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Original Articles

THE HISTOPATHOLOGY OF THE AUTONOMIC NERVOUS SYSTEM IN CERTAIN SOMATIC AND ORGANIC NERVOUS DISEASES[1]

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Recent work on the autonomic nervous system has been abundant, and has been directed chiefly along three lines, morphology (1), physiology (2), including the biological aspects of the system and its relation to the emotions, and clinical studies on its disturbances (3), with the aid of pharmacological reactions. The only recent study on the histopathology of the system, with which the writer is acquainted, is that of Myerson (4), although there have been cursory observations on the sympathetic ganglia in the course of the study of the central nervous system in certain diseases, notably pellagra, and a few studies of the changes in the peripheral ganglia (cardiac and intestinal) in various intoxications and infections.

It was thought, therefore, that an examination of a few representative parts of the system in a series of autopsies would be valuable, particularly in connection with conditions found in the central nervous system and ductless glands. Accordingly, during the past year a routine study of selected portions of the system has been made in certain suitable autopsies (those done within a few hours after death) at the Boston State Hospital. The material includes representatives of the common organic nervous diseases, some common visceral diseases, and certain unusual conditions, as pellagra and katatonic hirntod.

[1] Presented at the sixteenth annual meeting of the American Association of Pathologists and Bacteriologists, at Washington, May, 1916.

The structures studied were the thoracico-lumbar chain of the vertebral ganglia; the semilunar, representing the prevertebral plexuses; the plexuses of Auerbach and Meissner, and the adrenal and periadrenal plexuses, as representatives of the peripheral ganglia; also the cells of origin of the preganglionic fibers in the lateral horns of the cord; and the splanchnic nerves. Of the ductless glands, the adrenal, pituitary, thyroid, reproductive, and islands of Langerhans were studied. The autopsies were also worked up according to the routine employed at the Boston State Hospital which involves a microscopic examination of the trunk organs, of six regions of the cerebrum; one section of the cerebellum and medulla, three levels of the cord, a representative of the posterior root ganglia, and a peripheral nerve. The sections of the central nervous system were stained for the display of cells, fibers and neuroglia.

It may be said in passing that the terminology of Langley for the autonomic system is here used. Langley applies the term autonomic to the entire system, including the ganglia, the nerves connected with them, and the cells of origin in the central nervous system. The vertebral ganglionated cord is subdivided into the midbrain, bulbar, thoracico-lumbar ("sympathetic system" proper) and the sacral autonomic. The thoracico-lumbar section was the only part of the vertebral chain investigated in the present study.

Dissection of the thoracic and lumbar cords is easy. The thoracic ganglia lie on the heads of the corresponding ribs just under the pleura. The first thoracic (stellate) ganglion is larger than the rest. The lumbar cord consists of four ganglia, lying in front of the vertebral bodies, close to the anterior border of the psoas. On the right side they are beneath the vena cava, on the left behind and external to the aorta. The semilunar ganglia lie on either side of the cœliac axis.

Part of the material was fixed in alcohol and stained by the cresyl violet method for study of the ganglion cells. The remainder was put in Zenker's fluid and stained with eosin and methylene blue for the interstitial and perigangliomic tissue and adventitious cells. A representative of the vertebral ganglia, the splanchnic nerve, a peripheral nerve and a section of the cord and cortex were also stained by Marchi's method for the study of fatty degeneration.

Condensed abstracts of the findings in the cases are as follows:

1. Pellagra. Woman æt. 29. Symptoms of at least four months' duration. Autopsy showed gastritis and enterocolitis of chronic type and parenchymatous and fatty degeneration of the myocardium, liver, and kidneys.

Central Nervous System.—Sections from the various cortices show a few lymphocytes and pigmented phagocytes in the pia. The nerve cells are shrunken and angular, and stain darkly and diffusely. Axonal reaction not seen. Considerable satellitosis in the deeper layers. No ameboid glia and no perivascular lymphocytosis. In the cerebellum, chromatolysis of Purkinje cells and those of dentate nucleus, some of the latter showing the axonal reaction. The medulla contains shrunken darkly staining nerve cells scattered among those of normal appearance. The cells of the cord are much affected, many showing the axonal reaction, others chronic degenerative changes, similar to those in cortex and medulla. The cells of the Gasserian ganglion show both the axonal reaction and chronic degenerative changes.

Herxheimer's stain reveals a very large amount of fat about the vessels and in the nerve cells throughout the cerebrum, cerebellum, medulla, and cord, also in the white matter of the cord.

Autonomic System.—The ganglion cells of the thoracic chain show prominent degenerative changes. They are shrunken, indistinct in outline, and often appear vacuolated on the edges. The cytoplasm stains darkly and contains much lipochrome. Some cells are reduced to masses of debris, others show chromatolysis, appearing as shadows. The capsule cells are frequently swollen, and indent the distorted nerve cells, suggesting neurophagic activity. The capsular spaces are often dilated and contain granular eosin-staining material, and rarely a mass of homogeneous substance, staining deeply with eosin, like colloid. The nerve sheaths are swollen and vacuolated, and in one area large vacuolated mononuclears are present among the nerve bundles. A light infiltration of lymphocytes in the interstitial tissue of the ganglion. Changes in the lumbar vertebral and semilunar ganglia are similar, with the addition of numerous cells showing the axonal reaction.

Plexus myentericus—the majority of the ganglion cells are swollen and show chromatolysis; their edges are frayed, and their nuclei excentric, shrunken and pyknotic.

Ductless Glands.—Adrenals—the capsules are thickened. The zona glomerulosa is atrophic and contains numerous degenerate cells. Throughout the fasciculata the cells in large areas have disintegrated, leaving granular and vacuolated debris. There is only very slight endothelial leucocyte reaction, and no signs of regeneration. These necroses extend in places through the entire depth of the fasciculata; in other places are limited to the outer part. The remaining cortical cells are practically devoid of vacuoles. The medulla is edematous and contains collections of lymphocytes Nerve bundles in the periganglionic fat are not noteworthy.

Thyroid—a large proportion of dense connective tissue in section, in places obscuring the alveolar pattern. Remaining alveoli are distended with homogeneous colloid.

Pituitary, ovary and pancreas show no definite changes.

2. Pellagra. Woman, 37 years. Known duration of disease one year. The chief autopsy findings were gastritis and enterocolitis, with hemorrhage into the intestine; central necroses of the liver, and a pellagrous eruption on the hands.

Central Nervous System.—The giant pyramids of the precentral cortex show the axonal reaction. The other pyramidal cells are shrunken, stain diffusely, contain no Nissl bodies, and have excentric nuclei. Active neurophagocytosis, small collections of lipoid and occasional lymphocytes about the vessels, ameboid glia cells in the white matter. In the medulla and cord practically all the nerve cells are affected, showing either the axonal reaction or chronic degenerative changes, and there is also quite marked lymphocytic reaction about several vessels.

Autonomic System.—Sections from various vertebral ganglia and also the semilunar contain numerous cells showing chromatolysis or chronic degenerative changes. Swelling of capsule cells and exudate in the capsular spaces, although occasionally noted, is not prominent, as in case I. There is a mild lymphocytic infiltration in the ganglia, and numerous mast cells in the nerve sheaths. Marchi sections show much fat in ganglion cells, a little in the vessel walls, and a moderate stippling in the nerves connected with the ganglia.

Plexus myentericus—marked chromatolysis of the cells and edema of the tissues of ganglia and nerve sheaths. These changes are equally pronounced in the plexus of Auerbach and that of Meissner.

Ductless Glands.—Adrenals—capsules are thickened. The cortex is narrow, and shows extensive necrosis, with almost no cellular reaction, and no regeneration, the condition being similar to that in the preceding case, except that it is more extensive. The entire zona fasciculata is devastated, the glomerulosa affected in places, the reticulosa intact. The remaining cells stain clearly, but are practically without vacuolation. Mild lymphocytic infiltration in the medulla. A number of ganglion cells in the medulla stain poorly, and their nuclei are invisible.

Thyroid—several focal increases of connective tissue.

Ovary—normal inactive.

Pituitary—nothing of note.

3. A Case of Pernicious Anemia of two years' duration in a man 63 years old. In the last four months of life a psychosis, characterized by confusion, restlessness, depression founded on physical symptoms, and transitory depressive and self-accusatory delusions. Autopsy findings—septic pneumonia, fatty infiltration of myocardium, liver and skeletal muscles; coronary and aortic sclerosis, and mild chronic inflammation of intestine, with areas of hemorrhage.

Central Nervous System.—Marked changes of a chronic degenerative type, with lipochromatosis throughout cerebral cortex, medulla, cord and dentate nuclei of cerebellum; axonal reaction in giant pyramids of precentral regions; small collections of lipoid and scanty lymphocytic infiltration about vessels; focal degeneration of posterior columns of cord; fatty degeneration in white matter of cerebrum and cord, and in peripheral nerves.

Autonomic System.—The cells of the various ganglia are highly pigmented; many are also swollen, poor in chromatin, and frayed on the edges. Others are shrunken and angular and stain deeply and

diffusely. A few are represented by masses of pigmented debris. The capsule cells are irregularly grouped around the affected nerve cells, and often encroach on them. There is an excess of connective tissue in the ganglia, and numerous mast cells; also much fat in ganglion cells, the nerves connected with the ganglia, and the intima of the arteries.

Plexus myentericus—in some ganglia the cells stain fairly well; in others, however, they are misshapen, loaded with pigment, and have peripheral nuclei. The lesions of the ganglia do not run parallel with those of the mucosa, but in several instances are conspicuous where changes in the mucosa are slight, and vice versa.

Ductless Glands.—Adrenals—the cortical cells are well vacuolated and stain clearly. In a ganglion in the periadrenal fat, the nerve cells are rather poor in chromatin, but are otherwise not remarkable. A large group of nerve cells in the medulla shows distortion of cell outlines, marked pigmentation and some loss of chromatin.

Pancreas and pituitary—not remarkable.

Testicle—chronic fibrous orchitis.

4. PARESIS of 3 years' duration in a woman 41 years old. Staphylococcus aureus septicemia.

The cortex showed the usual lesions of general paralysis with much exudate and much disturbance of lamination.

Autonomic System.—Sections from the dorsal ganglionated cord and the semilunar ganglia show a few atrophic nerve cells, although most stain well. Fairly numerous plasma cells are present, not perivascular in arrangement, also a sprinkling of polymorphonuclears, and an occasional mast cell. A few lymphocytes in the nerve sheaths and periganglionic fat. The Marchi stain shows numerous fine droplets in the interstitial tissue of the ganglia and in the nerve sheaths.

The lumbar ganglia are not remarkable.

The lateral horn cells of the cord are somewhat shrunken, and their nuclei peripheral. They show rather more change than the anterior horn cells.

Ductless Glands.—Adrenals—considerable vacuolation of cortical cells. Periadrenal fat negative.

Other ductless glands are not noteworthy.

5. PARESIS. Simple dementing form, of four years' duration, in a 43-year-old woman; terminated by a left-sided lobar pneumonia.

The typical changes of general paralysis were present in the brain. The cord presented an unusual amount of pial exudate and degeneration of the posterior columns.

Autonomic System.—Pigment atrophy and chronic degenerative changes are prominent in the various vertebral and the semilunar ganglia. An occasional cell is reduced to a mass of debris. In some instances the capsule cells are heaped up around the nerve cells and encroach on them, but in general neurathrepsia is not prominent. Some ganglia contain a few lymphocytes, but plasma cells are absent. Mast cells are numerous in the nerve bundles. In one ganglion there is a large amount of green pigment in the stroma, also in the walls of the vessels in the surrounding fat. On the left side (on which the

pneumonia was situated) there is an excess of polymorphonuclears in the vessels of the thoracic ganglia and nerve bundles and acute inflammatory changes in the periganglionic tissues. There is a light stippling of fat in the nerves and stroma of the various ganglia.

The cells of the lateral horns appear normal, as do those of the enteric plexuses.

Ductless Glands.—Adrenals—some thickening of capsule, compressing the underlying tissue. Vacuolation of cortex is slight. Much pigmentation of deeper parts of cortex. A ganglion and nerve bundle present in the surrounding fat appear normal.

The other ductless glands show nothing of interest.

In addition to these two cases, sections of the semilunar ganglia from two previous cases of paresis were available. Both showed cell changes, in one case limited to chromatolysis, in the other frequent cell destruction. In both, the capsule cells were proliferated and swollen, and indented the nerve cells. No plasma cells were found, but in one case mast cells were numerous.

6. A Case of Cerebral Syphilis, of ten months' known duration, in a woman 47 years old. Death from streptococcus septicemia. The brain showed a basal meningitis, extensive bilateral softening of the temporal convolutions, softening of the left fusiform gyrus, gliosis of the right second frontal and precentral and left hippocampus. Microscopically, a thickening of the small vessels, scanty lymphocytic perivascular infiltration, subcortical gliosis, and degeneration of the left crossed pyramidal tract.

Autonomic System.—The ganglion cells show considerable pigment atrophy, without notable proliferation of capsule cells. There is a mild lymphocytic infiltration both diffuse and perivascular.

The lateral horns of the cord contain scattered degenerated cells, but these are not more numerous than in other groups.

Ductless Glands.—Adrenals—cortical cells are much vacuolated and stain normally. Otherwise nothing noteworthy.

The other ductless glands are not remarkable.

7. Cerebral Syphilis, duration 5 years. Woman æt. 54. Death from abscesses of lungs and septicemia.

Central Nervous System.—Brain small (weight 1,090 gms.). Atrophy in frontal regions. Microscopically, much lymphocytic exudate in pia of cortex, medulla and cord, also much perivascular exudate in same and marked endarteritis.

Autonomic System.—The ganglion cells of the thoracic and lumbar cords and of the semilunar ganglia stain normally. The stroma of the ganglia is negative, but there are some small collections of lymphocytes in the periganglionic fat and a few mast cells in the nerve trunks. Marchi sections show numerous fine droplets of fat in the nerves of the ganglionated cord.

The cells of the lateral horn of the cord stain well.

Ductless Glands.—Adrenals—an adenoma 1 cm. in diameter in the cortex of one gland. The tumor is infiltrated with lymphocytes and with phagocytes containing coarse granules of green pigment. The adrenal and surrounding fat are also infiltrated with plasma cells and eosinophilic mononuclears. The other adrenal presents no signs of infiltration.

The other ductless glands are not noteworthy.

8. A Case of Senile Dementia in a man 70 years old. Death from lobar pneumonia and follicular colitis. The brain showed atrophy of frontal and temporal convolutions; mild chronic degenerative changes in nerve cells with lipochromatosis; sclerosis of small vessels; zonal, subcortical and perivascular gliosis. No plaques were found.

Autonomic System.—The ganglion cells show marked pigment atrophy. The capsule cells are quite irregular in appearance and arrangement. They are shrunken and frequently absent; occasionally they indent the nerve cells. The capsular spaces appear wide around the withered nerve cells, and contain debris. Mast cells and foci of lymphocytes are present in the interstitial tissue of the ganglia, and the former also among the nerve bundles. No notable arteriosclerosis.

Enteric Plexuses.—In affected portions of the bowel the ganglion cells are distorted and frayed on the edges; their nuclei peripheral, and the nuclear membrane indistinct.

The cells of the lateral horns of the cord stain well.

Ductless Glands.—Adrenals—tissue lost.

Testicle—normal senile.

Pituitary—considerable increase of stroma in anterior lobe. Desquamation of cells into lumina. Small amount of colloid in anterior lobe, and a moderate amount in the pars intermedia. Very numerous pigment cells in the posterior lobe.

Pancreas—not remarkable.

9. Senile Dementia.—Man 70 years old. Death due to bronchopneumonia, coronary sclerosis, and chronic nephritis.

The changes in the brain were similar to those in the previous case, except that plaques were present.

Autonomic System.—Chronic degenerative changes in the ganglion cells with lipochromatosis are prominent in all sections. A number of nerve cells are reduced to masses of debris. The appearance of the capsular cells and spaces is similar to the preceding case. Lymphocytic infiltration, both perivascular and diffuse, is frequent in the ganglia, periganglionic fat, and nerve bundles.

Cells of lateral horns of cord—section from middorsal region shows a fresh hemorrhage into the lateral horn of one side blotting out the nerve cells. The cells of the other lateral horn are shrunken and stain deeply, but are not more affected than those of other groups.

Ductless Glands.—Adrenals—glands are large, both cortex and medulla being abundant. Cortex is much vacuolated and in its deeper parts highly pigmented. Medulla not remarkable, except for its amount. Vessels sclerotic. A light lymphocytic infiltration in the periadrenal fat. Nerve bundles in the latter situation appear normal.

Pituitary—several large areas of sclerosis in the anterior lobe, surrounded by alveoli filled with inspissated colloid. Lymphocytic infiltration about a vein in the posterior lobe. Chromatophores are numerous.

Other ductless glands show nothing of note.

10. Arteriosclerotic Dementia.—Death at 83 years from ileocolitis, chronic nephritis and general arteriosclerosis.

The brain showed an extreme thickening of the small vessels, multiple small foci of softening in cortex, surrounded by active gliosis; in addition zonal, perivascular and subcortical gliosis.

Autonomic System.—The ganglion cells are heavily pigmented, but are not shrunken; their nuclei are in normal position, and stain well. The capsules are thickened; the capsule cells are large, are fairly evenly arranged and often indent the nerve cell. The ganglia are surrounded by dense connective tissue capsules and the vessels are markedly sclerotic. The periganglionic fat contains foci of lymphocytes and an occasional mast cell.

Plexus myentericus—the ganglion cells stain very poorly, appearing as misshapen masses of pigment without visible nuclei.

Ductless Glands.—Adrenals—the capsules are thickened and the underlying tissue compressed. Cortical cells are much vacuolated, and in the lower layers deeply pigmented. Quite marked foci of lymphocytic infiltration, chiefly perivascular, in the periadrenal fat. There were also in this case bilateral hypernephromata, 1.5 and 2 cm. in diameter, respectively, in the kidneys.

Pituitary—a thickening of the capsule and stroma of anterior lobe. Large collections of colloid in pars intermedia.

Other ductless glands show nothing of importance.

11. Arteriosclerotic Dementia.—Woman, æt. 64. Death from subdural hemorrhage and chronic nephritis.

The central nervous system showed the usual lesions of arteriosclerosis of the small vessel type, without softenings.

Autonomic System.—A few swollen cells showing chromatolysis, and an occasional degenerate cell, but most of the ganglion cells stain normally. The fibrous tissue outside the capsule is frequently increased without obvious effect on the nerve cell. The arterioles are much thickened and are occasionally surrounded by lymphocytes. There is a general increase of connective tissue in the ganglia, and in one thoracic ganglion a large sclerotic focus, which contains a few atrophic nerve cells and numerous mast cells. The latter are also found scattered through the ganglia, periganglionic tissue and nerve bundles. Among the nerve bundles in one section are numerous large pigmented phagocytes. Marchi stain negative.

The cells of the lateral horns stain well.

Ductless Glands.—Adrenals—capsules are much thickened, compressing the underlying tissue. One gland contains a large area of coagulation necrosis extending through the depth of the cortex and infiltrated with polymorphonuclear leucocytes. There are also extensive areas of fresh hemorrhage in other parts of the cortex. Pigmentation of deeper parts of the cortex is unusually pronounced. The opposite gland contains an adenoma, 1 cm. in diameter, simulating closely the normal cortical structure and surrounded by lymphocytic infiltration. Both glands show numerous foci of lymphocytes with occasional plasma and mast cells.

Thyroid—the trabeculæ are thickened and infiltrated with lym-

phocytes. There are also a number of large hymphocytic foci, replacing the alveoli.

Pituitary—nothing of note.

12. A Case of the Paranoid Form of Dementia Præcox of 3 years' known duration, dying at 47 years from double lobar pneumonia. There was also a duodenal ulcer 1.2 cm. in diameter, which had given the patient symptoms for 4 months previous to death.

Central Nervous System.—Many nerve cells are shrunken and their cytoplasm granular. Moderate thickening of arterioles and small perivascular deposits of pigment. In the Gasserian ganglion are a number of cells showing chromatolysis.

Autonomic System.—Thoracic vertebral—quite a number of cells show the axonal reaction. The interstitial tissue of the ganglia is spread apart by edema, and the nerve bundles also are slightly edematous. A few mast cells and lymphocytes are found in the nerves.

Semilunar ganglia—sections show a general shrinkage of nerve cells, with peripheral position of the nuclei. A few cells are necrotic and a number are being phagocyted. Mast cells are present in the interstitial tissue and nerve bundles.

Lumbar Vertebral Ganglia.—The nerve cells stain normally.

The cells of both the anterior and lateral horns of the cord show the same changes as those of the cortex.

Ductless Glands.—Adrenals—some thickening of capsule, and small collections of polymorphonuclear leucocytes beneath it. Marked cloudy swelling of cortical cells, with entire lack of vacuolation. A ganglion present in the surrounding fat shows swollen nerve cells with indistinct nuclei, and cytoplasm which is poor in chromatin, and stains dully and diffusely.

The other ductless glands reveal nothing special.

13. Imbecile Woman, aged 46. The predominant signs and symptoms during patient's last illness were those of mitral regurgitation and general arteriosclerosis. Pulse was irregular, intermittent, increased in rate, and of high tension. The cardiac lesions found at autopsy were mitral and tricuspid insufficiency, coronary sclerosis, and moderate myocardial fibrosis with fatty infiltration. There were also multiple abscesses of the kidneys and a peritonitis with mild reaction. The appearance of the body gave a suggestion of ductless gland disorder. It was long (161 cm.), thorax long and narrow, shoulders and pelvis narrow, trunk long in proportion to legs, hands large. Skin of face, abdomen and thighs of a uniform light brown color. Gums not pigmented. Secondary sexual characteristics well developed. The brain was small (1,160 gms.) without atrophy. The convolutions were narrow and of complicated pattern except in the left frontal region where the second and third frontals were broad and flat. Microscopically the cortex and white matter appeared narrow, especially in the frontal and temporal regions, and the laminæ crowded together. A sclerosis of both large and small cerebral vessels was present, with occasional perivascular devastations in the outer layers of the cortex; a few lymphocytes and some pigment in perivascular spaces; and zonal and subcortical gliosis.

Autonomic System.—In the stellate ganglia the majority of the nerve cells are swollen, and show chromatolysis. The stroma and nerve bundles are negative, save for an occasional mast cell. In the remainder of the thoracic chain, the nerve cells stain well. The semilunar and lumbar ganglia show an occasional chromatolytic or shrunken cell and a very few undergoing dissolution and phagocytosis; also a scattering of lymphocytes and mast cells.

Intestinal Plexuses.—The mucosa of the small intestine was injected and covered with a thick layer of mucus. Microscopically, there is a loss of superficial epithelium, and in some areas a very superficial necrosis; some edema of entire wall, and in the serosa a perivascular infiltration of lymphocytes and eosinophilic mononuclears. The ganglionic tissues are edematous, and the nerve cells show chromatolysis. Several ganglia contain masses of homogeneous, eosin-staining material, which seem to occupy the site of ganglion cells.

Ductless Glands.—Adrenals—appear slightly small macroscopically. Microscopically the capsules are thickened and infiltrated with lymphocytes and a few plasma cells. Cortex is well vacuolated. Large collections of lymphocytes in medulla. The periadrenal fat contains numerous large mononuclears with reticulated cytoplasm, also a perivascular infiltration of lymphocytes and plasma cells. The nerve cells of a ganglion in the periadrenal fat stain well.

Thyroid—alveoli are filled with homogeneous colloid. Large foci of dense connective tissue.

Pituitary—of average size. Microscopically, considerable colloid in pars intermedia; otherwise nothing noteworthy.

Ovary—normal, inactive.

14. A Case of Alcoholic Dementia in a man 51 years old. Pulmonary, intestinal and peritoneal tuberculosis, of subacute course (active symptoms of 4 months' duration).

The brain showed a superficial softening involving the anterior part of the first and second temporal convolutions on the right and of the adjacent part of the third frontal. Microscopically, the cortex in the frontal region appeared narrow, and there was a rather scanty display of nerve cells in the outer layers. Scattered large pyramids in various regions of the cerebrum were shrunken and angular, and took a dark granular stain. Marked satellite reaction in the deeper layers and very marked subpial gliosis. Moderate subcortical and perivascular gliosis. The small vessels of the cortex and white matter are moderately thickened. Gliosis of the central core of the cerebellum, of the margin of the cord and slight gliosis of the posterior columns.

Autonomic System (see Fig. 1).—The ganglia of the thoracic and lumbar chains and the semilunar ganglia are all similarly affected. Many nerve cells show chromatolysis and others are in various stages of dissolution. The nuclei of the capsule cells are large; the cell bodies are visible, sometimes have an ameboid form and indent the nerve cells. The capsular spaces are dilated and frequently contain granular material similar to that seen in the first case of pellagra. The stroma is edematous and is infiltrated with numerous lympho-

cytes, eosinophiles, and mast cells, with an occasional perivascular plasma cell. A conspicuous feature also is the presence of numerous large mononuclear cells of the endothelial type, occurring singly or in groups throughout the stroma. These cells are oval or drawn out

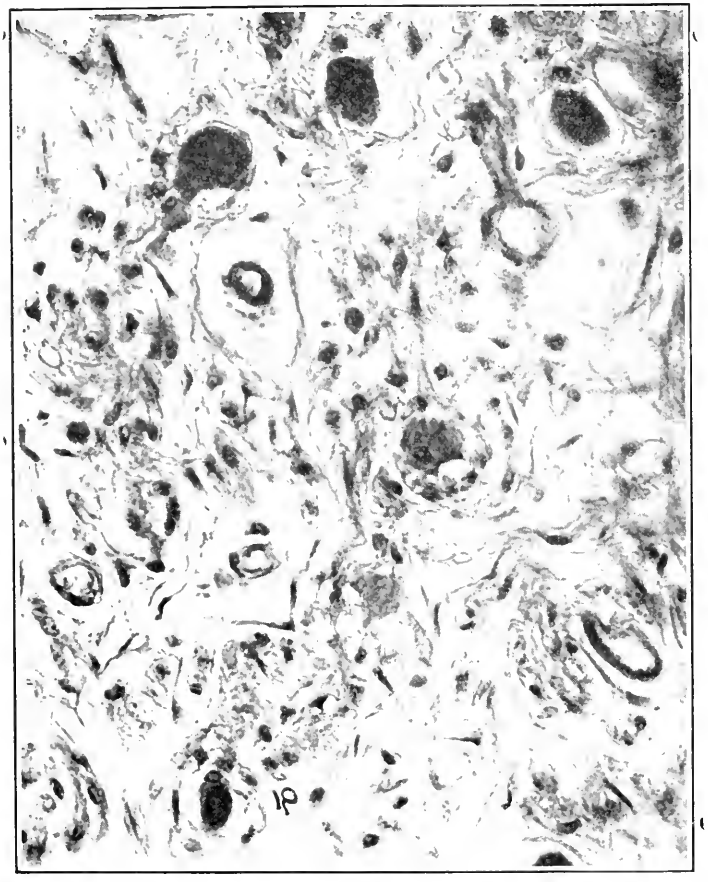

FIG. 1. Thoracic vertebral ganglion. Tuberculosis of lungs, intestine and peritoneum. Phagocytosis of ganglion cells by capsule cells. At *a* complete replacement of cell, with invasion of polymorphonuclears. Edema of stroma and vessel walls. Infiltration of endothelial cells. × 375.

into ameboid shapes, have large vesicular excentric nuclei, and nongranular cytoplasm staining deeply with eosin. Perivascular edema is very marked. Beneath the capsule of the semilunar ganglion is an area of localized edema, with diffuse and perivascular lymphocytic infiltration. Nerves connected with the ganglia show some edema and perivascular increases of connective tissue; also quite numerous mast cells and lymphocytes. Mild chronic inflammatory changes in the perigangliomic fat.

Enteric Plexuses.—The ganglion cells in the vicinity of the tuberculous lesions of both the mucosa and peritoneum are much affected. Many show chromatolysis, others are shrunken, and a few have disappeared. The tissues of the ganglia are very edematous, but, although surrounded by exudate, are not invaded. At short distances from the tuberculous lesions the ganglion cells stain well.

Cells of the lateral horns of the cord—in the upper dorsal region there is considerable lymphocytic infiltration about several vessels of the lateral horns; not seen at other levels. In the lower dorsal region there is chromatolysis limited to the cells of these groups.

Ductless Glands.—Adrenals—miliary tubercles in cortex. The medulla shows considerable perivascular infiltration of lymphocytes with a few plasma cells. Several collections of nerve cells in the medulla appear normal.

Thyroid—some general increase of stroma.

Other ductless glands not remarkable.

15. A Case of Manic Depressive Insanity of long duration in a woman 51 years old. Carcinoma of stomach. Large tumor mass in subpleural tissue, median to left scapula. Metastases to liver.

The brain showed moderate satellitosis and considerable thickening of the small vessels with perivascular lipoid deposits.

Autonomic System.—The ganglia near the subpleural metastasis mentioned above contain numerous distorted highly pigmented nerve cells. There is a sprinkling of lymphocytes and mast cells in the stroma, also phagocytes filled with yellow pigment. Similar phagocytes are found in the periganglionic fat. The other thoracic ganglia, also the lumbar, show nothing aside from a few lymphocytes and mast cells in the stroma. Sections from the semilunar ganglia show a few shrunken cells, and some edema of the stroma, with the presence of mast cells.

Ductless Glands.—Adrenals—each contains a carcinomatous nodule about 1 cm. in diameter. The metastases are surrounded with mononuclears filled with coarse granules of green pigment, and the cortex shows an extensive infiltration with lymphocytes and plasma cells. A ganglion in the periadrenal fat contains a number of shrunken nerve cells which stain deeply and diffusely. The stroma of the ganglion is edematous and contains lymphocytes, plasma cells and a few mast cells. The inflammatory changes are more marked in the ganglion than in the tissue surrounding it.

Thyroid—large focal increases of connective tissue compressing the alveoli in places.

Pituitary—small areas of fibrous increase in anterior lobe.

Pancreas—not remarkable.

16. An Involutional Psychosis of 3 years' duration in a woman 49 years old. Her illness began with distress in the stomach, loss of appetite, insomnia, agitation and apprehension. On admission to the hospital 7 months before death, she was physically reduced. Two months before death patient became more restless and agitated, screamed, adopted dramatic attitudes of anxiety and depression and uttered stereotyped expressions of distress. Termination by lobar pneumonia. The other autopsy findings were atrophy

of heart, liver, kidneys, and spleen, moderate aortic arteriosclerosis, small interstitial myomata uteri and a papillary ovarian cyst 6 cm. in diameter.

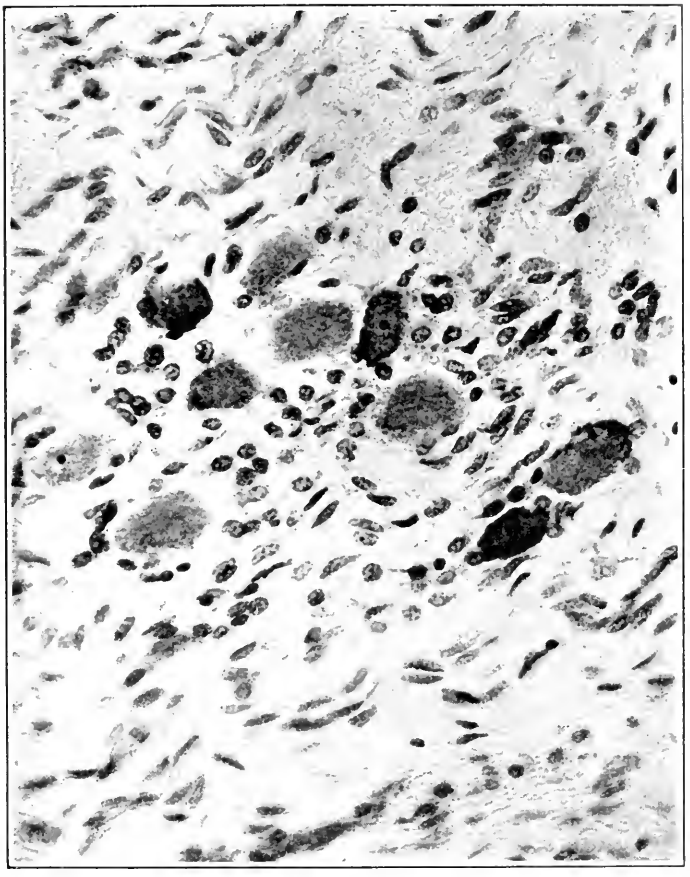

FIG. 2. Lumbar vertebral ganglion. Agitated depression. Chromatolysis of ganglion cells. × 375.

The brain showed a good display of nerve cells in the various cortices. Most of the cells stained well and had a good complement of Nissl bodies. An occasional one, however, was withered and took a dark granular stain, and a few, in the precentral cortex only, showed chromatolysis. There was a very marked satellite reaction in the deeper layers, and considerable perivascular pigment, especially in the white matter. The cells of the cerebellum, medulla, cord and Gasserian ganglia stained normally. Marchi sections showed a fine stippling of fat in the white matter of the cerebrum and cord, much fat in the nerve cells and around the vessels, and some in the neuroglia cells.

Autonomic System (see Fig. 2).—Cells showing chromatolysis are prominent in all sections. Some cells appear as shadows. Numerous other cells are shrunken, and take a dark granular stain, and their nuclei are withered, pyknotic, and peripherally situated. No neurophagia. Stroma contains small deposits of fat. Enteric plexus—the cells stain well.

Ductless Glands.—Adrenals—cortical cells are only slightly vacuolated. Small focal necroses in cortex. Both adrenals contain areas of adenomatous proliferation. A collection of plasma cells with a few lymphocytes in the medulla. A group of ganglion cells in the medulla stains well.

The other ductless glands present nothing noteworthy.

17. A Case of Katatonic Hirntod.[2] Man, aged 30, bank-clerk, who had had ideas of persecution for a year. An attack of katatonic excitement came on acutely ten days before death, and increased in violence until 36 hours before death, when patient's condition became critical. During the last two days of life the temperature was 103–104.6°.

Autopsy 7 hours post mortem.

The viscera showed nothing noteworthy macroscopically, except congestion. The description of the brain from the protocol is as follows: "The dura is congested and tense. The pia is markedly congested and moderately edematous. For the most part the pia is clear, but there is some thickening over the first frontal convolution of each side. The mesial surfaces of the frontal lobes are welded together by a rather pronounced pial proliferation involving an area approximately 3 cm. in its greatest extent. The engorgement of the larger pial vessels of the cerebral convexity is especially noticeable. The cerebral gyri are of good volume, the sulci of normal depth. No disturbance of the topographical landmarks is noted, and the convolutional pattern may be regarded as complex. The ependyma of ventricles is smooth, and horizontal section transversing the central ganglia is negative for coarse lesions; likewise vertical section of each cerebral hemisphere. The pons, medulla and midbrain are without gross lesions. The brain, with pia attached, and before section weighs 1,620 gms. (body length 167.5 cm.). Spinal cord—the pia is congested but clear. Section at cervical, thoracic and lumbar levels shows no gross lesions."

In cresyl violet sections from the frontal convolutions extensive changes in the nerve cells are apparent. All cells show loss of chromatin. Numerous large and medium-sized pyramids are slightly shrunken, their dendrites are traceable for considerable distances, and the entire cell takes a diffuse dark blue stain. The nucleus and nucleolus are indistinct. The former appears swollen, often filling the larger part of the cell. Cell shadows are frequent, the cell body being indistinctly outlined, and the nucleus invisible. The affected cells are beset with satellites, many of which are of the ameboid type. The pia is normal; lamination undisturbed, and the display

[2] The material from this case was obtained from the Westboro State Hospital through the courtesy of the pathologist, Dr. S. W. Fuller, who performed the autopsy.

of nerve cells good. Fairly numerous pigmented phagocytes in perivascular spaces. No swelling of the vascular endothelium. Herxheimer's stain reveals a considerable amount of fat in the nerve cells and in the perivascular spaces of cortex and white matter, and a small amount occasionally in a neuroglia cell.

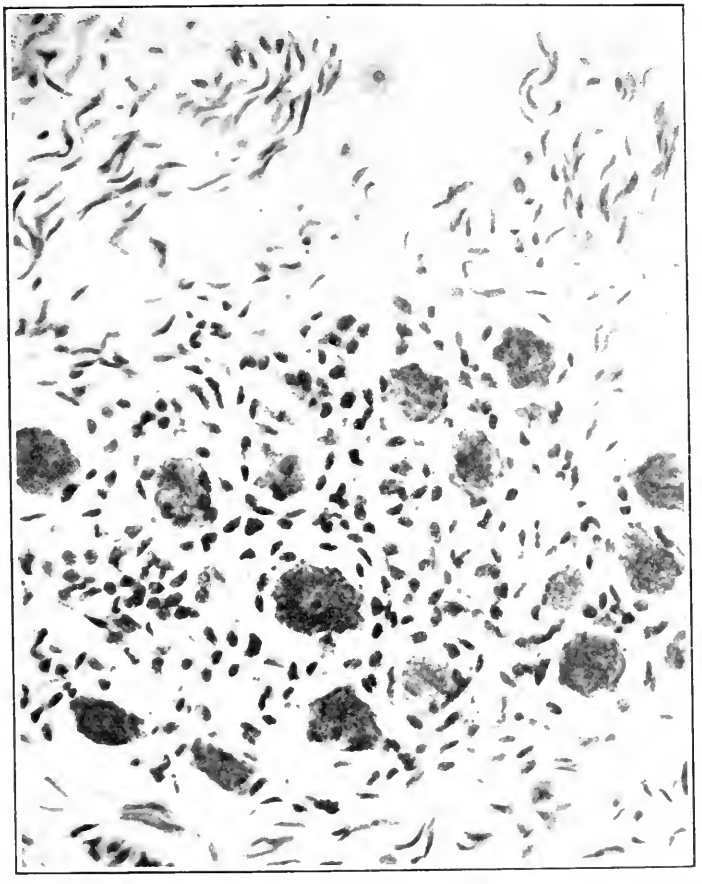

FIG. 3. Semilunar ganglion. Katatonic hirntod. Showing disintegrating ganglion cells. × 375.

Cord.—The nerve cells, including those of the lateral horns, stain well and contain a good complement of Nissl bodies. Miliary hemorrhages are frequent in the gray matter. Scharlach R sections show no fat in the white matter or around the vessels, but heavy deposits in some of the nerve cells. In a posterior root ganglion from the lumbar region most of the cells stain normally, an occasional one shows some loss of chromatin, and one or two are undergoing phagocytosis, as described below for the autonomic ganglia. The stroma contains deposits of green pigment and both stroma and nerve roots are infiltrated with mast cells.

A peripheral nerve shows nothing abnormal with the cresyl violet stain and no fat reaction with Scharlach R.

Autonomic System (see Fig. 3).—All ganglia examined present very great changes in the nerve cells. All show loss of chromatin. Those least affected take a dark diffuse granular stain. Numerous others appear as distorted disintegrating masses. Their nuclei are either invisible or seen as a shrunken opaque body at the edge of the cell. The capsule cells surrounding these ganglion cells are irregularly reduplicated, and their nuclei are large and sometimes indent the nerve cell. There is often a space around the nerve cell containing debris. Shadowy cells are frequent, and numerous cells are reduced to collections of debris which are being invaded by capsule cells and large mononuclears having the appearance of macrophages. Striking examples of neurophagia are frequent in the various sections. The stroma contains some excess of lymphocytes and in places quite numerous mast cells (five or six to each high power field). Mast cells are also numerous in the nerves. In two sections there is lymphocytosis about a vessel. The ganglion cells contain much fat, as evidenced by Herxheimer's and the Alzheimer lichtgrün method.

Enteric Plexuses.—Stain very well.

Ductless Glands.—Adrenal—the cortical cells contain little lipoid but their nuclei stain well. Medulla and periadrenal fat are negative.

Pituitary—the anterior lobe is injected.

The other ductless glands present nothing noteworthy.

Summary and Discussion

Two cases of pellagra.—Both showed prominent lesions in the vertebral, semilunar and enteric ganglia, consisting in chronic degenerative changes in the nerve cells and the occasional appearance in the two former situations of the axonal reaction, and in the latter of chromatolysis; neurophagia; light lymphocytic infiltration in the ganglia, and fatty degeneration and mast cells in the nerves. The lesions in the autonomic ganglia are similar to those in the central nervous system. The adrenals in both cases showed marked loss of lipoid, with areas of necrosis in the cortex, and collections of lymphocytes in the medulla. Both thyroids showed an excess of connective tissue, with lymphocytic infiltration in the second case.

Changes in the sympathetic ganglia in pellagra have been found by a number of authors. Belmondo (5) in 1889 described pigmentary degeneration with atrophy and loss of processes in the ganglion cells. Tuczek (5) and Lombroso also mentioned pigmentary degeneration. Singer and Pollack (5) note axonal degeneration in the semilunar ganglia of some of their cases, also in the enteric plexuses and posterior root ganglia. Kozowski (6) gives

an illustration of the heart ganglia in pallagra, showing cell degeneration, increased stroma, and hyperplasia of capsule cells.

On the other hand, we have found no mention of severe adrenal lesions in pellagra. Kozowski found nothing abnormal except capillary hemorrhages and other authors appear to have devoted no special attention to the glands. Study of the adrenals, from a number of cases of pellagra,[3] shows in the writer's experience that lesions of the cortex of greater or less extent are common. These comprise diminution or entire loss of lipoid, marked congestion, foci of lymphocytes and plasma cells, and areas of necrosis, usually small, situated in the fasciculata. In two instances groups of very large cells with large chromatin-rich nuclei of irregular shape, occasionally two nuclei to a cell, were found in the fasciculata. These might well be regenerating cells, although no mitoses could be demonstrated. Necroses of the adrenal cortex are fairly common in various toxic conditions, and their presence in pellagra would doubtless come under that heading.

A case of pernicious anemia presenting marked lesions in the central nervous system—chronic degenerative changes with lipochromatosis in the nerve cells, axonal reaction in the precentral cortex, degeneration of the posterior columns, and fatty degeneration in the cerebrospinal axis and peripheral nerves. The cells of the various autonomic ganglia were likewise much affected, showing either chromatolysis or pigment atrophy, associated with neurathrepsia. It is probable that the process of nerve cell destruction seen in the ganglia in this case is what is called by Levaditi (7) "neurathrepsia" rather than true neurophagia. Levaditi describes this as a proliferation of satellites, crowding in on the nerve cell, without consuming it, and due to primary atrophy of the nerve cell. There was also in this case marked fatty degeneration of the ganglion cells and the nerves connected with the ganglia, and numerous mast cells were present. Ganglion cells of the enteric plexuses and the adrenal medulla also shared in the pathological process, showing pigment atrophy and chronic degenerative changes, which in the intestine did not coincide in distribution with the lesions of the mucosa.

Two Cases of Paresis.—The first showed rather insignificant changes of an atrophic character in the ganglia, the second considerable cell destruction. Plasma cells were numerous in the first case, but absent in the second, in which, however, there was a light lymphocytic infiltration. In neither case did the ductless glands

[3] Occurring in the Massachusetts state hospitals, and the material obtained through the courtesy of Drs. A. E. Taft and M. M. Canavan.

show anything of note. In the semilunar ganglia of two additional cases of paresis neurophagia was conspicuous, but in neither were plasma cells found, although in one case there were numerous mast cells.

Two Cases of Cerebral Syphilis.—The chief change was a mild lymphocytic infiltration in the ganglia. Pigment atrophy of the nerve cells was present in one case, but in the second the nerve cells were normal. An adenoma of the adrenal, with inflammatory changes both in and around it, was present in the second case.

Four senile cases, two each of senile dementia and cerebral arteriosclerosis. In the senile dements the prominent features were chronic degenerative changes associated with lipochromatosis, and quite marked cell destruction. Irregularity of appearance and arrangement of capsule cells was conspicuous. They were in some places atrophic or even absent, in others large, collected at one point of the capsule, and encroaching on the nerve cell. The capsular spaces frequently appeared dilated and contained debris. A moderate lymphocytic infiltration was present in the ganglia, periganglionic tissue and nerves. The adrenals, in the one case in which they were examined, were large, but not otherwise notable. There was a sclerosis of the anterior lobe of the pituitary in both cases.

The picture in the arteriosclerotics was somewhat different, both in the ganglia and the adrenals. Both patients had chronic nephritis. Pigment atrophy and degenerative changes in the nerve cells and irregularity of the capsule cells, which were marked in the senile dements, were not notable, and in general the ganglion cells stained well. Fibrosis and arteriosclerosis however were prominent. The former appeared as a thickening of stroma and capsules of the ganglia, amounting in one instance to a large sclerotic focus with devastation; and also as localized thickenings around the nerve cell capsules. Pigmented phagocytes were found among the nerve bundles in the second case. The contrasting findings in the autonomic ganglia in these two classes of cases is interesting in view of the fact that microscopic changes in the brain in senile dementia are distinctly different from those in cerebral arteriosclerosis.

