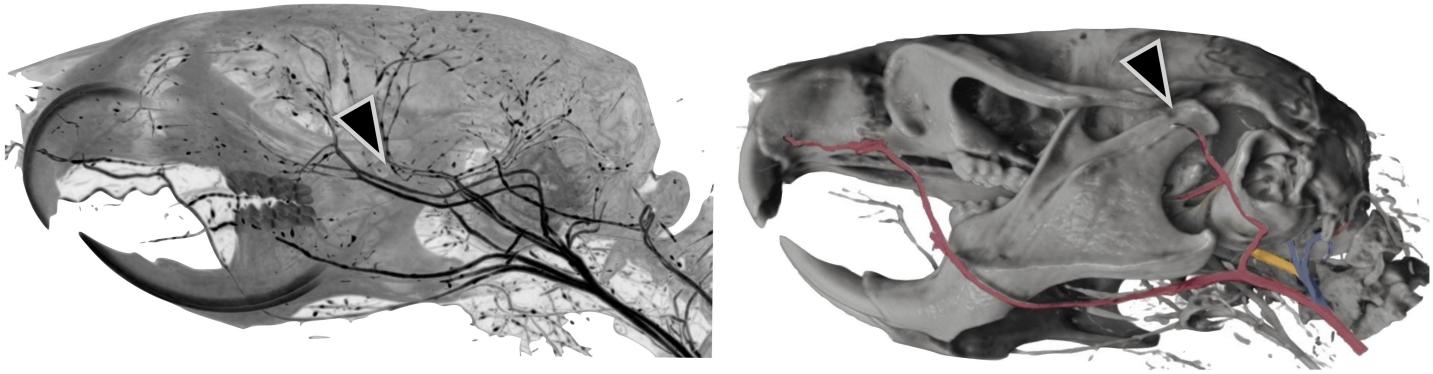
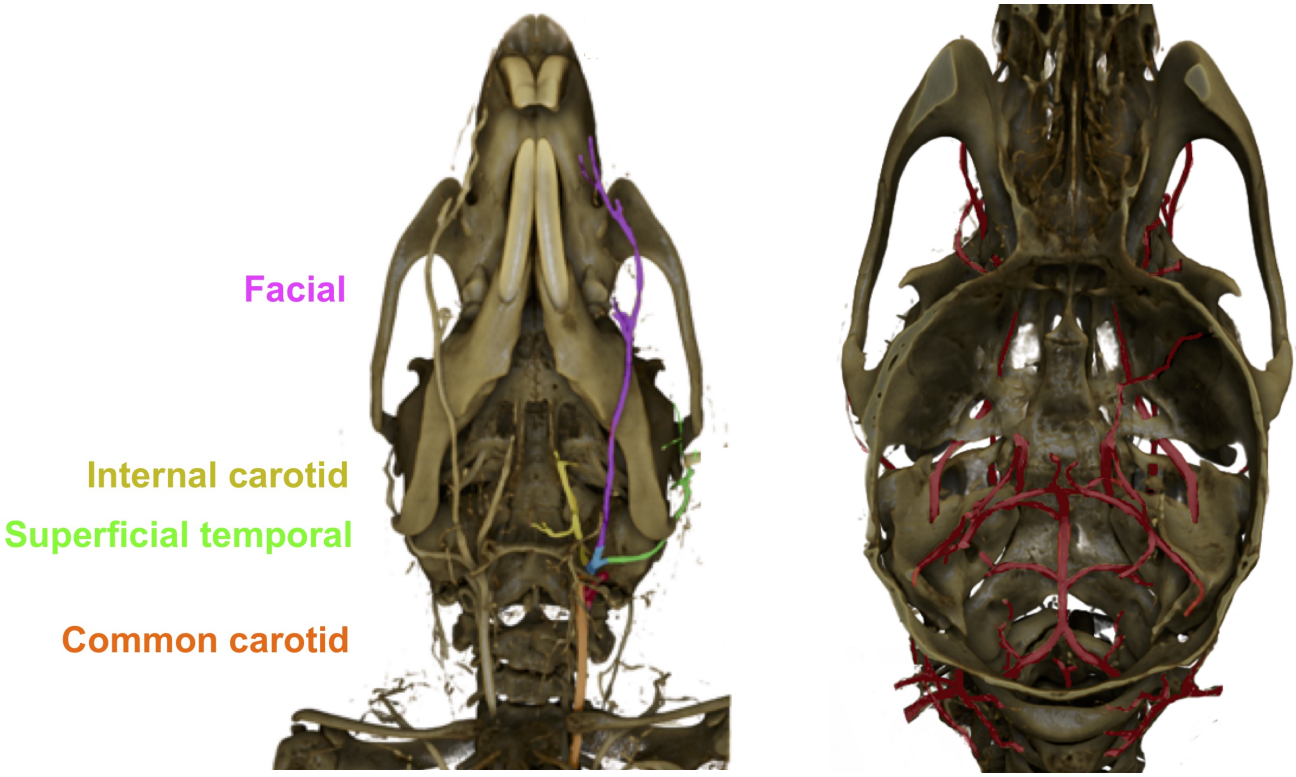


Figure 13: C3 morphology over the first month of life
μCT scan renderings representative of mouse cervical vertebra 3 (C3) at postnatal days 7, 14, 21 and 28.



Lateral view

Black arrowhead, mandibular condyle



Ventral view with major vessels

Dorsal endocranial view

Figure 14: Cranial vasculature

μCT scan renderings of the cranium of a 145 day old C57BL/6J mouse after perfusion with radioopaque contrast media.

