the affected side. The tegmental system has not suffered much apparently. Fig. 2 is a transverse vertical section through the mid-brain in the region of the posterior tubercules of the corpora-quadrigemina. Even here the constituents of the tegmental system have not suffered in a marked degree.

The pedal system has, however, undergone enormous diminution, and that not alone in the pyramidal constituent, but in all of them. Both the figures are enlarged twice the natural size. Fig. 3 shows the lateral aspect (natural size) of the normal central lobe, or insula, and corona radiata. The thalamic and mid-brain, with the position of the pons and cerebellum, the olfactory and optic outgrowths from their respective regions are also shown. The line drawn through the corona, central lobe, and pulvinar, marks roughly the amount of these regions wanting in the encephalon, the peculiarities of which have been shortly touched upon in this paper.

On the Typical Microscopic Lesions found in the Brain in Insanity: A Demonstration by T. S. CLOUSTON, M.D., JAMES MIDDLEMASS, M.A., M.B., B.Sc., and W. F. ROBERTSON, M.B., Royal Asylum, Edinburgh.

Dr. Clouston explained that he was the spokesman of Drs. Middlemass and Robertson, who had made almost all the sections and had supervised the micro-photography. He explained that as yet micro-photography had many disadvantages owing to the very delicate structure of the brain and the high powers that had to be used, as well as the difficulty in photographing many of the aniline stains. In the case of some of the sections more than six slides had been made before a satisfactory photograph was got.

Fifty-three sections were shown under microscopes and sixty-three slides by the lantern on the screen. Two lanterns were frequently used to bring out the contrasts between the normal and the pathological appearances of the same structures, both images being thrown on the screen at the same time. Most of the sections had been made by Bevan Lewis's fresh method, a few being made by the older hardening processes, and some by Golgi's method. The changes in the chief structures in the cranium were demonstrated. On account of the unquestionable solidarity

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that exists among them all teleologically, they all existed to serve the brain and its functions. Membranes, blood-vessels, lymphatics, neuroglia, spider cells, endothelium, nerve fibres and nerve cells had all an organic unity. They were all found diseased in insanity. No doubt a demonstration of any tissue change, whether gross or microscopic, did not really explain the pathology of mental disturbances, but the microscopic changes brought us nearer that end than the grosser lesions, and we could now say definitely that in all the well-marked and long-continued mental diseases the intimate structures of the brain could be shown to be distinctly diseased, even where no naked-eye changes could be seen. There was a vast hiatus between a degenerate nerve cell and a delusion, which in time might be filled up by hypothesis and generalization.

The following were the sections shown with the chief points illustrated by each:—

Dura Mater.

No. 1.—*Transverse section of normal dura mater*, showing (*a*) the smooth inner surface lined by endothelial cells; (*b*) the normal structure of the fibrous tissue; (*c*) the small blood-vessels, of normal calibre and appearance.

No. 2.—*Transverse section of dura mater with* fibrinous *sub-dural membrane*, from a case of brain atrophy with phthisis, showing (*a*) the granular appearance of the membrane due to transversely-cut fibrin threads; (*b*) absence of vessels in the membrane.

No. 3.—*Surface view of a similar delicate* fibrinous *sub-dural membrane*, showing (*a*) network of fine fibrinous threads entangling leucocytes and a few endothelial cells; (*b*) the absence of vessels.

No. 4.—*Transverse section of dura mater with* organized *sub-dural membrane*, from a case of general paralysis, showing (*a*) the distended vessels of the dura; (*b*) a thick membrane consisting of developing fibrous tissue and containing (*c*) delicate capillaries distended with blood, (*d*) granular masses of altered blood pigment.

No. 5.—*Surface view of a similar* organized *sub-dural membrane* from a case of senile insanity, showing (*a*) a network of capillaries with delicate walls, (*b*) granular masses of altered blood-pigment in close relation to the vessels, (*c*) cellular elements in process of development into fibrous tissue.

Pia-arachnoid.

No. 6.—*Transverse section of* normal *pia-arachnoid*, from the brain of a child, showing its thickness, texture, and the number of cellular elements.

No. 7.—*Transverse section of* thickened *pia-arachnoid*, from a case

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of general paralysis, showing (*a*) great thickening, (*b*) dense infiltration with round cells.

No. 8.—*Transverse section of* thickened *pia-mater infiltrated with colloid bodies*, from a case of epilepsy.

No. 9.—*Transverse section of* greatly thickened *pia-arachnoid*, from a case of chronic alcoholic insanity.

Blood-vessels.