In the first case of arteriosclerosis there were bilateral hypernephromata in the kidneys and periadrenal collections of lymphocytes. In the second case, in which death was from subdural hemorrhage, there were signs of disturbance in two ductless glands. The adrenal cortex contained an area of necrosis, multiple foci of hemorrhage, and marked infiltration of lymphocytes with a few mast and plasma cells. There was also a chronic thyroiditis.

Dementia Præcox, paranoid, age 43, lobar pneumonia, duodenal ulcer. The lesions in the ganglia varied in different regions. In the thoracic chain, cells showing axonal degeneration were numerous, and the stroma was edematous. In the semilunar ganglia, atrophic and degenerative changes and neurophagia were prominent. The lumbar ganglia appeared normal. The occurrence of the two different pictures, acute in the thoracic, and more chronic in the semilunar, in the regional ganglia of organs showing lesions of different duration (lobar pnoumonia and duodenal ulcer) is interesting. Although this isolated observation does not permit any definite conclusions, the fact that the lumbar ganglia were negative would tend to show that the association is more than a coincidence. That axonal degeneration in the thoracic ganglia in severe pulmonic lesions is an unusual finding, is evidenced by other cases in this series in which it was absent (case 5, paresis and lobar pneumonia; case 7, cerebral syphilis and abscesses of the lungs; case 8, senile dementia and lobar pneumonia).

Adrenal lesions, doubtless connected with the acute infection, were also conspicuous in the present case. They comprise cloudy swelling of the cortical cells, with absence of lipoid, and chromatolysis of nerve cells in a periadrenal ganglion. Loss of cortical lipoid is common in acute infections, and has been found by Elliott (8) to be the most rapid of all in pneumonia.

Imbecile Woman, aged 46. A suggestion of ductless gland disorder in the formation of the skeleton and pigmentation of the skin. Mitral and tricuspid insufficiency, coronary sclerosis, abcesses of kidneys, purulent peritonitis, mild enteritis. The cells of the stellate ganglia showed chromatolysis, while the remainder of the thoracic chain was negative. In the semilunar and lumbar ganglia a few cells showed chromatolysis, or degenerative changes associated with neurophagia. In the intestinal plexuses there was edema of the tissues, chromatolysis of the nerve cells with the presence of homogeneous eosin-staining material which appeared to replace ganglion cells. The adrenal and thyroid presented some changes, the significance of which is not clear. These consisted in marked lymphocytic infiltration of the adrenal medulla and periadrenal tissue, and focal scleroses of the thyroid. The ovary and pituitary were not remarkable.

The chief points of interest in this case are, first, chromatolysis of the cells of the stellate ganglia, which supply accelerator fibers to the heart, associated with valvular disease (unfortunately the cardiac ganglia were not examined in this case); and second, edema of the

tissues of the intestinal plexuses and chromatolysis of the ganglion cells in the presence of a mild enteritis and peritonitis. The changes in the autonomic ganglia in this case are different from those in the central nervous system, and in the case of the stellate and enteric ganglia appear to be in relation to visceral lesions.

A Case of Alcoholic Dementia, age 51. Pulmonary, intestinal and peritoneal tuberculosis of short course. The most prominent lesions in the central nervous system were a slight superficial softening of parts of the first and second right temporal and right third frontal convolutions, satellitosis, and a gliosis in cerebrum, cerebellum, and cord. The various ganglia (see Fig. I) showed chromatolysis of the nerve cells, considerable cell destruction, swelling of the capsule cells with neurophagia, and edema of the capsular spaces. There was marked edema of the stroma and vessel walls, and an infiltration of endothelial cells and lymphocytes, with small numbers of eosinophiles and plasma cells. The nerves connected with the ganglia also showed edema and cellular infiltration.

The enteric plexuses in the vicinity of tuberculous lesions were very edematous, the ganglion cells showed chromatolysis or shrinkage and some had disintegrated. The lateral horn groups in the upper dorsal region of the cord showed a perivascular lymphocytic infiltration, and in the lower dorsal region chromatolysis of the cells. The ganglion cells of the adrenal medulla appeared normal, although the glands were involved in the tuberculous process.

It seems reasonable to attribute the changes in the ganglia of this case to the toxins of the tuberculous process. The most prominent lesions, chromatolysis, neurophagia and inflammatory edema with the presence of endothelial cells, are entirely different from those in the central nervous system, and of a more acute type. They are different also from the ganglion cell lesions of experimental alcoholism. Changes in the heart ganglia in chronic alcoholism in rabbits have been described by Lissauer (9). These consisted of degenerative conditions such as loss of chromatin, shrinkage of the cell body, and vacuolation, and are similar to those described by others in the central nervous system in experimental chronic alcoholic intoxication. Severe degenerative changes in the plexuses of Auerbach and Meissner in the stomach have been produced by D'Amato and Macre (10) by feeding dogs with alcohol.

The changes in the enteric plexus in this case are similar to those described in detail for tuberculous enteritis by Leupold (11).

Manic Depressive, woman æt. 51. Carcinoma of stomach. Noteworthy changes were found only in ganglia near a large sub-

pleural metastasis and in the semilunar ganglia. In the former the nerve cells showed shrinkage and lipochromatosis, and the stroma contained lymphocytes, mast cells and pigmented phagocytes. The semilunar ganglia showed minor changes—a few atrophic cells, edema of the stroma, and the presence of mast cells. There was a large metastasis in each adrenal, and in one gland a thick infiltration with lymphocytes and plasma cells. A periadrenal ganglion presented quite marked changes both in the nerve cells, many of which were shrunken and stained deeply and diffusely, and in the stroma, which was edematous and infiltrated with lymphocytes, plasma and mast cells. The thyroid contained a large increase of stroma.

An involutional psychosis in a woman 49 years old, characterized by somatic complaints, insomnia, restlessness and agitation. Death from lobar pneumonia.

The findings in the central nervous system were: a few nerve cells in the various cortices showing chronic degenerative changes, marked satellite reaction, perivascular lipoid deposits, and a moderate fat reaction in the white matter of cerebrum and cord.

In the thoracic and lumbar vertebral and the semilunar ganglia chromatolysis was prominent (see Fig. 2), and there were in addition numerous shrunken dark staining cells. The stroma contained a small amount of fat, but otherwise there were no notable pathological changes.

The adrenals showed small foci of necrosis and areas of adenomatous proliferation in the cortex, with loss of lipoid, also a collection of plasma cells in the medulla. Ganglion cells in the medulla appeared normal. The other ductless glands showed no histological changes.

The striking feature of this case is the presence of very numerous cells showing chromatolysis in the autonomic ganglia in a psychosis characterized by agitation and emotional distress. Chromatolysis was very occasionally found in the large pyramids of the precentral cortex, but was insignificant in amount compared with that in the ganglia.

Chromatolysis of the cortical and cerebellar cells has been demonstrated by Crile (12) in animals exhausted by fear and insomnia, and also in the brains of persons dying from surgical shock and from exophthalmic goitre. The present case is not clear-cut on account of the terminal pneumonia but it seems within the bounds of possibility to interpret the chromatolysis in the ganglia as associated with the patient's emotional condition, which would be accompanied by over stimulation of the sympathetic system. No evidence for or

against this hypothesis is gained from study of the adrenal, as degenerative changes and loss of lipoid in the cortex are well known lesions in pneumonia, and the ganglion cells of the medulla appeared normal.

A case of katatonic hirntod, the acute excitement lasting 10 days. The trunk organs showed no lesions sufficient to account for death. The pia was thickened over the first frontal convolutions, and the mesial surfaces of the frontal lobes were adherent. Microscopically, the cortical cells showed severe acute changes, there was a marked satellitosis with ameboid glia cells; pigmented phagocytes in the perivascular spaces, and much fat in the nerve cells. The cord showed miliary hemorrhages in the gray matter.

The autonomic ganglia presented marked lesions (see Fig. 3) consisting of various degrees of cell destruction up to complete necrosis with neurophagia. Lymphocytes and mast cells were frequent in the stroma, and there was occasional perivascular lymphocytic infiltration. The intestinal ganglia did not show these changes.

The adrenal cortex showed loss of lipoid, but aside from this none of the ductless glands were remarkable.

The writer has been unable to find any mention of the autonomic ganglia in the literature on katatonic hirntod. The lesions, which in the present case were striking, would appear to be of importance, in view of the intense motor excitement, terminating in exhaustion.

The above summary shows that lesions in considerable variety are present in the autonomic ganglia in a variety of diseases, both of the viscera and the nervous system. Changes in the ganglia are in the majority of the cases of the same general character as those in the central nervous system, as for instance the chronic degenerative processes, chromatolysis and axonal reaction of pellagra, and the pigment atrophy and disintegration of senile dementia. In several instances, however, the lesions in the ganglia did not coincide with those of the central nervous system but seemed to bear a relation to somatic conditions, e. g., case 12, axonal reaction in the thoracic ganglia, lobar pneumonia; chronic degenerative changes in semilunar ganglia, duodenal ulcer; case 13, chromatolysis limited to stellate ganglia, mitral and tricuspid insufficiency; case 14, chromatolysis, neurophagia and inflammatory edema, generalized tuberculosis; case 15, pigment atrophy, pigmented phagocytes and lymphocytic infiltration in ganglia near a subpleural carcinomatous metastasis. The relations between the autonomic system and the organs are so complicated and obscure that one can do no more at

the present time than to record the above observations without elaboration.

The cells of the lateral horns of the cord were affected in cases in which cells of other groups also showed changes, but were the only ones affected only in the case of tuberculosis.

The enteric plexuses showed changes where there were lesions in the mucosa or peritoneum, notably in pellagra, tuberculous enteritis ileocolitis, and peritonitis. In pernicious anemia they showed changes of the same character as cells in the central nervous system and vertebral ganglia, and in distribution independent of lesions of the mucosa.

The ductless glands which showed lesions most frequently were the adrenal and thyroid.

In ten of the seventeen cases lesions of the adrenal cortex were present. No correlation could be made out, however, between the adrenal changes and lesions of the autonomic system, as the latter were equally pronounced in some cases in which the adrenals showed no change. In the group with adrenal lesions, however, there were in several instances, and in contrast to the other series, changes in the other ductless glands notably the thyroid, which showed fibrosis or chronic inflammation. This, in the writer's experience, is a common autopsy finding in insane women, particularly those dying in middle life or a little beyond. Changes in the adrenal and periadrenal ganglia seem not to bear any constant relation to adrenal lesions. The ganglion cells may appear normal although the cortex is severely affected (case 14, tuberculosis; case 16, lobar pneumonia) or may be affected in the absence of adrenal lesions (case 3, pernicious anemia), or show changes in the presence of adrenal lesions (case 12, pneumonia; case 15, carcinomatous metastases).

Cellular infiltration of the ganglia, the nerves connected with them, and the periganglionic fat was common, but reached a high grade only in the case of tuberculosis, where it was associated with considerable edema. Lymphocytes were present in the majority of cases, plasma cells in one case of paresis and endothelial cells in the case of tuberculosis. Mast cells were also frequent, and were most numerous in a case of katatonic hirntod. Nissl (13) considers the presence of scattered mast cells in the perivascular spaces of various parts of the central nervous system to be of no pathological importance. He, however, found them in great abundance in the cerebellum of a case of katatonic hirntod. Neither the origin nor the significance of these cells is settled. Nägeli (14) considers them an entity, the granules peculiar and specific, while others believe that

the granules may appear in any connective tissue cell, and that they are a phase in the history of certain blood cells, particularly lymphocytes.

Conclusions

I. The thoracico-lumbar, semilunar, and intestinal ganglia of seventeen cases were studied, in connection with the central nervous system and the ductless glands. The cases comprise two each of pellagra, senile dementia, paresis, cerebral syphilis, generalized (including cerebral) arteriosclerosis, and one each of pernicious anemia; imbecility plus mitral insufficiency; dementia præcox plus lobar pneumonia; alcoholic dementia and generalized tuberculosis; manic depressive and carcinoma of stomach; involutional depression; and katatonic hirntod.

II. In no instance were the ganglia normal. In the cerebral syphilis cases, however, the changes were rather insignificant, while in the other conditions, well marked or severe lesions, of either diffuse or local distribution, were found.

III. The conditions found may be grouped as acute and chronic degenerative changes in the nerve cells, and exudative manifestations in the stroma. Using the established criteria, we should consider as chronic changes cell shrinkage, finely granular cytoplasm, lipochromatosis, and neurathrepsia; as acute changes swelling of the nerve cell with chromatolysis, and fatty degeneration of the nerve sheaths. The axonal reaction, and neurophagia, are usually classed with acute changes, but may extend over considerable periods of time. The exudative processes consisted in edema of the stroma and capsular spaces and the presence of lymphocytes, plasma, endothelial and mast cells and phagocytes.

IV. Chronic degenerative changes in the ganglion cells predominated, as would be expected, in the chronic organic nervous diseases (paresis, senile dementia and cerebral arteriosclerosis). They were also found in ganglia in the vicinity of organs showing chronic lesions. Acute changes predominated in the case of katatonic hirntod, and in the local ganglia in certain pathological conditions, as valvular heart disease and acute enteritis and peritonitis. Both acute and chronic conditions and those which might be either, as axonal reaction and neurophagia, were present in pellagra, pernicious anemia, tuberculosis and involutional depression.

V. A point of interest and importance is the special incidence of lesions in the ganglia, and their possible correlation with adjacent visceral conditions. In several instances the lesions were not universally distributed, but were limited to ganglia in the vicinity of affected structures.

VI. The cases in this series may be grouped as follows:

(*a*) Those showing universal incidence of lesions in the autonomic ganglia. This includes the cases showing diffuse organic disease of the central nervous system—pellagra, pernicious anemia, arteriosclerosis, paresis, senile dementia and katatonic hirntod; also the case of involutional depression, and of disseminated visceral disease, tuberculosis.

(*b*) Those showing a localized distribution of lesions, standing in apparent relation to visceral conditions. This includes examples in the vertebral, prevertebral and peripheral ganglia.

(*c*) Those showing notable exudation. This group overlaps the other two, and includes the cases showing plasma and endothelial cells, a noteworthy number of lymphocytes and mast cells, or serous exudate.

VII. In an agitated depression changes suggestive of fatigue processes were found in the thoracicolumbar chain of ganglia, and in a case of katatonic hirntod marked lesions of an acute degenerative type, associated wtih neurophagia.

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THE RELATION BETWEEN OVER-ACTIVITY OF THE VAGUS SYSTEM AND ANAPHYLAXIS[1]

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Part I

The clinical study of the vegetative nervous system is comparatively new. A fundamental conception of the recent work is the anatomical parallel and the physiological antagonism between the two parts of the system, the sympathetic and the vagus. Exerting a constant balance one to the other, under physiological conditions a normal tone results. The normal excitant of the sympathetic is adrenalin. Its counterpart, the hormone or hormones for the vagal system, is not known.

Undue stimulation of one system results in an increased tone with characteristic manifestations, and the same general manifestations are seen under any influence that unduly depresses the opposite system. Manifestly, then, it is not always easy to say that a given effect is purely the result of stimulation of one side, to the exclusion of some degree of depression on the opposite side. Furthermore, the clinical manifestations of increased tone in one system are not always pure, *i. e.*, they may be accompanied by signs of overstimulation of the opposite system in another part of its anatomical distribution. For example, myotic pupils should accompany a thoroughgoing autonomic stimulation. But, on the contrary, the pupils of the vagotonic individual are often widely dilated (43). These limitations, however, are refinements that do not prevent the recognition of clinical types, and certain practical results are possible in treatment.

By "vagotonia" is meant the clinical appearance of chronic or recurrent symptoms recognized as manifestations of over-activity of the vagus system or parts of it.[2]

In the discussion to which the subject has given rise, there has

[1] Read before the Richmond Academy of Medicine and Surgery, March 28, 1916.

[2] Unfortunately, some confusion exists in the nomenclature applied to the vegetative nervous system. In this paper the terms "vagus system," "vagus extended," and "autonomic system" are used as synonymous with each other. No distinction is made between the states, vagus irritability and vagus stimulation, though the difference is real.

been some tendency to regard it as a clinical entity, based on a constitutional inferiority of the nervous system. In some cases this may be true. But there is probably more to be gained in the individual case by regarding it as a symptom-complex with an underlying toxic basis. In this paper, an attempt will be made to show the generality of a toxic cause of vagotonia, especially the influence of anaphylactic poisons.

The Distribution of the Vagus Nerve and the Vagus System Extended.—The motor fibers of the vagus nerve supply the intrinsic muscles of the larynx, the bronchi, esophagus, stomach, small intestine and part of the large intestine. Inhibitory fibers are carried to the heart, and secretory fibers to the gastric and pancreatic glands. Its sensory fibers are distributed to the mucous membrane of the larynx, trachea and lungs, and to the mucous membrane of the esophagus, stomach, intestines, gallbladder and ducts (1).

As part of the vagus system extended should be included fibers to the ciliary body and pupil of the eye, fibers to the salivary glands, the descending colon, sigmoid and anus, the bladder and genital apparatus. Physiologically, it seems also to dominate the sweat glands.

Stimulation of the vagus system, as by pilocarpin, results in myosis, the contraction of the smooth muscle fibers supplied by the vagus, cardiac inhibition, increase of glandular secretion, and sweating.

In a comprehensive monograph on Vagotonia, Eppinger and Hess (2) describe the symptoms and signs of vagus irritation as consisting chiefly of the following:

Myotic pupils, tendency to sweat, free salivary secretions, gastric hyperacidity, active gastric and intestinal peristalsis, pylorospasm, spastic colon, bradycardia, low blood pressure, shallow respiration and dyspnea, gag-reflex absent; cold, clammy hands; dermographism; nervousness; the marks of the status-thymico-lymphaticus; increased carbohydrate tolerance; eosinophilia; and hypersensitiveness to pilocarpin.

Of the above, the symptoms of which the patient is most likely to complain are:

Nervousness, hyperhidrosis, embarrassment of respiration, epigastric pain due to pylorospasm, constipation or alternating constipation and diarrhea. Few patients show all of these symptoms. Most vagotonic individuals present a general picture of vagus irritation, without special visceral manifestations. They are often diagnosed indiscriminately as "neurotics."

Often the emphasis is on one or two symptoms. When one is

especially aggravated, coupled with other perversions of function in the viscus chiefly involved, we are confronted with one of a series of clinical conditions long recognized, such as bronchial asthma; certain functional gastropathies; spastic constipation, neurogenic diarrheas and mucous colitis; bradycardia and its associated symptoms.

Experimental Anaphylaxis.—The phenomena of experimental anaphylaxis show a close parallel to those already described—are, in fact, manifested chiefly through the same mechanism of vagus stimulation. A physiological variation of vagus irritability in different animals (2*a*) is reproduced in anaphylaxis. The reaction in the guinea-pig most nearly resembles that seen in man. Following the description and explanation of Kolmer (3):

In the guinea-pig the manifestations are most evident in the bronchi, owing to the peculiar anatomic structure of the mucosa, which is relatively thick as compared with the lumen. Contraction of the smooth muscle throws it into folds that completely occlude the bronchi, causing death from inspiratory asphyxia. Or, if the animal survives, profound, permanent emphysematous distention of the lungs persists. There is peribronchial accumulation of eosinophile cells; and as in anaphylactic states generally, there is peripheral eosinophilia. When the intoxicating dose is administered subcutaneously, there is also a local accumulation of these cells in the surrounding inflammatory area described by Arthus.

The bronchial mucosa of dogs, rabbits and cats, however, is relatively thin and poor in smooth muscle tissue, which may account for an entire absence of transitory respiratory difficulties during anaphylactic shock in these animals.

In the dog the most marked effect is apparent upon the smooth muscle of the gastro-intestinal tract, contraction resulting in setting up vigorous intestinal peristalsis, hemorrhagic enteritis, vomiting, and involuntary emptying of the urinary bladder. Dogs, especially, show a fall in blood pressure.

In rabbits the heart is severely affected, while in guinea-pigs there is a remarkable lack of interference with the heart.

The fundamental fact in anaphylaxis is proteolysis. The parenteral reception of foreign protein so modifies cells of the body as to develop a special proteolytic capacity for that particular protein—the process of sensitization. Under certain conditions, this capacity for specific proteolysis is later exercised at a rate and in a degree to produce toxic substances clinically appreciable—anaphylactic intoxication.

The exact composition of these toxins is not known. One of them

may be histamin (4*a*), derived from histidin, a cleavage product of protein. Whatever their identity, their pharmacological effects, in general, resemble those of the alkaloids—quickly effective, and either fatal or strictly transitory. Their chief influence is exerted in their action on the vagus system or the muscles supplied by it—according to Schultz, directly on the smooth muscle. They, therefore, closely resemble pilocarpin and the other alkaloids of the class of vagus irritants. Histamin, pharmacologically, is in the same class as physostigmin, muscarin, cholin and the like.

If we trace out the action of pilocarpin and the action of anaphylatoxins, we have drawn two parallel lines.

If pilocarpin is administered to an individual already showing a tendency to vagus excitability, a more marked effect is produced than is obtained when the same dose is administered to a normal individual. When we administer antitoxin for diphtheria to the same type of individual, the vagotonic, say an asthmatic,[3] we may irritate the vagus system to the point of death, whereas a normal individual is only slightly affected if at all. Not all vagotonics, however, are susceptible to this exaggerated reaction to horse serum. If one vagotonic reacts to horse serum with symptoms of anaphylactic shock, while another does not, manifestly the vagotonia does not in itself determine the response, and a constitutional inferiority of the nervous system does not explain the reaction. The classification of this hyperacute form of serum sickness as an anaphylactic manifestation is not questioned any longer, and the individual displaying it is regarded as sensitized to horse serum. When the shock is survived, an anti-anaphylactic state has been observed in some instances (6). The question may, therefore, well be asked: Is not vagotonia in these cases itself an expression of an anaphylactic state, which becomes acute under a specific toxic influence: the same sensitization and previous milder intoxications accounting for the hitherto milder expression of vagotonia. If such be the case, then these phenomena bear a close relationship to the experimentally induced protein fever of Vaughan (38). The chronicity of the period of sensitization which must be assumed in the vagotonic cases is approximated in Vaughan's experiments. He found that any form of fever could be produced and maintained for weeks by regulating the size and frequency of dosage of protein. Conversely, the vagotonic who does not respond by prompt serum sickness to the injection of horse serum is vagotonic from some cause specifically different from horse serum.

[3] Gillette collected 30 cases of abnormal reaction to diphtheria antitoxin, 16 fatal. Twenty-two were subject to asthma (5).

Our object, therefore, is to inquire how far there is evidence to support the assumption that vagotonia seen clinically is due to a toxin acting like pilocarpin and histamin, probably in most cases an anaphylatoxin.

The criteria by which it is proposed to gauge this possibility are as follows:

(*a*) The closeness of the clinical analogy to experimental anaphylaxis.

(*b*) The reasonableness of a protein antigen to play the part of sensitizer and intoxicant under anaphylactic conditions.

(*c*) The possibility of demonstrating in the blood antibodies lytic to the suspected protein, or in the tissues a specific reactivity.

Naturally, the evidence will not be equally convincing in all the variations of the vagotonic picture. But the chief cause of incompleteness may lie in the lack of a working suspicion as to the antigen in a special instance.

Intestinal Parasites.—The vagotonic manifestations of these conditions have not been emphasized as far as I know, but they are often apparent.

In trichiniasis, in addition to the pain due to the presence of the parasites in the muscles, there is urticaria, eosinophilia locally around the parasites, and general eosinophilia, dyspnea, and in severe cases violent asthma (7).

An unopened echinococcus cyst may give rise to no toxic symptoms. But the symptoms of a ruptured cyst strikingly resemble those of anaphylaxis (4*b*). A local accumulation of eosinophiles occurs in the neighborhood of the cyst, as also at the site of attachment of the hook-worm to the intestinal mucosa.[4] Peripheral eosinophilia is characteristic of the presence of all parasitic worms. Urticaria is a common symptom.

In the production of induced anaphylaxis, it is a common method to sensitize the animal by spraying the nasal mucosa with the sensitizing agent (8). Compared with this process, on dissecting the parasite, *Ascaris megalocephalus*, sneezing, conjunctival irritation, and paroxysmal asthma are reported (9). According to Goldschmidt, these symptoms become progressively worse with repeated handling of the parasites (10).

Herrick (10), after experimenting with intra-peritoneal injections of aqueous extract of *Ascaris lumbricoides*, came to the following conclusions:

[4] It has been shown that extracts of certain parasitic worms have a direct chemotactic influence on eosinophile cells. The possibility of an anaphylactic reaction does not exclude the presence of primary toxic products elaborated by the parasites.

1. A notable eosinophilia of the blood could be developed.

2. The causative substance is a protein.

3. Previous sensitization is necessary.

4. It is impossible to produce such eosinophilia while the animals are immune to the extract.

5. The eosinophilia, therefore, may be considered evidence of previous sensitization.

6. There is a possible association of these facts with the problem of bronchial asthma.

Blood of the echinococcus carrier gives precipitin and complement-fixation reactions with extracts of the parasite (4*b*). Manoiloff (11) obtained marked and specific Abderhalden reactions in the blood of each of eighteen patients with *Tænia solium* and each of four patients with *Ascaris lumbricoides*.

Food Idiosyncrasies (3*a*).—The following case reported by Bronfenbrenner, Andrews and Scott (12), exhibits the vagotonic picture, and demonstrates the anaphylactic nature of one instance of food idiosyncrasy (13).

A girl, aged 17, had been subject to asthmatic attacks and severe gastro-intestinal disturbances whenever egg was taken by mouth. Following the accidental ingestion of this substance while under the authors' observation and the recurrence of the customary symptoms, the serum of the patient was examined by the Abderhalden method with coagulated egg-white as substrate. Specific proteolytic bodies were demonstrated beyond question. Further, guinea-pigs sensitized by the patient's serum, likewise showed the egg-proteolytic properties. Finally, the sensitized guinea-pig serum, reacting *in vitro* with egg-white, produced a toxin lethal for guinea-pigs.

Positive skin reactions are seen in children showing idiosyncrasy to egg (14).

Many other foodstuffs possess for certain individuals similar toxic power. Such are shellfish, strawberries and buckwheat. Their toxic action is seen especially in the symptoms urticaria and edema, accompanied by eosinophilia. Bruck demonstrated the anaphylactic nature of the reaction to pork. As Rosenau and Anderson state (15): "The power to assimilate and use foreign proteins is not achieved without a certain amount of violence to the body. The relation between the fundamental facts of protein metabolism and the immunity to certain diseases becomes clearer in the light of observations upon anaphylaxis."

Asthma.—We are accustomed to refer to the respiratory phenomena in cases like the one reported by Bronfenbrenner as "asth-

matic," because the protein is known. In an individual showing the same symptoms recurrently, without known cause, we would doubtless diagnose bronchial asthma.

The idea of the anaphylactic origin of asthma, at first tentatively advanced, has rapidly become fixed. True bronchial asthma is precisely the condition seen in guinea-pigs in the experimentally induced anaphylactic state. The symptoms common to the two conditions are the bronchial spasm, expiratory dyspnea and resultant emphysema, urticarial rashes, a local pulmonary eosinophilia, and a general peripheral eosinophile increase.

The instances in which the patient knows the protein to which he is sensitive are numerous. Of these we see most frequently the asthmatic who experiences his attack on coming near horses. Specific skin reactions similar to those in subjects of egg idiosyncrasy are obtainable (14). The asthmatic phenomena reported by Goldschmidt, associated with handling a parasitic worm the second time are, no doubt, typical of other protein agents.

Hay Fever and Spring Catarrh.—Clinically, these two conditions differ little save in their seasonal variations. They differ from asthma practically only in the level of the respiratory mucous membrane affected. Hay fever and asthma are often associated in the same individual, or the one may precede the other.

The symptoms of hay fever are essentially those seen in the guinea-pig following sensitization and intoxication through nasal sprays. There is a local eosinophilia in the nasal mucous membrane. In the peripheral blood, also, there is eosinophilic excess.

The corpuscles of many hay fever patients are laked by pollen. Forty-five out of a series of forty-nine patients tested by Goodale (16) gave a positive skin reaction with the pollen of ragweed. Many reacted to several varieties of pollen, suggesting a protein common to the several varieties (13).

Juvenile Emphysema and Eosinophilic Bronchitis.—Eppinger and Hess state that they have never failed to find signs of vagotonia in cases of juvenile emphysema. Emerson (17) and others state that the eosinophile cells are commonly found in excess in the blood in emphysema. The so-called eosinophilic bronchitis suggests asthma without marked bronchial spasm. The fact that asthmatics usually have eosinophilic bronchitis and more or less emphysema suggests an almost inseparable relation between the three conditions. The vagotonic features are common to the three, and an anaphylactic basis is probable at least in such cases as are characterized by eosinophilia.

In this connection the work of Koessler and Moody (13), relative to the etiology of chronic bronchitis and asthma is of interest. They claim to have experimentally proved the anaphylactic nature of bronchial asthma in at least two of its etiological varieties—egg-asthma and pollen-asthma, and their claim is in accord with the findings of others. But the greatest number of asthmatics do not belong to this class.

These writers found that most subjects of asthma give a history of the first attack following a cold, tonsillitis or grip of several weeks or months duration, and subsequent attacks introduced by a new cold or bronchitis. The chronic bronchitis seen in many asthmatics in the interval between attacks, they regarded as the primary rather than a secondary condition, and believe that the asthmatic patient has become sensitized to the infective agent causing his cold or bronchitis. Their bacteriological studies of the exudate in 28 cases gave constant results, the same three anaerobic organisms being present in each. In three cases the sputum contained histidin or histamin.

These authors refer also to a type of tuberculous chronic asthma-bronchitis associated with emphysema, due, not to the acid-fast bacillus, but to Much's granular form. These injected into guinea-pigs, produced typical tuberculosis. The effect of pressure of tuberculous bronchial glands was carefully excluded in these cases. The anaerobic flora found in the 28 cases referred to were present also in the cases showing the atypical tubercle bacilli.

Mucous Colitis.—It will be recalled that the phenomena of experimental anaphylaxis in the adult dog are exhibited chiefly in the gastro-intestinal tract, and consist of vomiting, violent peristalsis and hemorrhagic enteritis. After the severe symptoms of shock wear off, the intestinal mucous membrane shows a local eosinophilia in the submucosa (5*a*).

The vagotonic nature of spastic constipation and of the resultant mucous colitis is set forth by Eppinger and Hess. Despite any differences of opinion regarding the innervation of the large bowel, the influence of stimulation of the vagus nerve in the production of symptoms of this character has been shown by Roger (18), who found that stimulation of the vagus in rabbits leads to expulsion of mucous casts of the intestines. A similar result is seen in the administration of large doses of pilocarpin to rabbits.

Hertz (19) has drawn a close analogy between mucous colitis and asthma. The essential factor in asthma is bronchospasm: in mucous colitis, colonic spasm. Both are recurrent. The mucus

excreted in the two conditions is very similar. In both cases the few leucocytes embedded in the coagulated mucus are mainly eosinophiles, and are accompanied by Charcot-Leyden crystals. A similar type of individual is liable to the two conditions, both of which may sometimes occur in the same patient either alternately or simultaneously.

Eosinophilic Intestinal Crises of Children.—Closely related to mucous colitis in the adult, and probably bearing to it much the same relation as juvenile emphysema to asthma, is the condition in children emphasized by Langstein (5*b*) and others. Eppinger and Hess point out the vagotonic basis. It is characterized by profuse discharge from the bowels of mucus and pus, in which large numbers of eosinophile cells are found. Langstein described as typical a case in which there was facial eczema and a perpiheral eosinophilia of 8 per cent.

Eosinophilia.—Running all through the list of clinical conditions classified as vagotonic is a peripheral eosinophilia. This blood picture is likewise seen following the injection of pilocarpin and in induced anaphylaxis. It is not constant, of course, even when parasites are present in the intestines, but it is more or less characteristic of the conditions referred to. In 1911, Moschcowitz (20) made the broad claim that the invasion of eosinophiles in increased numbers into the blood stream is the expression of an active agent, or is the agent itself, in the production of anaphylaxis: and the corollary was drawn that all eosinophilic conditions are anaphylactic. Eppinger and Hess point out the general association of oesinophilia wtih vagotonic manifestations, especially of the skin, intestines and lungs (21). But these authors do not clearly state what they believe to be the sequence in cause and effect of the three elements, eosinophilia, vagotonia and anaphylaxis.

If it can be shown that a pure mechanical stimulation of the vagus is capable of producing eosinophilia, without the intervention of possible toxic factors, then eosinophilia should be regarded as a manifestation of vagotonia, rather than the result of a common cause of vagotonia and anaphylaxis. But as far as I am aware, there is no evidence that eosinophilia can be caused in this way either experimentally or in such clinical conditions where vagus irritation appears consequent upon mechanical stimuli, as pressure on the vagus in its course through the mediastinum. Nor, on the other hand, do I believe we are justified in the sweeping statement that all eosinophilic increase is anaphylactic. Though Herrick (10), in dealing with the extract of *Ascaris lumbricoides,* was unable to pro-

duce eosinophilia without previous sensitization, nor when the animal was immune, the primary injection of substances like pilocarpin does cause the blood reaction.

The peripheral eosinophilia is no more striking than the local accumulation of these cells at the main seat of the disease, *i. e.*, at the point of maximum concentration of toxins. In the instances where the toxic agent is known, this tendency constitutes a law: where a toxic agent is unknown, such an agent may be fairly deduced, and its area of maximum concentration likewise inferred from the site of the local eosinophilia. This feature is the counterpart of the Arthus phenomenon in experimental anaphylaxis and serum sickness. Whatever be the exact force implied by the term chemotaxis, that there is some attracting influence exerted by certain toxins toward these cells is apparent from the following experiment.

A capillary tube containing an extract of *Tenia cucumerina* and *Tenia cœnurus* was placed in the peritoneal cavity and subcutaneous tissues of rabbits, and was found at the end of twenty-four hours to contain many leucocytes, most of which were eosinophiles (10). Such results do not seem to involve a previous sensitization, but rather that such extracts contain substances capable of producing a local eosinophilia similar to that occurring in the Arthus area. Early in the process of acute inflammations generally, eosinophiles in increased numbers are seen at the seat of injury (9*a*). But their behavior in pyogenic bacterial conditions differs from those under consideration, at least in this: that they are not present in excess in the peripheral blood stream. Furthermore, as already quoted, Herrick was unable to produce peripheral blood eosinophilia with extract of *Ascaris lumbricoides* except when the animal had been previously sensitized.

It is reasonable to suppose that the local accumulation of eosinophiles in the Arthus area is due to a toxic influence, rather than to a vagus influence, and in the light of our present knowledge they must be believed to be transported to this area through the blood rather than manufactured *in situ* (5*a*). Moreover, according to Schlecht (5*c*), the principal source of the eosinophilia of anaphylactic conditions lies in an increased formation of cells in the bone marrow, and in an increased outflow of these into the circulation. It is not so difficult to see how these cells respond to the influence of vago-irritant toxins, just as do the neutrophilic elements in the presence of pyogenic bacterial toxins, but it is difficult to understand how an increased vagus tone could, in itself, influence these cells to migrate from the bone marrow.

If the local accumulation at the point of maximum concentration of toxins and the exodus of these cells from the bone marrow are conceived to be due to toxic rather than nerve influence, their appearance in the blood stream in increased proportions naturally has the same toxic explanation. Charcot-Leyden crystals, so often seen in association with eosinophilia, may be regarded as by-products of these cells, or, with them, the result of a common cause.

The occurrence of eosinophilia, at times, in certain other organic conditions, as carcinoma and leukemia, is not difficult to explain on the assumption of a proteolytic basis. For, in both conditions there is abundant evidence of increased protein destruction, and these body proteins may well be modified so as to be foreign to the organism. Thus, in the breaking down of such proteins, toxic substances of the type under consideration would be furnished. This mode of autointoxication is accepted as genuine by workers in the field of experimental anaphylaxis (*3b*, *22*).

The effect of atropin is likewise suggestive of a toxic rather than a nerve stimulus as the exciting cause of peripheral eosinophilia. While Eppinger and Hess state that atropin will dissipate eosinophilia, Herrick (*10b*) found that he was unable to get this result, save only by the use of large and toxic amounts, sufficient to exercise a general depressant effect on nutrition. The strictly vagus phenomena can, of course, be controlled by atropin.

The conclusion, therefore, respecting eosinophilia would seem to be the same as suggested for the majority of clinical conditions with which it is associated—the eosinophilia is not due to a basic inferiority of the autonomic system, but is the expression of a toxemia, due to a toxin acting like pilocarpin and histamin, probably in most cases an anaphylatoxin.

Urticaria and Angio-Neurotic Edema.—In many cases in which the predominating symptom has been urticaria, various observers have demonstrated an anaphylactic origin. Satinwood dermatitis, egg, pork and buckwheat poisoning, and similar conditions frequently spoken of as idiosyncrasies, have yielded specific antibodies for the respective proteins (*23*). In many other cases in which urticaria has appeared as part of a more general vagotonic picture, the same sort of evidence relating it to anaphylaxis has been obtained. Furthermore, the symptom appears in experimentally induced anaphylactic states. It is associated with peripheral eosinophilia, and these cells usually abound in urticarial wheals (Gilchrist). The evidence at hand seems to justify the belief that, like eosinophilia and vagotonic conditions generally, it is an expression

of a toxemia, due to a toxin with a predilection for the vagus system, probably in most cases an anaphylatoxin.

As to angio-neurotic edema, there is much that is suggestive of an anaphylactic origin of the condition as seen clinically, and definite proof that it may have such a basis under experimental conditions. The skin lesions of induced anaphylaxis are described by some writers as urticaria, by others as angio-neurotic edema (15). The same type of individual is liable to both conditions, and to asthma and mucous colitis. The same individual may exhibit in one attack urticaria, in another angio-neurotic edema. Synonyms of angio-neurotic edema are giant urticaria, and urticaria edematoma. Osler (24) says: The special lesion of angio-neurotic edema is nothing but a wheal of urticaria writ large. The difference is one of degree and amount of exudation, not of kind. It is associated with eosinophilia. Its clinical analogy to serum sickness has been observed by various writers. Munger (25) states that, as we know more about induced anaphylaxis, we will gain exact knowledge of the condition known as angio-neurotic edema. He quotes Weil (26) as of the same opinion.

The eosinophilia seen in these exudative skin lesions is more or less characteristic of certain other chronic skin conditions. Stimulated, perhaps, by this association, various writers have sought an anaphylactic basis for other skin lesions, but often without conclusive results. Wells (4c) quotes both Heyde and Vogt as of the opinion that the toxic symptoms of superficial burns, especially those dying unexpectedly ten or twelve days after the accident, are anaphylactic reactions to proteins rendered foreign to the body by heat. Johnson (27) discusses the subject of anaphylaxis in cutaneous diseases in a judicial manner, and concludes there is evidence of the relationship in some cases, but not in all the conditions for which it has been suggested.

Part II

Artificial Stimulation of the Vagus Nerve and the Effects of Pressure.—A type of vagus irritation as a result of stimuli of this character has long been known: likewise the possibility of stimulation of this nerve by reflex irritation. The effects are seen chiefly in the inhibitory influence on the heart, but are by no means so limited. The intestinal phenomena following this procedure in rabbits have already been referred to, and the paroxysmal dyspnea due to bronchial spasm and relieved by atropin is referred to by Longcope (28) as a reflex phenomenon of syphilitic aortitis. The hoarseness of aneurysm, dilated aorta, inflammatory masses and new growths in

the mediastinum are probably manifestations of pressure on the vagus, and paralysis of the recurrent laryngeal nerve seen in mitral stenosis probably has a mechanical basis. Hoover (29) has recently described attacks of paroxysmal dyspnea and acute emphysema in two cases. The first was associated with an inflammatory mass in the mediastinum, and the second with aneurysm of the arch of the aorta. In both cases the vagi were found at autopsy involved in the tumor masses. In two other cases of aortic insufficiency there were attacks of tachypnea, associated with slow pulse. Both patients were relieved by atropin.

But in the case of vagus irritation due to pressure, the outstanding features in most instances are the angina and bradycardia or arrhythmia, with a type of respiration we are accustomed to associate with angina rather than the breathing of the asthmatic. Moreover, as far as the reports go, eosinophilia is lacking. Eppinger and Hess, and also Hopkins (21) call attention to the fact that it is particularly in the cases where the lung, intestinal or skin element is prominent that eosinophilia is most likely to occur. These are routes by which, as shown by many observers, sensitization in the anaphylactic sense can occur (6). On the other hand, bradycardia is not a conspicuous symptom of the types of vagotonia in which the lung, intestinal or skin element predominates. Pilocarpin in sufficient doses to bring out strongly the lung, intestinal and skin features rarely slows the pulse rate in man (30, 31). These facts, taken in connection with the local accumulation of eosinophiles at the area of maximum concentration of the toxins and the peripheral eosinophilia, seem to indicate a rough dividing line between the bradycardiac and breast-pang cases on the one hand, as due to vagus irritation by pressure: and on the other hand, the eosinophilic cases in which the skin, intestinal or respiratory symptoms are prominent, as of probable toxic origin.

The Emotions and Psychic Stimuli.—Despite any degree of probability of a toxic basis generally underlying vagotonic manifestations, the influence of purely nervous stimuli must be recognized. The competency of such stimuli to excite attacks of mucous colitis, asthma, urticaria and angio-neurotic edema in individuals subject to these maladies has often been demonstrated. The story of the old lady, who, convinced of the association of her attacks of asthma with roses, promptly suffered a severe attack on being shown an artificial rose, is not exceptional. The thought or sight or smell of food as a stimulus to the secretion of the salivary glands is a physiological example. Adami (9*b*) is authority for the statement that

an imagined injury to a part may be followed by all the essential symptoms of inflammation, save, it may be, the migration of leucocytes. He cites the hypnotized individual as an illustration. Habit is preeminently a function of nervous tissue, and it is impossible to deny the emotions as a factor in vagotonic or other types of increased nerve tone. But this is a field in which therapeutics has, as yet, made only the slightest headway, and practical considerations justify an attempt to discover a primary toxic factor wherever it is possible.

Toxic causes of the types referred to, while not uncommon, are hardly co-extensive with the number of individuals presenting manifestations of increased tone of the vagus system. It is in order to inquire, therefore, for such widely prevalent toxemias as may be supposed, at times, to manifest themselves through vagus irritation, without reaching the plane of frank clinical disease after their own type. Two only will be considered—perversions of the internal secretions and tuberculosis.

The Ductless Glands.—The recognition of two types of thyreotoxicosis has received the endorsement of many practical clinicians. The division follows the line of physiological antagonism between the vagus and sympathetic systems.

The characteristics of the vagotonic cases, as distinguished from the sympathicotonic, are, especially: relatively slight tachycardia, sweats, diarrhea, gastric hyperacidity, lymphocytosis, unlessened carbohydrate tolerance, and eosinophilia. According to Osler (24*a*), urticaria, both spontaneous and factitious, is common in hyperthyroidism, giant urticaria occurring very rarely.

Halsted (32), in considering the relation of the thymus gland to Graves' disease, quotes Garre, von Haberer, Klose, Capelle, Bayer, von Noorden, Jr., Eppinger, "and, indeed, almost every clinician who has familiarized himself with the literature," as of the opinion that it is the vagotonic symptoms which indicate a preponderant influence of the thymus in a case of Graves' disease.

There is, therefore, in the vagotonic type of thyroid toxicosis a parallelism to the action of pilocarpin and anaphlatoxins, including eosinophilia, and, in addition, this striking peculiarity: in the Basedow-thymus, *i. e.*, in the gland of supposed maximum toxicity in the vagotonic cases, there is an accumulation of eosinophiles along the septa and blood vessels of the thymus (33).

The production of anaphylactogens through the modification of body proteins may account for an anaphylactic process in certain thyroid cases. But scientific support of such a mode of intoxica-

tion is lacking. There is hardly ground for drawing any conclusion further than that there is present in these cases a vago-irritant toxin. The converse of the proposition is of practical significance. The appearance of vagus irritation in an individual may be the expression of a thyroid-thymus intoxication.

