If ice is found on the bulb with an air-temperature at or above freezing, it may be evaporated by the air-current, or melted off with water. The former method is preferable if the wet-bulb temperature is below freezing. If, on immersing, a drop is found at the bottom of the bulb, it can be easily removed before it freezes by touching with the edge of the reservoir.

With these precautions, an accurate determination of the moisture in the air may be made; and this must necessarily add to the value of hygrometric observations, which are so important in the study of the progress and development of storms. H. A. Hazen.

A STUDY OF THE HUMAN TEMPORAL BONE.[1]—III.

The temporal bone at birth consists of three osseous pieces suturally connected and partially anchylosed, but readily separable. The pieces are named the *squamosal*, *petrosal*, and *tympanal bones*. In some animals they remain permanently distinct, and in others are variously anchylosed. The squamosal and petrosal correspond in the main with the squamous and petrous portions of the temporal as usually described; but the so-called mastoid portion is derived from both the former. The squamosal contributes about one-third to the mastoidea, while the petrosal contributes the remainder.

The *squamosal* is a nearly circular upright plate which joins the petrosal at the *petro-squamosal suture*. This appears internally as a fissure, extending from the notch at the lower border of the squamosal, in front, to the notch at its border behind. Externally it descends from the latter notch to a position just behind the tympanal.

The mastoid portion of the squamosal is proportionately larger than later, and its auditory plate is less distinctly differentiated from the general plane of the bone. Internally it is defined by a shelf on which rests the contiguous border of the tegmen of the petrosal. Below the shelf, the auditory plate exhibits the smooth surface of the scute, which forms the outer boundary of the attic of the tympanum. The cellular portion above and behind forms the outer boundary of the mastoid antrum. The articular surface for the lower jaw is a shallow concavity, with scarcely a distinction of glenoid fossa and articular eminence; and it deviates relatively little from the general plane of the squamosal.

The *petrosal* obscurely displays the labyrinth, already of mature size and bounded by compact walls, embedded in more spongy substance, from which it may be readily excavated. The superior semicircular canal is especially conspicuous, and includes a large recess, which is subsequently obliterated. The tegmen appears as a distinct triangular plate projecting from the petrosal and overlapping the shelf of the squamosal. The tympanic cavity with its attic and the mastoid antrum are well produced, and are of nearly mature size.

The mastoid portion of the petrosal extends behind that of the squamosal, and is commonly partially anchylosed with it. Its upper extremity is notched to a variable degree; and its lower part exhibits a comparatively slight eminence, premonitory of the future conspicuous mastoid process.

The *tympanal*[1] is a horseshoe-like bone, with its ends anchylosed to the auditory plate of the squamosal. From this it slants downward and inward, and is suturally connected along its posterior and lower border with the petrosal. Its inner margin is grooved for the insertion of the tympanic membrane.

In the development of the temporal bone, the squamosal and tympanal are produced from fibro-connective tissue, and the petrosal and styloid process from cartilage. Ossification commences in the squamosal about the close of the second month of embryonic life; a centre appearing at its lower part, and extending upward in the squamous and mastoid portions, and outward in the zygomatic process. The following month, a centre appears in the lower part of the tympanal, and grows into a slender ring, incomplete above. Ossification commences in the petrosal near the middle period of foetal life. Two centres appear, and extend in the walls of the labyrinth. These centres have been appropriately named by Professor Huxley the *prootic* and *opisthotic*. They quickly coalesce to form the labyrinth, by the subsequent continued growth of which the pyramidal and mastoid portions of the petrosal are developed.

The prootic produces all that portion of the petrosal seen within the cranial cavity, except that which is contiguous to, and forms, the jugular fossa. It gives rise to the upper part of the cochlea, including its base and cupola; to the internal auditory meatus, the upper part of the facial canal and its hiatus, the upper part of the oval window, the superior and external semicircular canals, the upper arm of the posterior semicircular canal, and the tympanic tegmen.

The opisthotic produces all the petrosal seen

[1] Concluded from No. 17.

