Abstracts.

Neurology.

NEURO-ANATOMY AND NEUROPHYSIOLOGY.


The author points out the danger of forgetting the general integration of the functions of the body in paying too much attention to the specific functions of various organs or parts of organs. The cerebral cortex is more differentiated than any other organ, and yet by virtue of the correlative function essentially a unit in itself. Much attention has been given to superficial localization of the cortex which divides it up into functionally differing regions and areas, but not so much to the deep localization, i.e., to determining the functions of the various layers of cortex perpendicular to the surface of the brain.

In 1884 Meynert described six morphologically distinct layers of the cortex, which, with the help of the investigations of a number of workers into the comparative anatomy of the nervous system, can be studied phylogenetically. In 1909 Kappers concluded that, excluding the superficial layer of fibres, the neocortex may be divided into two functionally distinct layers: (a) an outer supragranular layer (laminae 2 and 3) predominantly associative, receptive, and sensitive, and (b) an inner infragranular layer (laminae 5 and 6) predominantly corticofugal and commissural. Between the two is the granular layer (lamina 4), which Kappers considers is receptive and associative within the hemisphere and may also serve as matrix to lamina 3.

Nieuwenhuijse describes the cortex as an organ consisting of at least two organic parts relatively independent of one another, a peripheral part consisting of the four outer laminae, and an inner part consisting of the two inner laminae. Bielschowsky, in 1917, came to the same conclusion as Kappers in respect of deep localization from his studies of two cases of cerebral hemiplegia.

Dubois, on mathematical grounds, emphasized the fact that the receptor functions in larger animals increase more than effector functions, and therefore in light of the foregoing arguments an increase in the supragranular layers might be expected in them, which is precisely what the author has found in an investigation of the cortex. In the larger animals there was a constant decrease in the extent of the granular layer, giving the impression that the increase in height of the supragranular layers occurs at the expense of the granular layer. He concludes that the granular
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cells should be considered as matrix cells capable of giving rise to any sort of differentiated cell.

The author summarizes the results of his investigations as follows: (1) The supragranular cortex layers are recepto-associative; (2) The functional nature of the granules is also receptive and associative in the post-central region; (3) The granular cells should be conceived of as matrix cells not only in the fascia dentata, but also in the neocortex. It is surprising no reference is made in this paper to the work of Shaw Bolton in England.

R. G. GORDON.


In the newly-born we notice movements of all the limbs of such a varied nature that we cannot understand either their sense or their utility. The more the infant is excited the more he moves his limbs, and this disorganized agitation is doubtless his way of expressing his disapproval. It is not until the infant is four months old that he will make any attempt to use his hands to draw the nipple into his mouth, and this may be considered as the first real voluntary movement. If we ask a young child to shut one of his hands he immediately obeys the order, but very often we see that at the same time he will flex his wrist, turn his arm into the position of semi-pronation, flex the elbow, and adduct the whole of his upper limb so as to pass it across the trunk. If we then ask him to open his hand he does so, but at the same time he extends his elbow, opens out his fist, and moves the whole upper limb into the former attitude of repose. Later, when the child is bigger, he will shut the hand by itself without flexing the other articulations; but even then if one tells him to close his fist very hard he will flex his wrist and elbow, etc., especially if he is not particularly intelligent, or is not paying attention to the order given. In the adult these subsidiary movements of the wrist, and of the limb as a whole, can be noticed if he is asked to perform the actions against resistance. In the same way with the lower limb: when a young infant is lying in bed and is asked to dorsiflex his foot, he will at the same time flex the corresponding knee. The adult will do the same thing when the movement is performed against resistance. This phenomenon forms the basis of Strümpell's sign. It is thus evident that the tendency to combined movements which exists in the infant may persist under certain circumstances in the adult. These facts apply equally to the face. When a child, or an adult possessing low intelligence, is asked to shut his eye, all the muscles of the face are put in action at once, and the same is true of intelligent adults when asked not only to shut their eye but to screw it up. It would seem that the child is born with a tendency to make symmetrical and identical movements with the eyes, the face, the limbs, the trunk, and the abdomen, and it is only by exercises and education of his movements that he comes to confine these to one side of his body. The child at first performs unilateral movements so as to involve all the muscles of the limb, and the same phenomenon is met with in certain adult hemiplegics.
In not too severe lesions of the pyramidal tract, the combined movements described above as occurring in the infant are met with, and the author describes a case in detail exemplifying this. He thinks that this is explained by the fact that in order to close the hand it is natural to flex the elbow at the same time, since the flexor muscles are inserted on one side in the epitrochlea and on the other side on the phalanges. This arrangement explains the flexion of the two segments at the same time, but the reason that the normal adult can shut his hand without movement of the elbow is that he has the power to extend the elbow voluntarily, and so keeps it in this position while he closes his hand. If, however, he has lost the power of extending the elbow, as is the case in hemiplegia, it is easy to understand why he must close his hand and flex his elbow at the same time, and this will be equally true when the power of extending the elbow is not completely lost but only weakened. The same explanation serves to show why he closes his hand when asked to flex his elbow. All these movements can only be observed in the case of those hemiplegics who have kept a certain degree of voluntary movement.