In the realm of the ductless glands, in addition to these thyroid cases, there is much that is suggestive as bearing a possible causal relation to vagotonia. Eppinger and Hess (*2b*) were impressed by the fact that the "lymphatic constitution" coincided with the group of diseases which they had found associated with vagotonia. They think the anatomical entity status-thymico-lymphaticus corresponds closely to the clinical entity, the exudative diathesis of Czerny; that the exudative diathesis is but an infantile form of vagotonia. Strümpell's observation that those who are affected with bronchial asthma are, perhaps, of the class who had the exudative diathesis in childhood, is in line with their belief.

Increased sugar tolerance is a phenomenon we have come to connect with abnormal conditions of the ductless glands. This tolerance, seen in vagotonics generally, is suggestive of a causal relation of the ductless glands to the symptom-complex vagotonia.

Relation of Anaphylaxis to Infection and Immunity.—All the work of the past few years tends to relate the phenomena of infection and immunity to the fundamental facts of proteolysis. Not that split proteins and their effects on the organism are the whole of either infection or immunity in all cases. The primary toxic action of bacterial endotoxins and exotoxins plays its part in infection: antitoxin immunity differs from the anti-anaphylactic state. But the leading observers (*23*, *5d*, 34, 35, *3c*, *22*) are in accord on the principle that, in part, the symptoms of infection are phenomena of anaphylaxis (allergy of von Pirquet), and the state of immunity is, in certain instances, the state of anti-anaphylaxis (anergy of von Pirquet).

The selective action of anaphylatoxins for the smooth muscle of the body, and the predominating character of vagus irritation in anaphylaxis, would lead us to expect, *a priori*, that the anaphylatoxins produced in the course of an infectious disease, when not obscured by other toxic agents, would express themselves in the picture of vagotonia. Conversely, the vagotonic picture appearing clinically might, in some cases, have as its basis this phase of the reaction of the body to bacterial invasion.

The so-called epicritic eosinophilia following upon the course of acute infectious diseases generally (36, 37), and the coincidence of

this with a subnormal temperature (38), and post-infectious bradycardia, suggest that these symptoms may well be the common result of a vago-irritant substance formed in the course of the reaction of the body to the infectious agent.

In seeking an infectious basis for a condition manifesting itself constantly or recurrently over a long period, the chronic infections are naturally the first to be indicted, and of these the foremost is tuberculosis.

Eppinger and Hess (*2c*) state that scarcely any case of tuberculosis reacts to adrenalin, while they always react with typical symptoms to pilocarpin. They call attention to the symptoms of vagus excitation seen at the onset of many cases—tendency to sweat, diarrhea, lowered blood pressure, stomach and intestinal disturbances. Whether this results from sympathetic depression or vagus stimulation, the existence of a state of sensitization rendering the individual hypersusceptible to the toxins of the tubercle bacillus is beyond question. The positive skin reaction to the tuberculin test of von Pirquet is regarded by its author and generally by others as a local reaction to protein on the part of sensitized tissue, a phenomenon essentially anaphylactic. The occurrence of a peripheral eosinophilia following the injection of tuberculin (36, 20, 39) is, in itself, suggestive. According to Brosamlen (*11b*) only tuberculous individuals react with eosinophilia, while non-tuberculous individuals do not. In this connection, when it is recalled that nearly all adults examined at autopsy show old tuberculous foci, and the parallel fact that the positive von Pirquet reaction in adults is so common as to render the test practically valueless for diagnostic purposes; further, that this latter is an evidence of sensitization to the tubercle bacillus, the possibilities of a tuberculous infection in the production of vagotonia are strongly suggested. For diagnostic and prognostic purposes, however, such manifestations cannot now be interpreted as manifestations of clinical tuberculosis. On the contrary, they may be rather the expression of some degree of immunity.

In the production of experimental anaphylaxis, proteins of animal, bacterial and vegetable origin have been shown to yield either the same poison, or at least products closely allied in all cases. Vaughan (34) holds that the protein poison is one and the same in the clinical manifestations of all infections.

If it shall be ultimately proved that some of the symptoms seen in exophthalmic goitre and in tuberculosis are due to the same or nearly identical substances, it will go far to explain the similarity of

symptoms, leading at times to errors in diagosis. Crile (40) states that, even at autopsy, the lesions—barring the tuberculous focus itself—may be so nearly identical in the two cases as to baffle differentiation.

The Uses of Atropin.—Atropin, the physiological antagonist of pilocarpin, vago-depressant where pilocarpin is vago-stimulant, has long been recognized as a useful symptomatic remedy in the separate conditions which have been more recently grouped together as vagotonic. It is unnecessary to emphasize its value—

To control excessive sweating, as in the night sweats of tuberculosis and syphilis.

To diminish the secretion of the salivary glands.

In the treatment of bronchial asthma during the attacks.

To relieve the subjective symptoms associated with functional bradycardia, and in some cases, the cardio-respiratory symptoms of organic disease (29).

Its value in the following conditions is, perhaps, less widely appreciated:

In spastic states of the gastro-intestinal tract (41) and the hyperacidity associated with these conditions.

In spastic constipation and mucous colitis.

In the vagotonic type of thyroid, Barker (33) states that many of the symptoms are favorably influenced by good, stiff doses of atropin.

The generally favorable influence of atropin in cases exhibiting vagus excitation is attested to by Neuhof (42) and others. In individuals of this type, without any particularly outstanding symptoms, it is often seen to exercise much the sedative effect of the bromides.

Finally, its power to prevent the symptoms of induced anaphylactic shock has a clinical application in cases suspected of hypersusceptibility (vagotonics), when it becomes necessary to administer serum, as diphtheria antitoxin.

It is hardly necessary to say that I have not attempted to present a new subject. Suggestions of nearly all the relationships I have referred to are to be found scattered through the literature. Though the evidence is more often suggestive than conclusive, certain practical issues in treatment are involved. I have made no attempt to discuss either vagotonia or anaphylaxis in a comprehensive way. Certain broad features of the possible contact of the two have been omitted. Such is the part played by intestinal toxemia in the two conditions. In view of the obscurity and conflicting data surrounding this subject, it has been avoided. Syphilis, as well as tuber-

culosis, might be considered as a possible cause of over-activity of the vagus system.

Summary

The vagotonic condition described by Eppinger and Hess is the symptom-complex seen in a certain class of so-called "neurotic" individuals.

It is of advantage to recognize the type, whether or not an underlying cause can be determined in the individual. A better understanding is attained by recognition of the type of neurosis, as rational symptomatic treatment can be applied.

Anaphylaxis manifests itself chiefly through vagus irritation.

Certain products of the proteolytic process have the pharmacological properties of vagus irritants.

In this respect these toxins, pharmacologically, belong to the class of pilocarpin.

An exaggerated reaction to pilocarpin is displayed by vagotonic individuals. The clinical parallel seen in serum sickness develops in some, but not in all, vagotonic individuals. Such individuals must be assumed to be specifically sensitized to the serum.

The question arises, how far may toxic influences, especially anaphylatoxins, be considered as underlying the vagotonic state.

Definite proof exists of the anaphylactic nature of certain cases presenting vagotonic manifestations, viz.: parasitic infestations, food idiosyncrasies, asthma and hay fever.

Spastic constipation and the resulting mucous colitis are essentially vagotonic. Similar conditions can be experimentally induced in certain animals by the method of anaphylaxis. Clinically, they present a close analogy to bronchial asthma, and have many symptoms in common with conditions of known anaphylactic nature.

Peripheral eosinophilia usually appears in association with the evidences of vagus irritation: its chief clinical occurrences are in conditions of known toxic origin, many of them demonstrably anaphylactic. While it is impossible to say that it cannot be produced by other causes, its clinical appearance should suggest a toxic factor at work, probably in most cases an anaphylatoxin.

The interpretation of urticaria is practically the same as of eosinophilia. The close relationship between urticaria and angio-neurotic edema suggests the same etiology for the latter.

Mechanical and reflex influences are capable of causing vagal stimulation. But such factors manifest themselves chiefly through their action on the heart and in a type of dyspnea different from the asthmatic. There is no evidence that eosinophilia can result from

such causes: it is associated rather with the skin, lung and intestinal manifestations of vagotonia. Bradycardia, on the contrary, is not a frequent accompaniment of the manifestations of vagotonia in which either of these three elements predominates.

The influence of temperament and the emotions cannot be denied, but practical considerations suggest the search for a toxic basis in all cases.

In the interpretation of vagotonic symptoms without apparent cause, two toxic factors are among the possibilities—ductless gland disturbances and chronic bacterial infection. In these groups the most important are thyroid intoxication and tuberculosis.

Atropin is a valuable symptomatic remedy in most of the conditions discussed. Adrenalin usually gives better results in urticaria, and sometimes in bronchial asthma.

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DISPENSARY WORK IN DISEASES OF THE NERVOUS SYSTEM, III[1]

By Smith Ely Jelliffe, M.D., Ph.D.

ADJUNCT PROFESSOR OF DISEASES OF THE MIND AND NERVOUS SYSTEM

The first annual report, 1911, for the dispensary service of Prof. Hammond was published in the Post Graduate June–July, 1912. In that report a condensed historical and clinical summary was given of the work of the dispensary. The second annual report for 1912 was published in the Post Graduate for August, 1914. This contribution deals with the clinical work of the dispensary for the year 1913.

The personnel of the service changed little during the year and was as follows: Professor M. G. Hammond; Adjunct Professor S. E. Jelliffe; Chief of Clinic Dr. C. N. Haskell, Instructors Drs. F. H. Barnes, B. Hinkle, E. Altman.

There was another increase in the number of patients during 1913. This has been in response to the increased facilities and the greatly intensified attention given to the patients.

Lectures

During 1913 sixty-eight clinical lectures were given by different members of the staff. These were illustrated by charts, photographic and microscopical projections and by gross anatomical specimens. The list in part is as follows:

Prof. M. G. Hammond

Jan. 17, 1913. Hemiplegia (Hemianesthesia); Hemiplegia-Apoplexy; Hemiplegia-Thrombotic.

Feb. 12, 1913. Poliomyelitis; Acromegaly.

Feb. 19, 1913. Cerebrospinal Syphilis; Facial Palsy.

Feb. 26, 1913. Melancholia.

Mar. 12, 1913. Arrested Development with Epilepsy; Birth Palsy; Chorea; Tic Douloureux.

Mar. 24, 1913. Hemiplegia; Facial Palsy; Injection Tic Douloureux.

[1] Report of Clinical Service Dr. G. M. Hammond, Post-Graduate Hospital and Medical School for 1913.

Apr. 9, 1913. Spasmodic Wry Neck; Spastic Paraplegia; Internal Hydrocephalus or Brain Tumor.
Apr. 16, 1913. Anxiety Neurosis; Manic-Depressive Insanity.
Apr. 23, 1913. Polioencephalitis; Petit Mal (Ward Case).
Apr. 30, 1913. Chorea; Hysteria; Symptomatic Graves' Disease.
Oct. 22, 1913. Tabes.
Oct. 29, 1913. Presenile Dementia; Spastic Paraplegia.
Nov. 12, 1913. Chorea; Cerebral Syphilis; Traumatic Neurasthenia.
Nov. 19, 1913. Neurasthenia; Bell's Palsy.
Nov. 26, 1913. Enlarged Thyroid; Exophthalmic Goiter; Night Terrors of Children; Epilepsy; Neurasthenia.
Nov. 28, 1913. Neurasthenia; Hysteria; Migraine.
Dec. 10, 1913. Exophthalmic Goiter; Convulsive Tic.
Dec. 19, 1913. Locomotor Ataxia; Neurasthenia (Anxiety Neurosis).
Dec. 31, 1913. Exophthalmic Goiter; Cerebral Lesion (Hand Center, Left Side); Poliomyelitis Anterior.

Adj. Prof. S. E. Jelliffe

Jan. 3, 1913. Tabes: Cerebrospinal Syphilis *vs.* Paresis; Organic Tremor—Third Red Nucleus; Hysteria; Dementia Præcox.
Jan. 24, 1913. Spasmodic Tic; Hysteria; Mechanism of Dementia Præcox.
Feb. 7, 1913. Manic-Depressive Psychosis, Cyclothymic Form; Aphasia—Sensory; Paranoid Mechanism.
Feb. 14, 1913. Hemiplegia; Hysteria.
Feb. 21, 1914. Spasticity in Multiple Sclerosis: Effects of Strychnin and of Alcohol; Pseudobulbar Palsy; Mendelian Inheritance of Recessives.
Feb. 28, 1913. Angiospasm; Neurosis and Syphilis; Tabes.
Mar. 5, 1913. Sciatica—Radiculitis; Chorea—Cerebellar Mechanisms, Neuritis: Atrophy, Spasticity; Hysterical Dream State.
Apr. 11, 1913. Peroneus Palsy; General Paresis.
Apr. 25, 1913. Meningismus: Syphilitic Meningitis; Labyrinthitis: Medullary Embolism; Poliomyelitis with palsy of third, seventh and twelfth nerves.
May 14, 1913. General Remarks on Psychoanalysis.
May 16, 1913. Psychoanalysis.
May 28, 1913. Paresis *vs.* Manic-Depressive and Alcoholism; Symptoms in Hysteria.
June 4, 1913. Psychoanalysis: General Discussion on Instinct; Libido and Sexuality: Terms: Recapitulation Theory; Psychosexual Development.

Sept. 5, 1913. Hysteria and the Conversion Mechanism.
Oct. 10, 1913. Migraine; Multiple Sclerosis.
Oct. 15, 1913. Psychical Impotence; Symptomatic Depression; Dementia Præcox; Projection Mechanism.
Oct. 24, 1913. Myelitis; Chorea; Tic (Hysterical); General Paresis; Multiple Sclerosis.
Nov. 7, 1913. Multiple Sclerosis from the Pathological Standpoint.
Nov. 14, 1913. Tabes, Sciatica, Sacro-Iliac Slip; Tabes, Cerebrospinal Syphilis; Taboparesis.
Dec. 5, 1913. Multiple Sclerosis; Epilepsy Group.

Dr. C. N. Haskell

Feb. 5, 1913. Cerebral Syphilis; Obliterating Arteritis.
Apr. 18, 1913. Birth Palsy; Anterior Poliomyelitis; Multiple Neuritis; General Paresis.
July 9, 1913. Chorea; Bell's Palsy; Tabes.
July 11, 1913. Apoplexy; Paralysis Agitans.
July 19, 1913. Hemiplegia; Tabes.
Aug. 1, 1913. Birth Palsy; Anterior Poliomyelitis; Epilepsy.
Aug. 6, 1913. Sacro-Iliac; Arteriosclerosis.
Aug. 8, 1913. Pseudobulbar Palsy.
Aug. 13, 1913. Infantile Paralysis; Wry Neck (Case Diagnosis).
Aug. 15, 1913. Hysteria; Frontal Sinusitis; Brain Tumor.
Aug. 22, 1913. Migraine; Brain Tumor.
Aug. 20, 1913. Diagnosis; Brachial Neuritis; Cerebral Syphilis.
Sept. 10, 1913. Facial Paralysis; Hemiplegia.
Sept. 19, 1913. Apoplexy.
Sept. 24, 1913. Cerebral Syphilis, Brain Tumor.
Sept. 26, 1913. Birth Palsy; Infantile Convulsions.
Oct. 8, 1913. Two Cases of Epilepsy.
Oct. 17, 1913. Brain Tumor.
Dec. 15, 1913. Facial Paralysis; Chorea; General Paresis; Encephalitis.
Dec. 17, 1913. Syphilis of Nerves; Etiology of Apoplexy.
Dec. 24, 1913. Facial Palsy (Traumatic); Traumatic Neurosis; Cerebrospinal Syphilis (K. I. rash).
Dec. 26, 1913. Case for Diagnosis.

Dr. Barnes

May 9, 1913. Anxiety Neurosis.
Aug. 27, 1913. Mental Deficient Children; Chorea Minor.
Oct. 31, 1913. Epilepsy; Cerebrospinal Syphilis.

Nov. 5, 1913. Imbecile; Case of Retarded Development.
Nov. 21, 1913. Epilepsy; Case for Diagnosis, Dementia Præcox; Hyperthyroidism; Anxiety Neurosis.
Dec. 12, 1913. Dementia Præcox; Anxiety Neurosis; Neurasthenia.

Statistics.

The total number of patients on record for this period is 1,140, of whom 1,071 are available for this study, approximately the same numbers included in the report for 1912. The total number of visits made remains, too, nearly the same, 5,858, with the same average of five visits per person.

The distribution of visits throughout the year differs markedly from that of the previous report which showed a decided maximum in the month of May. In 1913 there is a more even distribution throughout the months with however a decrease in attendance from April to October inclusive with the exception of June when the number of visits reached 595, the highest number of visits for any month except December which numbers 596.

The previously reported routine has been followed in the matter of examination, registration of new and old patients and method of recording history. The blank forms for neurological or mental status are essentially those previously noted. The mental blank containing in the main the intelligence tests used was presented in full in the last report.

Clinical Summary

The total number of patients studied has been separated into two groups, 178 of them being diagnosed as non-neurological, while those distinctly classed as neurological and mental number 894.

The first group is not of interest for this report. It includes 98 male and 80 female patients. The second group embraces 446 men and 448 women, showing a slight increase in the number of women over men, though a preponderance of the male patients was noticeable in the reports of the two previous years.

Classifying somewhat loosely, which is unavoidable, we may divide the 894 cases into 414 mental, or psychical level disorders, and 480 distributed between sensori-motor and vegetative nervous disorders.

Mental Disorders. Psychical Level

The term mental has so rapidly outgrown its former restricted meaning that it now embraces a much larger variety of mental disturbances and also attracts to the clinic the milder forms, the psychoneuroses and neuroses for which it provides a fuller understanding

and therefore ampler treatment than they were accorded in the past. Many such patients are thus included in the total number of four hundred and fourteen mental patients.

Both the clinical service and the work of the lecture room have been directed toward the broader recognition of the reality of mental factors as contrasted with facts which the neurologist may discover anatomically and clinically and the greater amenability of these mental factors to therapy. The recognition of their importance scientifically and therapeutically is a significant element in the value of the work from the standpoint of investigation or in its direct service to the community.

The Feeble-Minded Group

The small number included in this group is no measure of its importance for special attention has been devoted to this class by Mrs. Pfeiffer and her assistants. The classification of the twenty-two patients who compose this group is as follows:

	Male	Female	Total
Arrested development	1		1
Backwardness		1	1
Feeble mindedness	4	6	10
Mental defectives	5	2	7
Mental status	3		3
	13	9	22

Neuroses and Psychoneuroses

We explained in our report of last year our attitude toward these disorders based upon a frank acceptance of the psychoanalytic principles, and the classifications which we follow under this heading.

Neurasthenia Group.—We still retain this rather too comprehensive term, by which we intend to signify definitely only those patients suffering from nerve fatigue of toxic or infectious origin or produced by some other immediate exciting cause. Less limited facilities for study of these cases would probably discover further predisposing causes of more fundamental importance and thus determine for many of the cases a more exact classification. As the group now stands it includes eighty patients, thirty-five male and forty-five female.

Anxiety Neurosis.—A large number of patients, fifty-one men and ninety-three women, one hundred forty-four in all, have been included under this head. These are patients who do not manifest the complex mechanisms of the psychoneuroses but the more acute

conditions incident usually upon sexual maladjustment in the stricter sense. They usually present definite symptomatic picture of anxiety states of definite character and intensity, such as insomnia, general irritability, marked emotional contrasts in depression and exaltation or ill-temper, apprehensive states, with physical symptoms of palpitations, asthmatic chokings, nervous dyspepsias, diarrheas, vertigo, etc.

A lengthy psychoanalysis is not needed in such cases but the application of its principles of readjustment in a few visits enables them to accept a more rational attitude toward their difficulties and thus to find relief from their symptoms.

Hysteria Group.—Fifty-nine patients, twelve men and forty-seven women, were able to avail themselves of the facilities offered in psychotherapy to this extensive and important group. This term recognizes Freud's conception of the *conversion* of mental conflicts into physical symptoms. The resultant cures brought about in the treatment of these patients, to which is devoted regularly four hours two or three times a week, contributes much to the understanding of the conviction of the conversion hypothesis and the value of psychoanalysis in exploring and adjusting these mechanisms.

Compulsion Neurosis.—This group is inclusive of several types of reaction which psychoanalysis is able to trace to a fundamental compulsion or obsession, and thus a number of patients are reached and their difficulties solved for whom other therapy has proved in vain because the nature of the underlying compulsion has not been understood nor appreciated. Tics, torticollis, alcoholism are some of the types we classify here and which yield to psychoanalysis either in a complete cure or in marked relief of distinct practical value. Twenty-six patients, seventeen men and nine women, are reported in this group.

Mixed Neuroses.—The broader attitude toward classification and the examination and valuation of the complex and diverse causation of mental disturbance which belong to psychoanalysis show the incompleteness of clinical groupings. Defining terms mean but little and are merely used as shifting boundary lines for approximate statistical purposes. Since our clinical work deals with the complexities of human personalities there must of necessity be many cases in which the characteristics of the groups we have named overlap, and where there is a confusion of phenomena belonging perhaps in several of the groups.

For convenience, therefore, we include under the term mixed neuroses various clinical pictures not clearly defined but which respond to psychoanalytic investigation and treatment. These number

thirty-three cases, fifteen male and eighteen female. We include also one case, female, of pavor nocturnus.

The psychoanalytic service forms a large and important part of our clinical work. The value of its understanding and appreciation of facts concealed from other methods of approach and of its treatment based upon these actualities is attested by the number of patients who present to the clinic the conditions depending upon these phenomena and the results in treatment of them. Drs. Beatrice Hinkle, and S. Blumgart have devoted three afternoons a week to this work.

Psychoses

Toxic Psychoses.—There is even overlapping between the psychoses and the borderland neuroses and psychoneuroses, since we recognize mental differences in degree rather than in kind in regarding mental disturbances. The ten patients, nine male and one female, who manifested alcoholic mental states have therefore been already listed elsewhere.

Dementia Præcox Group.—Twenty patients have been placed in this grouping, thirteen male and seven female.

Paranoia.—Three men and two women, five patients in all, appear under this heading.

Involution Melancholia.—It is difficult in the limitations of the clinic to observe these patients fully enough to define them as belonging to this class or to that of anxiety neurosis or anxiety hysterias. Four (female) patients are included under this term.

Manic-Depressive Psychosis.—Two patients, one male and one female, are reported here.

Senile and Presenile Psychoses.—One woman manifested the former condition and one man a state of depression belonging to a secondary presenile psychotic state.

The symbolic level disorders may be presented as follows:

Diagnosis	Males	Females	Totals
Feeble-minded group	13	9	22
Neurasthenia group	35	45	80
Anxiety neurosis	51	93	144
Hysteria group	12	47	59
Compulsion neurosis	17	9	26
Mixed neuroses	15	19	34
Syphilitic psychoses: cerebral syphilis	11	2	13
Dementia præcox group	13	7	20
Paranoia	3	2	5
Involution melancholia		4	4
Manic depressive	1	1	2
Senile and presenile	1	1	2
	161	237	400

Sensori-Motor Level Disorders.

The nervous disorders represented by the four hundred and eighty patients included in this group have been arranged according to the same threefold division of the nervous system which places the psychical disorders first in order. Next in order we consider the diseases of the sensori-motor systems and lastly those that occur at the autonomic or vegetative level.

Cranial Nerves

Bell's Palsy.—Twenty-nine patients, nineteen male and ten female, presented this condition.

Labyrinthitis.—Three patients, male, were treated for this condition.

Cerebral Disorders

One hundred and eighty-four patients, one hundred and six male and seventy-eight female, are recorded under this heading, manifesting a variety of cerebral affections.

Aphasia.—This was present in six patients, five male and one female. Besides 4 males given under "speech."

Arteriosclerosis.—Eleven patients, eight male and three female, manifested this condition.

Tumor of the Brain was present in two female patients.

Cerebral Embolism was diagnosed in one male patient.

Chorea.—Fifty-seven patients, twenty-four male and thirty-three female, presented this condition.

Epilepsy Group.—While an attempt has been made to eliminate from this group those cases which could definitely be referred to other groups in which they more accurately belonged, the classification must still remain a rather broad one for a variety of brain defects which seek the epileptic mode of discharge. We still report therefore in this group sixty patients, thirty-three male and twenty-seven female. This includes one patient, female, with paramyclonus multiplex syndrome.

Hemianesthesia.—One male patient presented this condition.

Hemiplegia.—Nineteen patients presented this syndrome, fourteen male and five female. Besides a thalamic syndrome was present in one female.

Cerebrospinal Syphilis was present in 11 male and 2 female.

General Paresis was diagnosed in seven patients, six males and one female.

Hydrocephalus.—One female patient presented this condition.

Little's Disease was diagnosed in the case of one male.

Multiple Sclerosis.—Seven instances of this were observed, six male and one female.

Paralysis Agitans.—This was present in three cases, one male and two female.

Vertigo was present in three males.

This material may be tabulated as follows:

	Male	Female	Total
Seventh nerve	19	10	29
Labyrinthitis	3	0	3
Brain tumor	0	2	2
Cerebral arteriosclerosis	8	3	11
Cerebral hemorrhage—hemiplegia	14	5	19
" " —aphasia	5	1	6
" " —hemianesthia	1	0	1
" " —thalamic	0	1	1
Cerebral embolism—monoplegia	0	1	1
Cerebro-spinal syphilis—arterial types	11	2	13
" " " —paretic	6	1	7
Little's disease	1	0	1
Chorea	24	33	57
Epilepsy	33	27	60
Hydrocephalus	0	1	1
Paralysis agitans	1	2	3

Peripheral Nerves and Spinal Cord

Birth Palsy.—Nine patients, six male and three female, manifested this disorder.

Peripheral Paralysis.—Nine patients, seven male and two female, suffered from neuritic palsies.

Pressure Paralysis.—One male manifested this form of paralysis.

Spastic Paraplegia.—One male patient showed this disorder. It was probably a diffuse myelitis of undetermined pathogeny.

Neuralgias and Neuritides.—Twenty-five patients, fourteen male and eleven female, suffered from neuralgia in various forms, and fifty-two from varieties of neuritides, twenty-five male and twenty-seven female. Fifteen of these, six male and nine female, were cases of brachial neuritis and one female was of traumatic origin. One male showed a multiple neuritis. There were besides twenty-two patients, fourteen male and eight female, with sciatic neuritis.

Occupation Neurosis.—Fourteen patients, thirteen male and one female, manifested this disorder.

Shock Neurosis.—Four patients, two male and two female, presented a neurosis of this origin.

Progressive Muscular Atrophy was present in two patients, one male and one female.

Anterior Poliomyelitis.—Seventeen patients were under treatment for this disease, eleven male and six female.

Myelitis.—One patient, male, is reported here.

Syringomyelia.—Two patients, one male and one female, showed this condition.

Multiple Sclerosis.—Six males and one female.

Tabes.—There were sixteen patients with this disorder, fourteen male and two female.

The summary is as follows:

SPINAL CORD AND PERIPHERAL NERVES

	Male	Female	Total
Birth palsy	6	3	9
Paralysis	7	2	9
Pressure paralysis	1		1
Spastic paraplegia	1		1
Neuralgias and neuritides	14	11	25
Neuritides	25	27	52
Sciatica	14	8	22
Occupation neurosis	13	1	14
Shock neurosis	2	2	4
Progressive muscular atrophy	1	1	2
Anterior poliomyelitis	11	6	17
Myelitis	1		1
Syringomyelia	1	1	2
Multiple sclerosis	6	1	7
Tabes	14	2	16
	117	65	182

VEGETATIVE SYSTEM LEVELS.

This grouping covers those disorders due to disturbances in the glandular secretions or in the non-nervous organs and tissues which are all however under the control of this portion of the nervous system.

Arthritis.—Two patients, one male and one female, suffered from this affection. Eight, three male and five female, are reported under the heading of *osteo-arthritis.*

Diabetes.—One patient, male, is reported here.

Thyreopathies.—Under this heading are recorded, five patients, female, who manifested signs of *hyperthyroidism.*

Two patients, female, suffered from *goitre.* Two patients, female, are recorded under *myxedema.*

Headache and Migraine.—Twenty-nine cases of headache, ten male and nineteen female, are recorded and ten, five male and five female, of migraine.

Lumbago.—Two patients, one male and one female, suffered from lumbago.

Myalgia and Myositis.—Nine patients, two male and seven female, suffered from myalgia and three, female, from myositis.

These may be summarized as follows:

VEGETATIVE SYSTEM LEVEL

	Male	Fmeale	Total
Arthritis	1	1	2
Osteo-arthritis	3	5	8
Diabetes	1		1
Thyreopathies			
Hyperthyroidism—mild grades		5	5
Goitre—exophthalmic		2	2
Myxedema		2	2
Headache	10	19	29
Migraine	5	5	10
Lumbago	1	1	2
Myalgia	2	7	9
Myositis		3	3
	23	50	73

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TRANSLATIONS

VEGETATIVE NERVOUS SYSTEM

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(Continued from Vol. 44, p. 465)

XI. Special Pathology and Clinical Aspect of the Vegetative System

The most important points in the special semiology of the various organs supplied by the vegetative system will be discussed, in so far as they are of anatomico-pathological and clinical significance. Since it is undeniable that rational diagnostics are built up upon the facts of pathological physiology, a short résumé of the physiology, particularly in its newest aspects, based particularly upon the facts in the sections of general physiology, will head each section.

1. *Eye.*—The eye contains a considerably large number of vegetative organs—the ciliary muscle, the sphincter muscle of the iris, the dilator of the iris, Müller's orbital muscle, smooth muscles in the eyelids and the lachrymal glands. Some of these are supplied by the autonomic, and some by the sympathetic nervous system. The innervation of the pupil plays a very important rôle.

The question of the spinal and mesencephalic origins of the pupillary nerve fibers, of their sub-cortical tracts and cortical centers, of the ganglia and communicating branches, as well as of the antagonistic actions on the part of the autonomic on the one hand, and the sympathetic on the other, has been a matter of controversy for decades.

What share do the sympathetic nerves take in the innervation of the eye? It is known that the origin or nucleus of the pupillary dilator fibers lies in the spinal cord at the level of the 1–3 thoracic segments (the cilio-spinal center of Budge). From this origin, the fibers pass by way of the white rami communicantes to the cervical sympathetic cord, through the lower cervical ganglion to the superior cervical ganglion where they are interrupted and pass as post-ganglionic gray fibers to the Gasserian ganglion. Here they join the first branch of the trigeminus, and pass in the long ciliary nerves to the orbit to supply its floor vessels as well as the dilator pupillæ

and Müller's muscle. This latter muscle, by its contraction, forces the eyeball forward.

We gain information as to the other central paths of the sympathetic pupillary fibers from the experimental work of Karplus and Kreidl. Electrical stimulation of a definite place in the floor of the mid brain, beyond the optic tract and lateral to the infundibulum, causes in cats a reaction of the sympathetic fibers. There results maximal dilation of the pupil, widening of the lid slits, retraction of the internal aspect of the lids, as well as reactions in the sweat glands and bladder. The stimulation acts upon the homolateral side of the brain and sends impulses down the cord which cross over in part and stimulate Budge's center bilaterally, thus sending stimuli up both sympathetic cords.

It is doubtful whether it be necessary to assume, in addition to the thoracic and midbrain centers already described, the existence of a higher bulbar cilio-spinal sympathetic center as Roux, Paviot and Cordier state. Sympathetic paralysis in bulbar and cervicothoracic lesions, nuclear and paranuclear, amply explain the centers above described. Whether indeed the cilio-spinal center be a completely coördinated center, only serving, as Roux would have it, pupillary reactions to skin stimuli, must remain an open question.

If we now consider the second class of innervation of the eye, we find the nerve to be the autonomic part of the oculomotorius and that its vertebral ganglion is the ciliary ganglion.

This latter is not a mixed ganglion with both spinal and sympathetic cells, but is a purely vegetative, autonomic ganglion. It contains absolutely no spinal cell elements, all the cells, according to L. Müller, being unipolar, hook shaped and encapsulated, with short dendrites. In spite of the vegetative nature of this ganglion, its histological appearance differs from that of the prevertebral abdominal ganglia, and the sympathetic cord ganglia in that the cells of these latter are not encapsulated, and have long dendrites.

The oculomotor nerve can only influence the smooth muscle of the iris through its autonomic ganglion, since its other fibers are solely for the supply of cross-striated muscle.

The following are the connecting tracts to the cerebrospinal axis and to the organs innervated. The pre-ganglionic fibers (ramus albus) are those which go from the oculomotor to the ganglion (radix brevis G. ciliaris). There is no agreement as to the origin of these particular fibers to the ciliary muscle and the sphincter of the iris. The intactness of the intrinsic ocular muscles in muscular atrophy, chronic ophthalmoplegia, poliomyelitis, and polyneuritis, in spite of

the injury to the extrinsic muscles, speaks for a difference in clinical behavior, anatomical localization, and physiological type of the nuclei in the central nervous system, differences which have long been considered analogous to those existing in the corresponding centers for smooth and cross-striated muscle in the spinal gray matter.

According to Tsuchida and Monakow the innervation of the pupil is controlled by the small ganglion cells at the anterior end of the main lateral nucleus of the oculomotor. These cells are hard to separate from those of the neighboring Edinger-Westphal nucleus as Bernheimer localizes it. The sphincter nucleus is at any rate to be sought for in the gray matter ventral to the third ventricle. The oculomotor fibers of the radix brevis of the ciliary ganglion are interrupted in the ciliary ganglion and become the ramus griseus and as the short ciliary nerves pass into the inside of the eye and to its smooth musculature. It must be added that these ciliary nerves in spite of being postganglionic occasionally have a thin sheath and on entering the ciliary muscle form a fine ganglionic plexus.

The ciliary muscle or muscle of accommodation, whose center lies at the anterior medial nucleus of the oculomotor group, also receives fibers by way of the ciliary ganglion. After being interrupted here they become short ciliary nerves and pass on to their end organ.

There are two communicating branches of the ciliary ganglion which are of comparative anatomic interest and will receive attention here. The first branch is comparable to the fiber which passes from the sympathetic chain ganglia to the posterior spinal ganglia and thence to the sensory root. There is a delicate sensory root, radix longa, which passes from the nasociliary branch of the trigeminal nerve to the ciliary ganglion. We are still uncertain whether these fibers end in the ganglion or pass further, nor do we know the significance or function of these sensory fibers. Experiments in which the ciliary ganglion has been removed show that these fibers have no relation to sensation in the eye. There is an equal uncertainty surrounding a second branch which, as we shall see later, is of considerable diagnostic significance. This is the radix sympathetica of the ciliary ganglion, a branch of the sympathetic plexus ophthalmica which envelops the ophthalmic artery and arises in the carotid plexus. It is significant that in this way the sympathetic and its upper cervical ganglion which sends fibers to the dilator pupillæ comes into contact with the autonomic which sends fibers to the sphincter pupillæ through the ciliary ganglion. Analogous conditions occur in other cranial ganglia as well as in the

ganglia of the sympathetic chain which supply the neighboring blood vessels with postcellular sheathless fibers.

The smooth musculature of the eye and orbit is supplied by two widely separated ganglia lying in two quite different localities of the cerebrospinal axis of the archipallium, *i. e.*, from the region of the mesencephalic corpora quadrigemina and from the upper region of the thoracic spinal cord.

The tract from the corpora quadrigemina by way of the oculomotor nerve causes the pupil to react to light, accommodation and convergence by narrowing. The spinal sympathetic tract causes dilatation of the pupil, widening of the lid slits and slight forward protrusion of the eyeball. The antagonistic action of the two systems, which holds for all vegetative end organs, is present in the eye and is not only physiologically but also pharmacologically demonstrable. This latter is shown by the action of atropin upon the sphincter and accommodation muscles and of cocain upon the dilator muscle.

Two parts of the pupillary fibers remain for discussion, the retinonuclear and the corticonuclear, and there is much discussion between physiologists and clinicians concerning these.

The retinonuclear tract reminds one of the sensory part of the simple reflex arc. In all parts of the nervous system the sensory arc carries the stimulus inward to the neighborhood of a motor nucleus. Here it transmits it to the motor nucleus by means of collaterals. These are very sensitive to injury by one means or another, as the loss of the Achilles, patellar or corneal reflexes in tabes, polyneuritis or increased intracranial pressure shows. There are no centripetal pupillary fibers specially for vision (Hess). The elements which receive the light stimuli also carry those causing reflex activities in the eye. These pass by way of the chiasma to the region of the geniculate bodies to the quadrigemina. At this place a branch passes to the sphincter nucleus.

Bumke, commenting upon the observations of Bechterew, Flechsig and Edinger, states that the connecting neuron does not commence in the external geniculate but that the pupillary fibers of the optic nerve pass immediately behind the chiasma before it becomes the optic tract, *i. e.*, in the central gray matter on the floor of the third ventricle and go thence by means of a second neuron to the oculomotor nucleus. In favor of this hypothesis is the intactness of pupillary activity after uni- and bilateral interruption of the optic tract. Mention has already been made of the course of the centripetal part of the reflex from the oculomotor nucleus to the ciliary ganglion.

Karplus and Kreidl have recently added some noteworthy observations to this much discussed question. Contrary to the results of others, these experimenters, working with monkeys, were able to show that the pupillary fibers did pass into the optic tract but did not enter the external geniculate body; they passed between the two geniculates, through the arm of the anterior corpus quadrigeminum and could be followed thence to the anterior lateral border of this body. Section of these fibers caused reflex immobility of the pupil with conservation of pupillary reactivity and accommodation, convergence and psychic activities.

If chronic meningeal or cerebral changes could be demonstrated in this locality in tabes dorsalis, we should be able to understand the Argyll-Robertson pupil.

The myosis occurring in voluntary convergence and accommodation may be regarded as a by-product due to excitation of the oculomotor. Under physiological conditions the converging reaction is much more active than the light reaction. Also the part played by the dilator is minimal.

The continuous minute oscillations or psychic reactions of the pupil are dependent upon various nervous and psychic influences as pain, fear and joy and disappear simultaneously with the light reflex in tabetics and paretics. The upper parts of the brain are not necessary for the sympathetic reflex and the pain reflex is carried via the midbrain.

The dilatation of the pupil due to psychic changes is probably dependent upon a change of tone in the oculomotor nerve having its beginning in the cerebral cortex. This is assumed since the dilatation can occur even though the cervical sympathetic be removed, but disappears if the oculomotor is paralyzed. The ordinary dilatation of the pupil is the resultant of the centrally inhibited tone of the sphincter on the one hand and of the dilator on the other. This seems automatically controlled and may be influenced by various parts of the cortex.

How may the relations of the cortex to the pupillary innervation be explained? Besides pain mydriasis, which is caused by the larger part of the cortex and is explained by cortical inhibition of the tone of the sphincter, there are two mechanisms which are carried out by means of the sympathetic and are reflex stimulations of this. Karplus and Kreidl established a subcortical sympathetic center in the medial part of the front of Luys' corpus subthalamicum. This may be activated either directly or from the frontal lobe of the cortex. This center was described as separate from the center at

the base of the midbrain. Sympathetic pain mydriasis, according to this idea, is not produced in the cortex but by a reflex passing to the midbrain which acts so as to increase the tone of the dilator. Both autonomic and sympathetic activities in the brain are thus independent of each other.

The following conditions of pupillary activity are of great clinical importance and will be discussed seriatim. (1) Complete immobility. (2) Reflex immobility. (3) Dilator or sympathetic paralysis. (4) Inequality and deformity of the pupil.

1. The absolute or complete pupillary immobility. All stimuli via the vegetative nerves to the muscles of the iris are absent except a minimal effect of the sympathetic. When the sphincter is paralyzed this influence upon iris activity is next to nothing. The pupils are dilated more than normally and are somewhat distorted. Since the ciliary ganglion automatically maintains a certain amount of tone in the sphincter muscle, destruction of the ciliary ganglion or nerves causes an almost maximal dilatation greater than is observed in disease of the nucleus or root of the oculomotor. Absolute immobility is observed in syncope, central lues, epileptic attacks, occasionally in hysterical attacks, and in very marked fear. Immobility in the mydriatic state is due in these cases to inhibition of cortical origin, immobility in the myotic state to an increase of the sphincter tone (Bumke).

2. Reflex or isolated immobility is more difficult to explain. This is the Argyll-Robertson phenomenon. Its characteristics are uni- or bilaterality, failure to react to light thrown either on the same or other side, intact vision, narrowness, inequality and irregularity of the pupillary outline, retained reaction to accommodation and convergence. Excepting a very few instances of chronic alcoholism (Nonne) this condition of the pupils is diagnostic of metasyphilis, particularly tabes and tabo-paresis with involvement of the posterior columns. The question as to the genesis of this condition and particularly the myosis which so often accompanies it is of great theoretical as well as of practical importance. It has been one of the most frequently discussed questions in neurology for several decades.

The old explanation of the myosis given by Romberg still holds. He maintained that the absence of sensory stimuli due to the disease of the posterior columns was the cause of the small diameter of the pupil. The immobility is much harder to explain. The following are some of the facts concerning this condition. (*a*) The condition is often unilateral. (*b*) There is rarely absence of the convergence reaction.

(*c*) Since the sensory collaterals are known to be a special locus minoris resistentiæ, it is very probable that the sensory and motor parts of the reflex arc remain intact in tabes and that the lesion is to be sought for at the nucleus of the sphincter, *i. e.*, where the centripetal influence is changed into the centrifugal, in other words at the point where the protoneuron spreads out and breaks up into small processes which embrace the ganglion cells of the centrifugal fibers.

Since the "immobility of the knee," absent knee-jerk (Westphal's sign) has been ascribed to the degeneration of the reflex collaterals, the adjacent motor ganglion cells of the spinal gray matter remaining intact, Bumke asks, and quite justly, why this cannot be applied to the pupillary fibers and serve as an anatomical explanation of the reflex immobility of the pupil. "If one imagine such an absence of axis cylinder endings in the region of the sphincter pupillæ nucleus (and a replacing mass of glial fibers), the result must be a unilateral and isolated unreactibility of one pupil to light, and one only, the reaction to convergence as well as vision remaining intact. Naturally the anatomic basis of the sign, as the sign itself, will usually be found on both sides." In another place Bumke states that the demonstration of the absence of these fibers by a Weigert or a Marchi stain does not enter the question. There might be nothing but a mass of glial growth in place of the defect.

It is extremely doubtful whether we could differentiate by anatomical means those cases of tabes and dementia paralytica which did and those which did not have an Argyll-Robertson pupil in spite of the frequency of these metasyphilitic diseases. The way in which the Argyll-Robertson pupil might be explained in man on the basis of the animal experiments of Karplus-Kreidl has already been stated.

3. The picture of sympathetic or dilator paralysis is known in physiology as Budge's symptom complex, in the clinic as Horner's symptom complex. In addition to vasomotor and sweat anomalies, it is characterized by sinking in of the eyeball, narrowing of the lid slit (m. orbitalis), lowering of the upper lid and raising of the lower lid (m. tarsi), narrowing of the pupil (m. dilator pupillæ) and retention of the psychic and optic nerve reflexes of the pupil.

In experimental section of the sympathetic the paralysis lasts only until the preganglionic part of the sympathetic chain again joins the preganglionic and the postganglionic the postganglionic.

The contrast between the very active sphincter contraction and the equally sluggish relaxation is typical of sympathetic paralysis (Bumke).

The localizing value of a diagnosis of sympathetic paralysis or irritation is self-evident. Both conditions indicate pressure upon the sympathetic chain due to a tumor, a traumatic lesion of the spinal cord (hematomyelia), or a tumor, degenerative process (gliosis) or an infective process in the upper dorsal segments of the spinal cord involving Budge's center. More rarely a lesion of the oblongata (thrombosis of the posterior inferior cerebellar artery, syndrome of Babinski-Nageotte) or a lesion of the spinal roots in the cervico-dorsal region (neuritis syndrome of Dejerine-Klumpke). The sympathetic lesion may be localized in its cervico-dorsal, bulbar or basal parts according to the accompanying symptoms (disturbance of the hand muscles, tongue, deglutition apparatus, trigeminus).

Pharmacological experiments with sympathecotropic substances during the last few years have added something to the differential diagnosis of sympathetic disease. For this cocain and adrenalin mydriasis have been used. These tests can be easily performed provided there is a healthy, uninjured, not inflamed conjunctival sac which is absorbing normally.

Cocain in a moderately strong solution (under 3 per cent.) stimulates the dilator. Absence of cocain mydriasis indicates weakness of the sympathetic. If a paralysis has been shown by this method in the absence of other signs, it becomes necessary to discover the location of the lesion for prognostic and therapeutic reasons. Whether it be preganglionic or postganglionic, above or below the superior cervical ganglion and whether it be in a place accessible to the surgeon. The very active endogenous hormone, adrenalin, will settle this question. A 1 per cent. solution dropped into the conjunctival sac normally produces no reaction. (2 drops are dropped in every five minutes for three times [Cords].) If the irritability of the dilator be increased as is the case in postganglionic disease dilatation of the pupil will result after fifteen minutes.

