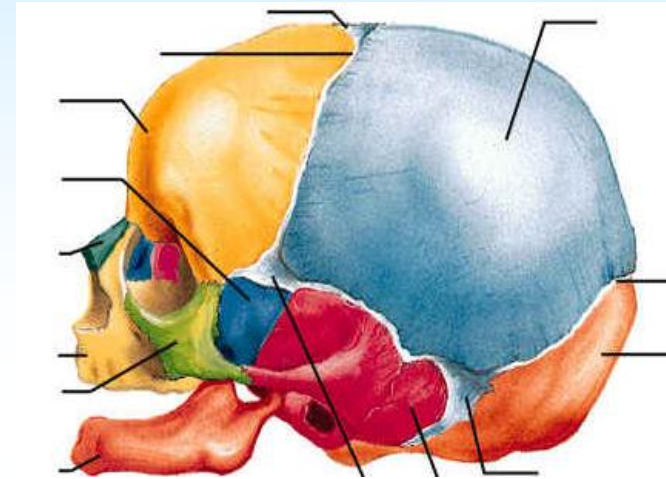


SCHÄDELENTWICKLUNG



Dr. Andrea D. Székely

*Semmelweis Universität
Anatomisches, Histologisches und Embryologisches Institut
Budapest*

Das im Halsbereich befindliche **Seitenplattenmesoderm**, das **paraxiale Mesoderm** und die **Neuralleistenzellen** tragen alle zur Entwicklung des Schädels als Ganzem bei.

Die Schädelknochen bilden sich auf zwei verschiedene Arten: durch **desmale** und **chondrale Ossifikation** bilden sich Compacta und Spongiosa. **Desmocranium** vs **Chondrocranium**

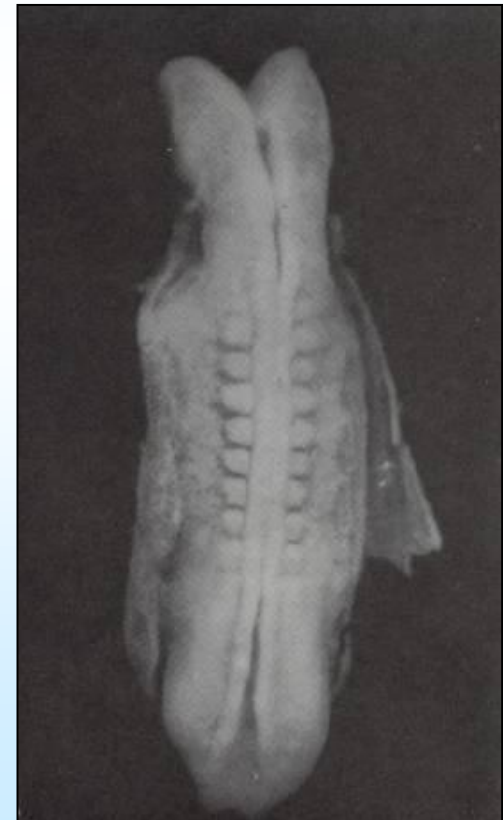
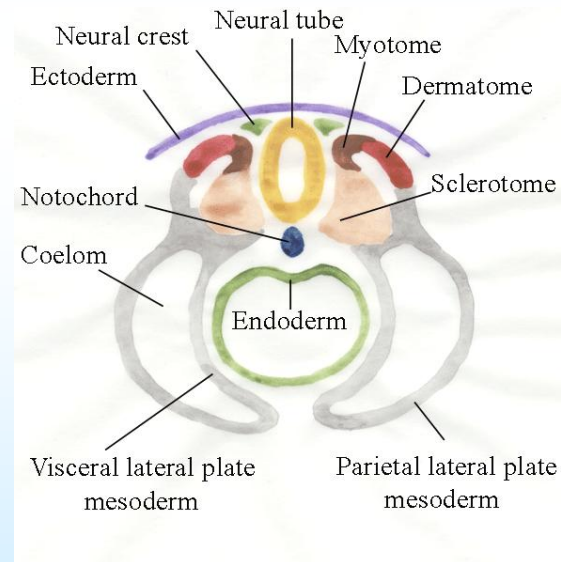
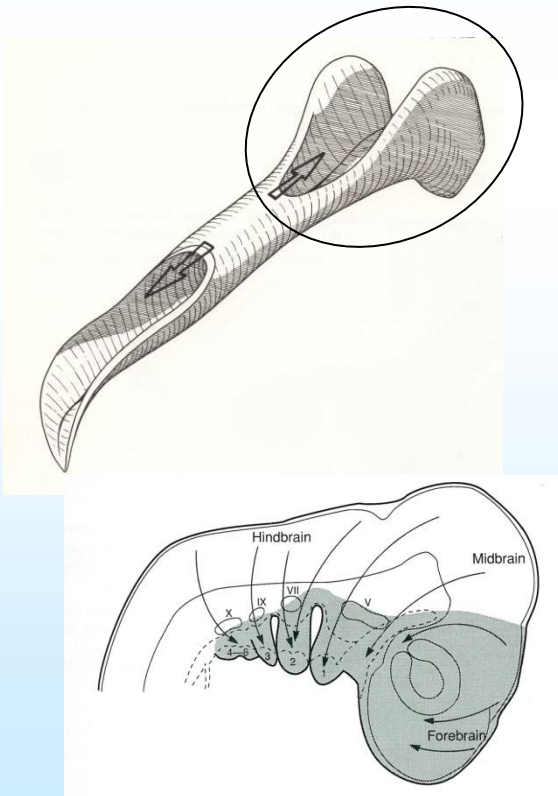
Der Schädel wird in zwei Hauptbereiche geteilt: das **Viscerocranium** und das **Neurocranium**.

CHONDRALES VISCEROCRANIUM
NEUROCRANIUM

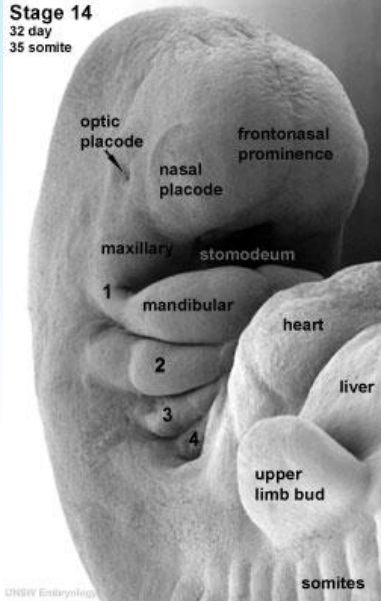
DESMALES NEUROCRANIUM
VISCEROCRANIUM

WOHER STAMMT DAS CRANIUM?

