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The strengths of field used in all other exposures, could be determined by comparison of corresponding iron lines in the spectrum under review and in the standard iron-zinc spectrum.

The field strengths utilised were near 30000 Gauss. In the following table all separations are reduced to $H = 31965$ Gauss.

A calcite rhomb introduced between the spark and the focussing lens made it easy to get separate exposures of vibrations perpendicular to resp. parallel to the field. The plates used were Dr. SCHLEUSSNER'S Spezial Rapid plates. They were developed with Edinol.

In the following table $\delta\lambda$ and λ are given in Å.U. The wavelengths and intensities are taken from EXNER and HASCHER'S tables.

In the case of triplets and quartets $\delta\lambda$ indicates the difference of the wavelengths of the two outer components vibrating perpendicular or parallel to the lines of force. In the case of quintets for vibrations perpendicular to the lines of force the difference of wavelengths of the components towards red and violet to the central one are given. For vibrations parallel to the lines of force the data are given as in the case of triplets.

Probably some triplets can be subdivided further, but even an approximate knowledge of the magnetic separation of the iron lines has become recently of some value by HALE'S important discovery concerning the spectrum of sun-spots¹⁾.

I hope to give in my thesis references to the literature of the subject.

Anatomy. — "*The nervous system of a white cat, deaf from its birth: A contribution to the knowledge of the secondary systems of the auditory nerve-fibres*". By Prof. C. WINKLER.

Through the kindness of Prof. ZWAARDEMAKER, speaker got in his possession the nervous system of a white blue-eyed cat, which during life, though most carefully observed, never reacted on acoustic stimuli, consequently deaf from its birth²⁾.

This nervous system had been slightly damaged in the removing,

¹⁾ GEORGE E. HALE. Solar Voices and the ZEEMAN-Effect.

P. ZEEMAN. Solar Magnetic Fields and Spectrum Analysis. Nature. Vol. 78, p. 368 and 369, 1908.

²⁾ Prof. ZWAARDEMAKER writes on this subject the following:

"This white cat, born of a white mother with normal hearing (one albino-eye) was obviously deaf from its birth. At any rate it was kept under observation since birth, and never a single reaction on acoustic stimuli was obtained. Even

probably because the tentorium, ossified in these animals, had been drawn through the occipital pole of the hemispheres.

With the exception of this damaged portion it was possible to make a continue series of frontal sections, partly after the WEIGERT-PAL method, partly coloured by means of carmine, which could be compared with the existing series of frontal sections from brains of normal cats.

The first thing noticed was that the peripheral octavus-roots which were attached to the oblongata, although smaller than in the compared preparations, *had not suffered any change*. In accord with this fact no degenerations were found either in the lateral rootfibres upon the corpus restiforme, or in the rootfibres in the ventral nucleus of the VIIIth nerve, or in the deep medullated layers of the tuberculum acusticum (speaker exhibits the microphotograms demonstrating those rootfibres.)

Although these nuclei too are somewhat smaller than in the compared series, yet it is impossible *that the deafness of this cat should have been occasioned by a primary affection of the labyrinth*. For in that case the well-determined and distinctly confined atrophies would have been found in the systems of primary rootfibres, which are in all cases consequent to the removal of the labyrinth in newborn animals. (These atrophies are demonstrated by the speaker on preparations and microphotograms of brainsections taken from rabbits where the labyrinth had been removed shortly after birth).

Those atrophies however were not found in the brain of this cat. The more striking is the fact that a secondary system of fibres, the dorsal octavus-tract, the so-called stria acustica (v. MONAKOW)

"an express investigation with the continue note-series and with strong sound-stimuli gave only negative results.

"The statical organ on the contrary was proved to be perfectly normal. On the 7th of June 1908, shortly before death, this was carefully studied in my Laboratory.

"Climbing along the frame of a rotation apparatus was done in the normal manner, likewise leaping from a chair. During rotation, when shut up in a blackened chest, with an aperture on the upperside in order to facilitate the observing of what is going on within, nystagmus of the head and of the eyes was shown in the usual way.

"On stopping the apparatus, a typical instance was observed of the well-known after-rotation, described once again by Mr. VAN ROSSEM (Sensations and reflexes, having their origin in the semi-circular canals Diss. 1907, Utrecht).

"Upon the small experimentation-lift of W. MULDER, whilst seeing is excluded, all otolittic reflexes are recognized, and nowise impaired.