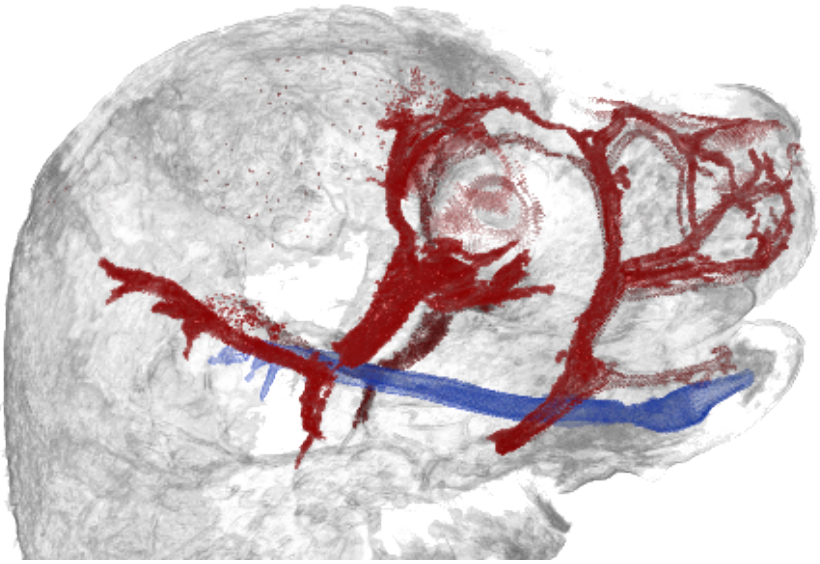


Figure 15: Meckel's cartilage and superficial vasculature

Meckel's cartilage and superficial cranial vasculature in an embryonic mouse pup stained with Alcian blue to label cartilage. The image was generated by segmenting an OPT (Optical Projection Tomography) scan reconstruction and selectively rendering the mandibular cartilage, vasculature, and skin. Absent from this image is the nasal capsule and endochondral bone anlage.

Key
Blue, Meckel's cartilage
Red, Superficial craniovasculature

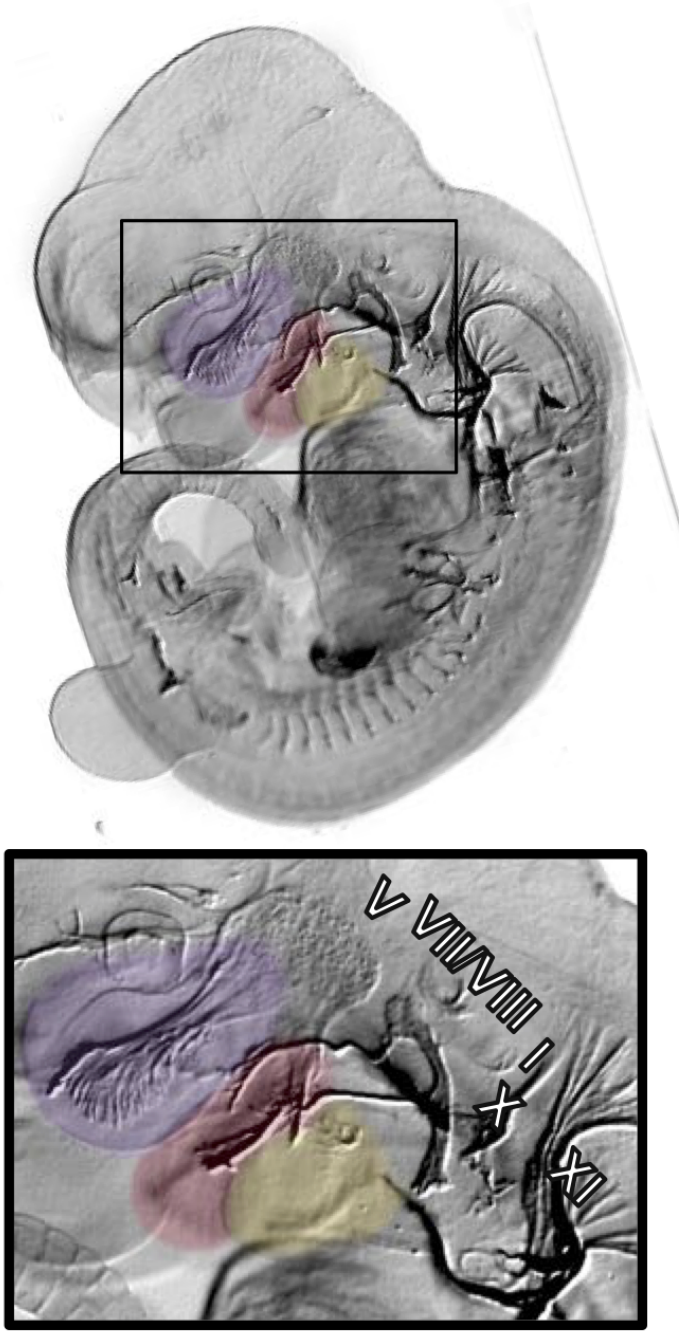


Figure 16: Embryonic cranial nerves

Cranial nerves in the embryonic day 11 C57BL/6J mouse, labeled with mouse a-rat neurofilament (2h3) antibody and stained with DAB.

Key
Purple and red, branchial arch 1
Yellow, branchial arch 2

CN V trigeminal
CN VII facial
CN VIII vestibulocochlear
CN IX glossopharyngeal
CN XI accessory

References

Gans, Carl (1993). “Evolutionary Origin of the Vertebrate Skull”. In: ed. by James Hanken and Brian K Hall.

Limaye, Ajay (2012). “Drishti: a volume exploration and presentation tool”. In: DOI: 10.1117/12.935640.

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