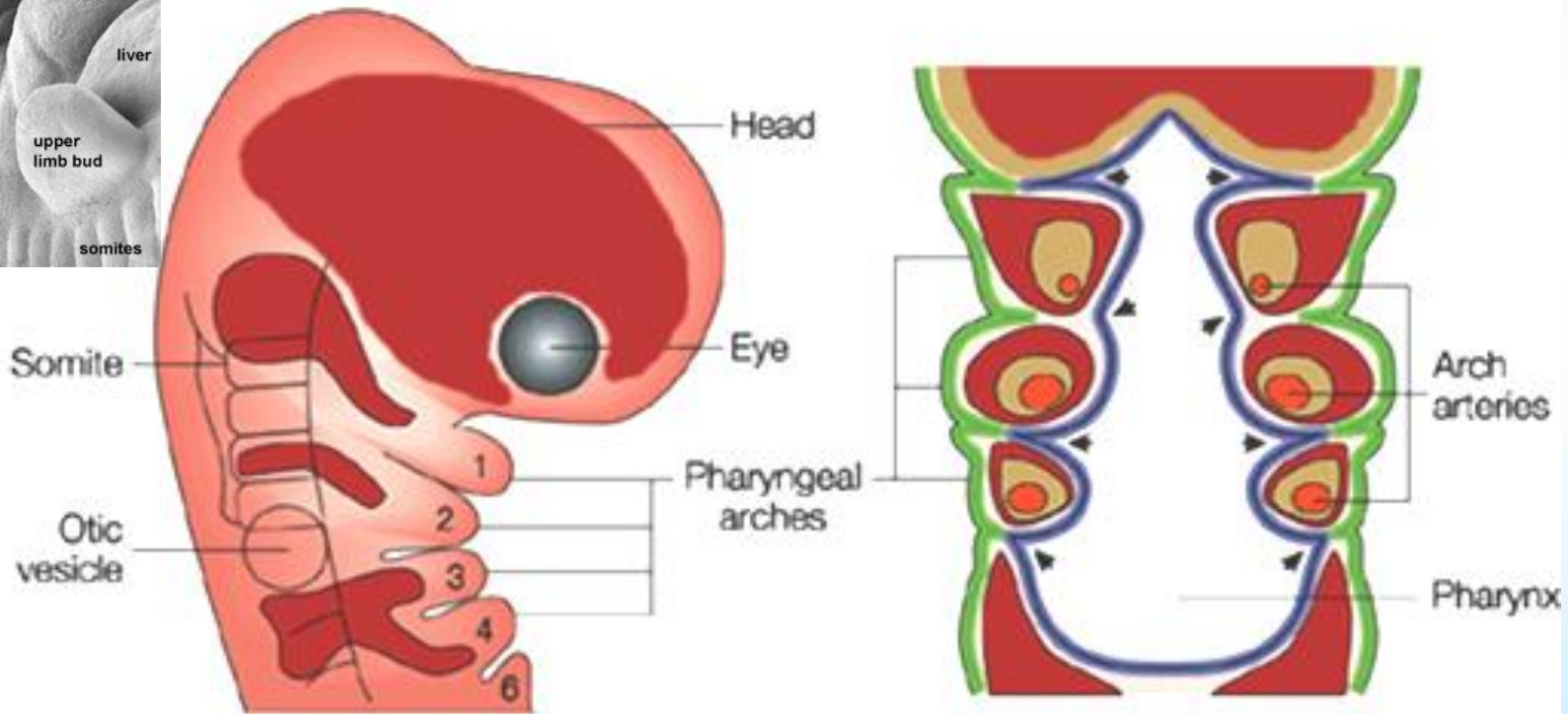
- Mesenchym um die proximale Ende des Neuralrohrs (bindegewebiger Kapsel des Prosencephalon)
- Neuralleiste (EKTOMESENCHYM)
- die erste 3 Somiten (sclerotom)
- Mesenchym der ersten und zweiten Kiemenbögen



WOHER STAMMT DAS CRANIUM?



Kiemenbögen und Schlundtaschen



■ Idegszövet ■ Ectoderma ■ Mesoderma ■ Endoderma

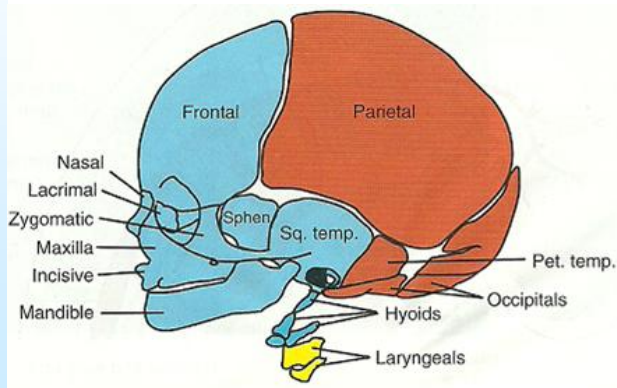
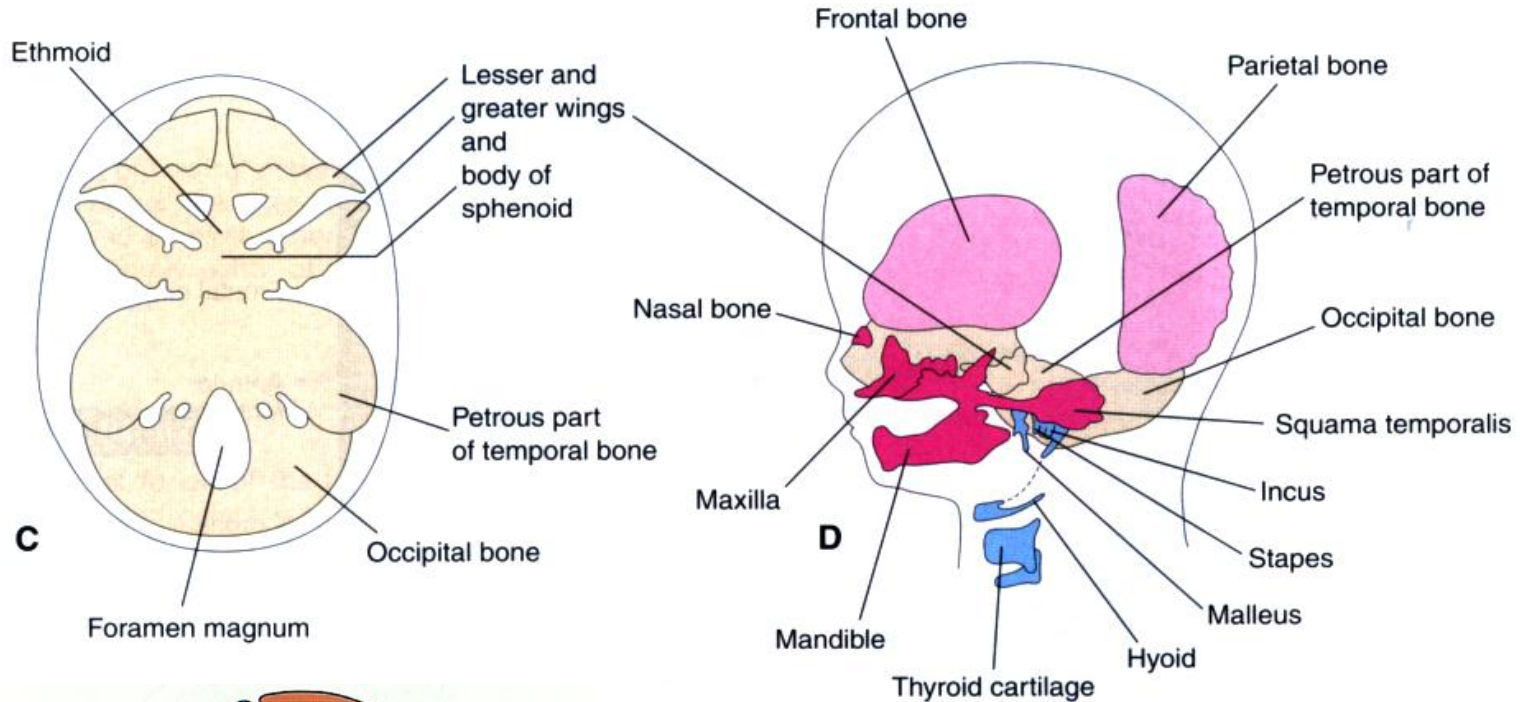
NEUROCRANIUM UND VISCEROCRANIUM