No. 10.—Normal *capillaries of cortex*, from the brain of a child, showing (*a*) their regular outline, (*b*) delicate and translucent walls, (*c*) number of nuclei present in the normal condition.

No. 11.—Thickened *and* granular *capillaries of cortex*, from a case of general paralysis, showing (*a*) their markedly irregular outlines, (*b*) somewhat opaque and decidedly granular walls, (*c*) considerable increase in the number of nuclei.

No. 12.—Normal *arteriole of cortex*, from the brain of a sane adult, showing (*a*) its regular outline, (*b*) degree of translucency, (*c*) number of nuclear elements in its wall.

No. 13.—*A diseased arteriole*, from a case of general paralysis, showing (*a*) markedly irregular outline, (*b*) thickening of wall, (*c*) irregular aggregations of round cells in it.

No. 14.—*Arteriole showing deposit of altered blood-pigment* in the perivascular space, from a case of general paralysis.

No. 15.—*Arteriole showing fatty degeneration of its wall*, from the cortex of a case of chronic delusional insanity. There are seen (*a*) very irregular contour, (*b*) deposit of fat in granular masses.

No. 16.—*Syphilitic endarteritis obliterans of cerebral artery (transverse section)*, showing the formation of much new tissue within the internal elastic lamina.

No. 17.—*Miliary aneurisms of vessels of pia mater*, from a case of senile mania. (From a specimen by Dr. J. J. Brown.)

No. 18.—*Minute apoplexies in the cortex* from the same case as the previous. There are seen several dark areas which are small hæmorrhages due to the rupture of aneurisms of the cortical vessels similar to those seen in the pia mater.

Neuroglia.

No. 19.—*Normal neuroglia of brain.* This photograph was of a section prepared from the brain of a healthy sheep by the fresh method, and is intended to demonstrate that the so-called "spider-cell" (larger cell element of neuroglia) is a normal constituent of the brain. In the healthy human brain the very delicate processes of these elements are not brought out by this method. In the brain of the sheep, however, they can be recognized, though with difficulty.

No. 20.—*Hypertrophied spider-cells*, from the margin of a small softening in the cortex in a case of senile insanity.

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Nerve-cells.

No. 21.—*Normal large pyramidal cells of the cortex*, from the brain of a child, showing the appearance of the protoplasm, nucleus, and processes.

No. 22.—Nerve-cells of cortex of hedgehog by Golgi's method. (From a section by Dr. G. Mann.)

No. 23.—*First stage of pigmentary degeneration of nerve-cells—period of over-activity*—from a case of epilepsy, showing the cell slightly swollen, the protoplasm and processes deeply stained, and the latter intact.

No. 24.—*Second stage of pigmentary degeneration of nerve-cells—period of diminished activity*—from a case of general paralysis, showing the cell in process of shrinking, the protoplasm staining faintly, pigment increased and surrounded by a "sclerosed zone" of protoplasm, and processes faintly stained.

No. 25.—*Third stage of pigmentary degeneration of nerve-cells—period of absorption*—from a case of senile insanity, showing cell still more shrunken, distorted, and breaking down, remaining protoplasm faintly stained and containing numerous pigment granules, processes mostly gone, nucleus eccentric, deformed, and irregularly stained.

No. 26.—*Early stage of granular degeneration of nerve-cells*, from a case of epilepsy, showing (*a*) granular condition of the protoplasm; (*b*) nucleus still distinct.

No. 27.—*Advanced stage of granular degeneration of nerve-cells*, from a case of delusional insanity, showing (*a*) protoplasm coarsely granular and faintly stained, (*b*) processes disappearing, (*c*) nuclei faintly stained and indistinct.

Nerve-fibres.

No. 28.—*Colloid bodies* in the outer layer of the cortex, from a case of epilepsy. It is to be noted that they have no affinity for the aniline blue-black stain.

No. 29.—"*Miliary sclerosis*," from a hardened section of the medulla, stained with carmine. (Section prepared by Dr. J. J. Brown.)

No. 30.—"*Amyloid bodies*," from the cortex of a case of general paralysis, showing a group of four rounded bodies upon a vessel-wall, which, in contrast to the colloid bodies, are stained with the aniline blue-black.

No. 31.—*A peculiar form of degeneration of the cortex*, from a case of acute mania. (For a full description of the case see Dr. Clouston's "Clinical Lectures," p. 188.)

No. 32.—*Granulation of ependyma*, from the fourth ventricle of a case of general paralysis.

No. 33.—*Granulation of ependyma*, from the lateral ventricle of a case of general paralysis, showing that a "granulation" is formed by

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a localized overgrowth of the sub-epithelial neuroglia, and that in places the normal epithelial covering often disappears.

