IV. "Further Note on the Minute Anatomy of the Thymus." By Herbert Watney, M.A., M.D. Cantab. Communicated by E. A. Schäfer, F.R.S. Received August 26, 1881.

Ciliated epithelial cells are found in the thymus of the dog: this is not the case in quite young animals, but ciliated epithelium can always be demonstrated in the thymus of a dog over thirty months old, and often in those of much younger animals. In the older dogs the ciliated cells are found lining cysts, and the cysts appear to increase in size with the age of the animal. The ciliated epithelial cells take origin from connective tissue corpuscles. The connective tissue corpuscles forming the network in the medullary portion are in places massed together, forming concentric corpuscles of small size; in these masses small cavities are formed, and the lining cells are transformed into ciliated cells.

In the thymus of the tortoise small cavities are found lined by columnar epithelium. The epithelial cells arise from connective tissue corpuscles, the process being essentially the same as that just described in the dog.

The fluid in the lymphatic vessels leading from the thymus can be obtained by tying the vessels immediately after death. The lymph thus obtained contains considerably more colourless corpuscles than the lymph of the large lymphatic vessels of the neck. The blood in the veins passing from the thymus does not appear to differ from the blood of the jugular vein.

V. "Experimental Researches on the Propagation of Heat by Conduction in Bone, Brain-tissue, and Skin." By J. S. Lombard, M.D., formerly Assistant Professor of Physiology in Harvard University. Communicated by Dr. Brown-Séquard, F.R.S. Received October 1, 1881.

(Abstract.)

The experiments (over 900 in number) were made on the skull and long bones of sheep, the ribs of oxen, and on the brain and skin of sheep. Thermo-electric apparatus was employed in the work.

The different tissues were thus prepared:—In the case of bone, a fresh piece was ground smooth on one side, and the face of the thermopile accurately fitted to it; then a thin coating of shellac varnish was applied to the surface of the bone and to the face of the pile, and firm pressure was maintained until the varnish was dry and permanent

adhesion between the bone and the pile had taken place. The whole pile, and the bone, to within a couple of millimetres of its free surface, was then wrapped in thick layers of cotton wool soaked in melted paraffine, these layers extending beyond the upper end of the pile and along the conducting wires for a little distance. In the cases of brain-tissue and skin, a pasteboard box was taken and filled with melted paraffine. When the latter had solidified, a hole was cut through the centre of the paraffine of the size of the piece of brain or skin, and the pasteboard bottom corresponding to the hole removed, and its place supplied by a thin copper plate. The piece of tissue was then inserted in the hole in the paraffine, until it rested on the copper plate; the pile was then passed into the hole and pressed firmly upon the piece of brain or skin, being kept in place by wedges of cotton wool thrust between the sides of the pile and the paraffine walls surrounding it.

The free end of the bone, or the copper plate of the box,* was brought in contact with water of the desired temperature, this temperature being tested by both thermo-electric apparatus and thermometers.

The differences of temperature to which the tissues were subjected ranged from 0°·1136 C. to 0°·1645 C.

We have to consider, first, the time required for the *first sign* of the change of temperature to show itself through the pieces of bone, brain, and skin. The following figures show the times required for 0°·1 C. to show itself through 7·5 millims. of sheep's skull, 7·5 millims. of upper surface of sheep's cerebrum, and 3 millims. of sheep's scalp respectively.

The galvanometer shows 0°·0006742 C.—

	Bone.	Brain.	Scalp.
Averages............	37·30 seconds.	40·490 seconds.	22·880 seconds.
Maxima............	55·86 ,,	63·706 ,,	29·417 ,,
Minima............	26·29 ,,	27·646 ,,	10·000 ,,

We have next to consider the degree of change of temperature produced by conduction, at certain measured intervals of time, through the same thicknesses of tissues as above, and calculated for 0·1° C., with the galvanometer showing, as before, 0°·0006742 C. The averages alone are given.

* It was found, by many experiments, that the presence of the copper plate could be disregarded. The same is true of the dura mater in the case of brain-tissue.

Average effects of 0°·1 C.

Time from the moment of contact of free surface of bone or copper plate of paraffine box with the water.	Skull. 7·5 millims. thick.		Brain. 7·5 millims. thick.		Scalp. 3 millims. thick.	
	Degrees of galvanometer.	Thermometric values.	Degrees of galvanometer.	Thermometric values.	Degrees of galvanometer.	Thermometric values.
At the end of—						
1 min. 15 sec.	23·864°	0·01609° C.	21·036°	0·01418° C.	17·191°	0·01159° C.
2 ,, 0 ,,	54·170	0 03652	42·721	0·02880	31·241	0·02106
4 ,, 0 ,,	88·804	0·05987	74·840	0·05045	59·208	0 03992
6 ,, 0 ,,	116·476	0·07853	99·075	0·06679	80·766	0·05445

It will be seen that at the above periods the bone is the best conductor, the brain coming next, and the skin last, although the latter is 2·5 times thinner than the two former.