Cartilaginous neurocranium

Membranous neurocranium

Cartilaginous viscerocranium

Membranous viscerocranium



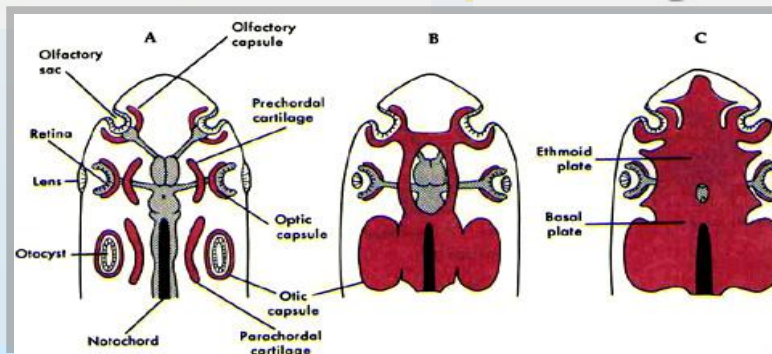
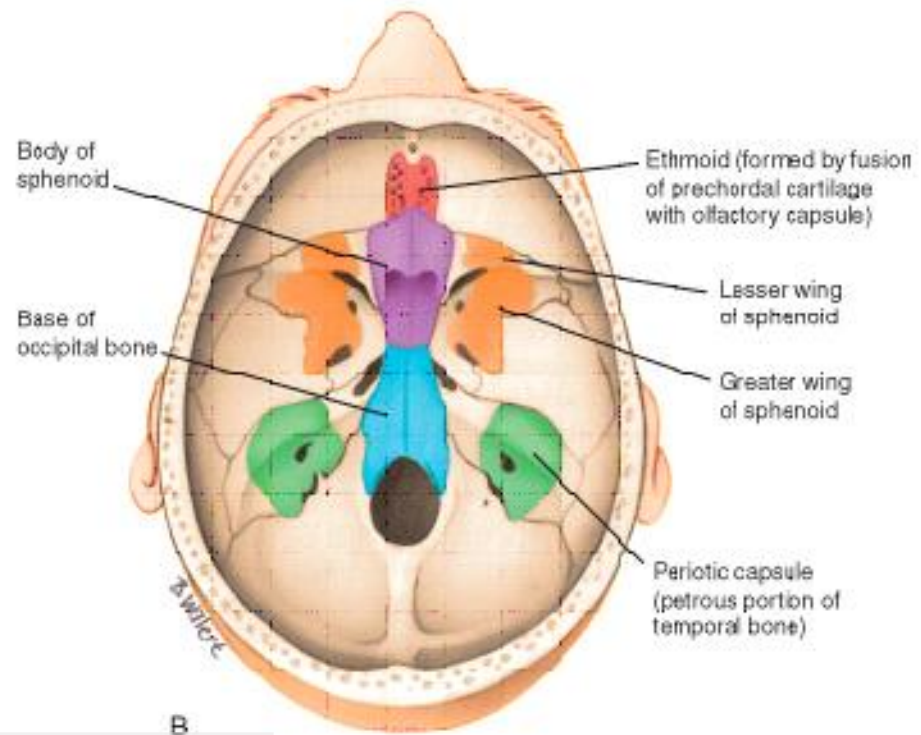
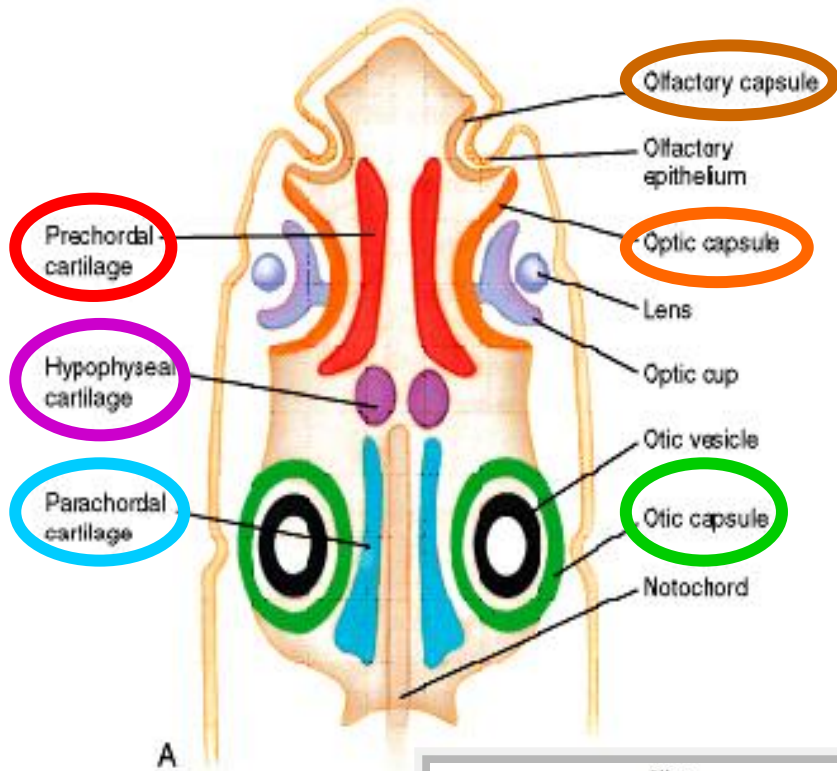
Blau – Neuralleiste

Braun – Paraxialmesoderm (somiten)

Gelb - Seitenmesoderm

NEUROCRANIUM - Chondrocranium

Woche 6



NEUROCRANIUM - Chondrocranium

parachordaler Knorpel

Knorpelanlage des
okzipitalen sclerotoms

Hypophysenknorpel
(um die Hypophyse)

Oticus Knorpelanlage
(um die Oticusplakode)

Nasenkapsel

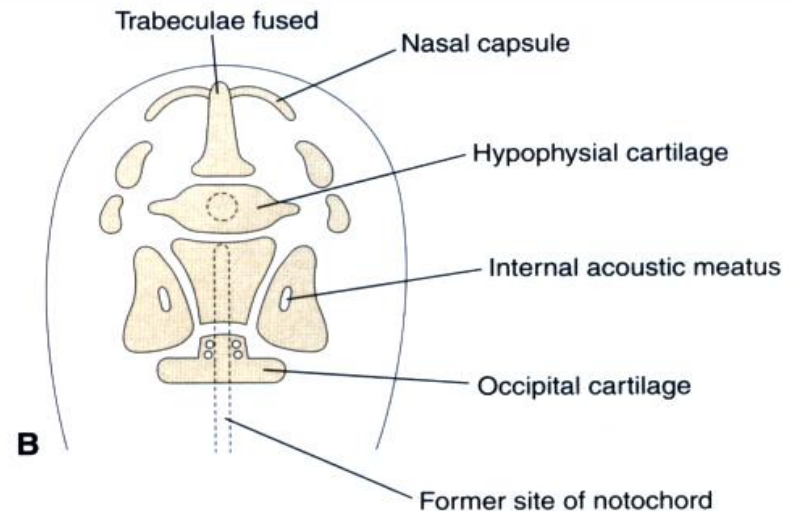
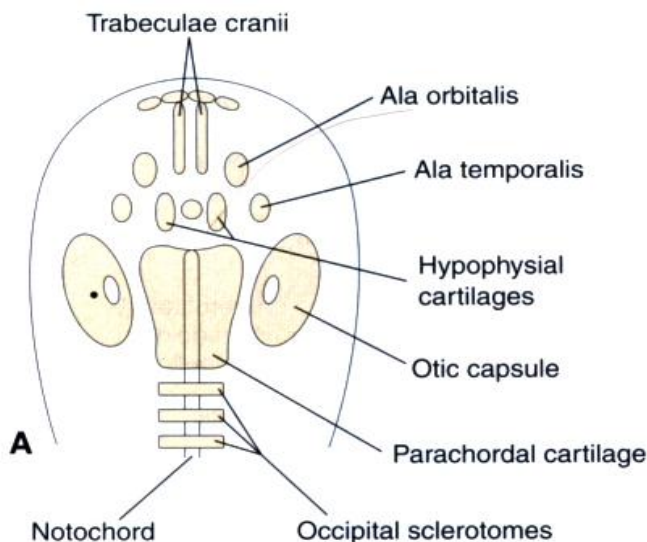


