

In his article on *the acoustic potentials of the human auricles*, Gardiner-Brown states that in a well-formed auricle the whole free margin of the cartilage gives a beautifully graduated ascending scale of notes, on friction of the parts, forming a complete octave from the tragus in front to the posterior border of the helix behind (C, D, E, F, G, a, b, c). He gives several explanatory diagrams.

The anti-tragus forms a distinct and isolated note, E, which serves to reinforce the E of the helix. The octave of the C is also reinforced by its octave c. The notes or friction-sounds are produced by quickly passing the finger or the rubber end of a pencil over the different segments between certain sections of the free margin of the cartilage. He gives a diagram in which there are radial lines indicating the positions of the semitones, or sharps and flats of the whole notes. He observes that it is very remarkable that the notes which form the basis of all music, viz., the 1st major triad or tonic (C, E, G), are very distinctly produced by friction on the tragus, anti-tragus, and the middle of the upper border of the rim of the helix.

After noting some very interesting actions of the intrinsic muscles of the auricle he ends his paper by observing : (a) the external ear, or auricle, is in the first place protective ; (b) it aids in catching by its increased area a larger amount of the sound-waves falling on it, and conducting them to the ear, than would arrive if it were absent ; (c) it conducts part of these immediately to the temporal bone, and so to the nerve of hearing, and part by its ordinary funnel action ; (d) it gives knowledge of direction of sound especially when acting with its fellow of the opposite side ; and (e) by its resonant qualities it reinforces musical sounds in a manner and by the means already set forth, and so aids in no uncertain way the perception of musical sounds reaching the ear, by intensifying the higher notes and the higher harmonics, or upper partials of the lower notes of the musical scale.

AMBROSE L. RANNEY, M.D.

b.—NORMAL HISTOLOGY OF THE NERVOUS SYSTEM.

THE BLOOD-VESSELS OF THE SPINAL CORD.—With the view of sustaining a theory recently advanced by him in the *Archiv für Psychiatrie und Nervenkrankheiten*, namely, that tabes is not a systemic disease, but is caused by an interstitial connective-tissue degeneration originating in the blood-vessels of the posterior col-

umns, Adamkiewicz¹ has made an extended examination of the distribution of the minute blood-vessels of the human spinal cord.

Most of the blood which enters the cord goes to the gray matter. All of the blood-vessels in the cord originate in two arterial systems: 1. A centrifugal system. 2. A centripetal system. 1. The centrifugal system commences in a row of small arterial trunks, 250 to 300 in number, which, springing nearly at right angles from the *arteria spinalis anterior*, pass to the bottom of the anterior longitudinal fissure and enter the anterior commissure. Here each one divides into two branches, which pass out horizontally into the gray matter, where they divide into tertiary branches, some of which run longitudinally and form anastomoses with branches from corresponding neighboring systems. Other tertiary branches spread out horizontally and form a capillary network in the central portion of the gray matter. 2. The centripetal system consists of vessels which come in on all sides from the pia mater and pass in converging lines into or through the white matter. One set of these vessels consists of small trunks, which supply the peripheral zone of white matter. Another set consists of larger vessels, which are distributed to the deeper portions of the white matter; while a third set of still larger trunks pass, with little branching, directly into the gray matter, where they break up into a rich capillary network, which supplies those parts not provided for by the above-described centrifugal system. Special systems are described in the posterior columns and in the anterior cornua. There is a general correspondence between the distribution of arteries and veins.

He considers, finally, that this arrangement of blood-vessels is confirmatory of his theory.

THE SEGMENTED CHARACTER OF THE SPINAL CORD.—Starting with the conception, which is not new, of the spinal cord as made up of a series of united segments, each one of which is furnished with a pair of anterior and posterior roots, Lüderitz² has studied the cords of the water-snake, the rabbit, and man. The individuality of the segments he naturally finds to be more pro-

¹Adamkiewicz: Ueber die mikroskopischen Gefäße des menschlichen Rückenmarks. *Trans. Internat. Med. Congress*, 7 sess., vol. i, p. 155.