General Paralysis.

No. 34.—*Transverse section of pia-arachnoid*, showing (*a*) great thickening; (*b*) dense infiltration with round cells.

No. 35.—*Pia mater and outer layer of cortex*, showing pia as in previous photograph, and numerous hypertrophied spider-cells below it.

No. 36.—*Pia mater and first layer of cortex with vessel passing downwards from the former*, showing (*a*) great increase of nuclei in vessel-wall; (*b*) large number of spider-cells with their processes forming a dense network, many of them being attached to the vessel. These changes explain how, when the pia mater is stripped off, a portion of the grey matter is removed along with it, leaving an eroded surface.

No. 37.—*Outer layer of cortex*, showing a number of spider-cells with interlacing processes. It is in this layer of the cortex in general paralysis that the development of spider-cells is most marked.

No. 38.—*Thickened capillaries in the grey matter*, from an advanced case.

No. 39.—*Thickened arteriole*, showing (*a*) an excessive number of round cells in the adventitia, causing irregularity of its outline, (*b*) numerous spider-cell processes attached to it.

No. 40.—*Transverse section of a similar cortical arteriole.*

No. 41.—*A typical spider cell*, showing a prominent "vascular process" and numerous other fine processes.

No. 42.—*Spider-cells of cortex prepared by Golgi's method*, showing several vascular processes from a single cell.

No. 43.—*Spider-cells in white matter.*

No. 44.—*Nerve-cells of the cortex from an early case*, showing the changes characteristic of the first stage of pigmentary degeneration.

No. 45.—*Nerve-cells of the cortex from an advanced case*, showing the changes which characterize the third stage of pigmentary degeneration.

No. 46.—*Nerve-cells of hypoglossal nucleus*, from an advanced case, showing various stages of pigmentary degeneration.

No. 47.—*Transverse section of peripheral nerve*, stained by Vassale's method, showing marked degeneration of most of the fibres.

Alcoholic Insanity.

No. 48.—*Pia-arachnoid and outer layer of cortex*, showing (*a*) dense infiltration and thickening of pia-arachnoid, (*b*) marked sub-pial felting.

No. 49.—*First layer of cortex*, showing numerous colloid bodies and spider-cells.

No. 50.—*Cortical arteriole*, showing thickening and localized aggregations of round cells.

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No. 51.—*Spider-cells in the deepest layer of the cortex.*
No. 52.—*Nerve-cells of the cortex*, showing granular degeneration.

Epileptic Idiocy.

No. 53.—*Nerve-cells of cortex of full-time fœtus*, showing (*a*) deeply-stained and prominent nuclei, (*b*) a small quantity of granular protoplasm around these.

No. 54.—*Nerve-cells of frontal cortex* in a case of congenital epileptic idiocy, showing a condition which does not differ from that of the cells in the preceding photograph. This condition has been named by Bevan Lewis "Developmental Arrest of Nerve-cells," and is the characteristic pathological change found in a number of cases of the above kind.

Senile Insanity.

No. 55.—*Small softening in the cortex*, showing a small central softened area surrounded by a zone of hypertrophied spider-cells.

No. 56.—*An atrophied area in the cortex.*

No. 57.—*Pia mater and outer layer of cortex*, showing (*a*) thickening of the pia, (*b*) numerous colloid bodies in the pia and below it, (*c*) some sub-pial felting.

No. 58.—*Nerve-cells of cortex*, showing advanced pigmentary degeneration.

Acute Mania (Puerperal).

No. 59.—*Nerve-cells of cortex*, showing great degeneration of the protoplasm and processes, and well-marked vacuolation of the nuclei. The case was one in whom the prognosis of recovery was very favourable, and the fatal termination may have been brought about by the above morbid changes in the brain-cells, which were present in all the layers.

Chronic Mania.

No. 60.—*Nerve-cells of cortex*, showing great excess of physiological pigment, but almost no signs of actual degeneration.

Delusional Insanity (with auditory hallucinations).

No. 61.—*Nerve-cells of 1st temporo-sphenoidal convolution (auditory centre)*, showing advanced granular degeneration, which was confined to this region.

Secondary Dementia.

No. 62.—*Nerve-cells of cortex* in a patient aged 44, showing the cells much degenerated, distorted and shrunken, protoplasm and nucleus staining faintly and irregularly, and the processes mostly gone.

Visceral Melancholia.

No. 63.—*Nerve-cells of semi-lunar ganglion*, showing degenerated protoplasm and great excess of pigment.

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