os occipitale um das foramen magnum

os sphenoidale corpus
ala major, ala minor, lam. lat. proc. pterygoidei

os temporale: pars petrosa, pars mastoidea

os ethmoidale, concha nasalis inferior, Nasenknorpel



NEUROCRANIUM - Chondrocranium

Vor der rostralen Ende der Chorda dorsalis

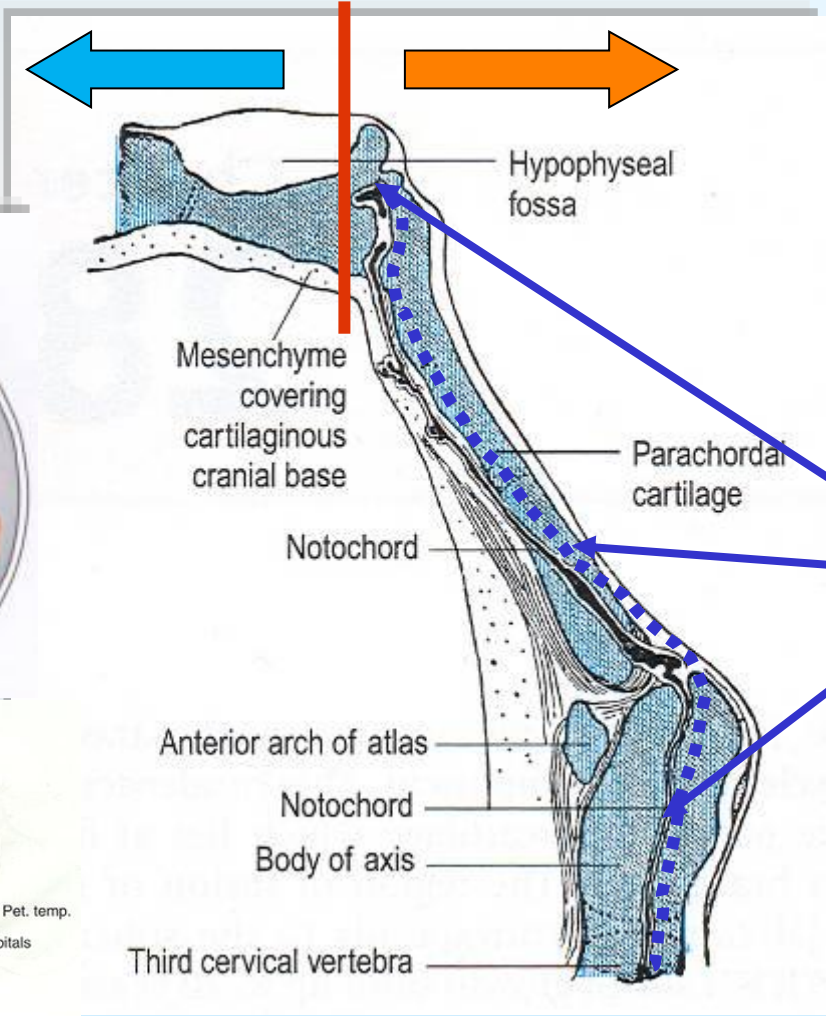
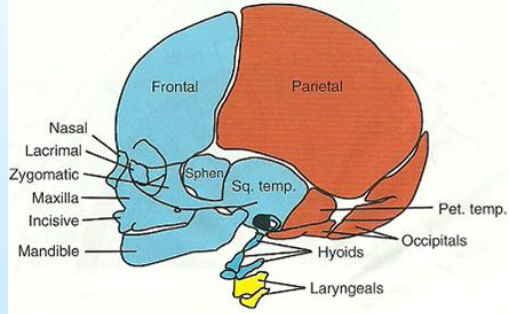
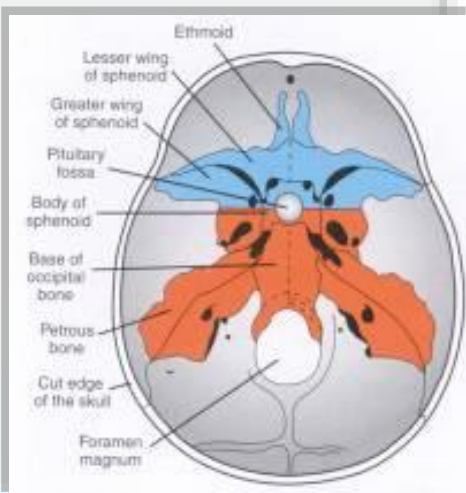
In der Ebene der Chorda dorsalis

Neuralleiste

paraxiales Mesoderm

praechordales Chondrocranium

chordales Chondrocranium



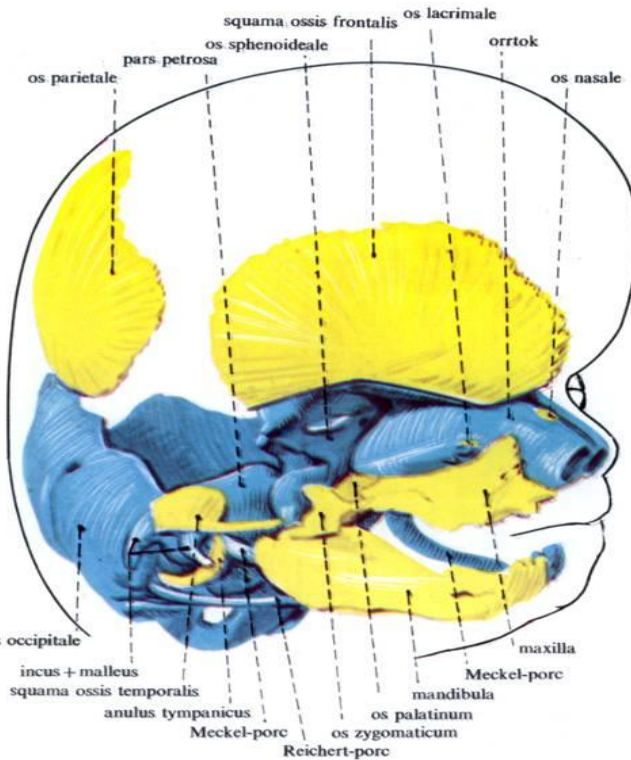
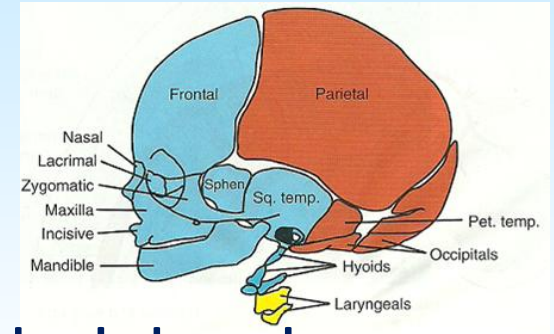
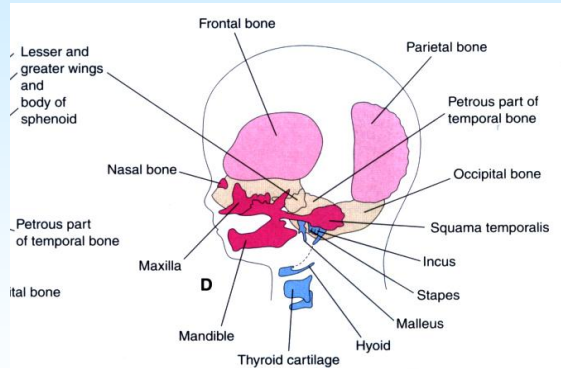
Chorda dorsalis

