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**Chemistry.** — “*On the Enantiotropy of Tin (II).*” By Dr. ERNST COHEN and Dr. C. VAN EYK. (Communicated by Prof. H. W. BAKHUIS ROOZEBOOM).

(Will be published in the Proceedings of the next meeting.)

**Chemistry.** — “*The mixture crystals of Hg J<sub>2</sub> with Hg Br<sub>2</sub>.*” By Prof. H. W. BAKHUIS ROOZEBOOM.

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**Chemistry.** — “*On a new kind of Transition Elements (sixth kind).*” By Dr. ERNST COHEN. (Communicated by Prof. H. W. BAKHUIS ROOZEBOOM).

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**Chemistry.** — “*On Isodialdane.*” By Prof. C. A. LOBRY DE BRUYN and Mr. H. C. BIJL.

(Will be published in the Proceedings of the next meeting).

**Zoology.** — Mr. HUBRECHT presents on behalf of Dr. J. F. VAN BEMMELLEN: “*The results of a comparative investigation concerning the palatine-, orbital- and temporal regions of the Monotreme-skull*”.

### I. *Palate.*

In both *Ornithorhynchus* and *Echidna* the palate has been secondarily prolonged backwards, in consequence of their mode of life, and therefore independently of each other, and in two different ways.

The palatine bones of *O.* are as broad behind as in front, the pterygoïds being situated entirely along their lateral borders, quite unconnected with the bones forming the wall of the cerebral cavity.

In the *E.* skull on the contrary, the palatines are prolonged backwards into slender points, which causes the pterygoïds to find a place at the roof of the mouth much nearer to the middle line, between the oblique postero-exterior border of the palatines and the petrosa, thereby allowing them to enter into the formation of the cerebral skull-wall.

The horizontal mouth-plates of the *Echidna*-palatines are provided at their lateral border with two vertical wings: a larger one in front, forming the basal part of the wall of the orbital cavity, and a

smaller one behind, stretching upwards in the temporal groove and separating the foramen ovale from a large bipartite opening at the border of the orbita, which represents the united foramina rotunda, optica and spheno-orbitalia. In O. the first mentioned of these apertures is separated from the two following by a short bone-column.

At the ventral side of this temporal palatine-wing in E. we notice the front end of a tiny canal, which may possibly represent the homologue of the well-developed *canalis pterygoideus seu vidianus* of O., this latter running longitudinally along the margin of the palatine-plate, between *for. ovale* and *for. rotundum*. The difference is explained by the occurrence of a large artery in O., branching off from the *carotis interna*, crossing the tympanic cavity externally to the stapes, and entering the vidian canal to reach the orbital cavity. This artery, called *art. stapedia* by TANDLER, is absent in E., where the orbits are provided with blood by the *carotis externa*, but perhaps the small artery occupying the above-mentioned tiny canal is the last remnant of the *art. stapedia*.

## II. *Sphenoïd.*

The *corpus sphenoïdei* in E. appears long and slender, owing to the want of connection with *ali-sphenoïdea* (*alae magnae*). It shows a concave ventral side, caused by its curving down at both sides in slightly elevated but very elongated pterygoïdprocesses. At its hinder margin it is pierced by the *foramina carotica*, and laterally to these it is provided with backward prolongations of the *processus pterygoïdals*, viz. the *spinae angulares*. These latter are much more developed in O., where they extend over the ventral surface of the petrosa. In this animal they form a narrow partition dividing the *foramina ovalia* from the *choanae*, whereas in E. these two are separated from each other by the whole diameter of the pterygoïds, which also hide the *spinae angulares* under their projecting median edge. The *sella turcica* of O. is much more elongated in a sagittal direction than that of E. This contrasts with the extraordinary development in the latter animal of the *lamina cribrosa ethmoïdei*, which totally anchyloses with the sphenoïd. In O. no trace of such a cribrous plate can be detected.