The conclusions drawn by the author are that combined movements are an economy of force, while dissociation of these movements demands a greater exertion, and that is why the former type of movements are found in the infant, since the pyramidal tract is not yet developed and consequently all voluntary movements are feeble. This also happens in the case of the adult who has a lesion of his pyramidal tract. It is more easy for him to make combined movements than to dissociate them.

R. G. Gordon.


In view of the increasing importance of the group of diseases associated with changes in the corpus striatum, it is essential to have an authoritative account of the normal histology of these masses of basal grey matter. By Nissl’s method two types of cell are found in the putamen and caudate, viz.: (1) Small star-shaped, spindle-form, or triangular cells, with numerous short and slender dendrites, and with axons which divide up in relatively close proximity to the cell-body; the latter is pale and without Nissl’s granules. To this group belong the majority of the cells. (2) Larger polygonal cells, more or less rounded, with chromatophil substance in the cytoplasm and with achromatic material that stains moderately deeply. Their axons break up at some distance from the cell, indicative of synergic or associative function. These larger cells often contain yellow pigment even in young subjects, and under normal conditions are nevertheless frequently surrounded by satellite glial cells, which must not be taken to indicate neuronophagia. They are evidently very labile structures, and any long illness or ante-mortem cachexia is calculated to produce a necrobiosis which must not be misinterpreted. In the globus pallidus is only one type of cell, large and with unusually long dendritic processes, and both
the cell-body and these dendrites are often covered with delicate 'Endkörperchen', thickly set, almost forming a covering to the cell. Bielschowsky furnishes further histological details for which the original must be consulted.

From his studies he concludes that the globus pallidus is a reflex organ of a primitive sort, with centrifugal connection to the ventral part of the thalamus, regio subthalamica, and corpus Luysii. Physiologically it is under the control of the putamen-caudate, and the ganglion as a whole resembles the cerebral cortex in being a highly differentiated terminal-grey matter (Endgrau). The afferent-efferent functioning of the globus pallidus is controlled by the putamen, which, with the caudate, may therefore be regarded as a regulating and inhibiting centre for extrapyramidal motility.

S. A. K. W.


The following are some of the author's conclusions:—

The cerebellum is subordinate to the cerebrum in the sense that centripetal impulses underlying equilibrium and muscle sense pass through the former on their way to the latter, while the co-ordinating paths of cerebral origin pass through the cerebellum to the periphery.

The cerebro-cerebellar co-ordination system is made up of a centripetal path from the cerebellum via the superior cerebellar peduncles and optic thalamus to the cortex, probably to frontal and temporal lobes, by which path muscle-sense and equilibrium stimuli are conveyed to the cerebrum and there 'changed into movement-images'; these produce a co-ordinating action by the crus, pons, and cerebellum, and so to the periphery.

Muscle-sense movement-images are located in the frontal lobe, and those connected with equilibrium in the temporal lobe; lesions of these parts may give rise to inco-ordination in either function; hence cerebellar symptoms may be produced by purely cerebral lesions.