NEUROCRANIUM - Desmocranium

Flache Knochen:

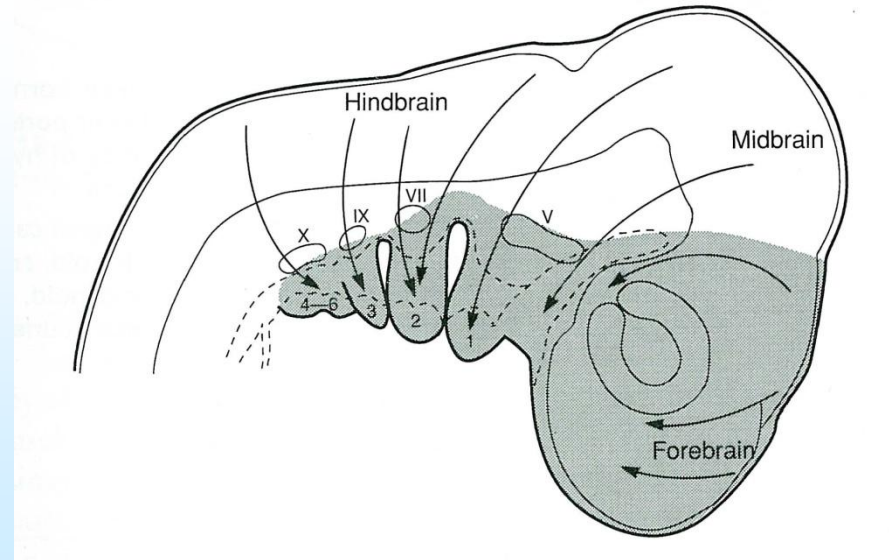
os frontale,
os parietale,
pars tympanica und
squama temporalis,
squama occipitalis,

**werden durch desmale
Verknöcherung gebildet.**



Die Zellen stammen aus :

Neuralleiste und paraxiales Mesoderm.



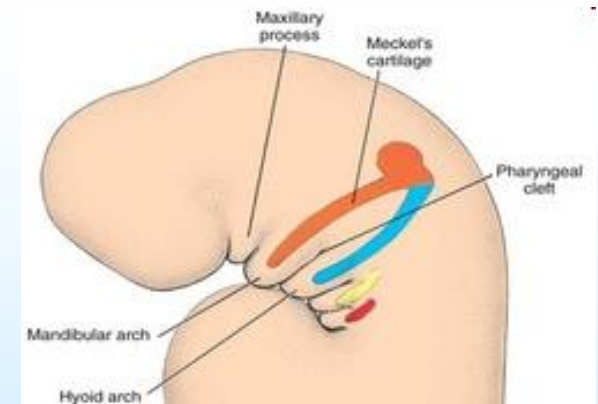
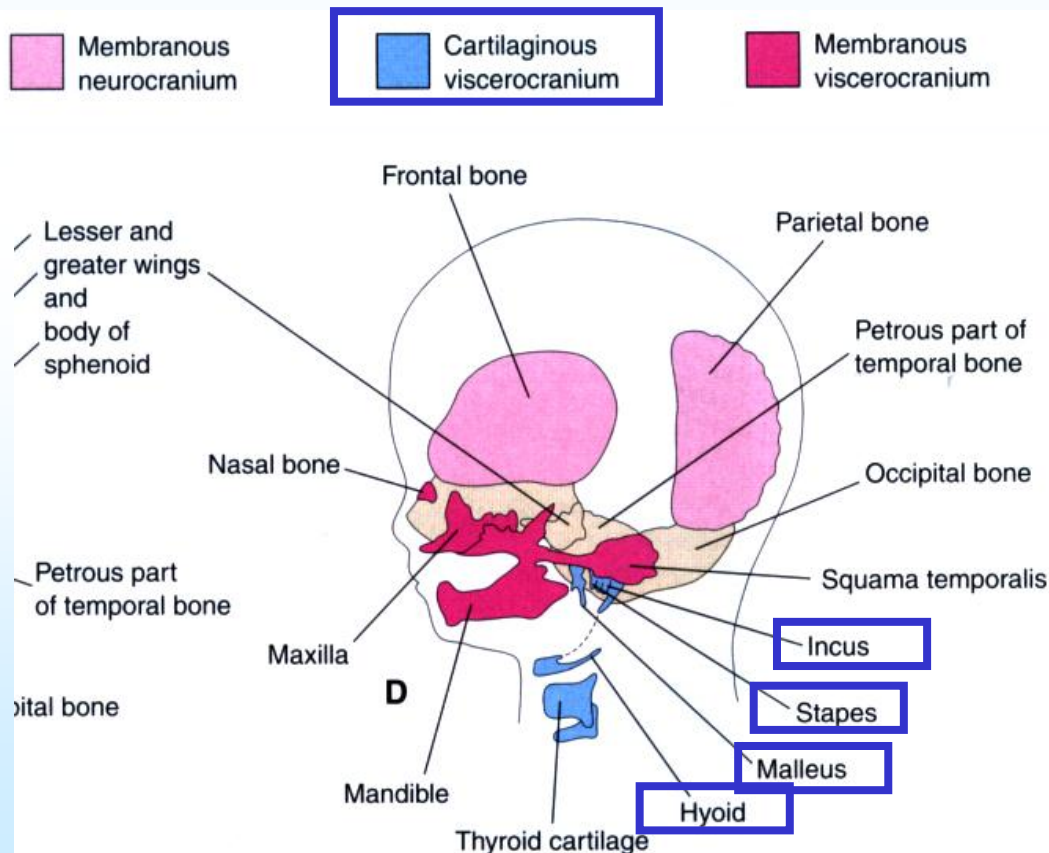
VISCEROCRANIUM - Chondrocranium