The space of the *ali-sphenoïds* is occupied in E. by thin bony plates, separated by suture from all the surrounding bones: the *basi-sphenoïd* as well as the others. These plates ossify at a very late period, so late indeed that even in the almost adult skull a large *fontanella* is found in this spot, leaving the *for. ovale* not

encircled by bone at its lateral border. In the partly-ossified skull of a young *E.* removed from the pouch, this fontanella even extended to the foramina rotunda, optica and spheno-orbitalia, which all confluated into one large vacuity in the lateral skull-wall. The same fact occurred in the skull of an *Ornithorhynchus*-foetus: the bony plate that was going to close up this open space, was growing out from under the squamosal as a dermal bone. In this character it resembled the *postfrontale*, which is destined to anchylose with the orbito-sphenoid.

In consequence of this latter occurrence the orbital wings of the sphenoid reach an enormous size in Monotremes. The presence of *postfrontals* in these animals, resembling those of Sauropsids, already mentioned by SEELEY, is proved beyond all doubt by the investigation of the skulls of new-born individuals. The orbital wings of the sphenoid anchylose with the median corpus, in *E.* as well as in *O.*, thus contrasting with the alisphenoidplates in the former animal.

### III. *Petrosum.*

The petrous bone of *O.* is separated from the surrounding bones by three large perforations of the skull-wall; 1<sup>st</sup>. an anterior one, the foramen ovale, dividing it from the alisphenoid, 2<sup>d</sup>. a posterior one, the for. pro nervo vago et glossopharyngeo, separating it from the exoccipital (occ. later.); 3<sup>d</sup>. a median one, through which no structures enter or leave the cerebral cavity and which separates the petrosum from the basi-occipital.

In *E.* these holes are apparently wanting, but in reality they are all present, only they are lying much farther apart, and moreover the anterior and median ones are separated from the petrosum by the large pterygoid. The posterior opening is divided into two orifices, an anterior one which serves as an outlet to the nerves and is situated within the borders of the petrosum, and a posterior one, which is nothing but a fontanella, closing up in the full-grown animal and surrounded by the exoccipital. In *O.* the large size of the corresponding single opening is also due to incomplete ossification in the neighbourhood of the nerve-foramen.

This scattered position of the three apertures around the petrosum in *Echidna* brings this bone into an all-round contact with other bones viz. the alisphenoid, pterygoid, basioccipital, exoccipital and squamosal.

At the lateral wall of the skull the petrous bone of *E.* appears to be continued in a dorsal direction as a large patch of bone, but in

reality it is separated from this patch longitudinally by a suture that runs through the lateral part of the tympanic cavity. By its form and position this patch resembles the mastoïdal part of the temporal of other Mammals, but as for its size and independence, it may be compared to the opisthoticum and epioticum, taken conjointly, of Sauropsida.

This mastoïdal part of the skull-wall is a chondrostosis, which fact is in itself sufficient to forbid its comparison with a squamosal, a comparison one might otherwise be much inclined to make, considering that the dermal bone which is situated on its outer surface might easily be mistaken for the jugal, with which it shows many points of resemblance, and which, but for this hypothesis, must be considered as absent in the Monotreme-skull.

#### IV. *Arcus zygomaticus.*

The malar arch of Monotremes is made up of two bony processes, running side by side for the greater part of their length. The anterior belongs to the maxillary, the posterior to the above-mentioned dermal bone, that I take to be the squamosal. A jugal bone is totally absent in E. In O. on the contrary a little prominence occurs on the dorsal side of the arch, marking the limit between orbital and temporal fossae. In some skulls this prominence was found separated by a suture from the underlying zygomatic process of the maxillary. Most probably we may look upon it as the last remnant of a disappearing jugal. The foetal O. skull did not show any trace of it.

#### V. *Canalis temporalis.*

Between the squamosal and the wall of the primordial-cranium (mastoïdal bone), a canal is left open from before backwards in both E. and O.

In no other Mammalian skull a trace of such a canal was found. In E. it is longer but narrower, in O, shorter but wider. Its lumen is filled up with fibres of the temporal muscle.

Moreover in E. an artery penetrates into the skull-wall by the posterior opening of this canal, but immediately leaves it to continue its way through the diploe of mastoïdal, parietal and frontal as far as the ethmoïdal region. HYRTL calls it art. occipitalis.