As has been stated before, it is probable that after the nerve to the dilator is gone the contractile muscle tissue becomes more irritable. (Munk's isolation phenomenon, Langendorf's paradoxical mydriasis). This adrenalin mydriasis is analogous to the rapid and maximal dilatation of the pupil after electrical, sensory or psychic stimuli in animals in whom postganglionic section of the sympathetic has been experimentally secured.

In many instances of disease involving in some way the region of the anterior or middle cranial fossæ (orbital disease, fracture of the base) adrenalin mydriasis has been observed. The explanation of this is that the sympathetic fibers going to the eye come from

the carotid plexus and join the 1st branch of the trigeminal nerve distal to the Gasserian ganglion. A combination of disease of the 1st branch of the trigeminal with the adrenalin mydriasis of post-ganglionic sympathetic paralysis can therefore be of great localizing value and makes an exact localization of the fracture, fissure or tumor of the base quite possible.

Bilateral mydriasis occurs as well as unilateral in diseases of internal secretion (pancreas diabetes, hyperthyroidism). This indicates an increase in the irritability of the entire sympathetic system.

A. Deformity of the pupils (asymmetry, irregularity) and inequality (anisocoria) are sometimes congenital, usually, however, acquired and of organic origin. The cause is most frequently syphilis in some form. Sometimes local disease as pressure upon the cervical sympathetic will cause the deformity. Transient inequality of the pupils is often found in severe unilateral migraine or in myalgias of the head and neck muscles with painful points in the neck (inequality due to pressure of the contracted muscle upon the cervical ganglion).

Hippus of the pupil and rapid mydriasis are of very slight clinical value.

From the point of view of vagotonia, the eye shows many signs worth clinical investigation. The vagotonic shows lacrimation and accommodation spasm which is relieved by atropin. The reaction of Löwi (positive adrenalin mydriasis) in diabetes and Graves' disease shows a lowered sympathetic tone. If there be spastic conditions in other vegetative regions as gastric crises, asthma nervosum, acute myosis will be found as an accompanying evidence of spasm. The opposite to vagotonia, *i. e.*, stimulating the sympathetic is shown in some cases of Graves' disease by paralysis of convergence (Moebius' sign) and exophthalmos (spasm of Müller's muscle).

Atropin acts slowly but persistently upon the pupil of elderly people, on the other hand rapidly but briefly in young people and vagotonics. v. Graefe's sign shows an increased tone in the autonomic levator palpebræ. It usually follows pilocarpin instillation in young vagotonics.

(*To be continued*)

Society Proceedings

PHILADELPHIA NEUROLOGICAL SOCIETY

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The President, Dr. Francis X. Dercum, in the Chair

SYPHILIS OF THE SPINAL CORD WITH STRICT LOCALIZATION IN THE WHITE SUBSTANCE

By Alfred Gordon, M.D.

Man, 42 years of age, colored, insurance agent, suddenly felt a weakness in his legs about six weeks ago. He rapidly improved in a few hours. On the next day the same occurrence, but some weakness remained. On the third day he became totally disabled and could not get off the bed. Upon examination it was found that while he could move his limbs in bed he could not stand or walk. The moment he was put on his feet he collapsed and fell to the ground. There was no rigidity whatever, the knee jerks were greatly increased, ankle clonus was marked on both sides, but there was no toe phenomenon. There was no pain at any time and no sphincter disturbances. The eyes were normal. A Wassermann test of the spinal fluid was strongly positive and gave a reaction of four plus.

The man was placed on mercurials and iodids and he greatly improved. At present he can walk but with marked ataxia. Romberg sign is very marked. There is no rigidity of the limbs. The sphincters are intact. There is no pain. The knee jerks are somewhat exaggerated. Ankle clonus is present on the left side. The toe phenomenon is present on both sides.

Diagnosis.—In view of the absence of sphincter disturbances, the presumption is that the gray matter of the cord was not involved. The absence of pain during the entire course of the disease, the absence of rigidity eight weeks after the onset, are all against a meningo-myelitis. The presence of marked ataxia, the presence of exaggerated knee jerks with Babinski sign, the absence of rigidity, make the condition as due to a strict limitation of the pathological process to the white matter (probably gumma). The occupation of the individual is in the sense of Edinger's view on overactivity very significant.

Dr. Alfred Gordon said that he had already mentioned the possibility of Erb's type of syphilis, but the typical Erb's syphilis is one in which we find the gradual development of spasticity and involvement of sphincters. The spasticity may not be marked, but this man at no time showed any spasticity and all the time showed absence of involvement of the bladder and rectum. By localizing the disorder Dr. Gordon felt that it was a condition which was very probably characterized by gummata located directly in the white matter without affecting the gray matter. It might be one of the varieties of Erb's spastic paralysis, but at any rate it was syphilis of the substance of the cord itself.

Dr. George E. Price said that Dr. Gordon's case resembled the familiar Erb type of spinal syphilis, with the exception of the bladder disturbance. The occurrence of increased knee jerks and Babinski in spinal syphilis with-

out marked rigidity has been in Dr. Price's experience rather common than otherwise. In fact this is in marked contrast to the rigidity which we find in ordinary hemiplegia or spastic paraplegia.

PARALYSIS FOLLOWING INOCULATION AGAINST RABIES

By George E. Price, M.D.

A man, age 43, white, a barber, was given the Pasteur antirabic treatment at the Philadelphia General Hospital following a bite on the hand by a dog. The presence or absence of rabies in the animal was not determined. After receiving twenty injections of the antirabic serum, the patient experienced a tingling sensation in his left arm followed by pain in that extremity and across his chest, with some weakness of the left arm and dragging of the left leg in walking. Examination showed diminution of power in the left hand and forearm and in the left leg, with increased reflexes and Babinski's sign on that side but not on the right. Light touch was perceived all over the body, but pain and temperature senses were lost on the right side below the ensiform cartilage. The cranial nerves and nuclei were unaffected. The urine, blood, and cerebrospinal fluid were normal, and Wassermann tests of both blood and cerebrospinal fluid were negative. The eyes were examined by Dr. Lawrence, who reported unequal pupils and general congestion of both fundi.

In the course of a few days the paralysis had extended until there was complete bilateral sensory loss below the fourth interspace, with partial motor paralysis of the upper extremities and complete motor paralysis of the lower extremities. Control of both bladder and rectal sphincters was lost.

During a period of three weeks following the onset there was gradual progression of the disease until the level of sensory loss reached the third interspace, and the breathing became entirely diaphragmatic. Fibrillation of the muscles of the upper extremities and neck appeared, swallowing and talking became difficult and the temperature rose to 103°. From this point there was a gradual improvement, the bulbar symptoms disappeared, sensation returned and finally motion reappeared, at first in the affected muscles of the upper extremities, then in the toes and later to a considerable extent in the legs.

The patient was on Dr. Price's service from the latter part of March, 1916, until August 1, then came under the care of Dr. Lloyd.

When seen recently through the courtesy of Dr. Lloyd, the man presented slight atrophy of some of the small muscles of the hands, with a corresponding weakness, the upper extremities being otherwise normal. He presented, however, a typical spastic paraplegia with associated sphincter incontinence. Sensation was entirely normal.

Attention was called to the possible influence of alcohol as an associated etiological factor, the man being an habitual drinker and intoxicated at the time he received the bite.

Dr. Price said that the case was the first instance of the so-called "treatment paralysis" that had been reported from Philadelphia, and in all probability the first that had occurred in this city.

Dr. J. Hendrie Lloyd, Philadelphia, said that he had examined this patient at Blockley, and taking into account the clinical history it seemed that the patient was permanently damaged. The whole subject was to him an entire mystery. He did not understand how the anti-rabic serum could cause a transverse lesion in the spinal cord, as in this man's case. He had gone over the man and could not make anything out of the pathology of the

case except that the patient was suffering with what seemed to be a spinal cord softening. Often he thought the man had better have died of hydrophobia than to have to lie hopelessly paralyzed as he does now.

Dr. George E. Price said that Dr. Lloyd had not read the last part of his paper, in which he spoke of the patient's present condition. Motion had returned first to the toes, then the feet and then the legs. At the present time he had a spastic paralysis and still retained some motion. The man was evidently permanently paralyzed. The majority of the cases usually clear up entirely and Dr. Price thought at the start that this man would, but he did not.

SYRINGOMYELIA WITH ARTHROPATHY OF THE SHOULDER JOINT

By J. Hendrie Lloyd, M.D.

Dr. J. Hendrie Lloyd showed a patient who had been suffering with a chronic painless lesion of the right shoulder joint. The joint was swollen, preternaturally mobile, and the seat of grating sounds on motion. The patient, a middle-aged woman, had applied to a surgeon, who, suspecting a Charcot joint, had referred the case to Dr. Lloyd. The patient seemed, at first sight, otherwise well; but it was soon observed that she had atrophy of the muscles of the forearms and hands; the muscles of the upper arms and shoulders were not involved. The patient herself volunteered the information that she sometimes burned her fingers without being conscious of pain. This thermoanesthesia and analgesia were confined to the upper extremities. There was no tactile anesthesia. The gait was not spastic or ataxic, but the knee jerks were very free, and a plantar extensor reflex was apparent. The pupils were normal. Such a case needs to be differentiated from cervical tabes, but the diagnosis in the present instance was not difficult, for the indications were clearly those of a gliomatosis in the cervical region, but in a small and strictly limited area. An X-ray picture of the joint was shown by Dr. Percival.

Dr. Charles K. Mills, Philadelphia, said it seemed to him that the case might be classed as a rather unusual form of syringomyelia. Dr. Mills said he had in his collection at home a good photograph of a case of syringomyelia with marked arthropathies of both knees. The atrophy of the hands, the dissociation of sensation and the arthropathy would all be in accord with a diagnosis of syringomyelia.

Dr. F. X. Dercum stated that with Dr. Spiller he had placed on record many years ago a case of syringomyelia of the cervical cord, attended by a marked arthropathy of the shoulder. The arthropathy was very much more marked than in Dr. Lloyd's case, being attended by very extensive destruction of bone. He still had the specimens in his possession. The case was published in the American Journal of the Medical Sciences, December, 1896.

Dr. Lloyd asked Dr. Percival to show the X-ray picture of the hip joints from a case of locomotor ataxia. The patient is a woman in an advanced stage of tabes. She has had the disease for fifteen years. She is entirely bed-ridden and has bilateral dislocation of both hips. The heads of the femurs are lying out, as Dr. Percival would demonstrate. They are atrophied and are lodged against the upper edge of the pelvis. We used to be taught that there were two types of arthropathy, the hypertrophic and the atrophic. In the present case there is some disintegration of the hip joint structures. It is commonly said that arthropathies are trophic, but to his mind the word

conveyed no meaning whatsoever. He did not know what was meant by a trophic influence under these circumstances, and he did not think anyone who used the term had a very definite understanding of it. It seemed like the terms "parasyphilitic" and "metasyphilitic," which really conveyed no intelligible idea whatsoever. His own idea was that there was a local agent of some kind acting upon the joint structure to destroy it, just as in the tubercular joint, and he had a strong suspicion that the organism doing it was the spirochete. The thought had appealed to him that this affection might after all be due to the local action of the spirochete itself. Dr. Lloyd said he hoped to see some day whether it will be possible to demonstrate the spirochetes in the joint.

Dr. W. G. Spiller said that he had reported a case of tabes with arthropathies of the shoulder and spinal column. These parts are seldom affected in this way.

Dr. F. X. Dercum presented a case of torsion neurosis.

Dr. J. Hendrie Lloyd said that he thought that in these severe cases of torsion of the trunk the primary cause or trouble was a spasm in the distribution of the spinal accessory nerve—in other words, a spasmodic torticollis. The extreme twisting or bending of the trunk was secondary. At least so it seemed to him in a case now under observation with Dr. Rugh, in which the spinal accessory nerve had been cut with beneficial results. In that case the torsion of the trunk, during the spasms of the neck muscles, was not unlike that seen in Dr. Dercum's case, although not quite so severe.

Dr. F. X. Dercum stated that in former years operations for rotary spasm were not infrequent. For instance such operations were performed on his patients by Drs. Ashhurst, Agnew and Keen. At times they consisted of a resection of the spinal accessory nerve and in one instance the entire sternomastoid muscle on one side was removed. In other cases again Dr. Keen cut the nerves supplying the short rotators of the skull, but as a rule these operations were attended with but a meager success. Sooner or later the turning movement of the head began again. There are some twelve pairs of muscles that are concerned in the rotation of the head and neck and even when one group is paralyzed the others maintain the movement. The case persented this evening shows how widely diffused a torsion spasm may become.

Dr. Alfred Gordon asked if he might suggest as a palliative measure local injections of alcohol into the musculature affected. Dr. Dercum replied that it might be tried.

Dr. Charles W. Burr presented a boy presenting mobile spasms.

Dr. W. G. Spiller said this case reminded him of a case he had reported. Dr. Spiller saw the boy first when he was about five years old. He had then a little limp in walking. Spasticity and athetosis gradually developed and became exceedingly pronounced in all four limbs.

Dr. Cadwalader said that he had observed Dr. Burr's patient since the beginning of symptoms three years ago. At that time some of the muscles of the lower extremities, particularly the adductor muscles of the thighs, were hypotonic, so much so that cerebellar disease was suspected. Since then, however, the case has progressed rapidly and has assumed a totally different appearance. Dr. Cadwalader said he believed that the case was one of progressive lenticular degeneration.

Dr. Burr said he remembered Dr. Spiller's case and certainly in many ways it was very much like the case Dr. Burr presented. Dr. Spiller's patient now is a young man and is confined to his bed or a chair and is rigid most

of the time. Efforts to bend his limbs bring forth clonic spasms and he is twisted and lies that way all day long. He is perfectly rigid, excepting that when an effort is made to extend his back or leg all the muscles over the body begin to go. The mental condition is very good.

NEW YORK NEUROLOGICAL SOCIETY

October 3, 1916

The President, Dr. William M. Leszynsky, in the Chair

A CASE OF MULTIPLE SCLEROSIS OR POLIOENCEPHALITIS

By Morris J. Karpas, M.D., and R. G. Cannaday, M.D.

The patient was admitted to the third division of the New York Neurological Institute on August 29, 1916, because of his staggering gait, tremulousness of his hands, and weakness in the lower limbs. His family history was negative. His personal history was rather negative. Patient was born in Italy, is 6½ years old, has been in the United States two years. The early development was normal. At seven months he had a fever, the nature of which is undetermined. The parents stated he got well in four days. The patient showed no defect in intellectual development. Onset of the neurological disorder was not determined, the parents claiming that he talked at the usual age, and that dentition was uneventful. He never learned to walk well. At fifteen months he was unable to coördinate his limbs properly, and since this same symptom was well defined. Physical examination showed a well-nourished patient, fairly tall for his age, with no well-marked stigmata of degeneration. Cranial nerves intact, except that the right side of face showed slight flattening. An important point was that there was no nystagmus and the discs were normal. No paresis of the upper extremities was seen, but a marked intention tremor in both hands, more in the right. Adiodochokinesis present in both hands, more in the left. Reflexes of upper extremities active. No sensory disturbances. Abdominal reflexes present, but right relatively sluggish. Knee jerks active, but not exaggerated. Babinski phenomenon was present on the left, and at times on the right. There was no clonus. The gait was both ataxic and spastic. In a Romberg position the patient showed definite swaying. Blood and spinal fluid showed a negative Wassermann and the latter showed no increase of cells or globulin. Diagnosis presented difficulties and the questions of multiple sclerosis and polioencephalitis came up for serious consideration. It was possible that the fever at the age of seven months was of a poliomyelitic variety and that the actual neurological condition developed at that period. However, the case was presented for discussion, rather than for positive diagnosis.

Dr. F. Tilney said that the difficulty lay in the differential diagnosis. In considering multiple sclerosis, the age of the child was against that condition. None of the characteristic symptoms were present that met that case in the juvenile type. He had seen but three cases, and they had been in older children, with a distinct tendency to recessive character, with regular progression and then tendency to recover. In this case the abdominals were present, and there was a doubtful Babinski, but there was an absence of the typical Charcot syndrome, and he believed they could rule out multiple sclerosis. He felt that the etiology was an acute inflammatory process involving the cerebellum, direct, and passing from the cerebellar system into the midbrain and peduncles. The pathology would be an inflammatory condition in the cerebellar system.

Dr. Foster Kennedy said that he would hesitate to speak of multiple sclerosis in a young child. He thought that this diagnosis would be open to considerable doubt. Whether or not this disease, as Charcot described it, existed in a child was open to grave question. This condition, running a progressive course of unknown etiology and having definite anatomical findings, as far as he was aware, rarely occurred before the age of 18, and rarely after 35. He did not know whether this statement was too arbitrary to meet the views of the members of the society, but he was inclined to believe that the symptom complex of multiple sclerosis appearing after 35 was the result of luetic degeneration. With these views in mind he would feel doubtful about applying the name of multiple sclerosis (which he appreciated Dr. Karpas did not mean to do) in a final fashion to this case. The child looked to him like those cases called acute cerebellar ataxia, which, when more closely studied, appear to be due to infection of the cerebellum with poliomyelitic virus. This prognosis would be favorable, whereas the other would be, in great measure, grave.

CASE OF MIGRAINE OPHTHALMOPLEGIQUE

By Foster Kennedy, M.D.

The case was one that did not present any obscurity. Although the condition was not uncommon, Dr. Kennedy thought the members would like to see the patient, who presented a very interesting history. The patient was 25, and suffered from transient ophthalmoplegia. The first attack, when the right eye turned in, occurred at six months. From that age to 15 years she had one attack a year. After the age of 15 attacks came on twice a year. They were prefaced by severe headaches over the right eye only, lasting about three days. On the third day the right eye turned in and remained so indefinitely, sometimes a few days, sometimes six months. Personally, he had seen two attacks of external rectus palsy on the right side coming on the second day after the headache. He had no theory to put forward for this condition, but he wished to stimulate discussion on the etiology of such a state. The condition of migraine ophthalmoplegique had been the subject of much speculative pathology. It had been suggested that in these individuals there was always relative or complete stenosis of the foramen of Munro, resulting in dilatation of the ventricles. If there was in migraine marked increase in intracranial pressure, then one could conceive a pathological condition similar to that produced by brain tumors; in that state ophthalmoplegia was not uncommon, particularly of the sixth nerve. Cushing had shown that the sixth nerves were then not stretched, but pressed upon by overlying arteries frequently to such degree as to leave a definite imprint, so explaining the transient ocular paralyses. He would like to ask the members whether these transient paralyses which occurred in migraine, might not be explained by an analogous theory, that there was a definite rise in intracranial pressure producing paralysis of the cranial nerves. In the case of this patient the girl's periods had been normal, without pain, lasting three or four days, and perfectly regular, and she had good health, apart from these headaches, which were of a distressing nature. The commonest paralysis in migraine was of the third nerve, which this patient did not show. In this case the paralysis was of the sixth and not of the nucleus, because the movement of the ocular motor nerve was perfect, so that the involvement was of the periphery of the nerve. The seventh was not involved.

Dr. B. Onuf asked Dr. Kennedy what his theory would be in a case where hemianopsia occurred. In a case under his care the attacks of migraine were ushered in by paroxysms of hemianopsia of about half hour's

duration; the fields of vision being cut off in the median line, the left side of which was entirely blind for the time being. How would Dr. Kennedy explain such cases on the basis of his theory?

Dr. William M. Leszynsky said that he had seen several patients with a similar history in which the external rectus was involved, and the condition ultimately became permanent. He had reported several of these cases.

Dr. Kennedy said that the paralytic phenomena which occurred with migraine were many in number. Severe aphasia, hemianopsia, hemiplegia might develop. He had not investigated the worth of his theory, and he did not know how far it might hold good. The conception of a transient rise in pressure would assist in explaining phenomena of such organic character as occurred in the course of these conditions.

A CASE OF BROWN-SÉQUARD SYNDROME

By Clarence P. Oberndorf, M.D.

The patient had a condition which remained long undiscovered and the nature of the etiology was in doubt. If, as Dr. Oberndorf thought, it was hemorrhage into the cord, it was rare. The patient escaped operation for a tumor, which was proposed, on account of the definite local symptoms. Oppenheim and Babinski had reported such cases. The onset of this case dated from the night of September 3, 1915, when she went into the yard, almost undressed, to investigate some disturbance. On her return she noticed a severe pain about the heart. This lasted two hours and following this she took an enema. On attempting to rise she noticed her left leg was completely paralyzed. She could not use the left leg at all for three weeks, when power gradually returned. There was absence of sensation to temperature and pain on the right side below the nipple line. The condition had been diagnosed as Brown-Séquard syndrome, due to hemorrhage. The woman showed no cortical symptoms. The Wassermann was negative in blood and spinal fluid. There were no cells. At Mt. Sinai an X-ray showed a slight spondylitis at the second dorsal vertebra. Urine and blood were negative throughout. In May, 1916, she began to suffer from vertigo and was admitted to Mt. Sinai. Operation was proposed for tumor of the cord, but patient refused consent. Subsequently she improved continuously. Dr. Oberndorf thought that the cause was hemorrhage into the cord, which was clearing up. The area of anesthesia remained very definite. On the paralyzed left side there was no loss of position sensation, which was observed in some of the classical cases, but there was a clonus and Babinski was present on that side. The gait was still somewhat spastic in the left leg, but patient could do her work without difficulty.

SARCOMA OF THE BASE OF THE SKULL

By R. McRoberts, M.D. (by invitation)

Patient, male, clerk, 38 years, first seen September 7, 1916. He was married and has three healthy children. Past: at 18 he had a severe attack of left-sided facial neuralgia, and for past eighteen years had had occasional attacks, preventing his work. Onset of present symptoms occurred in August, 1913. He had a gastro-intestinal disturbance. A week later he went for a drive and noticed pain in the cheek. After this he slept soundly but awoke with complete loss of control of muscles of the left side of face, apparently a typical Bell's palsy, for which he was treated fifteen months. At this time the condition had advanced; his voice was hoarse; he experienced difficulty

in swallowing. Symptoms progressed to present degree of severity in three months and from then on patient says they remained unchanged. Five years ago he had acute tenderness behind the angle of the left jaw and a swelling appeared at this place. This gradually divided into several smaller, less painful nodules. The muscles on this side became smaller and tired easily. In January, 1916, he developed difficulty in hearing on the left side; this improved and occurred again in July, when double vision also began and ptosis developed. He has noticed impairment of smell and taste, slight pain on left side of tongue and a peculiar creeping sensation on left side of face. Physical examination showed good condition; mental and physical alertness; normal station and gait; reflexes active and equal; no pyramidal or cerebellar signs. Symptoms appear limited to peripheral involvement of cranial nerves on left side: smell impaired; left corneal anesthesia; mobility of left eye wanting; complete ptosis of left eyelid; vision 20/30 rt., 20/40 lt.; fields complete; fundi normal except for fullness of retinal veins. Face shows left-sided analgesia with atrophy of left masseter, pterygoids and temporals. Left side of face smoothed out and expressionless. There is abductor paralysis of left vocal cord. Tongue shows absence of taste on left side, which is atrophic and analgesic. There is marked atrophy of the left sterno-mastoid and trapezius. Behind the angle of the jaw there are several small subcutaneous masses, tender on pressure. X-ray of the skull shows nothing abnormal. Muscles of left side of face give no response to either faradism or galvanism and left sterno-mastoid gives reduced response, as compared with right. The clinical condition is one produced by peripheral involvement of all cranial nerves on left side, excepting the first, second, fourth, and eighth. This could be due to slowly infiltrating lesion of the periosteum and middle posterior fossa on left side of skull. Three pathological processes could be considered: syphilis, tuberculosis, sarcomatosis. The first is excluded by normal cerebrospinal fluid and blood, negative history and absence of other signs; tuberculosis is unlikely, as patient gives negative tuberculin reaction. Sarcoma of brain and meninges may entirely lose its tumor character and extend in the form of a diffuse meningeal process which can only be recognized by microscopical examination. This lesion was believed to be present, and a sarcomatous neuritis of the cranial nerves might be considered, as described by some writers.

Dr. Goodhart said he would like to know whether or not with the ptosis there were evidences of further involvement of the oculo-motor nerve. If the paralysis was of nuclear or peripheral origin, he supposed it was of the latter. Was it possible that the involvement of the sterno-cleido-mastoid muscle was due to glandular pressure upon the spinal accessory nerve?

Dr. Karpas said he felt it was difficult to exclude a luetic condition of the skull on the negative serological findings. The case that came under his observation at Bellevue Hospital was one of syphilitic periostitis of the skull and indeed the serological findings were negative but the blood showed a positive Wassermann test. The patient showed well-defined symptoms of cerebello-pontine-angle involvement and intra vitam the case was diagnosed one of cerebellar-pontine-angle tumor and had it not been for the autopsy the case would not have been properly diagnosed. Dr. Gregory and he reported the case before the American Neurological Society.

Dr. William Leszynsky said it was now a well-established fact that a number of patients in whom there were unmistakable clinical manifestations of syphilis, gave a negative test of the blood and cerebrospinal fluid.

Dr. Tilney said the etiology interested him. It was necessary to ask whether this was sarcomatous or syphilitic.

One investigator had published a case beginning in the preorbital process and extending back and involving the cranial nerves. Recently cases of this

sort had increased in the literature and several had been reported in which the Wassermann was negative, but on anti-luetic therapy the cases had remarkably improved. He had seen one case of involvement of the third, fourth and sixth, in which the blood and fluid were negative, but yet the case cleared up on anti-luetic treatment. He thought it would be worth while trying it in this case.

Dr. Foster Kennedy asked would Dr. Tilney put forward any reason why an active syphilitic condition of the meninges would fail to give any syphilitic chemical reactions or any display of meningeal irritation. Was there any explanation?

Dr. Tilney said he did not know of any explanation except that there were a number of such cases occurring. They cleared up on salvarsan and mercury.

TUMOR OF THE PINEAL BODY WITH INVASION OF THE MIDBRAIN, THALAMUS, HYPOTHALAMUS, AND PITUITARY BODY

By Luther F. Warren, M.D., and Frederick Tilney, M.D.

Dr. Warren stated that the patient was a boy of 18 at the time that he came under his care at the Long Island College Hospital. The family history was negative. The personal history showed that the boy was bright and ambitious in school and was the most intelligent of six healthy children. The mother said that at 16 years he bought a horse and made a success of peddling vegetables. At 16 he was sent to an orphan asylum. On account of the pregnancy of one unmarried sister the other children were sent away. In April, 1915, it is stated that at this asylum a man became angry with the boy and struck him on the head with the buckle of a heavy strap. The boy was sent to the infirmary after this injury. Later on he began to develop symptoms of pain in the head and vomiting, which, from his description, was projectile in character and had no relation to the ingestion of food. Then began to occur attacks of drowsiness and he was increasingly difficult to rouse. Later he developed symptoms of thirst, drinking two glasses of water every hour. He had difficulty in seeing and hearing. Physical examination showed a markedly emaciated boy, with marked contractures over the entire body, so that the fingers, hands and knees were flexed. He lay practically without moving and when movement was attempted there was marked resistance and definite catatonia was present. The pupils were equal and reacted to l. and a. There were no extra-ocular palsies; no evidence of old iritis; palpebral and supra-orbital reflexes were present; negative Wernicke's pupillary inaction sign; marked pyorrhea; teeth not notched; ears negative. Thorax and heart negative; abdomen scaphoid; liver and spleen negative. Extremities showed all jerks present and active; ankle clonus present on right; Babinski on left. Blood count, 4,000,000 red cells, 7,000 white, 75 per cent. hemoglobin. Blood pressure 120 s. 75 d. Urine 3,000 c.c. in twenty-four hours. Blood and spinal fluid negative serologically. An X-ray showed the sella turcica eroded at base, but normal in size. Temperature was 99 to 101 daily, but without regularity as to afternoon hours.

Dr. Walter Timme said that the symptom of contractures was peculiar, but it was not new. Pineal gland tumors had frequently been described as having, besides actual signs of tumor growth, contractures of tendons and muscles; among others Jacouvsky reported a case where the patient from the beginning lay in bed with the legs drawn up and contracted. In the past year he had examined a family of muscular dystrophies, and on intimate examination he found that each one gave symptoms of pineal-gland disturb-

ance. The X-ray showed shadows of the pineal, so there was correspondence of metabolic disturbance leading to contractures associated with pineal gland involvement. A condition which produced such great changes should have given a double Babinski and double clonus. The combination of muscle contractures therefore was apart from pressure on the pyramidal tracts.

Dr. Tilney said that it seemed to him that the matter of contractures was interesting in the series already published. Most of them gave that history, but it was not necessarily due to change in the pineal gland itself. Certainly, in this case, the efferent tracts were compressed. This showed on section. The negative clonus was due to intense contracture. His own interpretation of the contractures was due to pressure upon the tracts and the peduncle, not to change in the pineal gland.

A CASE OF THALAMIC SYNDROME

By S. P. Goodhart, M.D.

The patient presented a typical thalamic syndrome. He was 35, married, with two healthy children; personal and family history negative. The onset occurred two years ago. The introduction to his illness was interesting and opened an investigation between functional and psychic effects. It was often noted that disturbances of large sections of the brain were anticipated by psychic disturbances. Beginnings of psychic trauma often occurred in a dream in which injury was the beginning of the trauma, as in the case of a patient who dreamed he fell and struck his arm and woke with a trauma. This fact was often noted in the case of patients with paralysis agitans. In this case the patient went to bed after a strenuous day in July with severe headache, but fell asleep, and had a very disturbing dream. He thought he saw a battle between Germans and Russians, in which the Germans were worsted. He thought he rushed to the window to help them and lost the use of his right arm and lost power of articulation. He awoke to find the right side of his body paralyzed. He was in bed with this right organic hemiplegia for several months, but recovered motor power in the leg and arm and face. Later he came to the Montefiore Hospital with marked sensory changes, especially deep muscle, joint and tendon senses. This had persisted. There were choreo-athetotic movements of the right extremity, due to affectivity. The mental state was depressed with inclination to intense laughter without cause. The man had analgesia, anesthesia affecting the tactile and postural senses; ataxia, and peripheral, not cortical astereognosis. He could feel pain on pricking on the left upper and lower extremity, and this caused disagreeable sensation when applied to the right side, but not pain, and no pain on Faradism. The man showed a slightly rigid gait. The association between the dream and the trauma was very interesting.

Dr. Frink said he could not throw much positive light on the case. It was well known that physical stimuli received during sleep, such as noises, sensations of pain, etc., were treated as dream material and woven into dreams. Dreams associated with somatic stimuli usually expressed, like other dreams, a wish fulfilment, and often were the equivalent of an effort to make pleasant some disagreeable sensation, with a view to maintaining sleep. This was probably the case with this dream. That is, it was provoked by the sensations caused by the organic lesion, not that the lesion was followed by or in any sense caused by the dream.

Dr. Oberndorf said it reminded him of a case which he saw in the service of Dr. Sachs at Mt. Sinai Hospital. The patient was in bed five weeks with a complete hemianesthesia, hemiparesis and clonus. On account of vomiting

there was a question whether she had a tumor of the thalamus or not. Operation was seriously considered. One day she got out of bed and walked away well. Naturally, it was decided that the condition was hysterical. He wondered if it was so in this case. Dr. Goodhart said they had no reason to believe it was so in this case. He thought there was some rational explanation for the dream, whether it was excited by central or peripheral irritation which suggested pain, he did not know.

Dr. Byrne asked Dr. Goodhart what methods he used in testing the reactions for pain and for gross heat and cold. There might be marked reaction to pinching and pressure-pain when there was none to prick. So, too, large pitchers of very hot or very cold water would often cause marked reaction where water of the same temperature in test tubes, as ordinarily used, would give no reaction. He felt there was here no evidence of over-reaction to grossly affective stimulation and on that account he felt that the case was not a typical one, although some features were highly suggestive. Further observation was needed to clear up the diagnosis.

Dr. Neustaedter asked Dr. Goodhart how he would account for hemianalgesia and anesthesia.

Dr. Goodhart said he thought that was always found. The trigeminal region in a supranuclear lesion was always involved. This was in contradistinction to functional cases. The cornea was not involved.

Periscope

Psychiatric Bulletin.

Abstracted by Dr. D. Sanger Brown, 2d, White Plains, N. Y.

(Vol. 9, No. 2)

1. Clinical Studies in Epilepsy (Continuations). Dr. L. Pierce Clark.
2. A Clinical Study of Epileptic Deterioration. Dr. John T. MacCurdy.

2. *Epileptic Deterioration.*—The mental condition in epileptic deterioration, because of a number of distinctive features, is well worthy of detailed observation by the psychiatrist. This deterioration differs from that which is encountered in gross organic brain disease, and at the same time it has features which make it distinct from the mental dilapidation seen in the terminal stages of the functional psychoses—notably dementia præcox. It differs from both these conditions, but still has some features in common with both. The study of epileptic deterioration, therefore, should broaden our knowledge of all forms of mental deterioration. This is what MacCurdy's study has accomplished. He not only indicates how deterioration may develop in epilepsy because of faulty adaptations in an abnormal personality, but by applying this explanation in the case of faulty mental adaptations observed elsewhere, he offers a general explanation of how deterioration may arise on a functional or psychogenic basis. This is interesting in the personality changes at times seen in essentially normal individuals. We know some people, who, although still apparently of normal mentality, fall off markedly in interest, in mental efficiency, and in productivity; they "get in a rut," or "settle down" as we say, and sink into insignificance. MacCurdy in his present analysis has offered an explanation which would account for these changes, although this interesting feature is discussed only incidently by him in order to illustrate the severer forms.

To return to epilepsy. MacCurdy emphasizes that the disease should not be studied through the seizures alone, since the seizures represent but one symptom. On the other hand, he considers the distinctive *personality* of the epileptic of major importance; and, although his explanation of epileptic deterioration is based largely upon this assumption, he none the less is quite prepared to admit an organic basis, could constant organic changes in the brain be found. This has never been consistently demonstrated or brought into correlation with the symptoms. Investigation in other directions, namely as to faulty functions of the ductless gland, etc., has also given us little definite as yet. In view of these essentially negative findings, MacCurdy feels warranted in approaching the subject from a *psychogenic* standpoint. In this direction ample clinical material is found. The epileptic is of a distinctive type of personality, having many of the more primitive attributes, and being essentially selfish, egotistical, boastful and insincere. He has a child like desire for praise, and in all respects, because of his primitive and egotistical mentality, he is very poorly equipped for the adult adjustments to life. Because of this poor mental equipment and inability to adapt himself,

the epileptic is anti-social in his tendencies. As he matures his conflicts increase, and he fails in all the broader issues of life. With this failure his deterioration begins. He grows more selfish, less considerate of others, less restrained, and because his former activities fail to satisfy him, he loses interest in them. Here we have a fair setting for deterioration from a psychogenic standpoint.

MacCurdy's description of the various degrees of this deterioration is particularly valuable. The milder form is very slight, difficult to define accurately, but nevertheless its presence is significant. The patient becomes more egotistical than formerly, more boastful, in a way which often makes him appear ridiculous. Of one of these cases it is said: "On careful inquiry it was found that he had changed in the following ways: he was more amenable to flattery and to secure it had frequently to be coaxed to play baseball. He would exaggerate little injuries in order that coaxing would be necessary. He boasted more and seemed less cognizant of the fact that he did not increase in people's estimation by so doing. He showed less judgment about 'showing off' than he had previously done; he was sometimes inexpressibly silly in this. These changes evidenced an egotism less curbed than before by a judgment as to how to secure approbation. . . . This patient, then, shows an easily understood development of egotism with a loss of judgment about the desirability of boasting, a coincident loss of adaptability and personal pride, and a restriction in his interests and output of energy." Here is a form of deterioration which we have not often found described. As mentioned above, we have something approaching this mild form in the gradual change of personality in some essentially normal pepole, who, because of certain failures or disappointments in life, exhibit comparable reactions. Subsequent to this milder grade a severer form of deterioration develops. This change has a number of distinctive features. It is not the deterioration or organic brain disease, in which memory, orientation, etc., suffer disproportionately; nor is it of the dementia præcox type; "interest is not taken from the real world to be placed in an imaginary one; realities do not turn into delusions; friends do not change to foes, but cease to exist; love does not turn to hate but indifference. The personality is not distorted; it is blotted out. Contact with environment in dementia præcox is lost at one or more points; in epilepsy contact is lost at all points. The epileptic's interest is withdrawn not to be put out again on some fantastic object but on himself, and, as his personality exists only in virtue of its being a social unit, the very self ceases to exist except as a body." In epilepsy there is a mental retraction in all directions, in interests, in attention, in acquiring new knowledge, etc. MacCurdy uses Hoch's explanation of this as "a loss of mental tension," *i. e.*, of a driving force directing attention. This force fails, interest is lost, and serious deterioration follows. Of one such patient it is said: "His apathy and lack of spontaneity were striking. He coöperated well and with apparent interest but showed no variations in his mood. When glaring defects in his memory were shown, he gave no evidence whatever of feeling sensitive about it. . . . There was no spontaneity in his talk; he never initiated any idea or kept any topic going that had been started. . . . He was well oriented and his retention on a test was good. His memory defect, however, was extremely typical. Colony events for the past week or so he recalled well but even striking events of several weeks previous he remembered with huge gaps." This memory defect makes one think of organic brain disease; but epileptic deterioration, in *aphasic symptoms,* has a still closer parallel to organic conditions. Aphasic symptoms have not previously been described in epilepsy, at least not to the knowledge of the reviewer. Certainly this symptom has never been carefully studied before in this disorder. MacCurdy has given some striking instances of aphasic symp-

toms in epilepsy. Cases are given showing the usual errors and difficulty in naming objects, in picking up objects, in using objects, and in other cases word amnesia and perseveration are illustrated. Some cases develop mutism because of this speech disorder. The question of aphasia is certainly noteworthy, and while it is shown to differ from the organic type in some respects, its similarity to the latter form is striking. MacCurdy's description of the terminal stages of epileptic deterioration is as follows: "The helpless dement, with roving eye, putting everything in his mouth, recognizing practically nothing in his environment, or making known his wants by inarticulate sounds, forces a comparison with the mental status of the first few months of extra-uterine life. There are other similarities not yet mentioned. The majority of such cases sleep in a fetal position; many of them walk on the balls of their feet, never touching their heels to the ground, like infants learning to walk"; MacCurdy points out that this identity is not complete in all respects.

How are we to understand this series of mental changes in epilepsy? MacCurdy believes that it is largely of psychogenic origin. The epileptic, because of his personality, is unable to adjust to life, and so deteriorates as a result. MacCurdy points out that the terminal deterioration seen in dementia præcox has more organic-like features than we have generally appreciated, and here the psychogenic origin is even more in evidence. In epilepsy, therefore, similar psychogenic factors may determine the course of the disease, although a severe grade of deterioration is reached. Cases are given to show that deterioration is greatly influenced by environment, and remarkable improvement has been observed in some cases under the influence of stimulating and encouraging surroundings. In the David Lewis Epileptic Colony in England, for example, the educative aims give excellent results; this indicates that deterioration can be controlled to a certain extent. Again, cases are observed to deteriorate when the patient loses hope of recovery. This view of the origin of epileptic deterioration may not be acceptable to all. In fact, MacCurdy does not state that the psychogenic origin is the sole one, and he suggests that a poorly endowed nervous system may form a basis for the condition; but in any case, it appears that psychogenic factors play an important part. The question of the influence of personality on the mental life and adaptation of the individual is a very interesting one, and this article suggests much for future study in this direction. Necessarily, all these features, as well as a number of others, dealing with the formal description of the mental states of epilepsy, cannot be brought out in this review.

Neurologisches Centralblatt

Abstracted by Dr. Lewis J. Pollock, Chicago, Ill.

(Vol. 31, No. 1, Jan. 2, 1912)

1. Shyness Toward Women as a Disease. WILHELM EBSTEIN.
2. Clinical and Anatomical Investigations of a Case of Isolated Loss of Pupillary Reflex to Light Without Syphilis in Severe Chronic Alcoholism. M. NONNE.
3. The Results of Salvarsan Treatment of Tabes. SILIVIO CANESTRINI.
4. Tabes Dorsalis in Later Life, Upon the Basis of Hereditary Lues. R. v. HÖSSLIN.

1. A report of a case in which timidity of women appeared in attacks. The last attack occurred at the age of sixty-three and had lasted for seven years.

2. A clinical and pathological study of a case of chronic alcoholism in whom the four reactions were negative and no clinical symptoms of paresis, tabes, or cerebrospinal syphilis were present, other than a double immobility of the pupils to light reflex.

Nonne concludes that in rare cases a real reflex pupillary immobility may appear in the absence of syphilis as the result of chronic alcoholism. He states that this may disappear entirely following abstinence.

4. Hösslin reports a case of a single woman aged fifty-two years in whom an autopsy confirmed the clinical diagnosis of tabes dorsalis. Her father died of paresis at the age of thirty-six years. Her mother had three miscarriages before the birth of the patient. One brother, who died at seven years, suffered with convulsions since infancy. At the age of ten the patient had necrosis of the skull. The author states that as hereditary lues was traceable in this case, we may suspect a hereditary lues in many other cases of tabes developing in late life when nothing can be determined of either a hereditary or an acquired lues.

(Vol. 31, No. 2, Jan. 12, 1912)

1. The Separation of Neurology from Psychiatry and the Creation of Specialized Neurological Clinics. P. Näcke.
2. A Review of Atrophic Myotonia. Rudolph Tetzner.
3. The Cerebro-spinal Fluid and the Wassermann Reaction. An Answer to a Similar Article by Frenkel-Heiden.
4. An Answer to the Frenkel-Heiden Article in the Centr., 1911, No. 22. W. Holzmann.
5. An Answer to Nonne, Hauptman and Holsmann by Frenkel-Heiden.

2. The author calls attention to the group of cases of myotonia congenita (Thomsen's Disease) which presents muscular atrophies or dystrophies. He describes a case of a man who six weeks after a fracture of the clavicle, developed the first indications of a myotonia. Inasmuch as he was thirty-two years old, Tetzner says that whether this case should be regarded as one of myotonia acquisita or a later manifestation of a myotonia congenita is a matter of opinion. The patient presented, besides the classical picture of myotonia, a succession of muscle dystrophies, typical in distribution as compared with the cases to which Steinert called attention. The forearm, shoulder girdle, neck muscles, particularly the sterno-cleidomastoid, and facial muscles were affected. The rest of the symptoms often found in atrophic myotonia developed ptosis, baldness and vaso-motor and trophic disturbances in the hands.

2, 4, 5. A discussion of the technique and some points of interpretation of the Wassermann reaction which is not suitable for abstracting.

(Vol. 31, No. 4, Feb. 15, 1912)

1. Clinical Contribution on a Heredo-Familial Disease of the Nervous System with Heterologous Strains. V. Rad.
2. Facial Palsy in Three Generations. Siegmund Aufrbach.
3. A Number of Cases of Paralysis Agitans in a Swedish Peasant Family. H. Lindborg.
4. James Parkinson's Essay on the Shaking Palsy. A Bibliographic Notice. Erich Ebstein.
5. The Psychology of Handwriting. George Schneidemuhl. Reply by Näcke.

1. The author credits to Jendrássik and Kollaritz the assembling of the multiple forms of hereditary family nervous diseases into one comprehensive

group, the heredo-degenerations. He calls attention to the fact that although "symptom grouping," as he calls the family spastic spinal paralysis with dystrophies or hereditary ataxia with dystrophy, is common, a homologous inheritance exists as a rule. He recalls that Jendrássik even goes so far as to state the similarity of the diseases in the same family has the constancy of an axiom. He describes four members of a family who developed three different family hereditary nervous diseases. Two brothers suffered with a similar type of spastic hemiplegia, one sister with muscular dystrophy, and one brother at the age of nine developed mental deterioration and a condition characterized by choreiform movements.

2. Auerbach reports a case of right-sided facial palsy in a woman twenty-five years old whose mother and grandfather each had a facial palsy. He thinks that a higher percentage of the hereditary appearance of facial palsy would be found if we could limit ourselves to the more educated circles of the populations in obtaining anamnesis for the purpose of obtaining such statistics.

3. Lundborg reports seven cases of paralysis agitans in three generations of one lineage of a family; all were examined by physicians and five of these by himself. Besides these two more existed, who had never consulted a physician and died before the full development of the condition. However, they were said by several persons to have suffered with a condition similar to the other seven.

5. A criticism of Näcke's article upon biological and legal aspects of handwriting, with a reply by Näcke, dealing principally with the possibility of character reading by means of handwriting.