1. Kiemenbogen – (Meckelsche Knorpel) wird Hammer und Amboss

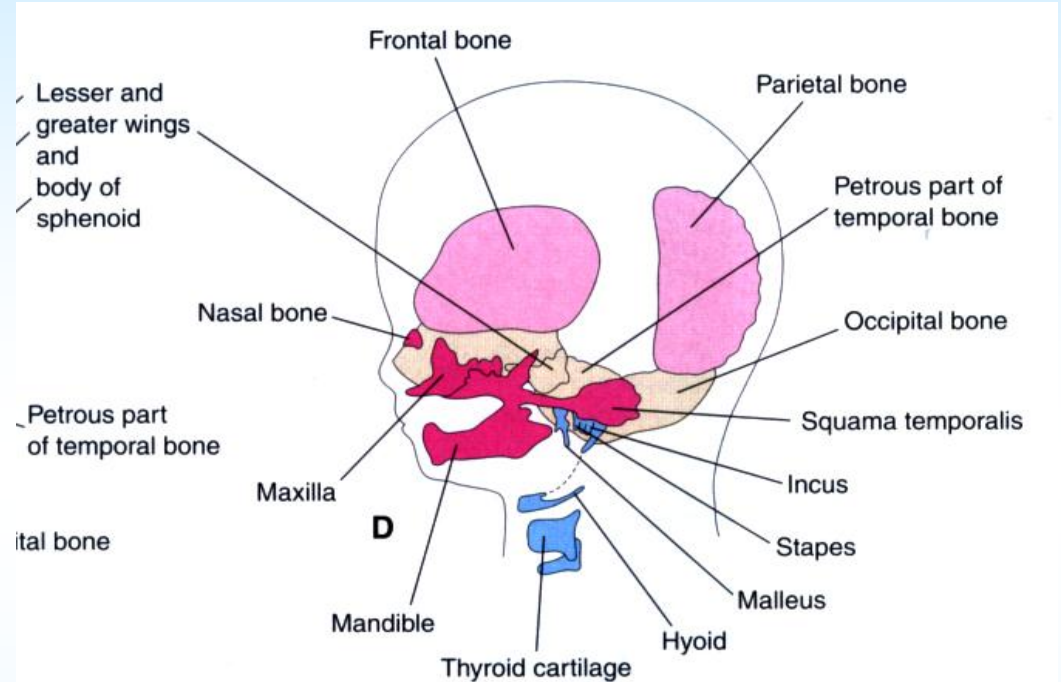
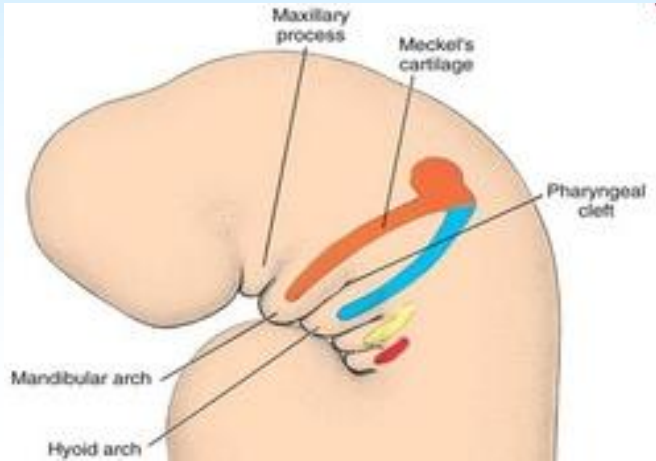
2. Kiemenbogen - (Reichert'sche Knorpel) wird Steigbügel

proc. styloideus ossis temporalis
obere Hälfte des Zungenbeinkörpers

Cornu minus



VISCEROCRANIUM - Desmocranium



1. Kiemenbogen

Dorsale subdivision

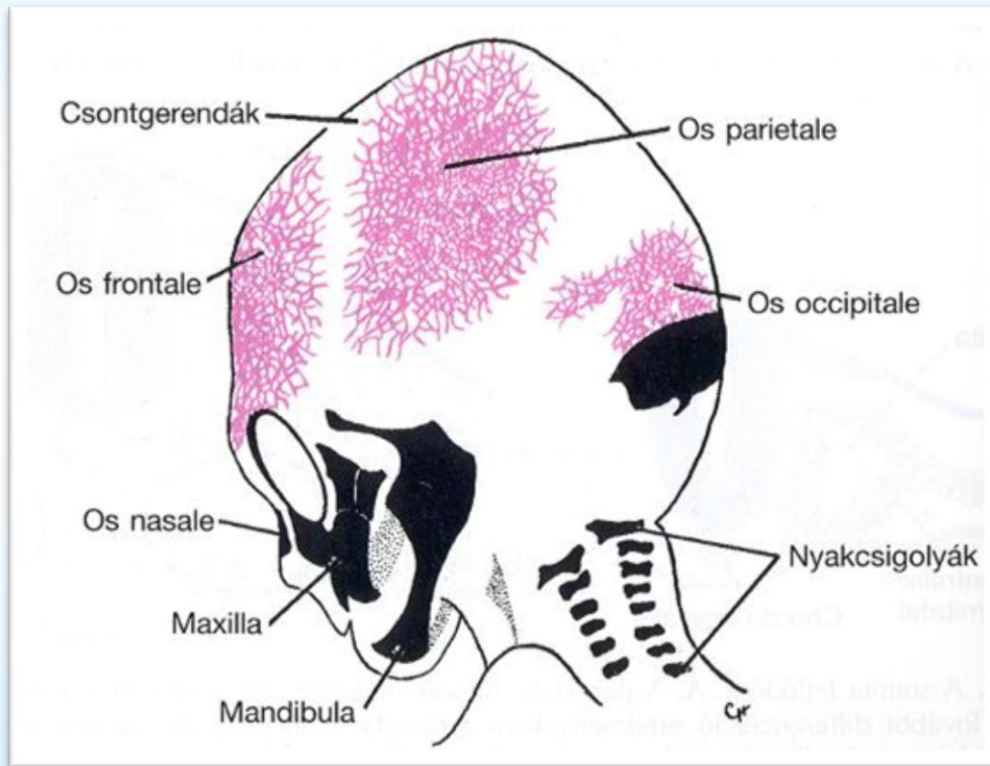
processus maxillaris – DERIVATE : maxilla, os zygomaticum, vomer und os palatinum, squama temporalis (später gehört zum neurocranium)

Ventrale subdivision

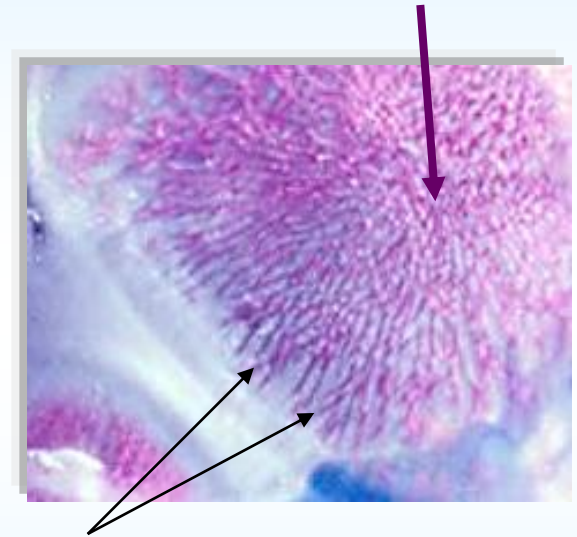
processus mandibularis (enthält den Meckelschen Knorpel) DERIVAT: Mandibula (ABER der **condylus** wird durch enchondrale Ossifikation verknöchert)