We have, in the third place, to see what is the transmission of heat through the three tissues, when the *permanent thermal condition* is reached. The following figures show the amounts of this transmission at the period in question.

Average effects of 0°·1 C. at permanent thermal period, through 7·5 millims. of skull, 7·5 millims. of cerebrum, and 3 millims. of scalp, respectively.

	Degrees of galvanometer.	Thermometric values.	Percentages of heat transmitted.
Skull.............	127 ·431°	0 ·08591° C.	85 ·918 per cent.
Brain	113 ·029	0 ·07620	76 ·208 ,,
Scalp............	100 ·155	0 ·06751	67 ·514 ,,

Here again the bone shows the highest, and the skin the lowest, conductivity.

Suppose, now, that we have a change of temperature of 0°·1 C. at the surface of the brain of a sheep. As a matter of simple conduction, what would be the change of temperature at the outer surface, after the passage through the thicknesses of skull and scalp given? We will give the averages for two minutes and for the permanent thermal state only.

Average effects of 0°·1 C. through 7·5 millims. of sheep's skull and 3 millims. of sheep's scalp, taken together.

	Degrees of galvanometer.	Thermometric values.	Percentages of heat transmitted.
At the end of 2 minutes..	11·409°	0·007692° C.	7·692 per cent.
When the permanent thermal state was reached..	86·033	0·058006	58·006 ,,

Lastly, we will calculate what effect a change of temperature of 0°·1 C., at one point of the cerebral surface, would have on a point of the outer surface of the scalp situated over another point of brain surface distant 7·5 millims. from the point where the change of temperature occurs. We have, in this inquiry, first, to take the alteration of temperature produced by transmission through 7·5 millims. of brain-tissue (pages 12 and 13), and then to calculate how much of this heat would find its way through the 7·5 millims. of skull and the 3 millims. of scalp (see page 13).

Average effects of 0°·1 C. on the outer surface of the head after first passing through 7·5 millims. of brain-tissue.

	Degrees of galvanometer.	Thermometric values.	Percentages of heat transmitted.
At the end of 2 minutes..	4·873°	0·003286° C.	3·286 per cent.
When the permanent thermal state was reached..	65·563	0·044202	44·202 ,,

If we compare the above figures with those previously given as the results of the *direct* transmission from the point of the brain-tissue, the temperature of which is altered 0°·1 C.,* it is easy enough to see that, with the apparatus we are employing, the temperature of a point of the outer surface distant 7·5 millims. from a point lying directly over the focus of change would present differences very easy of detection.

The following figures show the excess of the *direct* over the *indirect* transmission.

* See page 13.

Average excess in favour of *direct* transmission.

	Degrees of galvanometer.	Thermometric values.
At the end of 2 minutes	6·536°	0·004402° C.
When permanent thermal condition was reached	20·470	0·013804

Unfortunately the tissues with which we are dealing obey no physical law with which the writer is acquainted, as regards the effect of changes of thickness of the conductor. It is, therefore, impossible to reason with accuracy from one thickness to another. The effect of the circulation of the blood in the head on the outward transmission of heat from the brain, has been somewhat fully considered by the writer elsewhere.*

VI. "On the Comparative Structure of the Brain in Rodents." By W. Bevan Lewis, L.R.C.P. (Lond.), Senior Assistant Medical Officer to the West Riding Asylum, Wakefield. Communicated by Dr. Ferrier, F.R.S., Professor of Forensic Medicine, King's College, London. Received October 13, 1881.

(Abstract.)

I have endeavoured in this abstract to summarise the results of my recent researches into the minute structure of the brain in the smaller Rodents. The pig and sheep, which were the subjects of my former memoir, possess a highly developed olfactory apparatus conjoined to a well convoluted cortical surface; but in the smaller animals now under consideration the surface of the hemispheres is almost perfectly smooth, while the olfactory organ, from its comparative size and complex relationship, has an important part to play in the architecture of the brain.

Animals possessing the latter type of cerebrum have been classed together as the Osmatic Lissencéphales, in contradistinction to those which were the subject of my former enquiries, the Osmatic Gyrencéphales. My researches into the structure of the brain of prominent members of the former group, viz., the rabbit and rat, may be considered under two heads:—

(*a*.) The histology of the complete cortical envelope.

* "Regional Temperature of the Head." London, 1879.