Reviews.

Die Entwicklung des menschlichen Gehirns während der ersten Monate. Von WILHELM HIS. (S. Hirzel, Leipzig, 1904. pp. 176).

THE appearance of this monograph scarcely preceded its lamented author's death, and his precision and genius are so evident throughout it, that we cannot but regret it is the last work of one who has added so much to our knowledge of this branch of cerebral anatomy, who, in fact, almost created it.

His's apparent idleness during the past few years has been deliberate, as it has seemed to him advisable to allow the results of this fruitful period of the study of brain anatomy to accumulate, before concluding his work on its development.

As this volume only contains what has seemed to him definitely certain, it is incomplete in many respects, and is besides, in great part, a reiteration of his earlier publications, when he has been able to confirm or amplify the facts they contained.

His available material had increased to fifty-four embryos, ranging in age from two weeks to the end of the fifth month, and to their study the same method of reconstruction from microscopical sections was employed. He commences with description of the histological development of the neural tube. The spindle-shaped spongioblasts, the elements of the myelospongium which have developed from the primary epithelium, are arranged radially, and by the syncytial confluence of the protoplasm of their two ends two concentric layers, the laminae limitantes interna and externa are formed, while the nuclei of the cells lie chiefly in the intermediate zone. These three concentric zones are very apparent after the fourth week, and represent the first differentiation of the neural tube. Later, another layer comes into existence in the outer surface of the tube, the Randschleier, a protoplasmic net free from nuclei. The neuroglia develops only from the myelospongium through the intermediate stage of Deiter's cells; no mesoderm cells migrate into the

neural tube as His formerly maintained. The neuroblasts which begin to appear on the border of the *membrana limitans interna* arise by the unilateral outgrowth of the protoplasm of germ cells, whose nuclei divide by mitosis. Distinction between these and the spongioblasts is at first very difficult, and can only be definitely determined by their connections with nerve-fibres. All nerve cells, no matter how complex their later arrangement, have their origin in the central portion of the neural tube, and the organisation of the system is dependent on the migration of its cells, and on the arrangement of the fibres which spring from them. The former may remain at the site of their origin, as in the spinal cord; they may migrate to the surface, as those of the cortex of the cerebral hemispheres; or may otherwise change their position in the matrix, as do the cells of the inferior olives and of the pontine ganglia.

All his recent observations support the author's original contention of the origin of each nerve-fibre as the process of a single cell. He argues against Bethe that the origin of fibrils from the cells of the sheath of Schwann has not been definitely proved, free from objection, as there is much room for the misinterpretation of the histological appearances. Further, in mammals the sheaths of Schwann and their nuclei appear relatively later than in the lower vertebrates, on the study of whom Bethe's statements are based, and in man the bundles of nerve fibres are distinct before their appearance. Further, Bethe's observations cannot be applied to the central nervous system.

The development of the ventral portion of the neural tube precedes that of the dorsal. During the first month of embryonic life nerve fibres begin to develop, the first being those of the ventral spinal roots, but soon later the sensory fibres, and, almost simultaneously, those of the *acusticus* appear. The olfactory fibres can only be seen some time later, and the optic are the last to develop.

The first intramedullary bundles which can be made out are those of the ventral columns. These are chiefly composed of arcuate fibres springing from cells in the dorsal portion of the cord, which enter them directly, or after having decussated in the ventral commissure, but, in addition, cells lying in the ventral portion of the cord give origin to fibres which run longitudinally. At this time the dorsal columns only contain the fibres of the neighbouring roots, and their further development is chiefly due to the longitudinal growth of these.

The metencephalon undergoes analogous changes, but at a

somewhat later period. A ventral commissure of arcuate fibres, similar to that of the cord, which extends from the cervical region to the isthmus, is developed early. So also are the fibres of the dorsal longitudinal bundles, each of which is probably a complex of shorter tracts, which extends caudalwards into the ventral columns of the cord. In the first month, while there are scarcely any neuroblasts in the dorsal portions of the mid-brain or hemispheres, a continuous chain of them extends along the border of the hypothalamus from the optic vesicles to the mid-brain.

The development of the fore-brain is more complicated. The hemispheres appear early, even before the closure of the neuroporus, as rounded evaginations. The rhinencephalon develops basal to the neuroporus, and so cannot at any stage be confused with the pallium, and the corpus striatum from a depressed triangular area ventral and rostral to the hemispheres, and dorsal to the hypothalamus. In the beginning of the second month the primary longitudinal fissure rapidly deepens, and separates off the lateral ventricles from the primarily single cavity. The hemispheres also increase in size and begin to project over the 'tween-brain, and the rhinencephalon is definitely separated from the thalamus.