VISCEROCRANIUM - Desmocranium

3rd month



Primäres Ossifikationszentrum

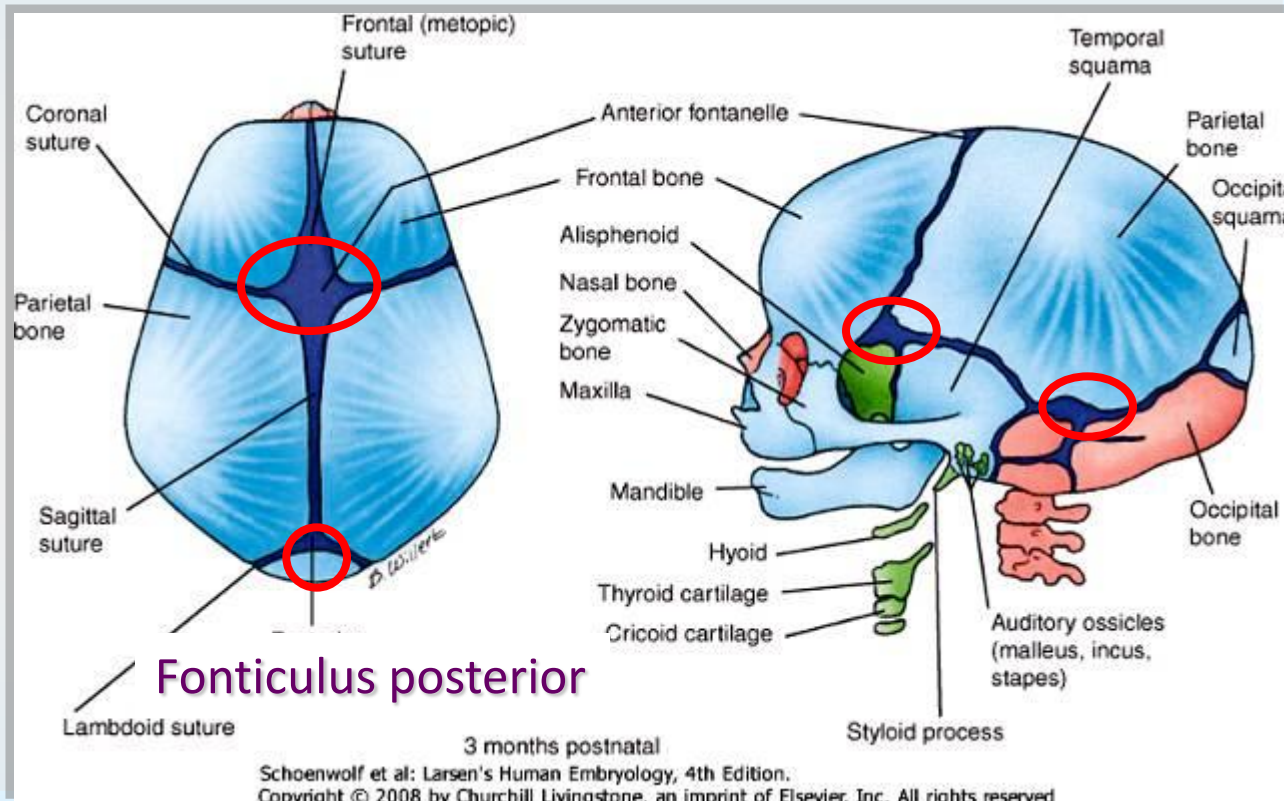


- radiär orientierte Knochenbalken (spiculum)
- flaches Knochen

VISCEROCRANIUM – Desmocranium

Suturae und Fontanellen

Fonticulus anterior

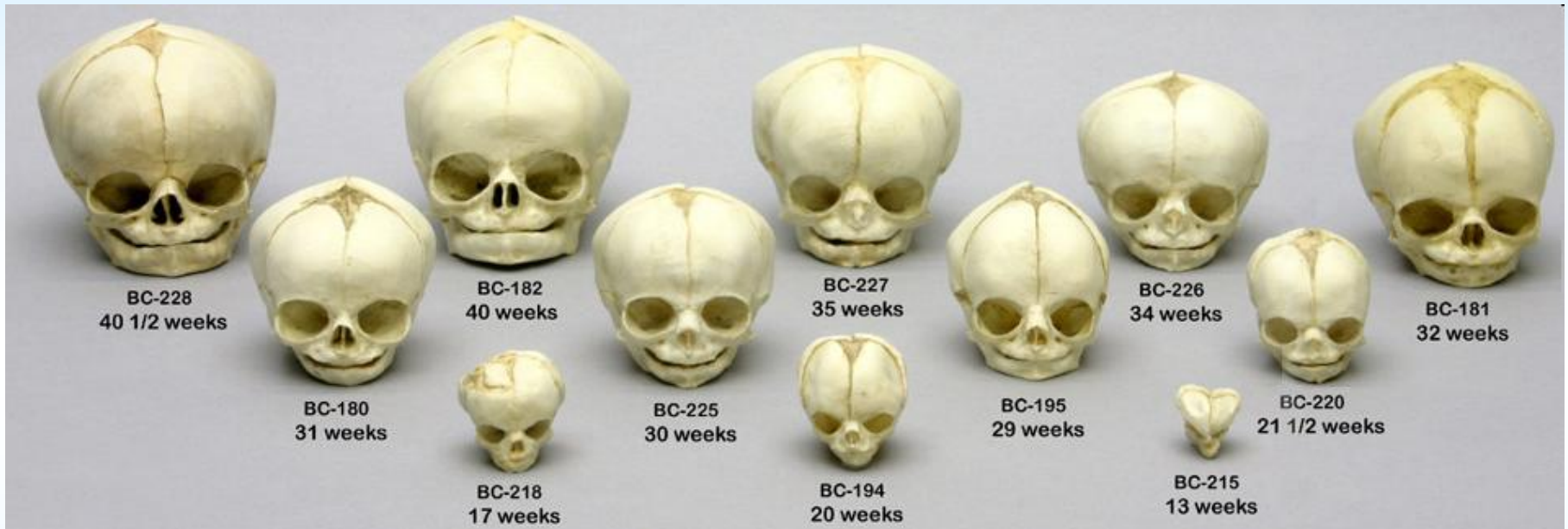


Fonticulus anterolateralis

Fonticulus posterolateralis

Das Bindegewebe von den Suturae/Fontanellen stammt aus der Neuralleiste und wirkt als ein ORGANIZATOR