(Vol. 31, No. 5, March 1, 1912)

1. The Relation of the Upper Cervical Cord to the Innervation of the Larynx. MAX ROTHMANN.
2. The Infantile Speech in Adults. Its Clinical Significance. LAD HASKOVEC.
3. Disturbances of Speech Expression in Schizophrenia. Zingerle.

1. From a careful experimental study, which is recorded in an article not well adapted for abstracting, Rothmann concludes that in dogs as well as in monkeys, following a section of the anterior and posterior columns of the upper cervical cord along with the intervening gray matter, a paresis of the adductors of the vocal cords ensues with marked hoarseness.

The spinal accessory nerve is not concerned in this disturbance. How far a possible spinal vagus connection enters into the question must be determined by further research. The motor laryngeal nuclei of the medulla are not only under the influence of the laryngeal center of the cerebrum, but are connected with a definite action of the cortex of the cerebellum, as Katzenstein and Rothmann have shown. Finally, it appears that the upper cervical cord is also able to influence the laryngeal innervation. With these extensive connections of laryngeal innervation, their disturbances will assume a greater importance in neurological diagnosis.

2. To be concluded. Abstract follows.

3. A study of the speech formation, word dissection and building, in a case of schizophrenia of paranoid type. Zingerle states that analysis had in this case tried to trace to the fundamental the schizophrenic thought disturbance in which knowledge and experience are rejected and with no consideration of the laws of logic imaginations have acted, that give no, or a very insufficient, connection with the main idea, and therefore should be excluded from the thought course.

(Vol. 31, No. 6, March 16, 1912)

1. A Case of Tumor of the Spinal Cord. O. Stender.
2. A Case of Juvenile Tabes with Anatomical Findings. Otto Maas.
3. The Infantile Speech of Adults. Its Clinical Significance. (Concluded.) Lad Haskovec.

1. Stender reports a case of a fibro-sarcoma of the spinal cord at the level of the sixth and seventh dorsal segment. Autopsy revealed a complete transverse lesion, no nervous tissue being visible in the place occupied by the tumor. The upper and lower portions of this transected cord being connected only by a connective tissue-like sheath of the cord. At first the symptom complex was that of a spastic paraplegia. Eight days before operation the spasticity began to disappear and a flaccid paralysis ensued. The knee jerks became scarcely obtainable and a Babinski present on one side only. Following the operation all skin and deep reflexes disappeared. One month later both patellar reflexes appeared plainly but feebly, and a Babinski was demonstrated on both sides. Stender contends that this case proves again that Bastian's hypothesis is untenable and that Oppenheim's contention that permanent absence of reflexes in the lower extremities in supralumbar transverse lesions means a simultaneous anatomical damage to the reflex arc, seems plausible.

2. Maas reports a case of juvenile tabes in a man. The patient's father had syphilis and later developed tabes. The patient shortly after birth had snuffles and a rash appeared all over his body. At thirteen years of age urinary disturbances appeared, a sixteen diminution in vision, slight uncertainty in his legs and absence of the knee jerks; at eighteen total blindness; at twenty-seven the appearance of lancinating pains in his legs; at twenty-eight decrease of sexual power; at thirty increase of uncertainty in his legs and total inability to walk ensued. The anatomical findings proved that the clinical diagnosis was correct. He observed a thickening of the pia mater of the cerebrum but attaches little significance to it Aside from the fact that both posterior columns were not involved to the same extent, he states that the findings were those usually found in all the cases of tabes of adults. Remarking upon the slow development of the case Maas says that cases of juvenile tabes do not show any peculiarities of development, and that such slow progress of this disease may be observed in the tabes of adults.

3. Haskovec reviews his case of infantile speech reported before the Société de Neurologie in 1906 and a case of Pick's, with which his case is considered by him to be identical. He reports a new case occurring in a healthy man, following an accident; after a long period of unconsciousness, symptoms of asymbolia and retrograde amnesia occurred with no disturbance of motor or sensory functions. After a year he receded to a psychic plane of a small child, as was perceivable from the knowledge, conduct, and all utterances of the patient. Dexterity, plasticity, etc., developed by experience was not regained, and after a year the appearance, impressions, ambition, memory and expressions of experience and speech was that of a child eight or ten years of age. Haskovec refers to his theory that besides the normal functions of the organs of sense, the sensory, motor, vegetative and ideative regions of the brain, a center for "central consciousness" exists. This particular center is not generally recognized, but is taken to be an expression of the function of the whole cortex. The development of our psychic maturity and our own cognizance is gradual until it becomes stable to its highest degree in ripe age. Just as in the course of brain lesions the most manifold, isolated, light and severe disturbances may occur in various physiological functions of the brain as dysarthria, anarthria, aphasia, paresis, spasms, paresthesias, etc., disturbance of the vegetative system and in the senses (blindness, etc.), so

these same lesions may cause disturbances of ideation and judgment and in the highest psychic centers especially in central consciousness. He assumes that in so serious a case as he reports not only are the combined components of consciousness involved but "central consciousness" itself has undergone a change. The patient cannot perceive his own condition and is not conscious of a change as is the case in certain rare cases of blindness where the patient is unconscious of his defect. With necessary reserve he localizes the center for central consciousness in the region of the third ventricle.

(Vol. 31, No. 7, April 1, 1912)

1. The Striæ ("Bodenstriæ") of the Floor of the Fourth Ventricle. G. Fuse.
2. A Febrile Dermatoneurosis. L. E. Bregman.
3. Babinski's "l'inversion du reflex du radius." Gotthard Söderbergh.
4. The Behavior of the Tendon Reflexes in Chorea. Minor K. Wendenburg.
5. A New Reflex Obtained from the Sole of the Foot. Alfred Caro.

1. A pathologic anatomical study of the "Bodenstriæ" based upon three cases of neuroma of the eighth nerve. Three cases of primary degeneration of the eighth nerve in deaf mutes and two cases of local cerebellar defects. From a consideration of the embryology and normal anatomy of the Bodenstriæ and the above pathological study, Fuse concludes that the Bodenstriæ are very young formations (phylogenetic) and while developing keep pace with the pons and pontine gray; therefore both are highly developed in humans. Their autogenetic development is parallel with the phylogenetic. The Bodenstriæ undergo secondary degeneration following deep cerebellar defects (especially in the vicinity of the flocculus) on the side of the lesion. They do not undergo degeneration with primary lesions in the essential auditory nerve region, that in malformation of the cerebellum with high-grade disturbances in development of the cerebellar medulla (middle peduncle and flocculus) the Bondenstriæ are very sparsely developed and in some cases absent on the affected side.

2. A description of a relapsing febrile dermatoneurosis occurring in a neuropathic individual, caused by a simultaneous stimulation of the vasomotor center and heat-regulating center. Bregman states that we are dealing with a rare and unknown form of disease which may merit an individual place in the field of vasomotor neurosis.

3. A report of a case of an extramedullary psammona of the spinal cord from which Soderbergh concludes that Babinski's "l'inversion du reflex du radius" (flexion of the fingers upon tapping the lower end of the radius, with no flexion at the elbow) is a sensitive localizing sign of a lesion of the cervical cord, particularly of the fifth cervical segment.

4. Wendenburg concludes that the tonic extension of the leg which occurs in cases of chorea minor as a response to stimulation of the patellar reflex does not occur in hysterical chorea, and may be used as a means of differential diagnosis.

5. The authors describe a new reflex. It consists of a contraction of the lateral quadriceps upon stroking the lateral portion of the sole quickly and lightly, from bottom to top, with the handle of a hammer. This reflex appears just as often as a patellar reflex and is classified by the authors as a deep reflex. In some cases (tabes, neuritis, recent apoplexy) they observed this reflex to be present when the patellar reflex was absent. They explain this discrepancy as follows: with interruption of the reflex arc through the L^2 to L^4, the reflex courses through the S^1 to S^2, the stimuli running through the intact tracts of the white or gray substance to the motor ganglia of the L^2 to L^4 segments.

(Vol. 31. No. 8, April 16, 1912)

1. Bodily Disturbances in Dementia Præcox. E. Meyer.
2. Short Remarks Concerning Zingerle's article, "The Disturbances of Speech Expression in Schizophrenia." E. Stransky.
3. Asphygmia Alternans, a New Pulse Phenomenon Upon a Hystero-Neurasthenic Basis. Kurt Halbey.
4. The Fate of Isolated Occurring Paresthesia in the Region of the N. Cutaneous Femoris Externus and Remarks Concerning Momentary Heat Flashes of the Extremities. Näcke.

1. A discussion of the occurrence of liability of pulse frequency, bradycardia, attack of cramp-like tonicity of the general musculature, associated with fever, and pupillary disturbances, occasioned through the observation of a case showing these symptoms. Meyer draws some comparison between the pulse changes in Reichardt's brain swelling, Stoke-Adams' syndrome, hydrocephalus, and those observed by him in dementia præcox, and comes to no definite conclusions.

2. Stransky says that Zingerle states that the separation between conception and speech expression is not an absolute one. It would seem that this is not one of the worst arguments in favor of the conception of intrapsychic coördination disturbances which Bleuler throws aside in his work, although his descriptions seem to point toward it.

3. The report of a case of hystero-neurasthenia in which there was observed, especially after awaking in the morning, attacks in which the right radial pulse gradually disappeared, remaining absent for one to one and a half minutes, while the left continued to beat strongly; as the right began to reappear, the left gradually ceased, and remained absent for three fourths of a minute, after which both continued to pulsate as before the attack. During this time no other subjective or objective symptoms were observed. Halbey attributes this phenomenon to a disturbance of the sympathetic system; a vasomotor cramp based upon a hystero-neurasthenic constitution.

4. Näcke describes the paresthesias and heat flashes, with which he was afflicted, and reciting the occurrence of a number of attacks separated by a long period of time, warns against ever calling these attacks cured.

(Vol. 31, No. 9, May 1, 1912)

1. Concerning the Uncompleted, Undeveloped Cases of Basedow's Disease. J. W. Langelaan.
2. Myasthenic Paralysis and its Relation to the Glands of Internal Secretion. Ernst Tobias.
3. Experience with Luminal in Mental and Nervous Patients. Emanual.

1. Langelaan says that any further subdivision of the various forms of Basedow's disease is impractical. The "Forme fruste" occurs only in asthenic individuals and offers a different prognosis and deserves a special therapy. It occurs frequently associated with bodily or emotional stress, and is seen in women during two periods of life, from fifteen to twenty-five or during puberty, and from thirty-five to forty-five, or menopause. Exophthalmos and other ocular symptoms are rare and undeveloped, cardiac hypertrophy and tachycardia are present. At times the pulse is small and in cases in which the asthenia affects the heart muscle the typical celerity is absent. Disturbances of sweat secretion and intestinal function (attacks of diarrhea) occur, the fine, rapid tremor characteristic of Basedow's disease is infrequently seen. Usually it is a coarse, irregular and rather slow tremor, often with some of the characteristics of an intention tremor.

2. A report of a case of myasthenia gravis occurring in a woman forty-two years old, associated with and closely following the development of

Basedow's disease: eleven months later, two months following a curetage for abortion, symptoms of tetany developed, in both arm and hands. Trousseau's phenomenon and Chvostek's sign were elicited.

From a review of this case which combines the symptoms of myasthenia with disturbance of the glands of internal secretion, thyroid (which is not rare) and parathyroid (which are unusual and contradict the views of Chvostek and Markehoff that myasthenia constitutes a negative phase of tetany), Tobias concludes that we cannot connect myasthenia with the parathyroid glands exclusively or take an antagonism between tetany and hypofunction and myasthenia with hyper-dysfunction for granted. He states that this case suggests a form which may be included under the heading of pluriglandular diseases, but further scientific research is necessary to establish the connection between the specific glands involved and the seat of the disease.

3. Emanual reports favorably upon the use of luminal in doses of 0.2 or 0.3 gm. in cases of insomnia and in cases of excitement in doses of 0.4 to 0.6 gm. He recommends an interval of rest from medication of one to two days after five days of regular use.

(Vol. 31, No. 10, May 16, 1912)

1. Itching and Tickling in Relation to Pain and Touch. Prof. Dr. Thöle.
2. Congenital, Unilateral Defect of all Muscles Innervated by the Vagus Accessorius. Paul Sterzing.
3. Amyotrophic Lateral Sclerosis with Involvement of the Vagus Nucleus and Clarke's Column. Gordon S. Mundie.
4. The Ferment of the Cerebrospinal Fluid. Victor Kafka.

1. A systematic investigation of the relation between pain and itch and touch and tickle sensations. Thöle bases his studies upon the sensory disturbances following spinal anesthesia and supports these results by similar investigations upon hysterical anesthesia, herpes zoster, Brown-Séquard's paralysis, tabes and syringomyelia. He states the skin itching is probably an epidermal sensation caused by stimulation of Langerhans fibers, whose increased and prolonged stimulation calls forth prickling and burning. If the stimulation be further increased and reaches into the deeper papillary nerve extensions the prickling and burning becomes pain. If Ducceschis' researches show that the perceptive organs for itching and burning on one hand and for pain on the other hand, are histologically different and vary in their position, there remains the question, whether these sensations are transmitted through different tracts. His observations make it probable that itching, burning and pain on one hand, tickling, faradic, prickling and touch on the other hand, stand in close relation, that they depend upon qualitatively similar, quantitatively different stimulation of similar and related fibers.

2. The report of a case of an almost complete absence of the following muscles on the right side: the trapezius and sterno-cleido mastoid, the muscles of the right side of the palate, pharynx and larynx. These muscles are supplied entirely by the vagus and accessory nerves. Sterzing assumes that we are dealing with a nuclear aplasia, because this defect was congenital, has remained unchanged since earliest youth and has shown no tendency to progress. This aplasia of the tenth and eleventh has heretofore not been described and is not anatomically established. In the literature the cases cited are those of the nerves supplying the eye muscles or combined with the facial or with facial and hypoglossal nerves. Quite peculiar to his case is the unilateral distribution of the lesion. He states that nuclear aplasia and congenital primary muscular defects may occur in combination, and because of the rarity of the disease he is unable to state with absolute assurance that this is a case of pure nuclear aplasia, although the probability is very strong.

3. The report of the pathological findings in a typical case of amyotrophic lateral sclerosis in which, contrary to the cases cited in literature, the cells of Clarke's column were greatly degenerated. Further, the cells in the dorsal nucleus of the vagus were also affected in this case, which is unusual.

4. Kafka reports his results upon the investigation of 80 patients suffering with diseases of the nervous system and 10 with other diseases, that the cerebrospinal fluid of cases possessing a normal nervous system contains ferments, chiefly diastatic, antitryptic and lipolytic. They occur in considerably less proportion here than in the blood. In diseases of the central nervous system, the ferment content of the liquor is generally heightened. In dementia paralytica we find an increased proportion and chiefly of lipolytic, diastatic, and antitryptic ferments. Here also occurs traces of the antilytic ferment. In dementia præcox, chronic alcoholism, and in non-luetic, organic mental diseases the increased content of diastatic ferment is worthy of mention, while in other diseases of the central nervous system the lipolytic ferment seems to predominate. Kafka concludes that a part of the ferment content of the cerebrospinal fluid originates from the central nervous system.

(Vol. 31, No. 11, June 1, 1912)

1. Mechanical Muscular Phenomena Following Death. STEFAN ZSAKO.
2. The Influence of Acute and Chronic Alcohol Poisoning Upon the Vestibular Reaction. I. ROTHFELD.
3. A Simple, Practical Method to Isolate Certain Muscles in a Nerve Trunk. Several Good Results from Partial Resection of Motor Nerves in Athetosis.

1. The description of certain muscle phenomena, namely, contraction, following stimulation by percussion with a hammer which Zsako thinks have never been described in this relation. The described phenomena are such as are seen in the triceps and infraspinatus reflex. They are easily obtained and bear a certain relation to idio-muscular mound formation and last for from 90 to 120 minutes after death. Zsako does not clearly differentiate the reaction from direct myotatic irritability of muscles.

2. An experimental study of the changes in vestibulo-ocular reactions following alcohol poisoning. Rothfeld describes among other things as the result of acute poisoning, the appearance of spontaneous nystagmus after movement of the head which is not influenced by turning, the disappearance of the quick component of the nystagmus and complete lack of every movement after rotation. With the chronically poisoned animals no spontaneous nystagmus appeared. The experimental nystagmus was normal, but the "drop reactions" which are present in normal animals after rotation with the head elevated to 90°, were absent. An exhaustive article including histological studies is promised.

3. The description of a method for isolating fibers of a nerve trunk innervating certain isolated muscles by means of mechanical stimulation by compression with a hooked forceps.

4. A criticism of the lay views of animal psychology, especially Krall's book "Thinking Animals."

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(Vol. 36, No. 1)

ABSTRACTED BY DR. J. W. MOORE, BEACON, N. Y.

1. Intelligence Tests by the Definition Method. A. GREGOR.
2. Experiences with the Abderhalden Blood Test. E. SCHWARTZ.
3. Clinical Symptoms and Pathology of an Atypical Case of Occlusion of the Arteria Cerebelli Posterior Inferior. H. HAIKE and F. LEWY.

4. Contribution to the Subject of Metabolism in Psychoses. K. Togami.

1. *Intelligence Tests.*—Forty selected words in common usage are given to the individual and he is asked for a definition of each. The time required, the degree of correctness of the definition and the ability of the person to express himself are observed. The method certainly has much advantage in simplicity, quickness and uniformity over any other method. The author claims for it that it is quite sufficient to disclose intellectual defect and to measure its intensity and also to gain an insight into the mental processes of the individual and their disorders. The scheme of age measurement is not given but can easily be arrived at. A large number of illustrations is given.

2. *Abderhalden Test.*—In the author's experience with the Abderhalden reaction in 145 sera and 22 spinal fluids from mental cases the results were very disappointing. They were so irregular that he concludes the method is of no use in diagnosis and of no assistance in explaining the etiology of psychoses. For example, in 38 cases of dementia præcox there was absolutely no uniformity of reaction. Several male sera reacted to ovarian extract and female to testicular. The method, too, is much too complicated for the clinical laboratory.

3. *Occlusion of the Posterior Inferior Cerebellar Artery.*—In a woman of sixty who had had much middle-ear disease there occurred transitory headache, nystagmus and vertigo. Later there were hyperestheisa of the right side of the face, drooping of the eye-lid, weakness of the right arm, adiadochokinesis, right sided ataxia, Romberg sign with backward swaying, tremor of the right hand. Section showed marked cerebral arterio-sclerosis; the right posterior-inferior cerebellar artery was occluded, causing a softening in the lobus semilunaris inferior, also a fresh hemorrhage in the neighborhood. There was little disorder of the medulla. In the cerebellum there was a peculiar histological process with numerous fuchsinophilic granules.

4. *Metabolism.*—The article records the results of rather extensive studies of the excreta in the various psychoses. One of the principal conclusions is that disturbance of sugar assimilation and reduction of the phosphoric acid content of the urine are due to disorders of oxidation which are most marked in dementia paralytica and in melancholia. In melancholia, however, the phosphoric acid content is not changed. The findings in the urine are practically pathognomonic and the author suggests this examination as a diagnostic method. An hypothetical explanation of the symptoms in paresis and catatonia is given. In the former it is a defect of oxidation; in the latter a disturbance in the filtration function of the kidneys. When either of these conditions become more aggravated there is an accumulation of waste products in the blood and seizures occur.

(Vol. 36, No. 2)

1. The Question of Repeated Slight Seizures. C. F. Engelhard.
2. The Physical Point of View in Neurological-Psychiatrical Literature. A Contribution to the Subject of the Existence of a Living Soul. Bunnermann.
3. Luminal Treatment in Epilepsy. A. Kutzinski.
4. A Case of Tuberculous Meningitis with the Pupillary Reaction of Bitemporal Hemianopsia. O. Sittig.

1. *Repeated Seizures.*—(A continued article to be reviewed at its conclusion.)

2. *Physical Viewpoint in Psychiatry.*—A rather technical article which endeavors to place a materialistic interpretation on many of the otherwise unexplained phenomena of the activities of the central nervous system.

3. *Luminal.*—This drug in daily doses of 0.15 to 0.3 grams causes great reduction or disappearance of the seizures. It works less well in infantile epilepsy. Poisonous or cumulative effects were not observed even after months of treatment. The mental symptoms are not altered nor is the beneficial effect on the convulsions a permanent one. If the drug is discontinued the attacks recur with their previous frequency.

4. *Tuberculous Meningitis.*—Clinically the case showed, besides the symptoms of cranial pressure, fever and reflex disturbances, a pupillary reaction such as occurs in bi-temporal hemianopsia, namely, a failure of reaction to stimulus of either eye from the temporal field. Light from the nasal side of either eye produced a reflex more pronounced than normal. On account of stupor the visual fields could not be tested. The case terminated fatally after a few days. The brain showed typical meningeal tuberculosis which was, as usual, most marked over the base. Microscopic examination showed no tubercles of the chiasm and no fiber degeneration in the optic tract. There was, however, an extreme inflammation and thickening of the meninges over the chiasm, and this probably, by pressure, caused the symptom described.

(Vol. 36, No. 3)

1 Muscle-action Currents in Organic and Functional Diseases of the Central Nervous System. W. Misch and A. Lotz.
2. Choked-Disc in Cerebral Vascular Disease. A. Kutzinski.
3. The Question of Repeated Slight Seizures. C. F. Englehard.
4. Atypical Sleeping-Pressure Palsy. K. Singer.
5. The Effect of Luminal in Epileptic Dementia. W. Grzywo-Dybrowski.

1. *Muscle Currents.*—Tests were made with a galvanometer in eight cases to determine whether or not there was any qualitative difference between the increased reflex excitability arising from organic lesion and that of a functional origin. No such difference was found.

2. *Choked-Disc.*—Two cases are described. The first was that of a woman of thirty who, after childbirth with complications, suffered from convulsions, left-sided weakness and anesthesia. Optic neuritis occurred, followed gradually by choke-disc. The last symptom cleared up, but the hemiplegic signs persisted. The various possibilities are discussed and the author concludes that the choke-disc was due to a temporary swelling of the brain accompanying a hemorrhage or softening coincident with childbirth. The second case was caused by distention of the ventricles accompanying vascular disease and cerebral hemorrhage.

3. *Repeated Seizures.*—Some thirty cases are assembled from the author's own observations and from the literature and an endeavor is made to determine what points, if any, serve to distinguish the benign cases from those of genuine epilepsy. By benign cases are understood those which do not produce a deleterious effect on the psychic state and those which recover spontaneously even after years' duration. As to frequency, it is rare to find a case of true epilepsy which presents daily and repeated slight attacks without having any seizures of the grand mal type. There is little in the seizure itself which can distinguish the benign from the epileptic. If unconsciousness is constantly an accompaniment of the attacks the case is probably one of epilepsy. In the benign cases the urine may be passed and there may be pupillary rigidity but the tongue is never bitten. Prolonged post-paroxysmal sleep may occur in the favorable cases, but points more probably to epilepsy. A sudden abrupt occurrence of small seizures in great numbers is in favor of a benign type.

4. *Pressure-Palsy.*—Eight cases of pressure-palsy of atypical distribution

from the author's experience are described. Six were of the arm and two of the leg. Nearly all occurred in alcoholic men.

5. *Luminal in Epilepsy.*—Very favorable action was noted even in cases of very long standing with marked dementia. There seem to be no contra-indications to its use and no complications occur if the dose is not too large.

Journal of Mental Science

(Vol. LX, No. 251)

Abstracted by Dr. W. C. Sandy, Columbia, S. C.

1. Presidential Address, Progress of Psychiatry. David G. Thomson.
2 Wet Pack in Treatment of Insomnia and Mental Disorders. H. Rayner.
3 Wassermann Reaction and the Male Insane. J. C. Wooton.
4. Intrathecal Treatment of General Paralysis. Edward Mapother and Thomas Beator.
5. The Detection of a Dysentery Carrier. H. S. Gettings.
6. The Use of Hyoscine in Mental Disorders. A. W. Daniel.
7. Observations on Cases of Encephalitis. E. F. Reeve and George A. Watson.
8. On Lethargy. K. Agadjaniantz.

1. *Presidential Address. Progress of Psychiatry.*—Thomson portrays some of the horrors of the early English "mad-houses," and then traces the progress made during the hundred years following 1814 in the care and treatment, scientific conception and the legal aspect of the insane. He concludes with a history of the Norfolk County Asylum, which was then celebrating its hundredth anniversary.

2. *Wet Pack in Insomnia and Mental Disorders.*—Raynor discusses the beneficial results of the wet pack, the most important being the eliminative action and the sleep-producing qualities. The quicker the application of the wet sheet and outer wrappings, the more prompt and thorough the reaction. The temperature of the water and the duration of the pack must be regulated according to the object to be attained and the vigor of the patient. The pack is particularly efficacious in cases of "acute delirious mania of the sthenic type with continued insomnia," and in "insomnia accompanying mental disorder, with associated toxic conditions, whether of melancholic or of maniacal type." The author deplores the fact that institutions for the treatment of the insane in England rarely employ this mode of treatment, due, he thinks, to its being classed as a form of restraint by the Lunacy Commission.

3. *Wassermann Reaction and the Male Insane.*—Wooton has made an interesting study of cases in the Cane Hill Asylum, consisting of all male epileptics to the number of sixty-six cases, one hundred and fifty chronic irrecoverable cases (diagnoses not given, but paresis excluded), two hundred and eighty-four consecutive male admissions and all suspected cases of general paralysis. Of the epileptics, 7.6 per cent. gave a positive blood serum reaction. In all positively reacting cases apparently of general paralysis that have since died, the postmortem findings confirmed the diagnosis. Investigation of the blood serum of relatives of general paralytics showed "a good proportion having no physical signs, were nevertheless syphilitic." Of the one hundred and fifty "chronic" cases, 8 per cent. gave a positive reaction. Of the two hundred and eighty-four consecutive male admissions, a positive reaction obtained in 31 per cent. or if the cases of general paralysis were excluded, in 12.5 per cent. Altogether four hundred and thirty-nine non-paralytic adult male cases have given a positive reaction in 9.3 per cent.

4. *Treatment of General Paralysis.*—A critical discussion of the various methods of administering salvarsan and allied preparations in general paralysis, with a consideration of the literature. The authors are inclined to be conservative and they call attention to the necessity for general systemic treatment as a part of or in addition to any method of intrathecal treatment which may be employed, as the infection is more than simply one of the parenchyma of the central nervous system.

5. *Detection of a Dysentery Carrier.*—A female patient, having a chronic diarrhea for four years, was transferred for ordinary reasons from ward to ward, following which cases of dysentery developed on these various wards. A bacteriological examination of her stools showed the presence of *B. dysenteriæ*, and she was finally isolated.

6. *Hyoscine in Mental Disorders.*—The author called attention to the fact that in a continued use of "hyoscine hydrobromide" increasingly larger doses were required and that symptoms of chronic poisoning or hyoscinism may develop. It should not be given in heart conditions or senility and "weak-minded epileptics appear to have a marked idiosyncrasy for the drug." Patients taking hyoscine regularly should be weighed frequently, a rapid emaciation being sometimes due to the drug. While "for acute excitement there is no drug so reliable, it should not be repeated indefinitely."

7. *Encephalitis.*—Reeve and Watson describe several cases, most of which they state were clinically diagnosed dementia præcox but later developed a widespread paresis, bringing about a condition resembling general paralysis. A number of the cases manifested gastro-intestinal symptoms, *i. e.*, abdominal discomfort and vomiting, and ulcerations of the buccal mucous membrane occurred. In one case pellagra was suspected, but stronger evidence pointed to cerebral tumor. Several cases showed a suggestive skin condition of face and hands. Those cases which came to autopsy showed none of the characteristics of paresis but the chief lesion was in the Betz cortex cells, which were swollen, the processes defective and they showed advanced chromatolysis. This report, announced as "preliminary," does not contain sufficient detail as to the symptoms to establish a diagnosis in the cases under discussion, but enough is given to suggest, to one familiar with pellagra, those types of the end stage of pellagra clinically resembling general paralysis or central neuritis.

8. *Lethargy.*—The writer gives detailed histories of two patients, both women, who had not previously shown evidences of a neurosis and who suddenly fell into a deep sleep, out of which they could not be easily aroused for a number of hours. The first case, aged eighteen, later developed measles, the second, aged forty, had the first attack following a passing emotion, the later attacks having no apparent etiology. The attacks were preceded by headache and accompanied by retarded respiration, increased deep reflexes, no paralysis, dilated pupils, and were followed by amnesia for the period of the attack. The theories of various writers as to the cause of the different symptoms as seen in hypnotism or hysteria are cited.

Book Reviews

PSYCHOLOGY OF THE RELIGIOUS LIFE. By George Malcolm Stratton. George Allen and Company, London.

Where is the feast of fat things we expect from the opening of this book? Why has the abundance of vital material gathered from the world's religions shriveled to dry bones in the author's hands? Ever and again he seems to strike some hidden living well of explanation with a rod of discernment only to pass on and leave it to be choked by the desert sand of barren description.

He suggests the many sidedness of human nature and hints at desire as the motive force; he touches the question of ambivalence of feeling and expression; he traces in part the evolutionary construction of religion out of human nature and experience. But as he touches these things he as quickly turns away as if indeed there were no way into "the obscurity in which all the deeper facts of consciousness are veiled."

Or is it that he dares not penetrate this obscurity? We suspect that though he attempts to include the multitude of causes which enter religious history and to accord value to each diverse element, his own personal inclination finds its security and therefore its ideal in the "sanction of the Best," that the fixity and permanency of contemplative or intellectualistic aspects of religion best fulfil his desire. Thus all his attempt at psychological understanding is frustrated and he really misses the causative *élan vital*, the dynamic energy which informs and vitalizes religious history in its development as in its manifold expression of energized desire. His historical perspective shifts also at times and thus fails, as if he were trying to bring back facts which are products and make of them determining causes. There is manifest in all this, as also in the discussions of the place of thought in religious psychology, the want of the illuminating distinction between the intellectual static product of thought and the vital but fleeting intuition. Into the latter the author partially enters, but it escapes him and he has missed the deeper reality.

The last chapters come again, like the introduction, nearer to this and reach more fully into the profound sources of the true psychology of religion manifest in its varied sublimated processes of attainment.

JELLIFFE.

MATTER AND MEMORY. By Henri Bergson. Authorized Translation by Nancy Margaret Paul and W. Scott Palmer. George Allen and Company, London; The Macmillan Company, New York.

A special privilege is sometimes granted the reviewer to disregard the demands of current literature and turn back to a work that is not recent. The intrinsic reality of Bergson's writings accord this privilege. Nor is this a reality in the sense of a crystallized form of truth once caught and held, expressed for all time. Bergson's consummate mastery lies in something the reverse of this, in the power with which he brings us into the reality which is ceaselessly becoming, where we also take our part as creators of the new and yet the real.

Matter and memory precedes his later fuller development of the basic principles of his philosophy, his theory worked out in "Creative Evolution."

Here in the earlier work he discovers and defines matter as we practically deal with it and consider it through our perception in conjunction, however, with the spirit, which we grasp in tangible form in memory.

Idealism has reduced matter to a phantom, a mysterious entity, by regarding its qualities as merely subjective appearances. Materialism, on the other hand, finds the origin of consciousness simply in the "interplay of material elements" out of which sensible qualities along with the phenomena of memory arise merely from the activity of brain processes. Both systems fail to establish a relationship between the reality which science finds extended in space and an unextended consciousness. They fail to explain the opposition which seems to exist between quality and quantity, the heterogeneity which seems to belong to our consciousness and the homogeneity of the universe extended before us. The question of freedom and necessity form their third stumbling block.

The fundamental reason for the failure of materialism and idealism before these apparently insurmountable obstacles lies in the speculative attitude which is taken toward the whole matter. Bergson's starting point, on the contrary, is essentially practical and pragmatic. It is that of action, and it admits of a middle course which is able to avoid the rocks which wreck the other systems, and thus to discover an adequate explanation of the interaction of matter and spirit, while yet preserving clearly their distinctness in nature and in function.

Perception, Bergson says, does not exist in consciousness; it lies rather in matter itself. His painstaking exposition of the theory of "pure perception" elucidates this. Matter is revealed in an infinite succession of images among which stands one privileged image, that of the human body, whose special prerogative is action upon the other images. The human body is not capable of seizing this succession of images in its entirety nor of comprehending a complete image. Its purpose is rather to bring into outline just so much of an image, just those facets by which is revealed its contact with other images, which serve a useful purpose. This central image, the body, is the source of the perplexing question which realism and idealism fail to answer: How to explain the relation of the system of images in which each image varies in itself and submits to the action of other images surrounding it only in well-defined measure, and that in which all other images change in form and measure according to the action of the one privileged image, the body?

The body projects itself into other images by an element peculiar to itself, which arises from its capability of acting upon itself also and thereby introducing an affectivity, that is, something of itself, into perception. Pure perception, therefore, can exist only as a theoretical starting point. Already the subjectivity involved in sensations, or this affectivity, appears as the impurity introduced into perception. Another element has to be admitted which gives to perception its duration, to the intuition of an actual moment that of other moments. This is memory.

Here we enter the domain of spirit. Perception presents virtual courses of action sketched out before it, action which concerns other objects, which gives place to real action as the distance decreases between the external objects and our body. The actual intuition, however, due to present perception, is immeasurably enriched by recollection. The difficulty of separating pure perception and pure memory are responsible for the confusion in psychology and in metaphysics in regard to their distinction, which is that of kind rather than of degree. Through perception we put ourselves into the heart of things. Through memory we bring from the past whatever of former experience can insert itself into the present action in useful form. The body with its nervous system is the organ of this action, the pivotal point always insert-

ing itself into the present in order to create through its action the new moment ceaselessly becoming. Memory may consist in a form which is ready to respond to a present stimulus by the setting in motion automatically of an adapted motor mechanism. Or it is preserved in independent recollections, from which the subject chooses certain ones to insert into present action. Bergson utilizes a diagram which graphically represents the varying degrees of tension in which these memories exist, an immeasurable gradation of planes between the extreme extension in the past of memory images existing only in themselves, discrete, the extended phantasy world of the dreamer, and the pointed end of a cone formed by these planes in which useful memories are concentrated to be inserted into the moment of action.

The homogeneous extension of matter in this theory of matter and memory is no more than a useful term for the sake of discussion. The apparent incompatibility of this extension in space and the non-extension of memory which endures in time melts away before the theory of action. Matter, too, partakes of duration. Its duration is entered by memory through the tension with which it is possible to contract memory into the intuitive point. Homogeneous space becomes then only a convenient imaginary network thrown beneath reality to bring into relief the images practically carved out of matter. The opposition between quality and quantity also dissolves if we accept the idea of tension, difference in rhythm of duration. Thus again the necessity which must practically be admitted in the duration of matter becomes modified by the freedom which the spirit bestows upon it. For consciousness retains the past always better and better able to organize it with the present, and, moreover, with growing intensity of contraction its creative capacity is increased in acts of inner indetermination.

The whole force of the exposition of matter and memory and their interrelation, in other words of the relation of matter and spirit, lies in the theory of action. The particular image, the body, with its highly developed nervous system, is merely the instrument of both conscious and unconscious activity, the mind, or as Bergson chooses to call it, the spirit. This theory is essentially pragmatic both in the clearness of its explanations and in its practical efficacy as an aid to the understanding of psychological and psychopathological data, as well, moreover, as a guide and stimulus in individual action.

JELLIFFE.

THE PSYCHOLOGY OF RELAXATION. By George Thomas White Patrick, Ph.D. Houghton Mifflin Company, Boston and New York, 1916.

It is indeed the question of repression with which the chapters of this book have to do. Psychoanalysis has appreciated its fundamental importance as the disturbing factor in individual life, because it is too frequently unsuccessful. Patrick brings to our attention in a more general picture the attempt of various forms of relaxation to escape the repression which increasingly higher mental and cultural development lays upon the individual.

Relaxation with this significance may rightly include such topics as he has brought together. They all represent the effort of the racially older reaction, which requires less stress and less restraint, to come to the front and provide a more reflex and therefore relaxing discharge of energy. Play, then, is an expression in children of the only level of activity for which they are yet capable, and in adults of the need to return temporarily to this earlier level. Laughter illustrates in the objects which arouse it the appeal of the earlier more primitive with its freer psychic and physiological discharge. Profanity performs the same service, since genetically it doubtless reaches back into the earliest vocal form of response to danger or other cause of emotional reaction. Alcohol, the author believes, man has always found a

quick and easy method of attaining this relaxation and inhibition of higher centers and therefore he has been ready to resort to it even when he knew its harmful effects. The present war, however, has been the supreme example of the necessity for man to revert to primitive behavior under the high tension of modern life. It has proved itself an anachronism shorn of all its former meaning and glory, but inevitable until mankind has learned to satisfy his need for relaxation in ways that shall offer effective release of energy by providing for the older physiological levels rather than neglecting these in concentration upon the higher demands of modern life.

This is the remedy which is offered for effectual control of alcoholism and this is also the attitude which must appreciate more fully the various forms of recreation and make of them true play and relaxation, instead of permitting the merely blind reversionary demand for amusement, which the too great tension of our strain for efficiency brings about.

The book emphasizes a fundamental genetic plan of action rather than the wasted effort of symptomatic treatment. It misses, however, two points of emphasis. It deals with the obvious, that which our conscious recognizes. The author has not looked into the unconscious "polymorphous" tendencies which condition the demand for "relaxation" or the older reactions. Again, failure to give full place to interest in the higher pursuits results in a suggestion of depreciation, apparent only, we believe, of the higher activity. A clear recognition of the libido, active through higher and lower centers alike, serves to unite the two and bring that harmony of adjustment, for which psychoanalysis has found the way for the individual and which is also the aim of this suggestive volume.

JELLIFFE.

OCCUPATION THERAPY. A MANUAL FOR NURSES. By William Rush Dunton, Jr., B.S., M.A., M.D. W. B. Saunders Company, Philadelphia and London.

The unassuming attitude of the author in the presentation of this book scarcely prepares one for the rich suggestiveness of its pages. It is a practical manual which can ill afford to be left out of the equipment of any nurse or companion to those in need of this sort of aid out of mental difficulties. Moreover, an important part of the service of the book is to emphasize the usefulness of such aid in practically all forms of mental disturbance.

Its value is such as to appeal also to any who would employ the same methods in developing and directing the interest of the normal or abnormal child in healthful and useful forms of recreation and occupation. This goes to show how essentially normal and educational these methods are in nature and purpose. The author provides the wider background which supports and enlarges this purpose and makes of the volume much more than a mere catalogue of practical suggestions. He has provided a brief history of occupational therapy and has also introduced a physico-psychological scheme which illustrates the mechanism of misdirected attention and its redirection to wholesome ends. More than this, however, he introduces several forms of recreation or occupation with a brief sketch which stimulates to further research as to its historical and cultural value.

We trust the book will soon need a second edition in which we would suggest a little more stress to be laid upon the value of these aids with due mention of the deeper psychical understanding and readjustment to which these can only be auxiliary. The vital importance of those factors brought to the attention of nurses as well as of physicians would serve to give the contents of this book only a fuller and more real value.

JELLIFFE.

THE DREAM PROBLEM. By Dr. A. E. Maeder. Translated by Drs. Frank Mead Hallock and Smith Ely Jelliffe. The Nervous and Mental Disease Publishing Company, New York, 1916.

The importance of this new publication of the Monograph Series is one which will fully justify itself by its practical applicability to the problems of everyday psychoanalytic practice. No less significant, however, is its theoretical value in the constantly broadening and advancing conception of the principles of psychoanalysis which represents its vitality and growth.

Maeder acknowledges the immeasurable service of Freud in laying the broad foundations of dream interpretation not only but in previsioning also though not yet definitely for the dream the progressive functioning of neurotic manifestations which, in regard particularly to the dream, forms the theme of this book. Maeder's difference from Freud is merely the carrying further of the work the latter has begun.

This progressive, "preparing function" of the dream links its interpretation with the ancient use made of the dream, not in any mythical mysticism but, with our increasing knowledge of the unconscious, as a clearly scientific revelation of the psychic situation and the attitude and activity of the libido in its acceptance of the dreamer's conflict or task.

The cathartic function of the dream precedes this, but if dwelt upon it keeps the patient only in the regressive phase of psychic activity. Emphasis upon the preparing function assists thus materially in the analysis in discovering the patient's attitude toward his task and is of greatest service for the patient's own understanding not only but for his determined grasp of the situation and progress through it. This necessitates a greater amount of attention to the manifest dream content than Freud has given. It leads also to a distinction between the objective and the subjective representation in the dream. This latter lifts the symbolisms of the dream as well as the condensations in personification and other mechanisms out of the merely regressive phase of infantile wishes and translates them into terms of adult striving toward reality. More consideration must also be given to the clinical and environmental setting of the dream.

The analysis of a number of illustrative dreams reveals the practical significance of these principles. A series of dreams of one patient reveals his gradual acceptance of the reality situation in place of his former pleasure-pain attitude through the stages of first an emotional grasp of the new demands and then advance to an effectual intellectual grasp. Two other contrasted dreams reveal the positive and negative working of the preparing and liberating function. The recurrent dream of the poet Rosegger freed him at last from an infantile attitude persisting through his otherwise successful life, while the nurse's dream quoted shows the failure of her libido to accept the terms of reality and her refuge in an infantile attitude.

Thanks are due the translators for making accessible this valuable contribution to the literature of theory and practice of psychoanalysis.

L. BRINK

LEONARDO DA VINCI. A PSYCHOSEXUAL STUDY OF AN INFANTILE REMINISCENCE. By Professor Dr. Sigmund Freud, LL.D., Translated by A. A. Brill, Ph.B., M.D. Moffat, Yard and Company, New York, 1916.

The translation of this small volume puts into our hands more than a fascinating study of a famous character. Freud's studies reach in breadth and profundity beyond the borders of the individual personal, however important the personality has been in history and art.

This background of human interest illumined by the author's psychological insight reveals, as his own words remind us, something otherwise

than an unlicensed exposition of certain trivial elements which would merely drag down one of the world's great men, which some critics are disposed to read out of psychoanalysis. For psychoanalysis there are no trivial details. The tracing of the elements so considered back through the individual's life into those earliest years of childhood when certain traits are laid down and fixations established show these to be of fundamental and lasting importance in his career. They explain in this case the qualities of the artist and his work and the insufficiency in his artistic accomplishment which finally ended in the complete turning of his endeavor away from art, matters which have baffled all historians and critics.

The discoverable facts of his life are but few. Those few, however, particularly some rare self-revelations, of small moment superficially considered, serve as guiding lines in this psychoanalytic investigation. The most important of these is the vulture phantasy which Leonardo himself confesses as significant in determining his destiny. Freud follows this as it works its way back into the infantile life and draws conclusions therefrom which are no less supported by the testimony of the psychoanalytic clinic and the results of comparative mythological investigation than substantiated by the artist's subsequent history, which they serve remarkably to illuminate. The investigation is carefully conducted into the early life of this illegitimate child, upon whom the normal psychosexual family situation thrust itself in complicated form and appraises the later influence upon his life and work of the child's reaction to the probably excessive attachment of the lonely real mother, the kindness of the childless stepmother and the complicated rôle the father played in such a scheme. Thus his psychosexual development suffered early fixation. Much of his intense infantile curiosity he was able to sublimate in his work, but the very intensity which the inquiring spirit had thus received in infancy prevented concentration of his rich possibilities in the finished execution of art and led to the final abandonment of it for pure investigation. The poverty of his love life reveals how strong a repression his impulses had to undergo in early years.

Not the least interest attaches to Freud's explanation of the enigmatical Monna Lisa smile which belongs to all his faces painted after he had discovered the woman who bore, as the author thinks, this resemblance to the unconsciously cherished mother. The vulture phantasy is the key to this explanation.

The subject of this sketch makes it one of special interest and adds likewise to its value as a contribution to our knowledge of the infantile determinants of later life. It reveals these in their persistence and their momentous significance, together with their capacity for sublimation and the tendency that yet lies in them to escape in part this sublimation.

S. Evans.

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Original Articles

THE STRATIGRAPHICAL ANALYSIS OF FINER CORTEX CHANGES IN CERTAIN NORMAL-LOOKING BRAINS IN DEMENTIA PRÆCOX*

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Abstract

Dementia præcox and schizophrenia.

Neglect of research into the structural side of dementia præcox.

The question of brain anomalies in dementia præcox as summarized by Kraepelin.

The existence of certain dementia præcox brains without demonstrable gross aplasia, anomalies, or acquired atrophy.

The desirability of microscopic work on dementia præcox brains that look entirely normal in the gross.