Impulses concerned with deep sensibility or with equilibrium are unconscious; they reach the Purkinje cells from the periphery and are thence transferred to the cerebral cortex; it is not known whether they are separable in the former, but they are separately located in the latter.

The peculiar position of the Purkinje cells renders a quick, reflex co-ordination of movements possible; in such rapid, reflex co-ordination the cerebrum plays no part, but it can and does in 'higher' co-ordination of a voluntary kind.

The cerebellum is a pure projection—and not association—organ. Impulses are always passing through it to and from the periphery; hence it contains very little white matter relatively because it has no association-fibres.

Cerebellar atrophy best shows the cerebellar syndrome; but it may be largely compensated for by the cerebrum; hence cerebellar defects, when they occur, are seen at a maximum in imbeciles.

S. A. K. W.
The so-called reflex automatisms of the spinal cord (Studien über die sogenanten Reflexautomatismen des Rückenmarks).—


The term reflex should only be applied to movements which follow an external stimulus without the intervention of consciousness, when the movement occurs in the part to which the stimulus is applied, when the afferent and efferent impulses traverse one reflex arc are alone, and when the movement is confined to one joint. For those complex movements which have been called réflexes de défense and réflexes d'automatisme médullaire, the author proposes the name ‘reaction’ (Reakt). In contrast with the reflexes, the features of the reactions are that several joints are moved, the impulses traverse more than one reflex arc, and the movements are not confined to the part stimulated.

As the reactions are seen when the functions of the pyramidal tract are in abeyance, Marburg decided to investigate them in newly-born infants, in whom these tracts are still unmyelinated and functionless. His findings can be summarized as follows: A sharp prick on the sole causes a fan-like spreading of the toes with abduction of the hallux, dorsiflexion of the foot, and flexion of the knee and hip. A lighter stimulus, such as gentle percussion of the outer border of the foot or stroking the sole, produces plantar flexion of the toes only. Dorsiflexion of the hallux does not occur as a rule until several vigorous stimuli have been applied to the sole, but it is obtained at once by compressing the calf or stroking the tibia firmly. These responses persist during the first week of life. At the eighth week dorsiflexion of the hallux is the only movement obtained—plantar flexion never occurs. The limb is withdrawn at the same time, but it is difficult to decide whether the movement is voluntary or reflex. Infants at the intervening ages were not examined.

These reactions in the newly-born are found to correspond with some of the phenomena seen in adults, e.g., Babinski’s sign and the reflexes of Rossolimo and Mendel-Bechterew. The reason why the same lesion should produce now one of these reflexes and now another cannot be given. In the newly-born it depends on the intensity of the stimulus; in adults the deciding factor has escaped detection.

After discussing the status of Babinski’s sign at length, the author concludes that although it is often part of a ‘reaction’, it may occur as an isolated sign. He also considers that the ‘reactions’ are of little importance and unworthy of the attention that has been given to them in certain quarters. With these opinions most readers in this country will not agree. Recent work has shown that Babinski’s sign is never an isolated phenomenon, but is essentially a part of one of the ‘reactions’ which Marburg decries, namely, the flexion-reflex of the lower limb. The significance of the ‘reactions’ as indices of the severity and progressive nature of lesions in the cord, and their importance for a proper understanding of the abnormal attitudes assumed by the lower limbs in disease, do not seem to be appreciated by the writer of this paper.

W. J. Adie.
ABSTRACTS

[110] **Peripheral nerve topography.**—W. M. Kraus and S. D. Ingham. *Arch. of Neurol. and Psychiat.*, 1920, iv, 259.

A knowledge of the functions of the various fasciculi that make up a nerve is of considerable importance to the surgeon, who has often to deal with incomplete war injuries of peripheral nerves. Marie and his co-workers were the first to employ electrical stimulation with the object of defining the motor localizations within nerves. The investigation undertaken by Kraus and Ingham was a continuation of that work, and had the same object in view, namely, to determine, by the application of a faradic current to the circumference of a nerve, the location and function of the fasciculi that lie beneath. It was found as a general rule that stimulation of the proximal part of a nerve did not cause contraction of the muscles supplied by its distal portion, the explanation probably being that contraction of the more powerful proximal muscles masks the actions of the smaller hand and foot muscles. A review of the results of electrical stimulation for a given muscle at various levels brought out one point of importance—the course of motor fasciculi is a straight one from the point where the nerve has been made up by its contributing segments to the point of offset of the fasciculi as a branch.