"During life the animal mewed."

in the deaf-born cat does not attain to $\frac{1}{4}$ of the compass that fascicle presents in the series taken for comparison.

The fibres originating in this fascicle and decussating in the raphe (the vigorous decussation of VON MONAKOW) are nearly all wanting. MONAKOW's decussation is represented barely by a few small fibres.

Likewise the fibres of HELD and their decussation are almost entirely wanting. On the other hand, the ventral secondary octavus-tract in the ventral layers of the corpus trapezoides is represented by a vigorous layer of fibres decussating in the raphe.

Together with the loss of MONAKOW's decussation the area at the dorsal and frontal top of the superior olivary bodies, where the fibres of MONAKOW's and HELD's crossings meet, is only represented by a few transverse sectioned fibres. It is wanting, and this deficiency in its turn is accompanied by a very important atrophy of the lateral lemniscus, more especially of its medial bundle of fibres. (The preparations and microphotograms illustrating this, are exhibited by the speaker).

Apparently nature did achieve in this cat, by some morbid process, a similar experiment as was made long ago by VON MONAKOW¹⁾, when he was the first who succeeded in isolating the dorsal octavus-tract by sectioning the lateral lemniscus.

For if the lateral lemniscus is sectioned, this so-called MONAKOW's decussation atrophies rather completely and the stria acustica is reduced to a small rest, whilst the large cells in the opposite tuberculum acusticum have nearly all disappeared and a certain number of cells are atrophied as well in the nucleus ventralis as in the portio interna corporis restiformis and in the nucleus of DEITERS. (The experimental loss and atrophy of those cells is demonstrated by means of preparations and microphotograms of brain-sections taken from rabbits, on which the section of the lemniscus had been performed directly after birth).

In the deaf-born cat almost all the large cells in the tuberculum acusticum have disappeared on both sides (and here — not in the loss of fibres — lies the cause of the slight decrease of the primary nuclei) whilst those in the dorsal portion of the nucleus ventralis, in the portio interna of the corpus restiforme and in the nucleus of DEITERS are partly atrophied.

This case therefore supplies a new argument in favour of the opinion *that the secondary system of true auditory nerve-fibres are to be sought for in the dorsal and intermediate octavus-tracts, in the*

¹⁾ C. VON MONAKOW. Striae acusticae und untere Schleife. Archiv für Psychiatrie. 1891. Bd. XXII. S. 1.

decussations of MONAKOW and HELD, and not in the ventral layers of the corpus trapezoides.

This opinion, put forward long ago by VON MONAKOW¹⁾ in opposition to the now generally accepted opinion of the school of FLECHSIG which presumes the course of the auditory fibres to be lying in the ventral systems of the corpus trapezoides, has been upheld by the speaker also once before.²⁾

The preparations from the deaf-born cat moreover enable us to find an answer to the question how this remarkable degeneration may be occasioned by a pathological process.

As is well-known, the roof of the 4th ventricle expands laterally into a so-called recessus lateralis, by which passes the tela chorioidea and consequently this latter is lying free at the ventral border of the oblongata.

At the entrance of this recessus, medial from the tuberculum acusticum (which forms the medial boundary of the recessus), the stria acustica is situated directly under the ependyme of the ventricle free at the surface.

Each hydrops ventriculi, tending towards dilatation of the recessus lateralis, becomes a danger for its surroundings, which may be oppressed either from the recessus lateralis as from the ventricle. It threatens to destroy successively first the stria acustica, next the tuberculum acusticum, and only after this latter the lateral root fibres become exposed. Now hydrops ventriculi may be caused by many different morbid processes, both of meningitis, ascending along the tela, and of encephalitis, complicated with ependymitis.

Now in this deaf-born cat we find hydrops ventriculi with a very important distention of the recessus lateralis, the tela chorioidea is thickened, with neo-formation of bloodvessels. The distention of the ventricle and that of its recessus undermined the lateral wall of the oblongata and the stria was pinched off. (This distention is demonstrated by the speaker on preparations and microphotograms).

Similar dilatations of the recessus with the tumefaction of the tela accompanying them, were found also in the IVth ventricle of deaf-and-dumb persons, together with atrophy of the stria acustica. The lateral root-fibres however were not always intact in such cases. They were sometimes destroyed, sometimes not. These facts will soon be published by Mr. A. BROUWER in his dissertation.

¹⁾ MONAKOW, l. c.