Previous work on the dissociation of parenchymatous and interstitial changes in the brains of certain psychotic subjects.

Alzheimer's claim of deep layer cortex changes in catatonia.

* Being Contribution of the Massachusetts Commission on Mental Diseases, whole number 166 (1916.24). The previous contribution was by H. C. Solomon and E. E. Southard, entitled "Notes on Gold Sol Diagnostic Work in Neurosyphilis (Psychopathic Hospital, Boston)," Journal of American Neurological Association. Read at the forty-second annual meeting of the American Neurological Association, May 8, 9 and 10, 1916.

Alzheimer, Sioli and Cotton on lipoid materials in dementia præcox brains.

More recent conclusions of Alzheimer as to permanent losses of nerve cells in the second and third layers of the cortex.

Summary of important structural questions in dementia præcox.

Clinical and anatomical analysis of four cases, being the only cases of probable dementia præcox without gross brain changes in a series of 150 autopsies in psychotic subjects.

Microscopic examinations.

Analysis of cases thought to show nerve cell losses.

Distribution of nerve cell losses in the infrastellate region of certain contiguous areas (postcentral, parietal, angular gyrus, superior temporal and area of Broca (Case I)).

Lack of parallelism between gliosis (including satellitosis) and nerve cell losses.

Suprastellate losses more isolated and capricious in distribution (Case I).

Kraepelin's suggestion that the small cell layers of the suprastellate levels are a vehicle for processes of distribution and combination (deeper layers more closely related to circumscribed functions).

Preservation of capacity to perform habitual complex acts in dementia præcox.

Infrastellate emphasis of lesions in Case I apparently exceptional; but the case was probably not schizophrenic.

Infrastellate lesions in Case I possibly related with late catatonia and hallucinosis.

Both suprastellate and infrastellate lesions in Case II.

Predominance of suprastellate lesions in Case III (but slight satellitosis, duration two years).

Case IV marked satellitosis in but one gyrus (right superior parietal area) and infrastellate as well as suprastellate losses elsewhere.

Shrinkage changes not markedly in evidence in this case and not associated with cell losses; evaluation difficult; axonal reactions also not often found in loci with marked cell loss.

Satellitosis in the fusiform layer in the majority of instances; not characteristically associated with either cell loss, axonal reaction or cell shrinkage.

Satellitosis at times extraordinarily developed in a single gyrus.

The histology of the cerebral cortex in dementia præcox is a

topic hardly ripe for discussion. When we remember that the histology of general paresis had only reached a phase suitable for discussion in 1904 or thereabouts, we perceive how immature must be any conclusions drawn from the far more complex situation presented in dementia præcox. In the first place, it may be asked whether we really possess the right to entify dementia præcox at all. To be sure, the term *dementia præcox* has obtained a surprising foothold in all quarters of the scientific world, and studies in dementia præcox appear not only in the German-speaking world, but also in the Russian, Italian, French, English, and American literatures; and no practical psychiatrist can afford to neglect the issues drawn by Kraepelin's great synthesizing effort. Moreover, out of the consideration of dementia præcox has proceeded the ingenious and penetrative analysis by the Swiss psychiatrist, Bleuler, of those symptoms and symptomatic tendencies known as schizophrenia. The concept schizophrenia, in a measure adopted by Kraepelin himself, has come to take its place alongside the concept catatonia in a small group of phenomena which are the especial property of the psychiatrist.

In the event, therefore, that dementia præcox fails to establish itself as an entity, nevertheless it cannot be denied that the synthetic effort of Kraepelin has been productive, and has produced a concept which another psychiatric master has been able to utilize for further speculations of great value. Accordingly, I hold that those who would postpone structural and histogenetic work in the field of dementia præcox until its etiology or etiologies have been established are a little unreasonable. Catatonia and schizophrenia, to say nothing of the characteristic emotional disorders of dementia præcox, are phenomena worth study in themselves regardless of their etiology in the prevailing medical sense of the term. We may inquire into the genesis of catatonia, schizophrenia, or parathymia, without knowledge of or inquiry into the etiology of dementia præcox. Whether dementia præcox breaks up into a number of diseases with separate etiological factors, or is replaced by some new nosological unit, at all events the problems of catatonia, schizophrenia, and parathymia are likely to stand.

For practical purposes, accordingly, I maintain that we must in the present stage of psychiatry adhere firmly to the conception of dementia præcox as formulated by Kraepelin and substantially developed by Bleuler. So far as time and opportunity have availed, the senior writer of this paper has been studying the anatomy and histology of cases denominated dementia præcox for some ten years.

American interest in dementia præcox was at its height at the time of the Triennial Medical Congress in 1910, when Meyer, Hoch, and Jelliffe presented views in which the functional side of dementia præcox was emphasized. It seemed even at that time that the anatomy of dementia præcox could not safely be neglected; yet it does appear that the anatomy of dementia præcox and of mental diseases in general, outside the neurosyphilitic group, has been somewhat unduly neglected on account of the diversion of young psychiatrists into functional fields. It is well enough to speculate concerning the physiology of mental disease, and one should not decry modern tendencies when such brilliant work as that of Bleuler has emerged from these speculations. One mentions this matter only to justify the extraordinary neglect which the structural fields of dementia præcox have suffered, notably in America, where several scores of laboratories might be available for these pursuits.

The present work accrues from an extremely laborious piece of microscopic work done by the junior writer of this paper. She should not be committed here to the speculative conclusions drawn by the senior writer, who will accordingly lapse into the first person from time to time. Since the major portion of this work has been completed, the third volume of Kraepelin's *Psychiatrie,* 1913, has appeared, and we have the advantage of Kraepelin's summary of structural investigations in dementia præcox. The internal evidence seems to demonstrate that Kraepelin's chapter on the endogenous deteriorations (dementia præcox and paraphrenia) hardly made use of any literature beyond 1911. It seems worth while to summarize briefly the statements of Kraepelin as to post-mortem findings in dementia præcox, together with some account of the general speculations very briefly appended thereto by him. I had myself been interested from the beginning in the anomalies and scleroses of dementia præcox brains, and had concluded from my own studies, which ran parallel with studies by the same criteria of manic-depressive material, that the potential victim of dementia præcox was probably born with the normal stock of brain cells, that the dementia præcox brain is subject rather to aplasia than to agenesia, and that the acquired atrophy apparent in certain cases was grafted on top of a congenital aplasia. These ideas, uttered in 1910, were given special illustration in 1914–15. I do not find that Kraepelin has taken special account of my structural work upon dementia præcox, but he calls attention to the work of several writers pointing in the same direction. Thus, Agostini has described traces of developmental arrests as well as residua of early disease of the brain. Mondio

found convolutional anomalies in six cases regarded by him as signs of degeneration. Schröder's finding of dislocation and binucleate condition of Purkinje cells as well as syncytial formations in the pyramidal cells of the cortex found in one carefully examined case, may be regarded also as looking in this direction, and this finding of Schröder has been favorably commented on by Alzheimer. Doutrebente and Marchand have also described numerous nerve cells having an embryonic appearance in certain cases. Despite these data and the, at that time, inaccessible work on anomalies and scleroses above mentioned, Kraepelin regards the gross anatomy of dementia præcox as negative. It was for this reason that the special work here reported was done upon normal-looking brains. There can be no question, in my opinion, that the brains of dementia præcox patients are more than usually subject to convolutional anomalies. Of course I grant that in the matter of anomalies, all depends upon the criteria which the examiner adopts; but whereas four fifths of my dementia præcox brains have exhibited anomalies according to the criteria adopted, only one fifth of the manic-depressive brains examined with the same criteria have exhibited such anomalies. I have latterly subjected this problem to special review with the advantage of systematic brain photography, which has afforded unparalleled opportunities for the careful comparison of hundreds of brains of all kinds, with and without mental disease, and although I am not prepared to report on the number and nature of anomalies in the already extensive material, I am certain that without the systematic aid which photography affords, the entire field of convolutional anomalies must remain unworked.

It is singular that the familiar paradigm of "structural" mental disease, general paresis, itself often exhibits no gross lesions or anomalies of the brain. If one were searching for entirely normal brains to study from a gross anatomical standpoint, one would perhaps rather more easily find such a brain in general paresis than in dementia præcox; despite the fact that the paretic brain would on microscopic examination exhibit appropriate diffuse and extensive changes.

I hold that there is considerable evidence in the literature for aplasia, not, I think, for agenesia (in the sense of a condition in which nerve cells were not originally laid down in proper numbers) and that my own estimate of the proportion of anomalies in dementia præcox brains has not been controverted.

However, my own work indicated that there were certain victims of dementia præcox who possessed brains at death without demon-

strable aplasia, without anomalies, and without acquired atrophy on top of the anomalies; in short, who possessed anatomically entirely normal brains. I did not find so many of these anatomically entirely normal brains in dementia præcox as I did in a special series of general paretic cases personally examined by me some years since; for in the paretic series, there were no less than 18 of the 38 brains in which upon finical examination I was unable to find substantial lesions. Of course, the thickening of the pia mater in some of these 18 substantially normal paretic brains might yield a pointer in favor of paresis, yet pia mater thickenings were themselves absent or of negligible nature in certain cases, and thickenings of the pia mater are not infrequent in dementia præcox brains (as Kraepelin himself states), as well as in (so far as I know) all other brain series, whether those of normal or psychotic subjects. Limiting ourselves to the brain substance, one would, in short, find not only in paresis, but perhaps to a lesser extent in dementia præcox, absolute normality so far as our present methods avail.

In view, therefore, of Kraeplin's silence as to brain anomalies (other than those of largely microscopic nature above mentioned) I determined that I would do preliminary microscopic work on brains that were entirely normal in the gross. I preferred to deal with the cerebral cortex rather than with the optic thalamus, cerebellum, or spinal cord, in which changes have been described, some of which may depend upon developmental difficulties or acquired disease due to the same factors that produce the psychotic picture of dementia præcox. If, however, the developmental difficulty had left the cerebral cortex grossly intact, yet nevertheless, its psychotic operations (if the term may be pardoned) must be looked on in the present phase of psychiatry as due in large part to cortical difficulties. Accordingly, I chose to work, in the first place, on the cortex. In 1914, I reported that the only two normal-looking brains in my series of 25 microscopically yielded abundant appearances of cell destruction and satellitosis in the cerebral cortex, which, as I felt, had not yet had time to be registered in the gross. These were, however, cases of but three weeks' and two months' duration respectively, and I questioned whether they might be regarded as cases of dementia præcox by all readers. I find that readers in the dementia præcox literature are exceedingly liberal in discounting other psychiatrists' diagnoses of dementia præcox, particularly if the other psychiatrists uphold views not favored by the critics. One estimable critic recently reviewing Mary E. Morse's work on

thalamic lesions in dementia præcox, dismissed the findings by charging that the cases were doubtful as to their status in the dementia præcox group, not appearing to observe that the cases were after all cases of something and that they at least showed thalamic lesions. In the present status of dementia præcox inquiry, I must beg to insist that it is not well to be too sure as to what dementia præcox is and is not. One safeguard, perhaps, is to examine cases of manic-depressive psychosis, to say nothing of the toxic-infective-exhaustive group, alongside cases of dementia præcox. Stranger things have happened in the history of medicine than that entirely new lines of division should appear in the midst of a group of cases thus constituted; for example, by dementia præcox, manic-depressive psychosis, and various examples of the toxic-infective-exhaustive group.

In view of the doubt whether dementia præcox brains are usually anomalous or to any degree sclerotic, and in view of the doubt of the diagnosis, especially in cases of brief duration, I felt that I should choose cases of relatively long duration in whose brains I could not myself detect anomaly or sclerosis. At the same time, I examined available cases of manic-depressive psychosis. I have elsewhere sufficiently discussed the method of arriving at the five cases of normal-looking brains (three of dementia præcox and two of manic depressive psychosis), and I am publishing in full in the Transactions of the Association of American Physicians an account of some of the general results of that study of five normal-looking brains. For the purpose of that Association, I was merely endeavoring to illustrate the possibility that chronic mental disease might possibly be consistent with normality of the brain. After securing about twenty brains free from gross lesions and anomalies and from any abnormality detectible by systematic photography, a microscopic examination was made of a few sample areas and the list decreased to five normal-looking brains without much, if any, microscopic change detectible in sample areas. I showed how these cases upon more extensive examination proved to be far from normal in four instances, and I showed that even the fifth (a case, perhaps, of paranoia) was not free from flaws. The title of the paper to which I now refer: "On the Dissociation of Parenchymatous (neuronic) and Interstitial (neuroglia) Changes in the Brains of Certain Psychopathic Subjects, especially in Dementia Præcox" indicates the line there taken. I seemed to be able to show that the most severe cell loss might be entirely unattended by interstitial (neuroglia) change. Again, I seemed to be able to show that the most severe interstitial change might remain unaccompanied by cell

loss. Other cases assumed an intermediate position with regard to cell loss and interstitial change. The point was raised whether we could not approximate in chronic mental disease the old classification of kidney diseases into parenchymatous, interstitial, and diffuse diseases.

Incidentally, I showed that the case with the least cell loss was one of manic-depressive psychosis. Curiously enough, there was a comparatively severe gliosis in this case despite the fact that there had been no induration of the brain in the gross. The case was, to be sure, elderly and the gliosis may have been incidental to the age process or to unknown factors. Another elderly case, one of dementia præcox, however, had far less gliosis than did this case of manic-depressive psychosis. The parenchyma alone, in any event, had suffered very slightly in this case of manic depressive psychosis. The interesting findings of Orton may be recalled in this connection, for Orton found a surprising degree of satellitosis in cases of manic-depressive psychosis where, on account of the early suggestions of Alzheimer, we had been prepared to find far less than in dementia præcox.

One other case of manic-depressive psychosis (if we are to adhere to the clinical diagnosis actually given) failed to show such extensive gliosis and did indeed show a large degree of cell loss, although the patient was not advanced in years. This case I shall append to the present study as probably a case of dementia præcox. The three remaining cases of dementia præcox (one of which may have been paranoia and was so regarded by some) form the rest of the present study. Three of these four cases (namely, all except the questionable paranoia) were afflicted with active tuberculosis. It is a question how far we should assign the large degree of nerve cell loss in these cases to tuberculosis acting, perhaps, in some toxic manner. My colleague, Dr. H. I. Gosline, has been working in this field and I do not intend to discuss the question here. It is, I believe, necessary to find and study by appropriate methods a large group of non-tuberculous cases of dementia præcox as well as a large group of cases that are not complicated by other bacterial infections.

In the above-mentioned paper on the dissociation of parenchymatous and interstitial changes in dementia præcox brains, I had no occasion to advert to topographical and stratigraphical considerations. These latter are of extreme interest in dementia præcox as well as in psychiatry at large. Kraepelin, in 1913, speaks once more of those cases of Alzheimer that presented a picture of delirium

acutum and received the diagnosis of catatonia, as showing cortical changes, particularly in the deep layers (nuclear swelling, nuclear membrane folding, shrinkage of cell bodies, tendency to cell destruction). Microscopic examinations of a few sample areas in all fifty of the cases that I have previously presented did not very strongly substantiate these findings. At all events, they did not substantiate the limitation of the changes to lower layers. On account of a variety of considerations, partly technical, a certain amount of doubt attaches to such nerve cell changes as are here mentioned, and more attention has been leveled at the findings of Alzheimer with respect to satellitosis in the deeper layers. Before coming to the matter of interstitial changes, however, the work of Nissl, Wada, Sioli, Moriyasu, and Goldstein on nerve cell changes may be mentioned from Kraepelin's 1913 summary, and to this should be added the extensive work of Cotton on nerve cell changes. It is the service of Alzheimer, Sioli, and Cotton to have shown the deposits of lipoid materials in and outside of nerve cells in dementia præcox. None of these authors claims that the findings are differential for dementia præcox, despite their importance in our ideas as to the genesis of the condition. Our own work has not dealt, except in a few demonstration preparations, with these lipoid findings. I have felt that the chances for confusion between essentially dementia præcox products and products of intercurrent disease were large; Alzheimer himself has, I believe, found such changes in cases of toxic delirium, and Cotton holds that these are merely quantitative differences between what is found in dementia præcox and what may be found in certain cases of senile dementia.

In this situation, it seemed to me that we must hold rather to evidences of cell loss than to evidences of abnormal lipoid deposits in dementia præcox brain tissues. Nissl is quoted as having regularly seen extensive cell disease leading to considerable cell losses. Alzheimer has described widespread cell changes of a chronic appearance, especially sclerotic cells. He also, according to Kraepelin, has been able to find diffuse losses of nerve cells, particularly in the second and third cortex layers. In any event, the large pyramidal cells seem to be relatively less markedly affected. There is some literature as to neurofibril findings which several authors describe as "injured." It might be supposed that the myelinated fibers would be somewhat affected, and some authors (Goldstein, DeBuck, and Deroubaix) have described slight changes therein, especially in supraradiary fibers. The situation, then, is that certain authors, particularly those of the Nissl-Alzheimer group, contend that de-

mentia præcox brains do show more or less nerve cell loss of a diffuse nature, and that the nerve cells that remain are often affected with more or less fatty degeneration. It is doubtful whether these authors would regard their findings as specific or pathognomonic for that disease; "characteristic" would be the more appropriate designation.

We have, accordingly, examined our cases with great labor and have recorded our findings as to nerve cells in all layers in numerous areas in each hemisphere. We have noted also neuroglia and vascular conditions so that our recorded data for each case ran from 144 to 232.

The general pathologist might well inquire whether the blood vessels in dementia præcox do not show changes, and Kraepelin mentions a few authors who have found such changes, but he regards them as due to intercurrent conditions of old age, alcoholism, syphilis, and the like. If we can safely dismiss the blood vessels and their concomitant connective tissues from consideration, we must approach the neuroglia question. There are, of course, certain problems as to the origin of the neuroglia, notably as to whether there may not be a mesoblastic origin for certain nerve cells; and this problem may arise particularly in connection with *Stäbchen* cells; but rod cells, like isolated plasma cells, do not have a particular significance or frequency in dementia præcox, and the problem for our purposes may be neglected. There is little doubt that undue attention was given to gliosis and satellitosis of the deeper layers in dementia præcox, partly owing to an over-valuation of Alzheimer's early statements which that esteemed pathologist did not himself entertain. Occasional speculations as to the interference with vegetative processes in dementia præcox have been made, based upon the idea that the characteristic process in dementia præcox was a process in the infrastellate layers, namely, those we possess in common with the lower animals. Nissl also observed in the deeper layers numerous large nucleated cells such as are usually found only in the outermost layer of the cortex. Nissl, too, described other swollen neuroglia cells closely investing nerve cells in the lower layers. Sioli and Elisah also concur. In point of fact, the permanent losses of the parenchyma according to Alzheimer's mature conclusions affect the nerve cells of the second and third layers of the cortex, despite the fact that the deeper layers are also affected in concrete cases of the disease, as therein shown by glia changes. Here is, accordingly, a most important topic for research. We have collated our results with the question in mind, whether

nerve cell changes and the neuroglia changes are characteristically suprastellate or infrastellate. We shall consider below the Kraepelinian speculations concerning the differential significance of changes in these layers.

Besides the stratigraphical question, there is a topographical question. Despite the fact that the gross anatomy of the dementia præcox brain is virtually negative so far as Kraeplin was able to find in the literature, he was able to gather from microscopic examinations by several workers (Mondio, Zalplachta, Agostini, DeBuck, Deroubaix, Dunton, Wada) that the frontal lobes, the central regions, and the temporal lobes are more markedly affected than the occipital region. A number of functional conclusions are drawn by Kraepelin from these statements, an analysis of which I have given in my paper in 1914, noting especially that my own findings in the central regions relate rather to the postcentral tissues than the precentral tissues. In this work we have endeavored to collate our findings by regions also, so as to throw light if possible on the important question raised by Kraepelin as to whether future research will show that the cortex changes are widespread in a uniform manner throughout broad regions of the cortex. We approach our case material, accordingly, with the following questions:

First, Are there cases of dementia præcox without gross anomaly or sclerosis which show characteristic parenchymatous and interstitial changes?

Second, Are these changes characteristically found in some areas rather than in others?

Third, Are these changes characteristically found in some layers rather than in others?

Fourth, Within a given brain, are the stratigraphical changes rather apt to be confined to the same layers?

Fifth, What attitude shall we adopt as to the question of the relative importance of suprastellate and infrastellate lesions?

The following are somewhat full analyses of the clinical histories of three cases of the dementia præcox group [I (10.9); female with at least 14 years of pronounced symptoms, with death at 56; II (12.41) a female dying at 60 years, with at least 10 years of pronounced symptoms; III (12.47) a female of 27, dying with two years of pronounced symptoms], together with a case [IV (11.36) a female dying at 31, with approximately two years of pronounced symptoms] which, although clinically diagnosticated manic depressive psychosis, we are inclined upon further analysis to regard as a case of dementia præcox. It is, perhaps, to be regretted that the

obvious onset of symptoms in two of these cases was in the 40's, but the fortune of the laboratory yielded precisely these cases of, apparently, dementia præcox with brains normal-looking in the gross.

Case I (10.9).—The patient was admitted to the Boston State Hospital in October, 1907, aged 52 years. Is reputed to have had normal development, graduated from high school, and married at 18 years. She had two children and one miscarriage, was divorced at 26 and again married. In 1904 at the age of 49, she was sent to the River Crest Sanitarium, New York, where she remained for 3 months and was removed against the advice of physician, coming to Boston State Hospital as above three years later and remaining 1 year and 2 months.

The onset of the mental disease was gradual with seeming jealousy, but seven years ago this developed sufficiently to be called a delusion and for the entire seven years, though getting along fairly well, has entertained the same ideas; onset therefore at 45 years, death at 56.

Physically.—At 37 had ovarian trouble, was to have been operated but recovered without. At 40 had "congestion of the brain" but was not delirious. At 46 had pneumonia. Other than these illnesses, was always well.

On the commitment papers (Drs. A. C. Jelly and Albert J. Shaw) patient said: "My husband is a bad man. My sister is a corrupt woman. She has been the mistress of several men. I have seen her in bed with 6 men at once. She has a piece of apparatus which she uses to kill people. She has a steel trunk in which she disposes of their bodies," etc. Carried a pistol and used to know how to shoot.

In the hospital she was described as being a refined looking woman (French nobility in heredity) of medium height (5 feet). Small clear-cut features, white hair and bright eyes. She was well developed and nourished, but has a markedly asymmetrical face with left eyebrow higher than right, and a tense and strained expression of eyes. There is no disturbance of reflexes tested (eyes and tendon) and with the exception of slight blowing systolic murmur at apex, nothing is found worthy of note in physical examination.

Mentally she has a wealth of paranoid ideas regarding her foster-sister and present husband and including most of her acquaintances: There is no limit to her delusions. Is resistive about going to bed and complying with ward routine, and eats poorly because she is controlled by ideas that the food is poisoned.

On a visit to her home of three months' duration, she was better for a month, then began being extravagant, talked freely of her delusions and scolded for hours of her husband's unfaithfulness and abuse, was returned and later was discharged, *not improved,* in February, 1909, after hearing nothing from her after removal by husband and sister in August, 1908.

In July, 1909, she was committed to the Worcester State Hos-

pital, No. 26211, the husband stating he could not tolerate her erratic manner any longer. She was painted and powdered but submitted to hospital routine better than before but writes and talks of being "kidnapped" and describes a scene of violence in being taken from her flat to the hospital. Speaks overconfidentially. She dresses in brilliant colors and wears a lace coat of a peculiar pattern at all times, dresses youthfully and with ribbons in her hair. She has no insight. She has some untidy habits which she denies. She destroys her clothing and that of other patients, and when her sister came to see her, stole her sister's keys, money, furs and wrist bag and demanded to go, making a great fight for freedom when her sister left; was abusive in her language, etc.

Again in Boston State Hospital by transfer from Worcester State Hospital on request of sister. She decorates herself with buttons, arranges her hair in little curls, talks continuously in a rapid, rambling manner and makes many fantastic statements. Denies the existence of present husband as such. Is troublesome and persistent, does not want her door locked, writes incoherently of her sister's relations with husband and other men in elaborate detail by street numbers and dates. Tries to make her escape.

In 1910.—She evidently has auditory hallucinations. Stands listening at keyholes and shouts to imaginary folks. Still is persecuted by her beliefs of people coming to kill her. Makes various attempts to escape. Was placed in wet packs, after which she became more quiet. For a time was tube-fed; states she has no stomach, no intestines and that she is poisoned, no blood in her body—attempted self injury. Was resistive to passive movements and exhibited cerea flexibilitas, keeps her eyes closed, retains constrained and peculiar attitudes but eats voluntarily now.

During last month of life, rapidly developed a bed sore and died of septicemia.

Autopsy performed 2 hours post mortem, Oct. 21, 1910, by M. M. C.

The skin was icteric and there was a mulberry stone in the gall bladder. The kidneys showed an acute parenchymatous nephritis and there was a swelling of the spleen. The ileum showed a slight congestion. There was trochanteric and sacral decubitus.

As for chronic lesions, the thyroid showed a fibrosis in connection with which the growth of hair on the lips, chin (normally distributed), over the temples, is of note. There was atrophy of the ovaries. The aortic valve showed a chronic fibrous, vegetative process and the ventricular walls were somewhat fibrotic. The spleen showed capsular changes.

On account of the tuberculosis found in the other autopsies of this series, it is of note that the lungs were normal throughout, a finding somewhat rare in autopsies in hospitals for the insane. However, the left pleural cavity was completely obliterated by fairly firm adhesions.

Following is a description of findings in the head. Calvarium dense, not unusually thick. Dura is thickened but not adherent to calvarium. The pia mater is slightly thickened; some subpial fluid.

Some slight injection of the pia mater. Hemispheres sag on board, exposing the corpus callosum. Lateral ventricles smooth and delicate. Basal vessels smooth. The convolutions are apparently normal, are plump and the brain has a nearly normal consistence. The pons and olivary bodies slightly reduced in consistence. No areas of sclerosis or softening otherwise.

Brain weight 1,100 grams. Pons and cerebellum 145.

Middle ear drums opaque. The pituitary and Gasserian ganglions negative.

Cord slightly softened in the lumbar region.

CASE II (12.41). *Heredity.*—The patient is stated to have had a dissolute father, and as a young girl had an illegitimate child. This child lived to the age of 27, dying eventually of pulmonary tuberculosis. He was a good scholar at school, worked as an office boy, and later ran a small but successful stationery news store, becoming a very much respected young man. Later she began to live out of wedlock with another man and had two children, one of whom was an idiot or imbecile with a deformed head; the other died in infancy. Apparently the patient had no brothers or sisters. Her mother is thought to have died at her birth or shortly after.

Personal History.—The patient was born in 1852, of a wealthy father who lost his money through mismanagement and dissipation. The patient went to live with an uncle at 14 years of age, attending an academy. She shortly had an illegitimate child by her uncle's stepson, whereupon she was turned out of the house and began to earn her living in a shop. She drifted into work as a waitress, maid and lodging-house keeper, afterward having children as above stated. At 25 years of age, patient is thought to have had a religious change come over her after attending church. When her paramour refused to marry her, she left him and became active in church work. She did odd bits of work, kept boarders, and did church work. The people who knew her after she got religion always had the impression of something lacking. She was devoted to the children, a neat housekeeper, kind to neighbors and friends, but never appreciated efforts to help her. Although she was able to read a scholarly book on theology and the like and to talk about it at length, recalling its contents, the people felt her knowledge was but verbal. In the 50's she became apparently mildly deluded about the pastor of the church, circulating stories of his misconduct, and she created several disturbances by shrieking in the church and by talking about the pastor's "influence" over her. She then began to threaten his life and was committed.

The summary of the mental examination at the Boston State Hospital showed a psychosis of indefinite duration, becoming somewhat more pronounced for about a year, together with the onset of pulmonary disease. The main mental symptoms appeared to be unsystematized persecutory delusions with the possibility of hallucinations or illusions of a somewhat vague nature. The patient stated that about a year before coming to the hospital a certain pastor had irritated her by turning the leaves of a book at a musical entertainment, thereby causing her to smile. As the pastor went out, he

went three times zigzag before her. Ever after this time, the patient had been a sick woman, holding the belief that the pastor had hypnotized her. "It is possible that many deaths in the church of late have been caused by the pastor." It appears that for some years the patient has been regarded as peculiar, irritable, and rather abusive of the church committee when they attempted to help her. The patient said she saw black hands waving before her eyes. During the pastor's sermons, she had cried out "Hypocrite; the devil spite him. Hypocrite; the devil spite him," after which she went to the Sunday School and denounced the pastor. After the development of the pulmonary disease, the patient took to bed, but later gained strength and threatened personal violence to an old friend who had come to stay with her, so that the friend left suddenly. The patient repeated the story over and over again of being hypnotized.

The positive findings on entrance were emaciation, slight development of hair on upper lip, musculature poor, waxy skin, papillar eruption of skin, deep-set but prominent eyeballs, early arcus senilis, grips weak, somewhat exaggerated knee-jerks, signs of pulmonary tuberculosis, rapid heart, peripheral arteriosclerosis.

Mentally the patient gave the impression of refinement; she had a keen glance and coöperated perfectly in the examination, frequently making humorous sallies, evidently enjoying her own wit. Her memory was apparently good in the main for remote events. She described in more or less detail her illicit relations with two men as above described.

It is not clear whether the patient actually had hallucinations. She stated that she saw black hands and queer signs, such as a cat jumping over a pitcher. These signs occurred occasionally when the patient was dozing and upon waking up. It is possible that they should be regarded as hypnagogic. The patient was in general paranoid, speaking about lies and misrepresentations of her character by a woman who had lived with her. Her ideas concerning the pastor remained and patient resented the fact that the members of the church had not come to see her. She would occasionally express her opinion forcibly and with objectionable language. Once she said she wished to have nothing to do with male physicians and accompanied her statement by spitting several times upon the quilt. Patient complained of the food and also of her own stomach, but refused to take medicine. In the summer patient developed diarrhea, which persisted to death.

Diagnosis.—In this case perhaps we must regard her as in some sense below par on account of her dissolute father and her own illegitimate children. She was undoubtedly not feeble-minded in the sense of being unable to support herself throughout the most of her life. Whether there should be a psychotic interpretation of her conversion to religion is also doubtful. The patient's paranoid condition is certainly the main mental symptom. The description of visual hallucinations is too vague for use. The development of amnesia was apparently a late phenomenon in the case. A certain lability of emotion, irritability, threats of violence, and a certain impassivity, are practically the only remaining symptoms of note.

The autopsy was performed three hours post mortem by Dr. Mary E. Morse and showed that death was due to a thrombosis of the left common and internal iliac veins. There was a marked bilateral pulmonary phthisis, with tuberculous lymphnoditis, and a tuberculous ulceration of the lower ileum, the cecum, and the colon. Miliary tubercles were found in the liver (weight, 1,080 grams), and also in the unusually large, firm spleen (230 grams). There was a slight degree of hydropericardium, a slight hypertrophy of the left ventricle, and a slight thickening of the mitral and bicuspid valve edges. The aorta showed a number of raised yellow plaques. The body was emaciated and the skin of a waxy appearance.

The description of the brain has to be brief through lack of lesions. The brain weighed 1,130 grams, which is possibly a slight reduction from the normal weight as estimated by Tigges' formula. The pia mater is described as slightly thickened and as edematous. The brain substance was firm. There was a considerable amount of cerebrospinal fluid. The dura mater was adherent to the pia along the middle line.

CASE III (12.47). *Heredity.*—The field study of this case was unsatisfactory but demonstrated that the patient has two brothers, both with police records for drunkenness. One of the two brothers has a record of repeated arrests and also has a son, a neglected child, now in a Catholic institution for homeless children. The patient's father and mother were born in Ireland, dying at 60 and 65 respectively, the mother of tuberculosis; the father is stated to have been temperate.

Personal History.—Patient was born in 1885, in Ireland; is described as of a happy disposition as a child. She went to school for four years and learned to read and write. (The patient's brother is unable to read or write.) The patient came to the United States at 20 years of age and went into domestic service.

The patient was found wandering about the streets aimlessly, and was brought to the hospital by the police, continually repeating the words, "Father Patterson, Father Patterson." It appeared that she had lost her position on May 10, 1911, and during the next six weeks had developed mental symptoms. It is, of course, possible that mental symptoms had developed before the patient lost her position. No details were obtainable on this point, although the patient had once stated that she was an Irish girl who did not understand much English.

On admission, the patient, 5 ft. 1 inch tall, weighed 72 pounds. The positive findings were as follows: Narrow palate, flabby musculature, skin eruption upon forearms, dull expression, slightly dilated pupils, slow, poorly marked dermographia, general muscular weakness, weak grips, diminished knee-jerks, signs of tuberculosis of the lungs, weak heart sounds, Riggs' disease, furred, dry tongue, tenderness over lower pelvic region (relieved by catharsis).

Mentally the patient arrived in an exhilarated and confused state, and was non-coöperative for the majority of tests. Patient complained of a general feeling of weakness, frontal headaches, refused to write, and remained quietly in bed with an apprehensive attitude.

The patient developed three attacks of vomiting, relieved after catharsis. As soon as the patient was dressed, she would become apprehensive, fearing injury from those about her. There were spells of depression with weeping. There was delay in answering questions, but it was a question whether this delay was retardation or blocking. The physician's certificate stated that the patient had been both restless and cataleptic. At first there was no evidence in this direction. The patient's reticence and admissions that she feared examination were indecisive as to the diagnosis, and the diagnostic summary speaks of a psychosis in a white woman, 26 years of age, of sudden onset and six weeks' duration characterized by apprehensiveness, depression, some understanding of her surroundings, a suggestion of retardation, and emotion not corresponding with her general attitude.

After admission, however, the patient became apathetic and indifferent, had to be urged to take food, began to expectorate carelessly on the bedclothing, would as a rule give no reply to questions, and would occasionally whimper childishly. The patient gained weight upon a special diet, but drooled, would reply in whimpering monosyllables, and in the course of a month became entirely noncoöperative. She is described as sitting for long periods with her eyes closed and her head turned to one side (apparently the left), with both arms extended, hands clenched, one hand over the left eye. Placed in other natural attitudes, the patient would retain them, showing a characteristic and marked *flexibilitas cerea*. She remained mute, so far as the records show, from August, 1911, to July, 1912. She would sit up daily but would assume the above described position. Patient was given to vomiting frequently but this tendency could be somewhat reduced by bismuth and bicarbonate of soda. The vomitus contained some blood. Latterly the patient lay in a sort of catatonic stupor, but July 1, 1912, she asked the physician if she could get up, as she was tired of lying in bed. She stated that she felt well, was as happy as she could be and had nothing to worry her. She showed what was interpreted as amnesia for recent and remote events; was disoriented for time and place. She began to feed herself, had a fine appetite, but drooled saliva from the mouth, mixed with food. It was suggested that she kept her head covered with her arms in the endeavor to exclude auditory hallucinations. Patient complained of headaches and dizziness, she was very untidy. October 14 the patient had a fainting attack, regarded as due to general weakness. She was put to bed and lay in what seemed a catatonic stupor, although she once rose from bed without the nurse's knowledge and attempted to go to the toilet. She fainted and injured her forehead. She took food only upon urging. Decubitus of left buttock developed. The feet were cyanotic. The patient died October 21, 1912.

Diagnosis.—There seems little doubt that this case is one of dementia præcox. At all events, catatonic signs, including *cerea flexibilitas,* mutism, and stupor, are characteristic enough. The headaches and vertigo are consistent with the diagnosis, as also the probable auditory hallucinosis, apprehensiveness, incoherence, and

confusion. To be sure, the patient exhibited a number of reactions more or less characteristic of manic-depressive psychosis, such as an apparent retardation, exaltation, depression, lability of emotions, persecutory delusions, and the like. It seems to be accepted on all sides that dementia præcox patients may show manic-depressive symptoms, whereas manic depressive psychosis should not show characteristic schizophrenia.

The autopsy was performed four hours after death by Dr. M. M. Canavan. The anatomical diagnoses may be grouped as follows:

Death was apparently due to complications of septicemia from a sacral and trochanteric decubitus.

Active lesions were as follows: Advanced pulmonary tuberculosis; tuberculous peritonitis with ascites; enlarged mesenteric lymphnodes; tuberculosis of the liver, spleen, ovaries, and tubes.

The body was emaciated and the skin slightly scaling. There was a fibroma of the uterus.

The brain weighed 1,210 grams, slightly in excess of the weight as estimated by Tigges' formula; body-length, 148 cm. There was a suggestion of opacity in the pia mater. The brain substance appeared normal to inspection and palpation. The blood vessels yielded an impression of being small and showed no sclerosis.

Case IV (11,36). *Heredity.*—The patient's fraternity consisted of two boys, dying in infancy of unknown cause, and seven girls, all still alive. Concerning four of them no data are available except that three are in domestic service in Boston. One sister is stated to be neurotic, thin, and suggestive of tuberculosis. A sister, informant, is well. Patient's father died at 73 of heart disease. A paternal uncle died in old age of heart disease; another paternal uncle died in old age with diabetes; a paternal aunt died in old age, rheumatic. The mother is alive and regarded as normal, but no further data are available except that the mother's fraternity died in old age also with diabetes and heart failure. The field examination in this case was more than usually unsatisfactory. The most definite points are that patient has a neurotic sister and that heart disease and diabetes are in both parental fraternities.

Past History.—The patient was born in 1881, in Nova Scotia. She went out as a domestic at 16 years. She is stated to have cared for a woman who died of tuberculosis, and her sisters have thought that she contracted tuberculosis at that time. Her disposition then became somewhat irritable but no psychotic symptoms appeared. At the age of 24 the patient was at the Rutland Sanatorium for the Tuberculous for a period of 6 months and there gained 40 pounds. Later she was at Boston Consumptives Hospital, from whence she was transferred January 14, 1910.

Data from the Boston Consumptives Hospital indicate that she was stolid and indifferent when first admitted but in the course of a few months became extremely joyous, screaming, singing, and calling out loudly in the ward. At times she would abuse the attending physicians. Her activity developed into mania, in which she ran about the bed, stood up in bed, and screamed discordantly at the top of her voice without apparent occasion. Once she threw her beads

across the ward at a patient, injuring her; at times she threw dinner plates to the floor.

Upon admission to the Boston State Hospital, the positive symptoms and signs were as follows: Pallid skin and wrinkles about eyes (suggestion of premature ageing), narrow palate, carious teeth, papules on back, weak grip, slight fine tremor of tongue, signs of tuberculosis in both upper lobes and suggestion of cavitation in the outer part of the left upper lobe. (Autopsy eventually showed two purulent areas 3×4 cm. in the left upper lobe.) Erratic, weak heart; slight clubbing of fingers. Sensory disorder was confined to hallucinations of hearing which, according to patient, had troubled her for some time and had caused her to perform foolish and mischievous acts.

Shortly before her death, the patient complained of considerable pain on the inside of the right arm and over the right chest, which pain was thought to be related to the pulmonary tuberculosis. Intellectually the patient was well oriented and able to give a clear account of herself if she could be made to be confidential. There was no evidence of memory impairment. The patient agreed that she might have been a little insane when she came to the hospital, and was fully aware of her tuberculosis. Patient's facial expression was bright and her conversation was not unusual except for the adoption of a mischievous and silly tone and a tendency to act somewhat foolishly during the examination. Emotionally the patient was elated, possibly mildly erotic, inclined to be meddlesome and mischievous, and inclined to laugh without apparent cause during conversation. Volitionally the patient's history indicates that she at times performed impulsive acts. She was often much disturbed, screaming loudly; at other times, she became quiet, even assisting somewhat with the ward work, and for a period of a few hours would be quiet, reading a religious book. The patient was admitted January 14, 1910. February 27, 1911, her temperature began to be more marked; tubercle bacilli were found. In August, 1911, patient developed a bloody diarrhea, and died August 12.

The diagnosis of manic-depressive psychosis made upon admission to the State Hospital was doubtless grounded upon the patient's obvious mania. The diagnosis remained unchanged. It is somewhat curious, however, that it would be not impossible to build up a theory that the patient was really a victim of dementia præcox despite the fact that she was clearly enough a victim of maniacal symptoms in themselves entirely characteristic of manic-depressive psychosis. In the first place, the patient herself described auditory hallucinations which had been of some standing; that is to say (though the data are here fragmentary), probably of some years' standing, since they developed doing housework which the patient performed after leaving Rutland Sanatorium, at 24, and before going to the Boston Consumptives Hospital. It is a moot point whether auditory hallucinosis is found in manic-depressive psychosis. It is certainly not characteristic of that psychosis and may be regarded as somewhat more characteristic of dementia præcox. Again, impulsive acts as described at the Boston Consumptives Hos-

pital might contribute to the diagnosis dementia præcox, as well as a certain silliness in the patient's conversation. She is also described as having been stolid and indifferent early in her stay at the Boston Consumptives Hospital.

To sum up, it is true that the patient's hypomania under observation at the Boston State Hospital, exaltation, exhilaration, and labile emotions, may be regarded as characteristic of manic depressive psychosis. It is also true that the patient's phase of indifference, persistent slight silliness, impulsivity, and auditory hallucinosis, might be regarded as consistent with dementia præcox. The total duration of the psychosis is set at 20 months, but if her own story of hallucinations may be trusted, the actual duration may have been somewhat longer.

The autopsy was performed 18 hours post mortem by M. M. C. The cause of death was a generalized tuberculosis. There was a tuberculosis of the appendix, which may have given rise to the bloody diarrhea. The mesenteric lymphnodes were also tuberculous, as were the ileum and colon. There was pulmonary tuberculosis, with chronic adhesive pleuritis of the left side. There were chronic changes in the pericardial wall, hypericardium, hypertrophy of the heart, and a sclerosis of the arch of the aorta, which was exceedingly small, admitting but one finger and measuring approximately 2 cm. in diameter. There was a cystic organ of Rosenmüller. The skin, and especially the scalp, showed a scaling lesion, and there was sacral decubitus. The kidneys showed in the gross a chronic interstitial process, and the liver appeared fatty.

The brain weighed 1,140 grams; apparently a considerable reduction from the proper weight by Tigges' formula (body length, 152 cm.). There were no lesions of the pia mater, and no detectible lesions of the brain, which was pale. There were no vascular lesions.

Microscopic Examination

The technique of preparation of sections and the method of recording the findings in the different areas and layers have been sufficiently described in the above-mentioned paper on the dissociation of neuronic and neuroglia changes. For the purposes of this work, we have omitted consideration of such microscopic lesions as in our opinion might be rather immediately due to agonal or very recent processes. Thus, we have abstracted from our notes references to the existence of axonal reactions and chromatolysis, to say nothing of certain tendencies to diffuse or poor staining in certain loci that are extremely hard to interpret (especially in view of the fact that the same section in adjacent layers under identical tinctorial conditions exhibit relatively perfect staining capacities).

The three major queries appear to relate to nerve cell losses, neuroglia proliferation, and perhaps nerve cell shrinkage; although

to the latter process (in view of artifacts of fixation and preparation) we attach less significance.

As to Case I (10.9), we may recall that this case showed the least degree of nerve cell loss. In fact, we found in 224 loci (layers in different areas) only 55 instances of nerve cell loss; that is to say, if we take a layer in a gyrus as a locus, but 55 of such loci exhibited nerve cell losses among 224 examined. This proportion was the lowest in the whole series, although the patient was 56 years of age and had had at least 14 years of pronounced symptoms. Moreover, the amount of gliosis demonstrable in this case was comparatively low, since but 19 of the 224 loci examined showed gliosis, whether of the satellite-cell type or of other types. This case was, in short, our most nearly normal case; at the same time, the case with the longest duration. There is in point of fact a question whether the earliest symptoms should not be put back to 40, at which time, symptoms designated "congestion of brain" appeared. It is clear that the distribution of lesions in the different loci may be of particular interest in such a case.

Before proceeding to this analysis, let us briefly summarize the general situation in the other three cases.

Case II (12.41) is a case with somewhat numerous cell losses estimated in the above-mentioned manner. There were, namely, 91 loci of nerve cell loss among 208 examined, or 43 per cent. and there were 11 per cent. loci having evidences of gliosis. It is this type of case, where the neuroglia proliferation to some extent follows the degree of nerve cell loss, that yields the general impression to the pathologist that gliosis is a reaction of the nerve tissues in the endeavor to replace lost elements. Of course, this parallelism of gliosis to parenchymatous loss may be proved eventually to exemplify the general law as formulated by Weigert. Still the examples afforded by III and IV look in another direction.