[1] Auditory process, annulus tympanicus.

beneath the cranium. It gives rise to the lower part of the cochlea, the promontory and lower part of the oval window, the round window, the lower arm of the posterior semicircular canal, the lower part of the facial canal, the jugular fossa, the carotid canal, and the floor of the tympanum.

The mastoid portion of the petrosal is produced, subsequent to the complete coalescence of the prootic and opisthotic, by outgrowths from the posterior and external semicircular canals. The outgrowth from the posterior semicircular canal first shows itself externally in the broad plate of cartilage which forms part of the cranial wall between the squamosal, the parietal, and occipital bones. It makes its appearance as an elliptical islet just in advance of the occipital. In this condition it has been viewed by Professor Huxley as a distinct ossific centre, to which he has given the name of the *epiotic*, regarding it as the specially mastoid part of the mastoid portion of the temporal bone. In my preparations, the elliptical islet has appeared as a continuous growth from the most prominent part, outwardly, of the posterior semicircular canal, after the completion of this by the co-ossification of its arms, which spring separately from the prootic and opisthotic. Later, a second element of the mastoid portion of the petrosal, as an outgrowth of the external semicircular canal, makes its appearance as a quadrate islet in the cartilage intervening to the elliptical islet and the squamosal. The two islets quickly unite, and thus together form the mastoid portion of the petrosal; the notch between them, above, still remaining at the upper extremity of the latter, at birth. From the anterior or quadrate islet, the mastoid process is subsequently developed, and not from the supposed epiotic, as has been asserted.

The squamosal and petrosal commonly anchylose in the external portion of the petro-squamosal suture, near the time of birth; and this portion of the suture is usually obliterated during the first or second year subsequently. Sometimes traces of it remain as irregular chinks, and rarely the greater extent or the whole of it may be retained, as represented in the accompanying fig. 3, from one of several similar specimens in the university museum. The suture is observed to descend from the notch at the upper border of the bone to the point of the mastoid process; and it thus indicates that the anterior third of the mastoidea pertains to the squamosal, while the rest alone belongs to the petrosal. The internal portion of the suture, commonly after some years, is but partially obliterated, and frequently remains, to a variable extent, as a fissure defining the tegmen of the petrosal from the inner surface of the squamosal.

The mastoid process, scarcely marked at birth, becomes conspicuous only after a year or two. The mastoid antrum is developed at birth; but the surrounding mastoid cellules undergo but little development until after puberty.

The external auditory meatus is produced after birth. The auditory plate forming its roof is gradually more differentiated from the rest of the squamosal, and its tympanic scute becomes more distinct by the production of spongy substance between it and the roof of the meatus. The floor and sides of the latter are produced from the tympanal ring, which becomes the tympanic plate of the more mature bone. Lateral processes grow outwardly from the ring, expand at the ends, and conjoin to form the auditory process, leaving an aperture in the tympanic plate. The aperture is obliterated about the third or fourth year, but occasionally is retained as an imperfection, closed by fibrous membrane. From growth downward and backward from the tympanal, the vaginal process and posterior extremity of the tympanic plate are produced.

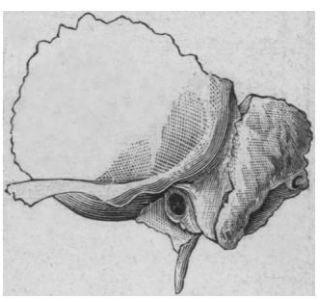

FIG. 3.—Temporal bone, one-half size, exhibiting the outer part of the petro-squamosal suture, permanently retained, and indicating the division of the mastoidea into a squamosal and a petrosal portion.

JOSEPH LEIDY.

THE NAPLES ZOÖLOGICAL STATION.[1]

II.

THE fleet of boats belonging to the station, to whose efficient services the constant supply of material is due, consists of two steam-launches and a number of row-boats and sail-boats. The larger of the steamers, named, after the great German biologist, 'Johannes Müller,' was given by the Berlin academy of sciences; while the smaller, the 'Francis Balfour,' was bought by the station. These are used for long excursions, being absent in summer sometimes for three or four days.

[1] Concluded from No. 17.