²⁾ C. WINKLER. The central course of the N. Octavus. Proceedings of the Royal Acad. of Sciences, 1907.

In our deafborn cat the hydrocephalus is nevertheless secondary to a morbid process situated elsewhere.

For in the left hemisphere are found the residua of a process of encephalitis having occurred long ago, in casu before birth.

This focus is situated in the left corona radiata and in the radiation of the corpus callosum. The cortex remains uninjured. Loss of fibres, tumefaction of glia-elements, formation of cavities and neo-formation of vessels mark the place where the focus is found.

Frontalward its boundary nearly coincides with the place where the gyrus lateralis divides into a gyrus ecto- and ento-lateralis. Thence it expands below the gyri supra- and ecto-sylvii mediales, caudalward not passing beyond the fissura ecto sylvia posterior. There is a secondary atrophy of the medullated radiations of the following convolutions: the gyrus splenialis, supra-splenialis, ecto-lateralis, supra-sylvius medialis and ecto-sylvius medialis and in the lateral portion of the gyrus ecto-sylvius posterior. (Speaker demonstrates the position of this focus with the aid of drawings, preparations and micro-photograms).

This morbid process has entailed consequences.

1. The hydrocephalus internus mentioned before, which has distended the lateral ventricles, the third ventricle, the aquaeductus and the fourth ventricle, in the latter mere especially the recessus lateralis.

2. The macroscopically visible atrophy of the radiations towards the aforesaid convolutions and in the fibres of the corpus callosum.

3. The atrophy of cells, more intensive in the before-mentioned convolutions, though also very evident in other convolutions of the left hemisphere and likewise in the right hemisphere.

A loss of cells does not exist in the anterior convolutions, it begins far behind the zone where the pyramides of BERTZ are found. The posterior pole was too much damaged to allow of any examination. But in the medial portions of the brain the degeneration is the following:

The loss and atrophy of cells is localized in the medial layers of cells of the cortex. The first layer of granular cells and that of the small pyramides are only slightly damaged, but the 4th stratum or interior granular layer and the 5th so-called sub-granular layer of the pyramides have lost all or a great number of the cells, the 6th or polymorphous layer of cells being again intact.

4. A macroscopically visible atrophy of the ventral nucleus of the left thalamus opticus, which has almost entirely disappeared at its frontal end and has lost cells as well as fibres.

5. A very slight atrophy in the most caudal part of the left

corpus geniculatum mediale, the more remarkable because therein many cells are lost, only there, were the brachium conjunctivum from the ganglion quadrigeminum posticum enters in the corpus mediale. At the same time the atrophy in the left brachium conjunctivum is more important than that on the right side. The preponderance of the atrophy in the left brachium, in accordance with the atrophy of the lateral lemniscus described before, is considered by the speaker as being occasioned by the encephalitic process. This focus was not situated (or only to a very small extent) in the temporal radiation of the corona radiata. It is not followed by an intense atrophy in the homolateral corpus geniculatum mediale, and therefore, cannot in itself be held answerable for the auditory defect of the animal.

This deaf-born white cat with the blue eyes consequently may not be considered to be a deaf variety of the genus cat. It is a pathological product. An encephalitis, probably during the intra-uterine life, has destroyed a part of the left hemisphere (not the so-called auditory radiation) and occasioned a hydrocephalus internus. Its pressure became a danger to all the systems at the surface of the ventricles. More especially those systems were endangered that were threatened from both sides by compression according to their position on the border of the recessus lateralis. The stria acustica was destroyed in that way.

Botany. — “*On the investigations of Mr. A. H. BLAAUW on the relation between the intensity of light and the length of illumination in the phototropic curvatures in seedlings of Avena sativa.*” By Prof. F. A. F. C. WENT.

Some years ago WIESNER¹⁾ attempted to ascertain, what is the minimum intensity of light to which various plants still react phototropically. He found, for instance, that with the epicotyl of *Pisum sativum* and the hypocotyl of *Lepidium sativum* the limit of sensitiveness is not yet reached at 0.054 normal candle power. (WIESNER expresses it in a unit which is equal to 6.5 Spermaceti candles). For the epicotyl of *Phaseolus multiflorus* the limit is exactly at 0.054 normal candle power. While in this case, the author does not mention the duration of the experiments, he states for the epicotyl of

¹⁾ J. WIESNER. Die heliotropischen Erscheinungen im Pflanzenreiche. Wien 1878. p. 178—180.