Case III (12.47) was of particular interest because it showed the fewest examples of loci exhibiting gliosis, namely; seven examples in 232 loci examined. This case was used in our study of the dissociation of parenchymatous and interstitial lesions to illustrate the extremest degree of such dissociation, since in strong contrast to the 3 per cent. gliotic loci, there were 53 per cent. of loci with nerve cell loss, namely; 123 loci of 232 examined. Of course, the general pathological situation exhibited by this case is altered by the fact that its assigned duration is but two years and death occurred at 27. It might be queried whether so young a case could show extensive gliosis such as is frequently found in older cases.

Case IV (11.36) shows a tendency to the same contrast, since there were but 7 per cent. gliotic loci (12 in 152) as against 43 per cent. of nerve cell loss (36 in 152). This case was also approximately two years in duration, with death at 31.

Having thus reviewed the general histological status of the cerebral cortex in these four cases with respect to gliosis and nerve cell loss, let us proceed to examine the distribution of lesions. We shall begin with the stratigraphical distribution. The impression which had been obtained from the less systematic studies of a few sample areas from the fifty cases of dementia præcox presented in 1910 and 1914 from the Danvers laboratory, was confirmed by this study; namely: that too much emphasis may easily be placed on the suprastellate and infrastellate distributions of nerve cell losses and gliosis.

As for Case I (10.9), our case with the least evidence of nerve cell loss, the majority of the losses demonstrable appear to be in the sixth layer, or that immediately infrastellate layer which, as a rule, contains large pyramidal cells. The greater degrees of cell loss were, in point of fact, found in but four areas in this infrastellate region, namely; in the postcentral, parietal, angular gyrus, and superior temporal regions. There are no losses demonstrable forward of the fissure of Rolando, so far as yet examined, except in the left area of Broca. There are approximately as many lesions in the suprastellate regions as in the infrastellate regions. The suprastellate lesions are far more scattering, however, a few corresponding to the regions of greatest infrastellate lesion just enumerated, and a few in the insula, gyrus rectus, and the pyriformis regions. One gets the impression from these data that the agency responsible for these cell losses acted chiefly over an area of adjacent gyri on each side; for example, the postcentral, superior parietal, and angular gyri; and although one would have to traverse the fissure of Rolando in one case and the fissure of Sylvius in the other, it might be pointed out that all the infrastellate cell losses so far determined occur in a single sheet of tissue since the areas just mentioned are closely adjacent to the areas of Broca and superior temporal gyri. However, in the event that such a proof could be brought, namely that the infrastellate region in a fairly continuous sheet over the flank of the brain was affected, yet the pathology of the affection must face the fact that similar degrees of lesion affect the coördinate parts of the brain, so that a certain bilateral symmetry is suggested.

As for the suprastellate instances of cell loss, these cannot be considered to occur in a single sheet. In the first place, they affect

at least three different suprastellate layers as well as the stellate layer itself. These lesions do not appear to be as symmetrical in their general disposition as in the infrastellate lesions. So far as may be told, these lesions are entirely capricious in their situation. Quantitatively there were but two of six suprastellate lesions that were striking in degree.

Kraepelin makes much of the fact which he alleges, namely, that the upper layers of small cells are those most affected with nerve cell losses. He points out that in long-standing cases, the second and third layers of the cortex should show the most marked lesions. Comparative anatomy teaches that the small cell layers of the suprastellate region correspond with the highest degrees of mental development obtaining in man; for example, there must be marked development in the frontal region. Kraepelin is tempted to regard these areas as the vehicle for the process of abstraction which translates perceptions into general concepts, turns the lower feelings into higher ones, and turns impulses into volitional conduct. In short, what Kraepelin terms the nucleus of the mental personality is dependent upon such processes of abstraction, and consequently upon the existence and operations of these suprastellate layers. It would appear that many other authors would in general agree with this trend of Kraepelinian analysis; similar or identical considerations may be found in several other authors. It is not over-bold to assert, according to Kraepelin, that in dementia præcox the loss of the abstractive power of the mind, so characteristic of the scattered thinking, mutable emotionality and impulsivity, is to be explained on the basis of this disturbance in the suprastellate layers.

Kraepelin also suspects that these suprastellate layers have another function in addition to that of abstraction. These layers, namely, should have the task of the general combination of the activities of the deeper layers. The activities of the deeper layers need such combination inasmuch as they are in all probability more closely related to circumscribed objects, such as sense-perception and impulses to movement. The actual elaboration of external experience and the unifying of this experience with that of the past, as well as the power of critique exerted on the basis of the standards of past experience, prove to be a function of these outer layers. These outer layers may, in short, prove to be the basis for inner unity and orderliness of the mental life. It is a disturbance of this unity and orderliness of the mental life which is the fundamental disorder in dementia præcox. Kraepelin goes on to point out that in these cases there is no tendency to an extensive injury of the

deeper layers; and he points out that dementia præcox patients preserve relatively well their powers of sensory intake and powers of recollection of perceptions as well as the products of education. The phylogenetic inheritance of men is relatively well preserved in dementia præcox. It is rather the higher mental faculties that are injured.

Of course, dementia præcox patients do preserve their capacity to perform a good many habitual complex acts. Their memory of such acts is normal. To explain this situation, Kraepelin points out that the actual seat of sensory and mechanical memories is to be looked for in the deeper layers rather than in the suprastellate layers. In fact, the memories preserved by the patient may permit him to conceal to a certain degree the destruction of his higher faculties so long as activities not requiring independence are going on. A good many common constellations of ideas and commonplaces of thought are well preserved. As soon as any adaptation of emotions and action is required to particular circumstances, then the deficiencies of the dementia præcox patient become transparent. It is on this account, thinks Kraepelin, that the clinical disorders that we see early in dementia præcox are rather more strikingly shown in the field of emotion and will than in the intellectual field. The intellectual field seems intact for a long time on account of the preservation of these commonplaces of thinking and phrase-making, of which so much of life is compounded. Grant the destruction of the unifying forces of the personality, then come into play the instinctive or lower volitional tendencies which are normally suppressed. Thus, Kraepelin characterizes such phenomena as mechanical obedience and the characteristic (non-ideogenic) negativism of dementia præcox, as well as the stereotypies and even the mannerisms and purposeless acts of certain cases. Neologisms and other characteristic speech disorders in dementia præcox are also due to a loosening of association between ideas, sounds, and movements, as well as to a faulty execution of speech formulæ.

It cannot be denied that such speculations are extremely attractive and that the data of comparative anatomy lend firm support to some sort of generalization along these lines. A number of obvious objections spring to mind, as to the details of Kraepelin's suggestive formulation, which may itself be regarded as largely based on Alzheimer's findings. Our own Case I (10.9), in point of fact, seems to be an exception to the rule. In one sense the disease may be regarded as a psychopathic jealousy of great duration and a certain tendency to elaboration, although without anything which could

be called systematization. The delusional complex was by no means limited to the patient's husband or near relatives, but eventually dealt with beliefs concerning various people coming to kill her. It may be that our histology has nothing at all to do with these delusions, which were elaborated and multiplied from a quasi natural belief in the husband's jealousy. We are, at any rate, not willing to regard the scattering evidence of suprastellate lesion as sufficient basis for a hypothesis concerning loss of abstractive power on the part of this patient.

It must be remembered that Case I developed auditory hallucinations at the age of 55, standing, listening at keyholes and shouting to imaginary persons. She later became resistive to passive movements, exhibited cerea flexibilitas, and retained constrained peculiar attitudes. It would seem that our infrastellate lesions are well placed from the topographical standpoint to account for such hallucinosis, resistivism, and catatonia (temporal, postcentral, and parietal regions). So far as catatonia is concerned, and possibly also hallucinosis, one is often tempted to think that these symptoms are rather more irritative than destructive in the sense of Hughlings Jackson. As for hallucinosis, its occurrence in alcoholic conditions, where curable fatty changes may be suspected to exist, indicates their "irritative" nature. The situation with catatonia is more complex. However, the association of catatonia with stupor gives rise to the idea that the lesions or conditions subtending catatonia ought to be infrastellate rather than suprastellate. If schizophrenia is a suprastellate effect, then catatonia might well be an infrastellate process. However that may be, it would seem that the stratigraphical situation of the lesions in this case is suggested. The topographical situation of the lesions is entirely consistent with the hallucinosis and perhaps also with the catatonia (if former contentions concerning the post-Rolandic site of processes subtending catatonia be upheld).

So far, then, we find in our analysis of Case I that our infrastellate lesions are grouped chiefly in a sheet of continuous tissue in the two flanks of the brain, in and about the angle made by the fissure of Rolando with the fissure of Sylvius, whereas we find the suprastellate lesions apparently entirely capricious in their site. We find no particular correlation for the jealousy delusions of this case, which, for that matter, did not show special evidence of schizophrenia, but rather of a more and more synthetic power of including other new persons in the delusional complex. Unless hallucinosis and catatonia, or the mere fact of delusions, are to be

taken as necessarily schizophrenic in their nature, we should hardly be able to discover a characteristic schizophrenia in the case. In brief, the personality of the case was relatively well preserved, and remained so to a very late phase: an eventual phase of hallucinosis and catatonia. May we perhaps draw from this case the conception that in the absence of demonstrable dissociative or schizophrenic processes, there may be no need of asserting the probability of suprastellate lesions? It might be inquired, finally, whether the evidences of satellitosis, also not numerous, have any bearing on the microlocalization of these symptoms. There is a general tendency to satellitosis in the areas above mentioned as characterized by nerve cell losses in the region below the stellate zone. There are scattering evidences of satellitosis elsewhere. The most striking evidences were found in the external layer of large pyramids in the right superior temporal gyrus. It does not appear that these distributions are particularly suggestive in functional analysis. They hardly parallel the nerve cell losses since the satellitosis is in almost every instance found to the greatest extent in loci themselves not characterized by nerve cell losses.

If we now turn to Case II (12.41), the case with numerous cell losses and the highest amount of gliosis which we have found in our series, we are in point a fact almost embarrassed by riches, since a degree of cell loss is to be found in practically all layers examined, although the prefrontals and occipitals, and certain other areas, show less evidence of nerve cell loss. An endeavor was made to register roughly the amount of cell loss in these loci. If we try to correlate the greatest amounts of cell loss with the loci, we discover that the cell losses are in this case, also, in the infrastellate region; for instance, in the left precentral and right transverse temporal regions. Although not approaching these extreme degrees, marked cell losses are found in numerous other infrastellate layers: for example, on the left side, stretching from the precentral, through the postcentral, the superior parietal, the angular, to the superior, transverse, and middle temporal areas. In a sense, therefore, we have a similar distribution to that of Case I, although on the whole the losses seem to be more in the fusiform layer immediately adjacent to the white matter than in the layer characterized in many areas by large pyramidal cells. On the right side, the cell losses are similarly placed both in the fusiform and in the internal large pyramid layers, but they appear to be less continuous with one another. If, now, we examine the stellate and suprastellate layers, we discover more or less marked cell losses, stretching back on the left side from the superior frontal,

through the precentral and postcentral, but not so largely affecting the postcentral, and not especially in evidence in the parietal and angular gyrus regions. However, the transverse superior and middle temporal gyri are somewhat strongly affected, as well as the Broca area. The occipital areas, as above stated, show comparatively few lesions. As in the infrastellate region, the suprastellate region of the right side shows less continuity in the occurrence of cell losses. Both gyri recti seem to exhibit considerable cell loss in the suprastellate region, as against a slighter development of such losses in the infrastellate region.

Corresponding with the cell losses of the suprastellate region, we find evidence of cellular gliosis in the plexiform and small pyramid layers, and we find inside the cortex a considerable display of satellitosis, especially in the fusiform layer but also in occasional layers elsewhere. One particular gyrus, the right middle temporal, showed remarkable degrees of satellitosis throughout the stellate and suprastellate layers, whereas there was almost total absence of such satellitosis in the suprastellate region of the adjacent superior temporal gyrus and in the transverse temporal gyrus.

The clinical analysis of this case also seems to show an erotic element, like that of the previous case. It will be remembered that this case was the mother of an illegitimate child in her 'teens, led a reasonably normal life thereafter, underwent a religious change of character in the twenties, renounced her lover, and became extremely religious, externally speaking; and that in the fifties, she became deluded concerning her pastor. Auditory hallucinations were never proved to exist in this case. As for statements that black hands were seen, as well as a cat jumping over a pitcher, it is a question whether these phenomena were not dreams. It is doubtful whether there was any catatonia in the case. It is a question whether there was any true parathymia, or whether the lability of emotions did not run practically parallel with the patient's persecutory ideas. It would not be impossible to deny altogether that the case is a characteristic one of dementia præcox; at all events, if we insist upon demonstrable schizophrenia for a diagnosis of this disease. Despite the comparatively slight degree of gliosis and satellitosis, we may perhaps regard the somewhat diffuse cell losses as somehow due to old age, and may perhaps align them with the hair on the patient's upper lip, the arcus senilis, prominent deep-set eyeballs, rapid heart, and the like. At all events, there seems to be nothing characteristic about the stratigraphical or topographical distribution of the cell losses found. Perhaps we are here dealing with a more

globar and diffuse disorder of personality than that which we think of in schizophrenia. At all events, it would not appear that the data of this case are of service in evaluating the speculations of Kraepelin concerning the differential importance of stratigraphical lesions.

If we turn to Case III, we have to deal with that case which showed the least neuroglia change and the most nerve cell losses. What little satellitosis occurred in the case was infrastellate, affecting both prefrontal regions and the left superior parietal region. If we examine the distribution of cell losses, we find them in no instance so numerous as some in Case II. The most extensive losses appear to be those in the angular gyri of both sides, both infra- and suprastellate, and the two superior temporal gyri are almost as seriously affected. Hardly an area escapes cell losses somewhere in the suprastellate region. On the whole, a good many areas escape evidence of cell loss in the infrastellate region. There is apparently in this case somewhat more tendency to the sort of thing observed by Alzheimer than in previous cases. This case appears to have been characteristically catatonic, and at times showed cerea flexibilitas, and was at times in a stupor. There was considerable contention whether the patient had auditory hallucinations. It would appear that the patient was at least somewhat schizophrenic, although there is less evidence of an intellectual schizophrenia as opposed to catatonia than might be wished. An early period looking like manic-depressive psychosis and occasional almost normal intervals, complicate analysis. At all events, it would seem that a pretty well marked case of dementia præcox of something like two years' duration fails to show special evidence of satellitosis; and if we are to suppose that catatonia and stupor are in some sense irritative symptoms, we do not find anything to bear out this idea in the histology; in fact, if we can correlate our histology with the catatonia at all, we might rather think of this process as due to nerve cell losses; of catatonia, in short, rather as a phenomenon of dissociation than of over-irritation of particular mechanisms. We regard this case, accordingly, as somewhat equivocal in the discussion of the relation of stratigraphical and topographical lesions to dementia præcox.

There is one case remaining, Case IV (11.36). Unfortunately, there is a question whether this case is one of dementia præcox at all, although on the whole we regarded her indifference, persistent slight silliness, impulsivity, and auditory hallucinosis, as consistent with the diagnosis. Here, again, the lesions are both suprastellate and infrastellate. There is but one area which has marked satel-

litosis, namely, the right superior parietal area; the left superior parietal area shows far less, although more than adjacent areas. There is little or no cellular gliosis in the case except, curiously enough, in the occipital areas, which are as a rule spared from lesions in these cases. The post-Rolandic regions are in general free from lesions, although scattering degrees of cell loss are found in a few loci. The most marked lesions in this case appear to be in the two superior frontal regions, as well as in the left precentral. On the whole, this case shows about as much evidence of cell loss in the infrastellate as in the suprastellate layers. Whether we can attribute the silliness and impulsivity to frontal lesions is doubtful.

Alzheimer emphasizes a process termed sclerotizing of nerve cells as a feature in dementia præcox cortices, and Kraepelin has followed Alzheimer in presenting plates of such change in his description of the histology of dementia præcox from which we have been abstracting. We have, consequently, thought it worth while to examine our preparations for such processes. The shrinkage changes are, on the whole, not much in evidence in our preparations. In Case I (10.9), the case, we remember, in which the least nerve cell loss was demonstrable, there are eleven loci of shrinkage, involving eight cortical areas, with repetition on both sides of the brain, and with about equal distribution in supra- and infrastellate zones. It is rather interesting to observe that these shrinkage changes do not occur characteristically in loci characterized by cell loss. The association of shrunken cells with loci relatively bare of cells is not characteristic.

Case II (12.41), although it exhibits far more evidence of cell loss, exhibits but slightly more shrinkage changes, namely; 14 loci involving 11 areas. Here again, the loci with shrinkage changes are rather apt to be loci without evidences of cell loss. The impression gained from these findings is, that if the shrinkage process is a genuinely ante-mortem one, and not merely an artifact, then the process of the nerve cell loss is practically at a standstill in the loci where cell loss is found, and the shrinkage changes are proceeding in nerve cells in loci that have not been subject to cell loss. If this conclusion were sound, as indicated by Cases I and II, we might think of a rather uneven progress of disease from locus to locus, with relative completion of the process in a given locus before another is attacked. Case II likewise shows example of shrinkage change in both infra- and suprastellate layers.

Case III (12.47) the case which showed the maximum percentage of local cell losses and the minimum percentage of neuroglia

cell proliferations, shows 15 instances of local cell shrinkage in 11 areas, both suprastellate and infrastellate, although more frequently affecting the former. Here again, the shrinkage changes occur rather in areas free from pronounced nerve cell loss than in areas with such cell loss.

Case IV (11.36) shows but five instances of cell shrinkage, again both suprastellate and intrastellate in distribution, and as a rule not associated with nerve cell loss.

Accordingly we perceive that all the cases concur in the distribution of shrinkage changes and in their elective situation *in loci without much evidence of cell loss.* We are not inclined to attach too much significance to these shrinkage changes, and for our part are unable to evaluate them as to their ante-mortem or post-mortem character. It would seem that if cell loss is preceded by shrinkage changes, there should be a good deal more evidence of shrinkage changes in the nerve cells throughout these four brains. The question then arises, whether the process of cell loss is not a different one. Such a change might proceed in the manner of a gradual disappearance, in which case there would be cell shadows and similar phenomena in all grades of hypochromasia. We have not seen good evidence of this process in these sections. We have, however, seen a good deal of the so-called axonal reaction, or changes closely similar thereto.

The analysis of the distribution of these axonal reactions, or analogous changes, leaves us in a somewhat similar plight as did the analysis of the distribution of the shrinkage changes, for axonal reactions are not often found in loci where there is evidence of cell loss. There are, for example, in Case I (10.9) 28 instances of axonal reaction, the majority of which are suprastellate; but there are rather more instances in the fusiform layer adjacent to the white matter than elsewhere. Case II (12.41) exhibits 11 instances, all distributed in loci without evidence of cell loss. Case III (12.47) yields 21 instances of axonal reaction, of which but six are associated with degrees of cell loss, and in only one of these with any marked degree of cell loss. As in Case I, there is a tendency to the occurrence of these changes in the fusiform layer: 11 instances. An occasional gyrus—for example, the left pyriformis—yields examples in four layers, though for the most part the reactions are not generally distributed. Case IV (11.36) yields 11 instances of axonal reaction, again distributed in areas without cell loss.

As a rule, one thinks of these axonal reactions as due to some injury of the appended nerve fibre, and one thinks of these changes

in non-traumatic cases as incidental to a central neuritic process, perhaps of toxic origin. If so, there is no extreme tendency to universality of the lesions, such as one might think appropriate to febrile or toxic changes. It is of note that the majority of cases showed no axonal reactions in the cells that are best suited to the demonstration, namely; the large Betz cells of the precentral region, as this change occurred in but two of the eight precentral regions examined.

It remains to inquire how much relation there is between cell loss and satellitosis, since it may be conceived that there is some active or malignant process on the part of the satellite cells, which either actively act in the destruction of the nerve cells, or aid in their destruction. Concerning satellitosis, it may be remarked that the majority of instances (Case I, 8; Case II, 7; Case IV, 3 instances) occur in the fusiform layer. Case III, to be sure, has but one instance, but there are only four loci in this case that show satellitosis at all. The satellitosis is in association characteristically with none of the lesions, being very occasionally associated with cell shrinkage, with axonal reaction, and with cell loss. One of the most marked instances of satellitosis occurring in all the pyramidal layers and the stellate layer, is to be found in the right mid-temporal region—Case II (12.41)—but there is no evidence of cell loss in these stellate and suprastellate regions; and although there is some evidence of cell loss in the layer of internal large pyramids, there is no satellitosis in the infrastellate layers in this area. Another area, the right superior parietal area of Case IV (11.36) shows five instances of satellitosis, in all layers except the layer of small pyramids, but without correlation with cell loss. It would appear, therefore, that satellitosis is a process which occurs, as it were, in showers in certain gyri at a time when it does not appear in other gyri. It is a process characteristically associated neither with shrinkage nor with cell loss.

As to the meaning of these different disease processes in and about nerve cells, it would appear that no one has ever considered axonal reactions as at all characteristic of catatonia or dementia præcox. Such reactions on the part of cells are regarded as intercurrent or adventitious. We have ourselves no reason to suppose that they represent anything important in the brains of these cases so far as an interpretation of the mental symptoms is concerned.

As to satellitosis, this process will always be remembered as the one that Alzheimer described as occurring in the deeper layers of certain cases of catatonia. We find (except in Case III, which was

a case which showed very little neuroglia reaction of any sort) that the satellitosis is beyond question rather frequently found in the deeper layers, and particularly in the fusiform layers. Although similarly exact studies have not been made of other diseases, it is our general impression that this elective situation of satellitosis holds for a variety of other diseases as well. In these relatively long-standing cases of mental disease, satellitosis is not unusually prominent. The question arises whether satellitosis has not occurred in many areas and then disappeared. As to the length of life of the satellite cells, perhaps nothing can be definitely said at this time. Satellitosis, as above remarked, does, however, occur in certain gyri when it is absent from all others. If this finding is substantiated in future, we may have a basis for ascribing a remarkable focality of disease process to certain cases.

Summary and Conclusions

The writers present an analysis, chiefly stratigraphical, of certain lesions, notably nerve cell loss and gliosis (including satellitosis) in four cases of dementia præcox. These cases were cases which showed no gross aplasia, sclerosis or atrophy in the gross brain and yet exhibited symptoms of two years' or greater duration, entitling them to be considered in the dementia præcox group.

In connection with this work, a review of Kraepelin's estimate of structural work in dementia præcox brains is offered, and the stratigraphical data are presented in relation to Kraepelin's views as to the functions of suprastellate and infrastellate layers.

Absence of suprastellate lesions in a case of the paranoic or paraphrenic group was noted, but there was no special evidence of schizophrenia in this case as clinically viewed; the case did show infrastellate lesions in areas contiguous with one another in the two flanks of the brain. It might be possible to correlate the late catatonia and late hallucinosis in the case with these infrastellate lesions. Other cases possibly more typical of dementia præcox exhibited lesions both in the suprastellate and infrastellate regions, sometimes numerous, sometimes isolated and apparently capricious in distribution. No good example of lesions chiefly limited to the suprastellate layers has been found.

Gliosis and satellitosis do not follow the nerve cell losses. The same holds true of shrinkage changes and axonal reactions. Nor is satellitosis closely associated either with shrinkage changes (which are not numerous in this series) or with axonal reactions. The dissociation of parenchymatous (neuronic) and interstitial (neuroglia) changes reported in a previous communication is further emphasized.

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TUMORS OF THE THYMUS IN MYASTHENIA GRAVIS

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No characteristic lesions were described in the first seventeen autopsy reports of cases of myasthenia gravis. However, in 1901, Weigert reported a case with a thymic tumor and numerous foci of lymphocytes in the skeletal muscles. In the majority of autopsies since 1901, lymphocytic foci have been noted in the muscles, and the thymus has been frequently described as enlarged or the seat of a tumor. In this paper only the thymic abnormalities are to be considered.

Starr (1), in 1912, reviewed two hundred and fifty cases of myasthenia gravis, and noted that a pathologic condition of the thymus was recorded in twenty-eight per cent. of the cases that came to autopsy. But Starr evidently included all the earlier reports in which it is probable that the thymus was not carefully examined. Thus in Campbell and Bramwell's (2) review of seventeen autopsies in 1900 the thymus was not mentioned, although in recent autopsies it is very commonly described as abnormal. The percentage of cases with thymic involvement can therefore be more accurately determined by considering only the reports which have appeared since the publication of Weigert's paper.

Fifty-six autopsies have been published since 1901. The thymus was described as enlarged in seventeen of these cases; and in ten others it contained a tumor. Therefore some form of thymic involvement seems to occur in nearly half the cases of myasthenia gravis.

Persistent or Enlarged Thymus.—Enlargement or persistence of the thymus has been recorded in seventeen cases. These are listed in Table I, with the information as to actual size furnished by the respective authors. The data are not satisfactory in every case. Such divergent views are held as regards the normal weight of the thymus at different ages that one is not convinced of a true enlargement merely by the author's statement unsupported by any weights or measurements.

TABLE I

ENLARGEMENT OF THYMUS

Author	Patient	Size of Thymus
Steinert,[3]	Elderly woman,	Persistent.
Meyer,[4]	Male, 47 years,	Enlarged.
Moorhead,[5]	Female, 25 years,	Persistent; extends over pericardium.
Booth,[6]	Male, 11 years,	11 cm. × 5.5 cm. × 1 cm.
Marinesco,[7]	Female, 31 years,	Persistent.
Burr and McCarthy,[8]	Female, 21 years,	Enlarged.
Burr,[9]	Male, 30 years,	22 gm. (abscess).
Hödlemoser,[10]	Female, 18 years,	Status thymico-lymphaticus, large thymus.
Symes,[11]	Female, 21 years,	Each lobe, 11.4 cm. × 3.8 cm.
Hart,[12]	Female, 30 years,	No age involution.
Dupré et Pagniez,[13]	Female, 32 years,	8 gm., persistent.
Link,[14]	Male, 43 years,	3 cm. long.
Boudon,[15]	Female, 17 years,	36 gm.
Buzzard,[16]	Male, 40 years,	9.5 gm.
Buzzard,[16]	Male, 40 years,	59.4 gm. (cystic).
Buzzard,[16]	Female, 28 years,	41 gm.
Schumacher & Roth,[17]	Female, 19 years,	49 gm.

The enlarged or persistent thymus in myasthenia is usually described as showing a normal histologic structure or a simple hyperplasia. In Burr's case the thymus contained a large abscess. Schumacher and Roth's case had exophthalmic goitre as well as myasthenia. The patient's myasthenic symptoms disappeared after thymectomy.

The frequent occurrence of hyperplasia of the thymus in myasthenia is of special interest in connection with the study of the thymic tumors which occur in this disease. Ten cases of myasthenia gravis have been recorded in which a tumor of the thymus was found at autopsy. It will be more convenient to describe my own case before discussing the literature.

The case to be reported occurred in the service of Dr. W. A. Jones at the Minneapolis City Hospital. The patient, a male 58 years old, presented the typical clinical picture of myasthenia gravis. A full clinical history is given by Dr. Jones in a paper read at the Detroit Meeting, June, 1916, and soon to be published in the Journal of the American Medical Association.

At autopsy[1] a tumor was found in the thymic region just above the heart and immediately behind the sternum. It was embedded in the loose connective tissues and was not adherent to the sternum or any of the thoracic viscera. Microscopic examination of the adipose tissue lying around the superior part of the tumor revealed the usual senile thymic tissue, viz., very small thymic lobules con-

[1] The autopsy was performed by me, and a report of the findings was submitted to Dr. Jones.

taining Hassall corpuscles, and separated by large quantities of adipose tissue. The tumor is therefore intimately related to the thymus gland which otherwise shows the typical senile involution.

The tumor was easily separated from the adjacent connective tissue. It weighed sixty grams. It is 6 cm. long, 3.5 cm. deep antero-posteriorly, and the transverse measurements are 3.6 cm. above and 4.2 cm. below. It is completely enclosed in a strong fibrous capsule, about 0.5 mm. thick, which is not perforated at any point. The external surfaces show low nodular elevations (Fig. 1). The cut surface is of soft consistence, somewhat softer than the

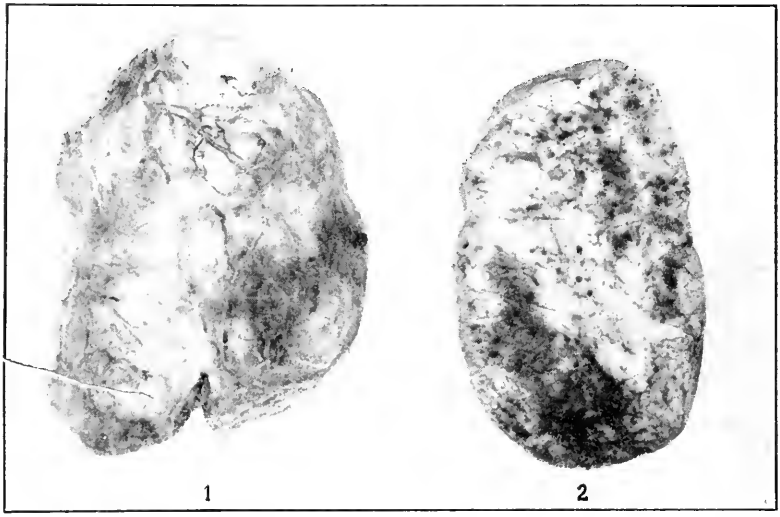

FIG. 1. Anterior surface of thymic tumor, after removal of the adjacent connective tissue. Photomicrograph. × 1.

FIG. 2. Cut surface of tumor. The dark areas are hemorrhagic. Photomicrograph. × 1.

thymus of a child, and is studed with hemorrhagic areas (Fig. 2). The tissue is of light gray color except in the hemorrhagic areas. No lobules are seen.

Under low magnification no definite lobulation can be made out, although there are some irregular septa composed of very loose connective tissue, containing small lymphocytes and blood vessels. Numerous small hemorrhages are to be seen. Around these areas there are often many phagocytic cells filled with blood pigment. There are a few areas of necrosis.

The tumor tissue consists of cells with large vesicular nuclei and abundant light-staining cytoplasm, fused together to form a syncytium. Throughout the syncytium are numerous spaces of variable shape and size, containing small lymphocytes (Fig. 3, 4). In some areas the lymphoid cells predominate, in other areas the epithelial cells. To those familiar with the histogenesis of the

thymus it will be clear that this tissue corresponds closely to the structure of the embryonic thymus at the stage when the epithelial organ is being transformed into a lymphoid organ. The cells with large clear nuclei are thymic epithelial cells. In another paper I (18) have published figures illustrating this stage in the development of the thymus. There is no true differentiation into cortex and medulla in any part of the tumor examined; but some areas

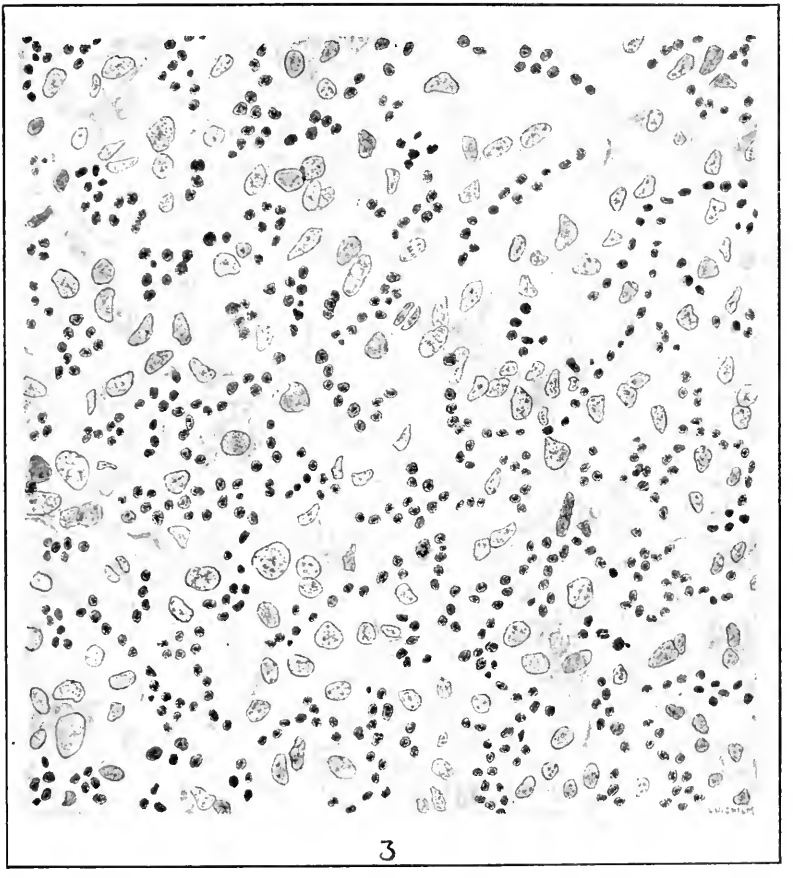

FIG. 3. A typical area of the tumor showing the epithelial reticulum and numerous lymphocytes in the spaces. This corresponds to the structure of the fetal thymus at the stage of the lymphoid transformation. Drawing. × 600.

contain many more lymphocytes than other portions (Fig. 5). It is to be remembered that the entire reticulum of the thymus is of epithelial origin, and that the cortex normally contains a great many more lymphocytes than the medulla—the latter retaining somewhat of an epithelial appearance in the fully formed gland.

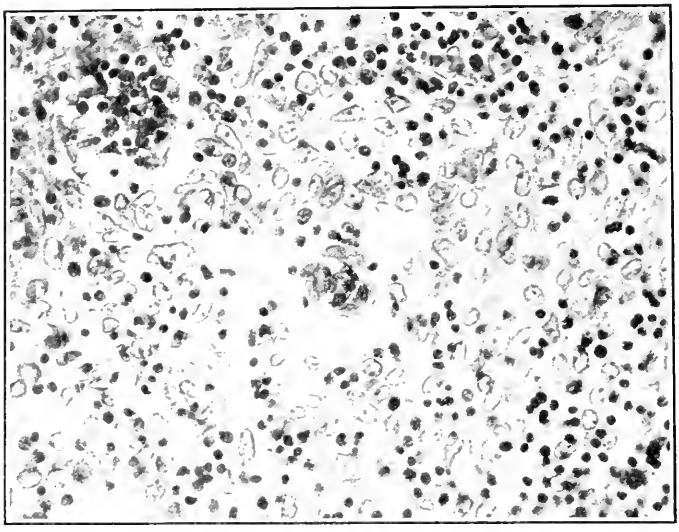

FIG. 4. Area of tumor. In the greater part of this area there are relatively few lymphocytes; the epithelium is therefore prominent. In the center of the field is a blood capillary surrounded by a large space containing only a few lymphocytes. Photomicrograph. × 500.

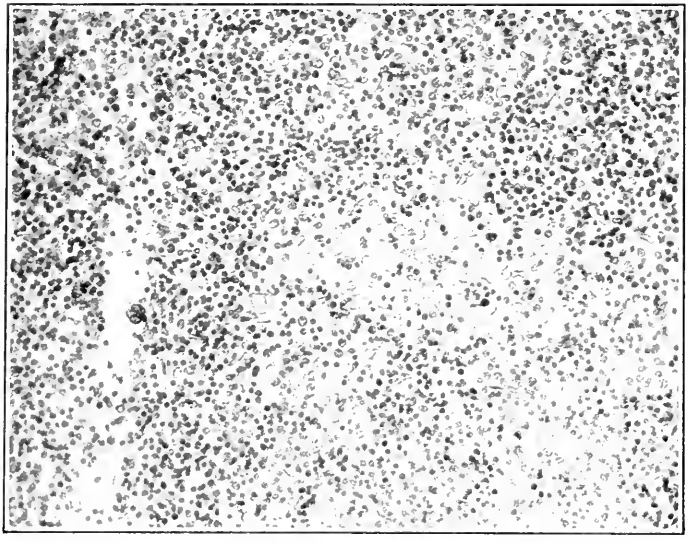

FIG. 5. Area showing a central portion composed almost entirely of epithelium, surrounded by tissue in which the lymphocytes are very numerous. This probably represents an early stage of differentiation into cortex and medulla. Photomicrograph. × 80.

No corpuscles of Hassall are to be seen. These structures do not appear in the development of the thymus until the medulla has become well defined, and since the tumor tissue has not yet attained this stage of differentiation one would not expect to find them. However, there can be no doubt that the tumor is composed of young thymic tissue, even though no corpuscles are present.

In some parts of the tumor there are tubule-like structures which contain one or more small blood vessels and a few lymphocytes (Figs. 4 and 6). The cavity is much larger than the contained vessel, and the epithelial syncytium is arranged in a smooth layer to form its wall. Examination of serial sections shows that these

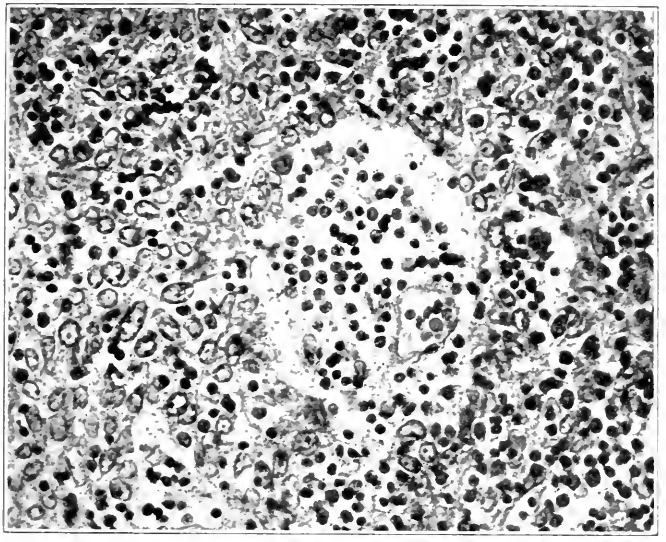

FIG. 6. In the center of the field is a large rounded space containing lymphocytes, in the upper right hand corner of which a blood capillary is shown. These spaces are continuous with the interlobular septa. They are not to be interpreted as tubules or lymph vessels. Photomicrograph. × 500.

tubular cavities are branched off from the larger septa. Small blood vessels accompanied by lymphocytes penetrate the more solid parts of the tumor, forming cavities in the tissue much larger than the invading vessels. The chief interest of these structures is the danger of their misinterpretation. They might readily be mistaken for lymph vessels or tubules. Apparently Mandelbaum and Celler (22) did not recognize their true nature.

This is evidently a benign tumor. It is completely encapsulated, and there are very few mitotic figures. It might properly be classified as an adenoma, but it is probably better in the present state of our knowledge of these growths to designate it simply as a benign thymoma.

Ten cases of thymic tumor associated with myasthenia gravis have been reported. These will be discussed separately.

1. Laquer and Weigert (19), 1901. Male, 30 years old. A reddish tumor, 5 cm. long, 5 cm. wide, and 3 cm. in thickness, was found in the thymic position in the anterior mediastinum close to the pericardium. The cut surface was partly dark, partly bright red. Microscopically, there were abundant free masses of blood surrounding islands of tissue. The tissue islands consisted mainly of lymphoid cells, such as are found in the normal thymus, and less numerous larger cells with abundant cytoplasm and large clear nuclei—the so-called epithelioid cells. Hassall's corpuscles were found. Tumor cells were found in the veins and arteries of the growth.

The lymphorrhages (foci of lymphocytes) in the muscles were interpreted by Weigert as metastases of the thymic growth; but these have been shown to occur in myasthenia in the absence of any thymic abnormality and can in no sense be regarded as metastases. This error is apparently chiefly responsible for Weigert's interpretation of his tumor as a lymphosarcoma. The presence of cells in the blood vessels (if these were lymphocytes) does not mean malignancy, since there is always a considerable increase of lymphocytes in the thymic blood vessels during the lymphoid transformation of the normally developing thymus. Weigert's description shows clearly that he saw the epithelial reticulum and the lymphocytes. He described fetal thymic tissue. His tumor is clearly a benign growth very similar to my case.

2. Weigert (19) mentions a mediastinal tumor, similar to the one first described, seen by him in an uncertain case of myasthenia. No further details are given. The tumor was apparently not examined microscopically.

3. Oppenheim (20), 1911. Female, 40 years old. A somewhat atypical case of myasthenia. A tumor the size of a five-mark piece was grown to the right lung. In the region of the thymus was a light brownish-red tumor the size of a mandarin. The cut surface was sprinkled with numerous red and black points and stripes. In stained preparations there were closely crowded masses of deeply stained round cells and large pale nuclei. Oppenheim's diagnosis was lymphosarcoma of the thymus. However, the size and gross appearance of the tumor correspond to Weigert's case. The microscopic description was not detailed, but apparently a reticulum and lymphocytes were present. It is probable that this was a benign tumor similar to Weigert's.

4. Hun, Blumer, and Streeter (21), 1904. Male, 32 years old. In the anterior mediastinal space behind the manubrium was a rather soft, almost fluctuating globular tumor, about 5 cm. in diameter, and

not connected with either trachea or esophagus. It was possibly a trifle lower than the usual position of the thymus. On section it was exceedingly soft and some parts were distinctly hemorrhagic. The nonhemorrhagic parts had a grayish-white color and the appearance of a cellular sarcoma. A connective tissue capsule surrounded the tumor. Microscopically it consisted of irregular columns or islands of cuboidal epithelioid cells with large granular protoplasmic bodies and rather large pale nuclei. Surrounding these were an almost equal number of small cells resembling the lymphoid cells of the thymus. The authors stated that the appearances suggested an hyperplasia of the thymus, but they concluded finally that the tumor was a lymphosarcoma. This error, as in Weigert's case, seems to have been due to their interpretation of the lymphorrhages in the muscles as metastases of the thymic tumor. The tumor corresponds closely both grossly and microscopically with my own case.

5. Mandlebaum and Celler (22), 1908. Male, 52 years old. Thymus weighed 20 gm.; it was 5 cm. in length, 3.5 cm. in width, and 2 cm. in thickness. The cut surface was pinkish in color, very firm and lobulated. In only a few places could any normal thymic tissue be found. This, in some instances, was separated from the tumor by layers of connective tissue, but in other places it was seen to be in direct relationship with the tumor. The tumor itself was separated from the surrounding structures by a well marked connective tissue capsule which extended into the tumor, dividing it into lobes. Scattered areas of blood pigment were seen in the connective tissue septa.

Microscopically, the tumor contained numerous widely dilated lymph channels or lymph spaces lined by endothelium. The tumor tissue between the lymph channels was of a very dense cellular structure. The cells were large, of an oval, polygonal, or irregular shape and contained large vesicular nuclei. The cytoplasm was granular and stained lightly with eosin or picric acid. Throughout the section the cells had a tendency to form fairly large concentric bodies, somewhat resembling those found in psammoma and certain types of endothelioma, but having no direct connection with any blood vessels. None of the cells showed any mitotic changes. In some of the sections small islands of lymphoid cells were seen scattered between the tumor cells. The lymph spaces were well filled with large spherical cells, smaller lymphocytic cells, and granular matter.

The authors believed that the tumor cells were all derived originally from the endothelium of the perivascular lymph spaces, and therefore concluded that the tumor should be classed as a peri-

lymphatic lymphangio-endothelioma. Apparently no true Hassall corpuscles were found in the tumor proper.

It is probable, however, that the lymph channels described by Mandlebaum and Celler are only spaces in the epithelial tissue hollowed out by invading blood vessels, such as were described in my case (Figs. 4, 6). These spaces are lined not by a true endothelium but by a condensation of the adjacent epithelial cells (cf. their Fig. 7). A simpler explanation of this tumor is to regard the large cells as thymic epithelium, not as endothelium. With this interpretation the growth would differ from my case only in containing a much smaller proportion of lymphocytes. It would be classified as a benign thymoma composed largely of epithelial cells.

6. Wiener (23), in 1908, demonstrated a case of myasthenia before the Verein deutscher Aertze in Prague. The patient, a woman 67 years old, died later and at autopsy a tumor was found in the position of the thymus. No further details are given in this reference.

7. Meggendorfer (24), 1908. A case of myasthenia in a male 47 years old, regarded by the author as somewhat atypical. The veins of the right side of the thorax and neck were very prominent, apparently because of the thymic enlargement. The leucocyte count was 9,200, of which 39.5 per cent. were polymorphonuclears and 60 per cent. lymphocytes. Both lobes of the thyroid were enlarged. There was some albumen and at times sugar in the urine. No myasthenic reaction was present. At autopsy a firm nodular tumor mass was found in the position of the thymus. The aortic arch and its primary branches, the vena cava, and the left vagus nerve were surrounded by tumor tissue. On both sides the tumor was firmly adherent to the upper anterior parts of the lungs. Metastases were found in the visceral pleura of the right lung and in the diaphragmatic pleura of the right side. The cut surface was mainly firm with a few soft areas. Microscopically the tumor was described as a large round cell sarcoma with strongly developed fibrous connective tissue. No Hassall's corpuscles were found, but the author noted an unmistakable resemblance to thymic tissue.