VISCEROCRANIUM - Desmocranium



FETALES CRANIUM

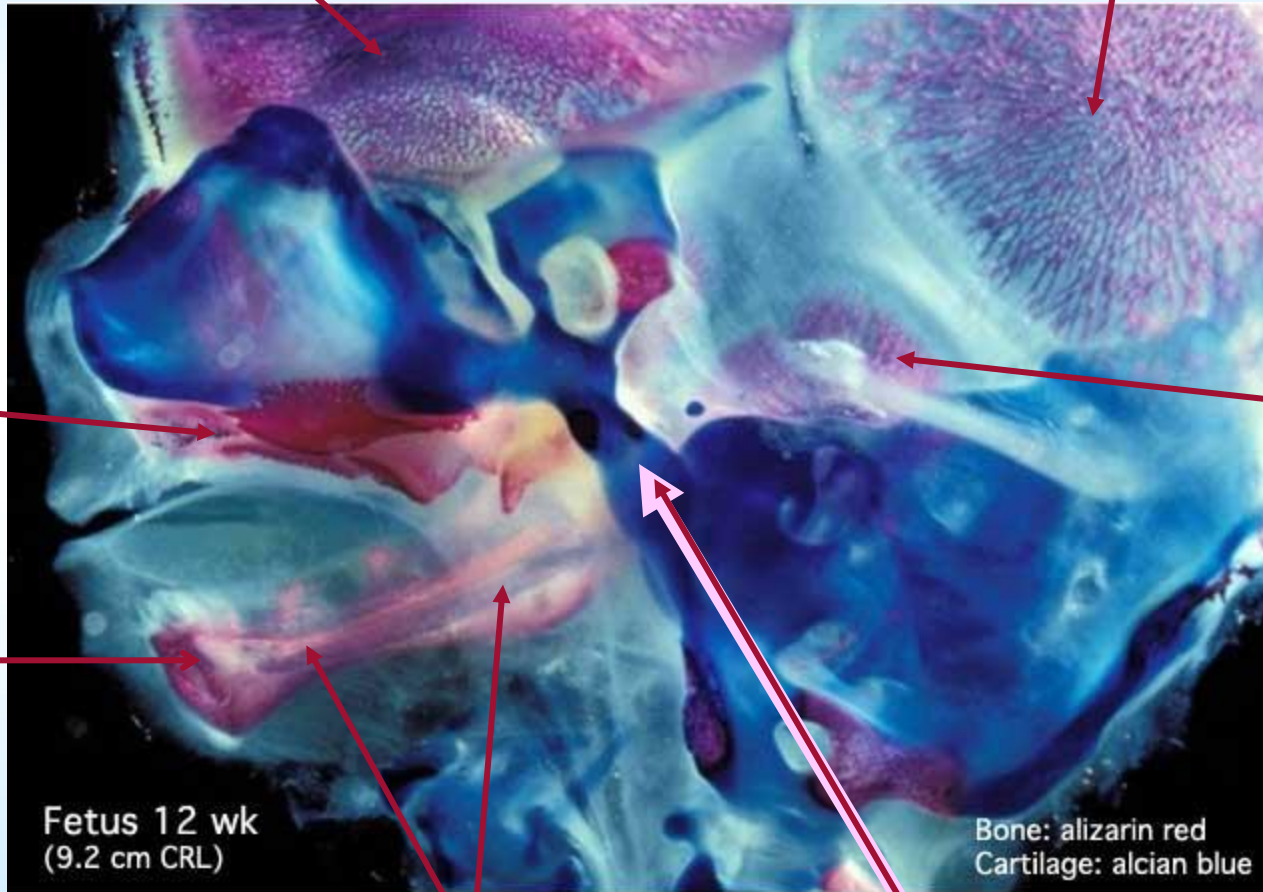
frontal bone

parietal bone

maxilla

temporal
squama

mandible



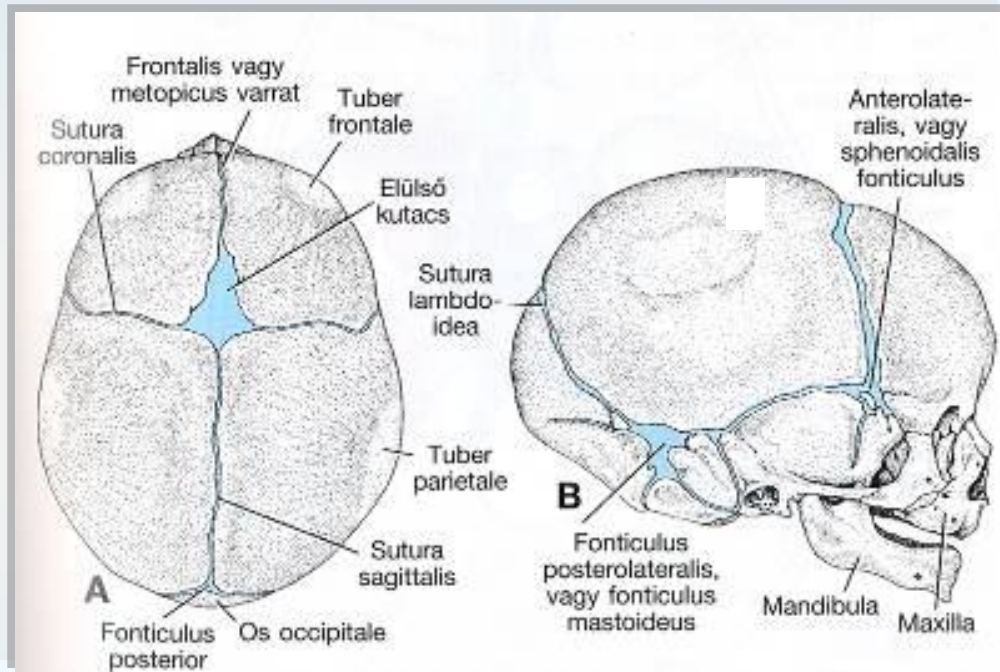
Fetus 12 wk
(9.2 cm CRL)

Bone: alizarin red
Cartilage: alcian blue

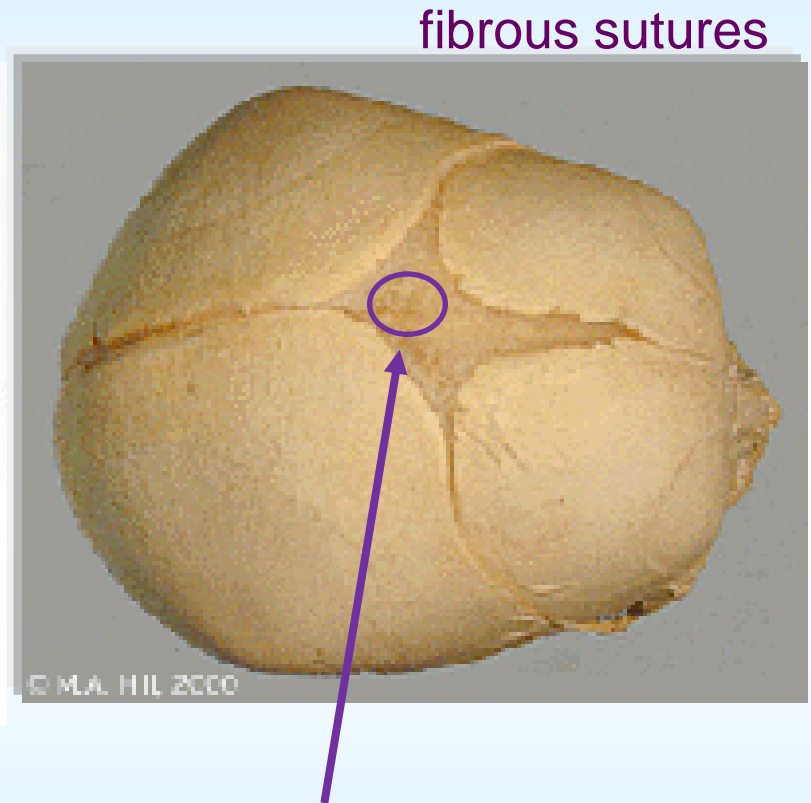
Ossifying Meckel's cartilage

chondral basicranium

NEUGEBORENE



anterior fontanelle
(closes in the middle of 2nd year)



Location of the parietal eye of reptiles
(phylogenetic relevance)



FEHLBILDUNG



Scaphocephalia



Turriccephalia



Craniosynostosis
FGF Receptor 3 mutation

FEHLBILDUNG



brachicephalia



dolichocephalia



trigonocephalia



INKABEIN – Variation

Knöchernliche Inklusion innerhalb der Sutura lambdoidea

A



B



Os (interparietale) incae