The greater part of the paper, which does not lend itself to abstracting, is devoted to a careful record of the findings in individual nerves and their branches, and is illustrated by a large number of diagrams.

R. M. S.

[111] **The motofacient and non-motofacient cycles in elevation of the humerus.**—B. Stookey. *Arch. of Neurol. and Psychiat.*, 1920, iv, 328.

The generally accepted view that, in raising the humerus to the vertical, the deltoid elevates the arm approximately to a right angle, and thereafter scapular rotation completes the elevation, is rejected by Stookey, who studied a series of röntgenograms taken of himself under constant conditions. He divides the mechanism of elevation of the arm into three physiological cycles in which the deltoid and supraspinatus are alternately motofacient and non-motofacient.

The first cycle of elevation is accomplished by the action of the deltoid and supraspinatus, raising the humerus to about 60°, and accompanied by slight rotation of the scapula; the second cycle is accomplished principally by rotation of the scapula, due to the action of the serratus magnus, trapezius, rhomboidei, and levator anguli scapulae, which raises the arm to approximately 115°, and is accompanied by slight elevation of the humerus; the third cycle is accomplished by elevation of the humerus from 115° to 178°, and is due to the action of the deltoid and supraspinatus, there being only slight rotation of the scapula. The deltoid, therefore, raises the arm both in the initial and final stages of elevation; in the latter the coracobrachialis and the clavicular head of the pectoralis major assist. Phylogenetically the clavicular head of the pectoralis major is present only as such in the higher forms, particularly in the chimpanzee and gibbon. It may
be considered as a migration of the innermost muscular fibres of the clavicular head of the deltoid. Hence it is not surprising that this muscle should resume its former association in function, and assist in elevation of the humerus from above 115°.

R. M. S.  


Loss of ability to maintain a normal body-temperature after extensive traumatic injury around the third ventricle is common to all warm-blooded animals from man to birds. Few animals will long survive such an operation; in the dog one week is the maximum recorded length of life; but in birds, with proper precautions, the animal may be kept alive for several months.

In an attempt to analyze the factors that lead to this loss of ability to regulate body-temperature, studies were made on the circulation of the blood in these animals.

It was found that removal of the cerebral hemispheres in the pigeon, leaving the thalamus intact and body-temperature normal, leads to a constant fall in arterial pressure of from 10 to 20 per cent. This fall comes on immediately, and persists for as long as seventy-five days after the operation. Removal of the hemispheres and thalamus leads to a loss of temperature regulation, and usually to a slightly greater fall in arterial pressure than does loss of the hemispheres alone. The poikilothermous condition that follows deep lesions of the brain-stem is not due to changes in the arterial blood-pressure alone.

R. M. S.

NEUROPATHOLOGY.


A complete review of this syndrome (Froin's syndrome) and its causes, with full bibliography. The phenomenon must be regarded as a rarity, the author having been able to collect from the literature only thirty-eight cases in which coagulation was really spontaneous and complete. The clinical facts are as follows. Lumbar puncture performed at the usual site yields a fluid which is always clear, but almost constantly of a golden-yellow colour. The pressure is usually less than normal, and the fluid may be viscous. In a certain number of cases the amount obtainable is exceedingly small, which may be due to one of two causes: the needle may have entered a sac full of fluid shut off from the general subarachnoid space, or the flow may have been obstructed by spontaneous coagulation within the lumen of the needle. More often coagulation does not take place for ten to fifteen minutes, sometimes only after several hours. The clot is as a rule so complete that the test-tube may be inverted without spilling it. After a while it contracts, with exudation of golden-coloured serum.
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J Neurol Psychopathol 1920 s1-1: 263-269
doi: 10.1136/jnnp.s1-1.3.263

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