His joins in the discussion as to the nature of the so-called transitory furrows of the hemispheres, and comes to the conclusion that they are only the result of *post-mortem* shrinkage. The only definite indication of the existence of a true furrow is the thickening of the soft membranes opposite it, or their projection into it.

The hemispheres develop rapidly from the second month till, in the fourth, they have attained almost their normal form. The development proceeds from the region of fusion of the pallium and corpus striatum toward the apex, and, last, to the mesial surface. It is there that the first germ cells, which, by mitotic division, produce the future cortical cells, are found in the inner layer of the hemisphere. The pyramidal cells slowly migrate from the ventricular surface through the thickness of the hemisphere wall into the cortical layer, the first reaching it in about the eighth week. They are generally bipolar structures, with the longer and more definite process directed centralwards. They further differentiate and change their form as they pass out, and accumulate till the cortical zone contains several layers of them. They first appear in the mesial surface of the hemisphere in the third month, but that portion of it and the caudal end of the rhinencephalon where the two hemispheres later fuse and from which the corpus callosum and fornix develop, remain free from cortex.

In the second month the first fore-brain bundles appear; these, which are the thalamic radiations to the pallium, come from the region of the internal capsule, and break up in the lateral surface of the hemisphere. The steady increase in thickness of the hemisphere walls is chiefly due to growth of its intermediate layer (*Zwischenschicht*), and it is later at the expense of this that the convolution of its surface is effected.

The corpus striatum develops *pari passu* with the pallium. Its anterior end is early divided into three limbs by the *Fissura epirhinica*, *F. mesorhinica*, and *F. metarhinica*. The anterior limb fuses with the lateral wall of the anterior olfactory lobe, and the posterior with the mesial wall of the hemisphere, their union being the structure through which the fornix passes on its way to the corpora mamillaria. The ventro-caudal end of the nucleus caudatus develops considerably later. Then, as the hemisphere bends over the 'tween-brain, the nucleus caudatus curves into semi-lunar shape, with its anterior end resting on the rhinencephalon and its caudal in the inferior horns of the lateral ventricle. The appearance of the internal capsule in the third month divides off the nucleus lenticularis. Embryologically considered, this, with the claustrum, is a portion of abortive cortex rudiment.

From the end of the second month the pallium exceeds the rhinencephalon in size. This is divided into a rostral and a caudal portion by the *F. mesorhinica*; from the former the olfactory bulb and trigenum develop, and the latter forms the trapezoid area (*Trapezfeld*) from which the central connections of the olfactory system are developed, and which is of considerable importance in the secondary fusion of the hemispheres. The anterior commissure results from fibres which grow through the secondary fusion of the two trapezoid areas; it first appears in the eleventh week, and its development is complete in the middle of the third month. Similarly, the corpus callosum and fornix develop from the fusion of the limbic areas of the mesial walls of the hemispheres. At first only the middle portion of the former appears, the genu and splenium being of later formation.

The development of the cerebellum begins later than that of the hemispheres. At the end of the second month a prominence appears on each side of the metencephalon, and these two, having increased in size, fuse medially. The earliest portion of the corpora restiformia only contains olivo-cerebellar fibres, whose termination in the vermis is very easily followed.

A concise table shows the dates of the successive appearances of the intramedullary tracts, the spinal root of the trigeminus,

the fasciculus solitarius, and the dorsal longitudinal bundle being among the first to appear, and the cortico-spinal and pontine bundles the last.

The monograph is so replete with facts, newly discovered or authoritatively confirmed, that an adequate summary of its contents would require more space than is here available.

Only one feature offers itself to adverse criticism. The volume is liberally supplied with illustrations, but the majority of these are photographs, often of sections under high magnification, which leave much to be desired in distinctness. They have evidently been deliberately preferred to drawings or diagrams, that the author may represent exactly what he sees; but he has been able to examine them under conditions very different to those of his readers, and they, on the other hand, are ever ready to assume so much scientific honesty on his part as to allow him to temper exactness with clearness. The lack of any lettering on the illustrations often gives considerable trouble in exactly determining what is described, and frequently necessitates repeated reading.

GORDON HOLMES.

Jahresbericht über die Leistungen und Fortschritte auf dem Gebiete des Neurologie und Psychiatrie. VI. Jahrgang. Bericht über das Jahr, 1902. (Published by S. Karger. Berlin, 1903. Price 35 marks.)

THE sixth volume of this *Jahresbericht* contains a catalogue of all the papers published during the year 1902 on Neurological and Psychological subjects. Not only is it a catalogue, but it also contains a digest of the most important papers on the various subjects. To all those who are engaged in looking up the recent literature of a subject this work is invaluable, for, in many instances, when from the title of the paper it might be considered necessary to look up the original article, the reference to the digest of the paper will show whether it has bearing on the subject under consideration or not. How completely each subject is reviewed may be judged from one instance taken at random, viz.,