²Lüderitz: Ueber die Rückenmarkssegment. Ein Beitrag zur Morphologie und Histologie des Rückenmarks. *Arch. f. Anatomie u. Entwicklungsgesch.*, 1881, p. 423.

nounced in the lower animals. In the human cord, when freed from the membranes and nerve-roots, there are no external marks of the divisions of the segments, except where the divisions of the nerve-roots are separated by spaces, and this is only in the dorsal region, where the segments are longest. Internal differences in the white matter at the middle and at the ends of the segments are evident only in the peripheral zone. In the middle of the segments the anterior and posterior cornua are slightly narrower than at the point of entrance of the roots.

While a comparison of the different parts of a segment shows but slight differences, a comparison of the segments one with another shows considerable variation. First, there is a marked difference in the length of the segments. This is dependent upon the mode of development. While originally the segments are all of about equal length, as development proceeds the growth goes on unequally, the segments in the cervical and lumbar regions lengthening more slowly than in the dorsal. As a result of this, the amount of gray matter in these regions is much less in proportion to the size of the nerve-roots which originate in these parts—is, so to say, denser in texture, than in the dorsal region, where the segments are longer.

A difference is also seen in the general shape of the large ganglion cells of the anterior cornua, which are more elongated and more loosely packed together in the region of the lower segments.

ON THE PREPARATION OF NERVE TISSUE FOR MICROSCOPICAL EXAMINATION.—In a series of articles not yet completed, Dr. Bevan Lewis¹ has dealt with the pathological anatomy of cerebral lesions and given many practical suggestions as to the methods for gross examinations. In his last paper² he enters upon the methods of preparing brain tissue for microscopical examination, and at the outset justly lays great stress upon the necessity for most careful and intelligent technical procedure in this department of research. The necessity of studying the fresh tissues by frozen sections is emphasized, and he calls attention to the more satisfactory results in the use of the ether-freezing, than in the use of the ice- and salt-freezing microtomes, since by the use of the latter instrument spicules of ice are apt to form in the tissue.

¹ *Brain*, vol. iii, p. 314; vol. iv, pp. 82 and 351.

² *Idem.*, vol. iv, pp. 441-446.

Numerous instruments for freezing and for hardening tissues are described.

Passing on to the various methods of hardening, the one which he prefers may be summarized as follows: A portion of the brain, about 3 cc in bulk, is surrounded by a little cotton-wool to permit contact on all sides with the hardening agents, then immersed in a couple of ounces of alcohol, and put in a cool place for 24 hours. The alcohol, which was used for the purpose of dehydrating the tissue and facilitating its subsequent permeation by the chromic fluids, is now replaced by Müller's fluid, which is changed in 3 days, and at the end of a week replaced by a 2 % solution of potassium bichromate. This solution, at the end of the second week, is increased in strength to 4 %, and the hardening is finally finished by a solution of chromic acid, $\frac{1}{8}$ %.

The hardening under these conditions is completed in from 4 to 8 weeks. Plain practical directions are given for embedding and for microtome section-cutting. His suggestions as to the details of staining and mounting are to follow.

T. MITCHELL PRUDDEN, M.D.

C.—PHYSIOLOGY OF THE NERVOUS SYSTEM.

ACCURACY OF SIGHT AND TOUCH.—Prof. H. P. Bowditch and Dr. Southard have been comparing the senses of sight and touch. The method was as follows: The experimenter was seated at a table covered with a large sheet of white paper, upon which a small movable object was placed. After various experiments the most convenient object was found to be a small brass disc about five millimetres in diameter, having in the middle of one side a small projecting point. This object was placed in different positions on paper, a short rod being used for moving it about without touching it with the hand. The experimenter then having observed its position, closed the eyes and endeavored to place the point of the pencil held in the right hand as accurately as possible upon the disc. The error, that is the distance between the disc and the pencil point, was then measured and recorded. In a second set of observations the experimenter closed the eyes and placed the disc in position with the left hand. Then withdrawing the left hand and keeping the eyes still closed, he endeavored to place the pencil point upon it as before. In a preliminary series of experiments comprising sixty