It is unfortunate that the microscopic description of this case is so incomplete. It is not clear in what respect the tumor tissue resembles thymic tissue or how it differs histologically from the benign thymic tumors. There is a possibility that the tumor was primary in the lymph nodes, though this is improbable. This is the only case in the literature in which myasthenia was associated with a malignant thymic tumor. It is also the only case of myasthenia in

which the thymic tumor was large enough to cause pressure symptoms.

8. Klose (25), 1912. Male, 23 years old. A sarcoma the size of a hen's egg was found in the thymus. Metastases were found in the muscles of the extremities and the diaphragm. (These were evidently only the lymphorrhages which are usually found in the muscles in myasthenia, independently of thymic tumors.) The thymic tumor is described as probably extirpable. Small Hassall corpuscles were found in the tumor. The description given of the tumor is so incomplete that no exact diagnosis can be made. It is evidently, however, not a sarcoma, since the author mistook the lymphorrhages for metastases. Judging from its size and shape it is presumably the same type of tumor found in my case.

9. Claude, Géry, and Porak (26), 1914. Male, 51 years old. An encapsulated tumor the size of a duck's egg was found in the position of the thymus. The external surface was nodular and a cyst the size of a hazelnut was found at the lower pole. On the cut surface the tumor was divided into lobules by connective tissue septa. Microscopically, there were numerous tubular structures lined by epithelium or endothelium. The cellular tissue between these structures in some places was arranged to form concentric bodies suggesting Hassall's corpuscles. The tissue was interpreted as epithelium with a sinusoidal circulation. The authors designated the tumor as an epithelioma. No lymphoid cells are mentioned.

This is presumably a benign thymoma composed almost entirely of epithelium. The significance of the tubular structures is not clear.

10. Hart (12). An acute case of myasthenia in a recruit (age not given). The thymic tumor measured 5 cm. in length, 4 cm. in width, and 4 cm. in thickness. Externally it was nodular and firm. Dense fibrous septa penetrated the tumor, appearing as an irregular network on the cut surface. Between the septa the tissue was soft and grayish-red in color; in some parts hemorrhagic areas were present. Some atrophic thymic tissue was found around the upper pole of the tumor. In the tumor lymphocytes were intermingled with large epithelioid cells, the latter predominating. Hart regarded his case as a special form of hyperplasia of the thymus, and not as a true neoplasm. This tumor is very similar to my case.

Of the eleven thymic tumors found in myasthenics at autopsy, five correspond very closely in gross and microscopic structure, viz., the cases of Laquer and Weigert, Oppenheim, Hun, Hart, and my own case. The tumors reported by Mandlebaum and Celler and by

Claude may be interpreted as benign tumors composed mainly of thymic epithelium and differing from the five cases just mentioned in that the lymphoid cells have infiltrated or developed only to a slight extent.

The earlier thymic tumor mentioned by Weigert, Wiener's case, and Klose's case are all too meagerly described for accurate classification, but the sizes and shapes of these tumors suggest that they belong to this group of benign epithelial growths of the thymus.

The thymic tumors occurring in myasthenia form a distinct group. They are all comparatively small benign growths, composed of young thymic tissue. Many are hemorrhagic. This type of tumor seems to occur only in myasthenia.

Meggendorfer's tumor is an exceptional case. It is the only malignant thymic tumor ever found in association with myasthenia; although a great many malignant thymic tumors of this type have been reported independent of this disease. It may be a coincidence such as Goldflam's (27) case of myasthenia with a malignant tumor of the lungs. Over sixty malignant tumors of the thymus have been reported and only one of these occurred in connection with myasthenia. It is therefore difficult to believe that the two conditions have any causal connection.

Tumors of the Thymus Not Associated with Myasthenia.—A large number of thymic tumors are recorded in the literature. Hoffmann (28), in 1896, collected thirty-five cases; and Rubaschow (29), 1911, added thirty-six more. It has been pointed out by Hoffmann and others that it is frequently impossible to determine the exact origin of a mediastinal tumor, and that many tumors are attributed to the thymus that may or may not have originated there. Statistics on thymic tumors are therefore to be used with some reservations. I have studied the reports of seventy-three thymic tumors, not including those occurring in myasthenia. Thymic enlargements in leukemia are not considered here because these are presumably merely infiltrations and not true neoplasms.

The seventy-three cases were grouped by the several authors as follows: 27 lymphosarcoma, 3 round cell sarcoma, 2 fibrosarcoma, 19 other varieties of sarcoma or sarcoma without special designations, 10 carcinoma, 6 thymoma, 1 fibroma, 5 miscellaneous. Carcinoma and sarcoma are not sharply distinguished. The small cell carcinoma of Rubaschow and Eisenstädt (30) would probably be classified as sarcoma by the majority of authors. Thymoma is apparently used synonymously with lymphosarcoma.

The prevailing type of malignant thymic tumor, usually called a

sarcoma, consists of large cells of round or irregular shape, sometimes arranged in masses suggesting epithelium. A stroma is often mentioned but seldom carefully described. It does not seem justifiable to assume that tumor tissues of this type are of connective tissue origin. We know that malignant neuroblastomata often assume this appearance, and it is not uncommon to find the rapidly growing parts of malignant epithelial tumors of the kidney composed of loosely arranged rounded cells. It is easily possible that tumors arising from the thymic epithelium may take on this "sarcomatous" appearance when growing rapidly. Ewing (31) is of the opinion that thymic sarcomata develop from the reticulum, and his three cases make a strong argument in support of this interpretation. Ewing's Case III is especially valuable in showing a transition between the benign tumors, such as occur in myasthenia, and the very malignant tumors. The epithelial reticulum is very prominent and compact in the benign tumors; but as the rate of growth increases it becomes more and more drawn out and large cells separate from it until the free cells become more prominent than the reticulum. Lymphocytes seem to be less numerous in the more malignant growths.

The type cell in these tumors is probably a thymic epithelial cell. The term sarcoma will lose all its original significance if applied to tumors of this character, and it seems equally inappropriate to call them carcinoma. The term thymoma, suggested by Grandhomme (32), and employed by Thiroloix et Debré (33), Simmonds (34), and Ewing seems most suitable. A thymoma may now be defined as a tumor, benign or malignant, probably derived from the thymic epithelium, and usually identifiable by the epithelial reticulum and lymphocytes. Hassall's corpuscles are sometimes present. Thymoma as thus defined would include practically all the tumors classed as lymphosarcomata by various authors, the benign tumors occurring in myasthenia, and some cases described as small cell carcinomata. It would not include tumors in which the type cell is evidently not from the thymic epithelium, such as Lange's (35) fibroma and Schneider's (36) fibrosarcoma.

It was mentioned above that Hart does not regard the thymic growths found in myasthenia as true tumors, but as a special form of hyperplasia of the organ. The fact that there is a uniform hyperplasia of the entire thymus in many cases of myasthenia gives support to Hart's interpretation. It is indeed probable that the thymic tumors and the diffuse thymic hyperplasias in myasthenia are due to the same underlying cause; but, since we do not know the cause

either of myasthenia or true tumors, there can hardly be any objection to classifying a well-defined encapsulated growth, such as I have described, as a true neoplasm.

Lymphorrhages have been found in the muscles and internal organs in a large per cent. of recent autopsies. No satisfactory interpretation of these lesions has been given. Their occurrence is not dependent upon the condition of the thymus. They were very numerous in the liver in my case, and a few were found in the adrenal. Several pieces of the neck muscles were examined but no lymphorrhages were found. Unfortunately, other muscles were not preserved.

Thymic lesions cannot be regarded as the cause of myasthenia, since they are present in only about half the cases. Probably the abnormal thymus is due to some more fundamental disorder which is also responsible for the muscle weakness and other features of the disease. The hyperplastic thymus of Graves' disease is usually interpreted in this way.

Summary

A benign thymic tumor from a typical case of myasthenia gravis is described.

The tumor is composed of thymic tissue of a fetal type, *i. e.*, a dense epithelial reticulum with lymphocytes. The usual thymic rests were found in the adipose tissue around the growth.

The thymic tumors occurring in myasthenia gravis seem to form a distinct group unlike any other thymic tumors. They may be classified as benign thymoma.

Some abnormality of the thymus is found in nearly half the cases of myasthenia gravis.

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THE ABDERHALDEN REACTION IN MENTAL DISEASES[1]

By Henry A. Cotton, M.D., E. P. Corson White, M.D., W. W. Stevenson, M.D.

Since Fauser in 1912, with the assistance of Abderhalden, began to apply the principle of the Abderhalden reaction to psychiatry very little has been accomplished. Simon has shown that uniform results can be obtained in various psychoses, and Ludlum and White have also reported results with certain psychoses. In the work of Fauser and Simon only sex and thyroid glands were used as substrates.

In this preliminary report of the work at the New Jersey State Hospital we will merely present the results of the Abderhalden tests in 289 cases, including the various psychoses and some normal individuals. It is not our purpose to discuss the nature of the reaction or to take up the various theories that are represented by the various investigators. The original method of Abderhalden was used in all cases and in 31 cases the reaction was confirmed by the ice incubation method of Bronfenbrenner.

It is important to remark that in the hands of one who has had considerable experience the reaction not only is of value as shown by the uniform reaction obtained in the same case on repeated examinations, but also that certain definite types of psychoses apparently give uniform findings in a number of cases.

We have used as substrates the following glands: Pituitary, thymus, thyroid, pancreas, adrenal, sex (ovary and testicle), but have not employed brain tissue as did Fauser. The blood of the patients to be tested was always taken before breakfast, to avoid any dietary influences, and the tests made within three hours.

	Cases
Dementia præcox....58	46 positive to sex, 9 negative, 3 sex and thyroid.
Paranoid condition .. 4	4 negative to sex.
Epilepsy 69	All positive to adrenal.
Manic, M. D. I. 19	1 pancreas, 1 thyroid and sex, 17 negative.
Dep., M. D. I. 18	2 pancreas, 3 adrenal, 13 negative.
Psycho-neurotic 13	2 thyroid, 1 thyroid and sex, 1 adrenal, 9 negative.
Const. defect. 13	1 thyroid, 3 mixed, 9 negative.
Art. Scler. B. D.... 7	7 negative.
Syph. (G. P.) 10	10 negative.
Unclassified 17	2 thymus. 2 thyroid and sex, 13 negative.
Normal 13	13 negative.

[1] Read before the American Neurological Association, May 8, 9 and 10, 1916.

Groups

The most important findings from this investigation are in the groups of dementia præcox and epilepsy. It can be readily seen from the above table that the other psychoses give practically negative results, at least the results are not so uniform and constant as in epilepsy and dementia præcox.

Dementia Præcox

In dementia præcox the number of positive cases to sex gland was 46 out of 58 tested or 81 per cent., and in 9 cases the reaction was negative. But these negative cases were all with few exceptions diagnosed as doubtful. Quite a few of them were foreigners, in whom the diagnosis was very uncertain. In the allied cases such as paranoid condition the reaction to sex gland was negative, and to all other glands. In three dementia præcox cases, positive to both thyroid and sex, two of them were distinctly catatonic and one was a phantastic somatic paranoid type. So that the 46 cases showed a rather uniform reaction to sex gland alone. Of this number 17 were male, 29 female.

In connection with the Abderhalden reaction blood counts were made in all cases, but in dementia præcox wide deviations from the normal were noticed. Thus the lymphocytes were present usually in a larger percentage than the polymorpho-leucocytes, in smears, lymphocytes were 56 per cent. and polys only 38 per cent. There was also a very marked increase in the eosinophiles, in some cases reaching as high as 6 per cent. The total leucocyte count was also low, one case 2,100 per c.cm., and averaging about 6,500.

In the other psychoses the blood count was approximately normal. Coupled with this we find usually a slightly increased pulse rate and usually a low blood pressure and temperature somewhat subnormal.

In discussing the relation of the Abderhalden tests in dementia præcox, *i. e.*, positive to sex gland, several hypotheses may be advanced.

1. A primary dysfunction of the sex gland, which is an agreement with Fauser's theory.

2. A toxemia, which might arise in several ways. (*a*) From alimentary tract, insufficiency of liver and pancreas. (*b*) Stasis of alimentary tract. (*c*) Infection of alimentary tract.

3. A low-grade infection, absorption of toxins. This is supported by the physical signs, low blood pressure, increased pulse rate, cyanosis.

4. As a possible infection tuberculosis will have to be seriously considered. The fact that 75 per cent. of the cases of dementia præcox die of tuberculosis is more than a coincidence, especially as the group with the next highest proportion of tuberculosis is general paralysis, in which 16 per cent. die of tuberculosis. The acute cases of dementia præcox, the type in which death occurs in from three to five years, practically all die of tuberculosis. The question of the relation of tuberculosis to dementia præcox demands further investigation, but enough data are at hand to formulate the hypothesis that the occurrence of tuberculosis in such a large percentage of dementia præcox is of some etiological significance.

5. The pathological changes in dementia præcox also indicate a possible toxic condition due to bio-chemical changes, probably from a disturbance of the glands of internal secretion.

Further work is necessary before a definite relation can be established.

Epilepsy

Another important finding in the Abderhalden reaction is to be found in epilepsy. We have made a preliminary report of this finding to be published soon. In 69 cases examined all were positive to the adrenal gland.

We know that this reaction may be caused by several things:

1. Removal of pituitary gland causes changes in the sex gland and later changes in the adrenals.

2. Experimental removal of the external function of the pancreas also produces an adrenal gland reaction.

3. Irritation of duodenum in two dogs produced a slight reaction to adrenal.

4. Fright, as shown by Cannon, causes an excessive secretion of the adrenal gland, and probably a dysfunction.

The recent work of Reed and others would show that epilepsy is definitely associated with intestinal stasis and absorption of toxins from the intestinal tract. It is probable that the dysfunction or hyper-secretion of the adrenal gland would not itself cause convulsions, at least such has not been proven, but Cannon has proved conclusively that one of the principal physiological actions of the adrenal is to inhibit smooth muscle fibers such as are found in the intestines. Other physiological reactions in increasing the coagulation time of the blood which has also been found by Turner and others. Blood pressure is also raised and the blood driven to viscera, lungs and brain. This physiological action of the adrenal corresponds to the

condition found in epilepsy. We have treated these cases with pancreatin with considerable success.

Conclusions

From this brief outline we can conclude that the Abderhalden reaction gives certain definite and uniform results.

2. That these results are practically negative except in dementia præcox and epilepsy.

3. That in dementia præcox 81 per cent. of the cases show a positive reaction to sex gland and in three cases out of 55 give a positive reaction to thyroid and sex; two of these were the catatonic type. Differential count of the blood shows rather characteristic conditions in dementia præcox; *i. e.*, high red blood cells, low white cells, and high lymphocyte count and low polymorphonuclear.

4. That our knowledge at present of the incidence of tuberculosis in dementia præcox justifies the hypothesis that probably the former stands in some etiological relation to the latter.

Table I

Total Reaction

Positive To:		Pit.	Thym.	Thyr.	Pan.	Adr.	Sex.	Thym. and Adr.	Thyr. and Sex.	Adr. and Sex.	Pos.	Neg.
No. of cases	261	7	4	6	0	69	52	1	5	2	146	115
No. of tests	329	18	10	7	0	69	72	1	5	2	184	145

Table II

Diagnostic Reaction

	Total		Positive to										
	Cases	Exam.	Pit.	Thym.	Thyr.	Pan.	Adr.	Sex.	Thym. and Adr.	Thyr. and Sex.	Adr. and Sex.	Pos.	Neg.
Dem. præcox	78	108	2	1	1	0	1	46	0	3	0	54	24
Manic dep. ins.													
(*a*) Manic phase	23	33	1	0	1	0	2	1	0	0	1	6	17
(*b*) Depr's phase	18	46	0	2	3	0	0	0	0	0	1	5	13
Psychoneurotic	13	13	0	0	0	0	2	1	0	1	1	5	8
Defective group	13	13	0	1	0	0	0	2	1	0	0	4	9
Organ Conditions:													
Art. sclerosis	7	7	0	0	0	0	0	0	0	0	0	0	7
Syphilitic	10	10	1	0	1	0	0	0	0	1	0	3	7
Epilepsies	69	69	0	0	0	0	69	0	0	0	0	69	0
Senility	2	2	0	0	0	0	0	0	0	0	0	0	2
Unclassified	13	15	2	0	0	0	0	2	0	0	0	4	9
Normal	13	17	0	0	0	0	0	0	0	0	0	0	13

5. That in epilepsy practically all cases, 69, gave a positive reaction to adrenal gland.

6. That the value of these reactions is to lay the foundation for therapy, based upon the facts deduced.

Table III

Differential Blood Count in Dementia Præcox

Cases Giving Reaction to:		Lymph.	L. Mon.	Eosin.	Trans.	Poly.	Basi.	Bl. Press.	Eryth.	Leuc.	Hem.
Positive to	A	26	0	1	6	67	0	140–90	4,560,000	4,000	80
Pituitary	2B	41	0	5.2	5.2	48	4	140–90	3,840,000	7,000	75
Thymus	1	48.9	0	1.7	6	43	0	130–85	3,820,000	4,212	80
Thyroid and sex	3	47.7	0	2.23	2.23	47.1	0	90–55	4,626,000	4,805	75
Adrenal	1	41.7	0	1.53	14.7	48	0	115–72	4,400,000	4,000	85
Sex	46	38.5	1	.4	1.8	56.1	0	120–85	4,400,000	4,300	83
Sex Allied to											
Dementia præcox	3	63.6	0	1.4	.99	29.3	0	140–95	5,280,000	5,250	83
Sex, dem. præcox assoc'd with alc.	3	27	0	1	0	71	0	120–70	5,200.000	3,180	80
Negative to All											
Dementia præcox?	9	35.4	0	2.5	1.5	59.3	0	115–77	4,300,000	4,300	72

Explanation of Chart

Cases divide into separate clinical groups, with blood count. Pituitary, thymus, adrenal and doubtful dementia præcox cases negative to all were of the fanciful delusional, mildly paranoid, with slight dementia. Of the 46 sex cases 72 per cent. were hebephrenic, about 2 per cent. catatonic, the remainder paranoid. Those giving sex reaction with a very high lymphocyte count were the cases frequently classified as allied to dementia præcox, showing marked manic reaction. Those cases associated with alcohol which might possibly be classified as alcohol dementia, on dementia præcox basis, showed a slight deviation from the normal, but a definite deviation from the differential count found in the ordinary dementia præcox.

Translations

VEGETATIVE NERVOUS SYSTEM

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Authorized Translation by Dr. Walter Max Kraus, A.M., M.D., New York

(*Continued from page 65*)

XI. Special Pathology and Clinical Aspect of the Vegetative System

(2) *Lacrimal Glands.*—The last organ of the orbit to be considered is this gland. Its autonomic supply comes via the sphenopalatine ganglion, its sympathetic via the superior cervical ganglion. Stimulation or paralysis of the cervical sympathetic causes respectively increase or decrease of the secretion of tears. The postcellular fibers from the cervical ganglion—secretory or vasomotor—pass upward in the inner carotid plexus and reach the gland either by the ophthalmic plexus or the cavernous plexus and the lacrimal nerve, a sensory branch of the trigeminus.

The bulbar autonomic supply corresponds to the general diagram of communicating branches given in a previous section. The afferent tract comes from a motor nerve and is sheathed. This goes to a ganglion and leaves this, sheathless, to continue in connection with a sensory nerve. The white radix motorica of the sphenopalatine ganglion springs from the facial nerve and is called the major superficial petrosal nerve. The gray postganglionic fibers pass with the zygomatic and lacrimal nerves of the trigeminus to the lacrimal gland.

The bulbar centers for the lacrimal glands and the nasopharyngeal mucous membrane lie in the region of the facial nucleus. They are composed of small ganglion cells and are like the paracentral cells of the spinal cord in circumference, form and staining qualities. The sphenopalatine ganglion lies near the nasal mucous membrane. It is hard to preserve or stain. It has connections with the sympathetic. This connection is a thin bundle of fibers from the internal carotid plexus. This bundle lies in the vidian canal and is called the deep petrosal nerve. It is postcellular and sheathless.

For many animals stimulation of the conjunctiva will arouse the lacrimal glands to activity. Pain, psychic changes and emotional changes cause lacrimation in the elephant and man only. Anatomical relations explain the lacrimation occurring in superior trigeminal neuralgia and high facial palsy (unilateral weeping). The sympathetic tracts go to the periphery via the lacrimal nerve while the autonomic excitolacrimal fibers leave the facial above the geniculate ganglion and pass to the sphenopalatine ganglion.

3. *Mucous and Salivary Glands of the Head.*—Before passing on to a discussion of the vegetative innervation of the alimentary tract, we must devote some time to the mucous and salivary glands of the mouth, nose and pharynx, a group closely related to the alimentary functions. The four ganglia, sphenopalatine, otic, submaxillary and sublingual, so classically investigated by Müller and Dahl, require description at this point.

(*a*) The sphenopalatine ganglion, which has already been mentioned in conjunction with the lacrimal gland, supplies the mucous glands of the nasopharynx and the autonomic vasodilators of the mucous membrane (the vasoconstrictors are derived from the sympathetic).

(*b*) The otic ganglion receives its afferent fibers from the glossopharyngeal nerve. It is closely related to the parotid gland. The radix motorica of the ramus communicans albus of the ganglion is the N. tympanicus or more properly speaking its continuation as the minor superficial petrosal. The gray postcellular fibers leave the ganglion in the auriculotemporal branch of the trigeminus (a sensory branch) and go to the parotid gland. There is the nonal sympathetic anastomotic branch, in this case, fibers from the middle meningeal plexus.

The autonomic bulbar center has been described as Kohnstamm's nucleus salivatorius inferior, lying between the motor nucleus ambiguus and the inferior olive.

The parotid gland is also supplied by the cervical sympathetic, which sends secretory fibers or vasomotor fibers affecting secretion. It has long been known to physiologists that autonomic stimulation produces a secretion quantitatively and qualitatively different from that produced by sympathetic stimulation. Experimental section of the nerve supply and clinical observations of the absence of parotid function due to lesions of the tympanic nerve in middle ear operations have familiarized us with the function of the parotid gland tracts.

(*c*, *d*) The ganglia of the lower jaw salivary glands, the sub-maxil-

lary and sublingual have almost identical anatomical and physiological relations. The first of these only will be described and Müller and Dahl will be followed. The sheathed ramus communicans albus of the submaxillary ganglion leaves the facial nerve as the chorda tympani and then joins the lingual nerve. It produces a secretory as well as a vasodilator effect upon the gland. The sheathless postcellular fibers are quite short and lie entirely in the gland, since the outlying ganglion is situated there. The autonomic bulbar center for the salivary fibers lies, according to Kohnstamm's researches, above the facial nucleus (nucleus salivatorius superior). He draws this conclusion from section of the chorda tympani and subsequent tigrolysis in the ganglion cells in the above mentioned region.

There is also a sympathetic nerve supply to the submaxillary and sublingual glands. This causes both secretion and vaso-constriction. The scanty, viscid secretion thus produced has long been known by physiologists and forms a contrast to the thin, abundant chorda secretion. It is very probable that the autonomic nerve is secretory, controlling water and salt excretion, while the sympathetic nerve is trophic, controlling the secretion of organic components.

The secretion of the salivary glands may be reflexly produced, via the sensory fibers of the trigeminus supplying the mouth, the sensory fibers of the chorda tympani or the taste fibers of the glossopharyngeal, by severe pain or psychic influences springing from various parts of the brain.

Of the better known drugs the following are of interest. Atropin paralyzes the autonomic, adrenalin and cocain stimulate the sympathetic.

Xerostoma (Hutchison) is a little known nervous disease of the salivary glands. It is not unusual in old people (atrophic senile xerostoma) and often leads to glossodynia. It is frequently observed as an independent disease in individuals with vasomotor instability (Curschmann) and in psychopaths, related to a fear of dryness (xerophobia of actors). The neurological character of this idiopathic form is shown by its dissociation in that the lack of saliva occurs during speaking and singing, during excitement and depressing emotions, while it is absent in chewing and swallowing.

4. *Sympathetic and Vagus in the Cervical Region.*—Before leaving the vegetative end organs, we shall give a short résumé of the rôle of the sympathetic and vagus in the innervation of the head region. The autonomic innervation comes from the mesencephalic and bulbar centers.

(*a*) Sympathetic. The large shaped, superior cervical ganglion, about 2 cm. long, lies at the base of the skull. It gives off a large nerve, the internal carotid, which passes into the plexus of the same name. This ganglion has a histological structure like that of the sympathetic chain ganglia (cells with large dendrites passing through the cell capsule, more rarely with small intracapsular dendrites). It receives its preganglionic from the thoracic spinal cord segments via the cervical sympathetic. Some of the gray rami pass to the upper sensory peripheral cervical nerves. The upper cervical ganglion supplies through the internal carotid plexus the following organs:

1. M. dilator pupillæ.
2. M. Mülleri (smooth muscle).
3. Lacrimal gland.
4. Salivary glands.
5. Pilomotor muscles of the face.
6. Vasoconstrictors of the face.
7. Sweat glands of the face.

The signs of absence of function of the cervical sympathetic and its upper ganglion are well known and have been known for many years. They are due to long lasting compression or trauma.

1. Narrowing of the ipsolateral pupil, its reactivity being retained.
2. Narrowing of the ipsolateral lid slit.
3. Retraction of the eyeball (enophthalmos).
4. Hyperemia of the ipsolateral face and head area.
5. Transitory anidrosis of the ipsolateral face and head area.

The motor part of Horner's symptom complex, ptosis, miosis, enophthalmos is always present, while the vasomotor, trophic and secretory disturbances are only present in deep lesions. The accompanying symptoms are of value in atopical diagnosis, atrophy of the tongue, vocal cord paralysis, thenar atrophic, etc. (minor).

We have included the mucous and salivary buccal glands as a part of the digestive tract and of course the muscles and glands also form a part of it. Examples are the stomach, intestines, liver and pancreas. This part of the visceral system, as well as the mucous and salivary glands, is supplied by both nervous systems, autonomic and sympathetic. The autonomic supply of the digestive organs below the pharynx is the vagus.

(*b*) The vagus nerve, like the oculomotor, facial and glossopharyngeal, is not of pure vegetative nature, though the majority of its fibers are for glands and smooth muscle. The location of the vagus nuclei in the medulla is like that of the anterior lateral and

posterior cell groups of the spinal cord. The somatomotor nucleus ambiguus lies mainly ventral and is composed of large multipolar ganglion cells, which are very similar to anterior horn cells. Their fibers go to voluntary muscles—pharynx and larynx. The nucleus solitarius lies more dorsally. It is sensory and corresponds to the posterior horn with its substantia gelatinosa Rolandi. It supplies the mucous membranes of the pharynx and larynx. The third largest nucleus lies on the floor of the fourth ventricle and is called nucleus dorsalis vagi. This is visceral and supplies the heart, lungs and gastro-intestinal tract. Its ganglion cells resemble those of the paracentral nucleus of the spinal cord (lateral column).

All the fibers which leave these three nuclei pass through the ganglion jugulare and nodosum to become the vagus. The nerve probably passes through two ganglia because it represents two nerves phylogenetically.

The ganglion nodosum resembles a spinal ganglion for it has no multipolar ganglion cells, *i. e.,* vegetative elements. Whether the ganglion jugulare, in which a few vegetative ganglion cells are to be found, represents an intervertebral ganglion like the ciliary or otic, and gives rise to post-ganglionic fibers to the viscera is hard to say, first because there are so few vegetative elements in the ganglion and secondly because there are many ganglion cells in the viscera near the entrance of the vagus fibers. The histological structure of the jugular ganglion is of theoretical interest because vegetative and spinal ganglion cells are intermingled, a developmental union of an intervertebral and a vertebral ganglion.

The fibers of the vagus in passing through the jugular ganglion certainly recall vegetative structure. That it may be a synapse is suggested by the fact that an anastomosis is made with the sympathetic superior cervical ganglion.

The next consideration is the branches of the nuclei and ganglia of the vagus.

1. Pure motor—rami pharyngei.
2. Pure sensory—ramus meningeus and laryngeus superior.
3. Mixed motor sensory vegetative—ramus laryngeus inf. S. recurrens (motor to larynx, sensory to trachea, visceral to the heart, aorta and laryngeal vessels).
4. Pure visceral—all other branches (for the digestive tract, heart, aorta, liver and lungs). (These will be discussed in the sections to follow.)

If one appreciates that the many centers of the medulla (for example the swallowing center) are but the places where the stimu-

lus passes from the sensory nucleus solitarius to the motor nucleus ambiguus, the whole matter of centers becomes more readily understood, particularly the visceral centers. That there are relations of this kind has been established by section of the vagus nerve above, below and at the branching of the recurrent nerve. In the first case there is degeneration in the nucleus dorsalis and ambiguus, in the second case only in the ambiguus, while in the third case only in the dorsalis. The ganglion cells of the dorsalis are smaller than those of the other nuclei and resemble the cells in the lateral columns of the spinal cord. Visceral fibers in the vagus are recognizable by the delicate sheath.

Of the supranuclear relations of the vagus the following are noteworthy:

The motor vagus crosses the pons and the peduncles to the internal capsule and goes to the motor cortex in the region of the anterior central convolution (motor area) and the area of Broca (pharyngolaryngeal center).

The sensory vagus goes from the fasciculus solitarius and nucleus solitarius to the medial line and via the bulbothalamic tracts to the sensory cortex.

The visceral centers are not definitely known in man. In lower species they are placed in the gyrus fornicatus or supracallosus. Many authors deny the existence of these centers on a priori evidence. Jacob localizes the visceral cortex in the gyrus fornicatus or supracallosal gyri in lower animals.

5. *Gastro-Intestinal Tract.*—In passing to a discussion of the special physiology of the digestive tract, the following facts must be mentioned: The sympathetic nervous system supplies the tract from one end to the other. The vagus, besides supplying the large glands of the abdominal cavity, supplies the lower two thirds of the esophagus, the stomach, and the intestines as far as the descending colon.

Experiments with stimulation and section of nerves have given the impression that the sympathetic vertebral and paravertebral ganglia play no part in the direct control of the movements of the gastro-intestinal organs. The ganglion cells in the walls of the organs do this, while the vagus and the sympathetic fibers only exercise the regulatory functions of acceleration or inhibition.

As is well known, the vagus nerve, through its depressor nerve, has an inhibitory action upon the heart, while the sympathetic, through its accelerator nerves, has accelerator functions. In the digestive tract this is just reversed. The vagus accelerates, while the sympathetic inhibits.

Smooth muscle, unmixed with cross-striated, begins in the second third of the *esophagus*. The peripheral peristaltic waves of the gastro-intestinal tract may be inhibited through swallowing rapidly and repeatedly. In order to prove that the peripheral peristaltic waves are under control Mosso's experiment must be tried. This consists in showing that the constricting waves of peristalsis in the esophagus will proceed unhindered toward the stomach even if a circular piece of esophagus, with its ganglion cells, be cut out.

6. *Stomach.*—The stomach wall is supplied at various places by groups of ganglion cells both from the sympathetic and vagus systems (Fig. 6). These are found in the muscularis and subserosa, but are supposed to be absent in the submucosa.

It is, of course, necessary, in order to comprehend the innervations of an organ, to understand the anatomy and histology of its nerves and ganglion cells. This applies, more than anywhere else, to the gastro-intestinal tract.

But not only in man but also in animals, there are considerable difficulties in finding out the anatomy and histology of these nerve-endings and ganglia. This is due to the fact that even in the finest specimens, impregnated with metals, the digestive juices and ferments digest the little endings of the nerves after death and after the circulation is impaired, even though the specimen be perfectly fresh and taken from a living person or experimental animal.

Among the structures of the sympathetic system, which join it as end-organs, are the nervous networks of the stomach and intestines. These are the most complex in nature and have the greatest number of connections among themselves. The cells, both in size and structure, in the make-up of these fiber-networks, and in the number and type of their branches, are so varying that at this time, they cannot be classified or even described at length. This much, however, may be said, that the nerve cells from which the anatomic pictures are made up vary and are recognized and clearly distinguished according to the structure to which they belong. The various anatomic and functional localities give the ganglion cells, irrespective of their arrangement, or of their number or distribution, a cytological character, which cannot be mistaken. All cells, which are found in the digestive tract, may be divided into the two main types of cells, which have been described in the section on General Histology.

The stomach is shut off above and below by the tone of its sphincters. Above, it opens after a peristaltic wave has begun in the esophagus, provided these waves do not follow each other too

rapidly. Below, it opens rhythmically, after food has been taken, provided the intestine is not full.

Consequently at one moment the sphincter pylori relaxes, at the next the cardiac sphincter does the same.

Visual, auditory and olfactory sensations have a marked psychic effect upon the gastric secretion. This varies both in quantity and quality, according to the stimulus (meat, bread, milk).

The following experiments, with bilateral vagotomy, show the effects of this operation:

(*a*) The normal influence of chemical agents (meat extract), which act either directly upon the glands or through the blood, is little changed.

(*b*) The reflex psychic secretion of gastric juice is stopped.

(*c*) There is a severe, though transitory, paralysis of the stomach musculature.

(*d*) Those inhibitives of the flow of gastric juice which follow and are characteristic of mental pain are absent.

The new experiments of Kirschner and Mangold throw some light upon the motor functions of the distal segment of the stomach after a complete cross-sectioning has been performed so as to separate the pyloric part from the influence of the vagus nerve and from that of the cardiac part.

The following functions of the stomach remain unchanged: (These observations are of great value in considering the part played by the vagus nerve in practical surgery.)

1. The tone of the sphincter pylori and the rhythm of the alternation between the closure and opening during emptying of the stomach remain normal.

2. The amount of increase in pressure due to the contraction of the antrum pylori and the rhythm and type of the contraction of the antrum remains normal.

3. The functional coördination of the sphincter and antrum pylori remains normal.

4. The chemical reflex action originating in the duodenal mucous membrane and affecting the pyloric part of the stomach remains normal.

Animals are best suited to pharmacological testing of the stomach. For this purpose either the Pawlow method—intact connections between the stomach and nervous system—should be used or the Bickel method.

(To be continued)

Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

In Conjunction with the Meeting of the Neurological Section of the New York Academy of Medicine

NOVEMBER 14, 1916

The Presidents, DR. WILLIAM M. LESZYNSKY and DR. FOSTER KENNEDY, presiding

IDIOPATHIC EPILEPSY

By John T. MacCurdy, M.D.

Dr. MacCurdy said that his paper was not an argument in favor of epilepsy being a disease of ultimate psychic origin, but a report of some mental phenomena which he thought to be of diagnostic value. A striking clinical experience led him to formulate the hypothesis that epilepsy was a disease characterized by a functional instability of consciousness and control of muscles wherein both were lost in *crises* and that the excitement of the aura, when present, might contribute such a crisis. To test this view, the auras of idiopathic epileptics were studied. These studies revealed the following:

1. That no primary motor aura exists in idiopathic epilepsy, all movements being apparently reactions to primary sensations.
2. That every aura is accompanied by a painful affect, usually fear, directed against the convulsion which is felt to be impending.
3. That auras always occur apart from convulsions as well as preceding them.
4. That the patient always feels that if he can distract his mind the fit will be averted, for which conviction there is good objective evidence.
5. That the symptomatology of auras corresponds closely to that of neuroses and psychoses, occurring independently of epilepsy, so that they may not be epileptic symptoms in essence, but concurrent attacks that are psychologically determined.

In general one could say that the attitude of the idiopathic epileptic towards his aura is subjective and rather hypochondriacal. The auras of pure Jacksonian cases, on the other hand, were often primarily motor—the sensory component was not so prominent and the attitude of the patient was objective rather than subjective. The patient (as a rule) felt no fear, and never believed that disregarding his symptoms would ward off the attack. On the contrary, he thought that a concentration of attention on the part affected was more apt to abort the attack. This difference of attitude should be a valuable point in diagnosis, when neurological signs were absent, particularly if operation be thought of.

Some histories seemed to show that a case might begin as Jacksonian epilepsy and develop the idiopathic disease as the former was being recovered from. Such cases showed a change in auras from the objective to the subjective type. One could probably not hope to cure epilepsy by the removal of the aura, for a patient might substitute another, if one disappeared for

any reason. Therapy, in so far as it was mental, should be directed towards relieving the stress, either internal or external, which tended towards creating crises.

Dr. L. Pierce Clark said that he had looked over his own cases in the light of Dr. MacCurdy's contention as to the significance of the aura in idiopathic and organic epilepsy, and had found it in the main to be true. Unfortunately but a third of the cases of epilepsy had any sort of aura upon which one could place a differential dependence. He was rather inclined to consider the aura as really a part of the attack, and not as a separate phenomenon. He thought there was some reason to think the fear element in idiopathic cases was due to the automatic conscious repression of the inherent and underlying demands for the psychic expression of the unconscious, and thus a riddance from the type of stress and irritation present in the individual's life, thereby producing fear as a result of such conflict. It may also be true that the fear element not being present in the Jacksonian cases was due to the gradual loss of consciousness in which the individual had an opportunity to adjust himself to all the possibilities of an attack and its accidental consequences. The fear in idiopathic cases may be due to the sudden threatening of the loss of consciousness. It was interesting to note that probably the great value of mental distraction in doing away with the fear, which had been universally practiced since ancient times, had some good justification on psychic grounds. He called attention to the fact that many writers, such as Gowers, had indicated that hemiplegic epilepsies had a tendency, later on in life, to take on the clinical sequence of ordinary idiopathic attacks. It was interesting to note, though, in such cases, finally showing idiopathic attacks, that the fear element was not added in their aura. He would not be inclined to agree that the consequential epileptic phenomena, after the focal lesion of the brain had been removed, should be considered as a neurosis, but rather idiopathic epilepsy initiated by a traumatic factor. He thought that Dr. MacCurdy's point of not depending upon certain types of convulsive movements for operations on the cortex was quite sound: it indicated clearly that we should still depend upon paralytic phenomena and alterations in the reflexes as diagnostic criteria for any focal operation on the brain in which epileptic attacks were to be treated surgically.

Dr. Charles L. Dana was then asked to discuss this paper, but on account of the length of the program and the importance of this subject, he moved that further discussion be postponed until the next meeting of the Society, when sufficient time could be given to its consideration. This motion was seconded by Dr. J. Ramsay Hunt.

The following papers dealt with the problem of the management of poliomyelitis in New York City.

MANAGEMENT OF THE RECENT EPIDEMIC OF POLIOMYELITIS IN NEW YORK CITY, FROM THE NEUROLOGIST'S VIEWPOINT

By William M. Leszynsky, M.D.

Dr. Leszynsky stated that a meeting of the Council of the New York Neurological Society was held on October 12, 1916, for the purpose of discussing the management of the recent epidemic. A committee, consisting of Drs. F. Tilney, B. Sachs, C. L. Dana, W. Timme and W. M. Leszynsky, was appointed to survey the field. Clinics were visited in order to ascertain the scope of the work. Conditions were found to vary at the three large ortho-

pedic institutions, but owing to lack of funds facilities and equipment were entirely inadequate. Treatment was limited to braces and massage, and no neurological observations were made. Two hundred, 300 and 200 patients were treated respectively in each; in one only was neurological aid sought. At Bellevue Hospital and Cornell Medical School there was coöperation of neurologists and orthopedists. At Mt. Sinai Hospital and the Neurological Institute patients were supervised by neurologists; at all other dispensaries patients were treated in the orthopedic departments. In 1907 the epidemic in New York, comprising about 2,500 cases, was not discovered until the large number of paralyses in children attracted attention in the dispensaries. No official measures were instituted, but in October, 1907, the Neurological Society appointed a committee to study the epidemic of that year, consisting of neurologists, pediatrists, bacteriologists and orthopedists. Results of careful analyses of 752 cases were embodied in a volume called "Epidemic Poliomyelitis; Report of the Collective Investigation Committee on the New York Epidemic of 1907." This fully demonstrated the interest of the neurologists in the disease. Since then the health department had been active in quarantining and controlling the disease, but the report of the Neurological Society seems to have been disregarded or forgotten. In the recent epidemic the value of coöperative neurological study had been entirely forgotten or ignored and no official invitation by the New York City health department had been made to request the coöperation of neurologists, either in committees of the city administration or those for "after care." Of the Committee for After Care, there were 53 members, 25 of whom were physicians, only 3 of whom were neurologists. Furthermore, the New York City health department had provided only information to parents as to where orthopedic treatment might be obtained. Thus the entire medical control was in the hands of orthopedists. These remarks, the doctor stated, were not meant in any spirit of rivalry. It was, however, universally admitted that poliomyelitis was a disease of the central nervous system, and the disease had hitherto been assigned to the province of neurology, so that the state of affairs, as above described, was the more extraordinary. The scientific interest of neurologists in the diease, however, could not be so easily eliminated. It should be added that the care by orthopedic institutions was probably a matter of expediency rather than medical selection or preference. If the children were being properly cared for their condition could be properly studied through suitable medical coöperation. The importance of preventive measures, immunization and laboratory research was fully realized. There should, however, be a standardization of treatment to suit individual requirements, and the best interests of the patients would be served by harmonious coöperation of orthopedists, pediatrists and neurologists. Disabled children should not be deprived of any benefit resulting from associated service.

THE PRESENT METHODS OF MANAGEMENT OF POLIOMYELITIS IN NEW YORK CITY

By Frederick Tilney, M.D.

Dr. Tilney said that last spring preparedness was preached and after some excitement they were satisfied that they were sufficiently prepared. In the summer came the epidemic, the third in nine years, and found them unprepared. Quarantine was a travesty, and hospitals were not ready. The measures for proper clinical management were lacking, and the opportunity to increase knowledge of diagnosis, prognosis and treatment was not recognized. Owing to lack of intelligent organization, the epidemic would have

to go down into history without scientific record. Treatment of the acute stage fluctuated between the radical experimentation and the conservative expediency. The after treatment lacked the necessary organization. Patients were recommended to attend certain clinics and there the matter ended. The victims of the epidemic needed the best help of the medical profession and to give this the adequacy of the means now in force had to be considered. Based on a study of the ten largest institutions there were about 3,000 cases, and a clinical plan of treatment should determine which departments should care for the patients and also which departments should work together. Classification for the grouping of cases should be made and patients should be individualized with reference to therapeutic needs and after care. Careful records would have to be kept of the cases of paralyses and reëxaminations made at stated intervals. Although all cases were treated in orthopedic departments, only 30 per cent. were receiving strictly orthopedic treatment. Few cases had neurological care. As the disease was essentially one of the nervous system, the services of the neurologist must have value. Coöperation between the neurologist and the orthopedist had been lacking. As 64 per cent. of children were under five years of age, muscle education in these ages was impossible. After five years it could be successfully done. Only the neurologist could make the distinctions between the groups of cases as regards types of involvement. He should judge the advisability of electrical treatment for particular cases. A particular type of current was indicated—the galvanic sinusoidal, a slow wave current with alternating polarity. In conclusion Dr. Tilney said that what was most needed at present was a comprehensive plan of organization. The suggestions offered by him covered the following points:

1. The neurologist should direct the after care of patients.
2. Coöperation between neurologists and orthopedists was the ideal plan.
3. Classification of cases should be made by neurologists.
4. Reëxaminations should be made at stated intervals to classify methods of treatment.
5. There should be a distribution of cases according to the institutions most accessible to the patients.
6. Every therapeutic means sanctioned by good authority should be employed.
7. Institutions should adopt certain regulations as to staff organizations with special reference to the number of physicians, nurses, and masseuses, per number of patients. Equipment of institutions engaged in the after care should be brought up to a desired standard.

THE DIAGNOSIS AND TREATMENT OF POLIOMYELITIS

By B. Sachs, M.D.

Dr. Sachs said that he would single out points of special interest which would bear on the proper future diagnosis and treatment of poliomyelitis. The duty of the neurologist to the public was twofold, first, if possible, to assist in prevention of another epidemic, second, to lay down sensible rules for the public in the matter of treatment. Little was known about transference of the disease from one person to another. It had appeared in a crowded section of the city, spread rapidly, and then had appeared in other parts of the country, evidently spread by healthy carriers and also by intimate contact with those afflicted with the disease. Contagion was probably most frequent in the prodromal stage of the disease. In families children had evidently caught the disease from one another, but in hospitals this had not

occurred. Thus it appeared that intimate contact was necessary for infection. In the uncertainty of the exact method of transference, it was necessary to advise strict quarantine and the greatest possible cleanliness in the home. The dirty condition of the New York streets, with many uncovered garbage cans, invited epidemics, but the better care of children's food in the past summer had lowered the death rate from gastro-intestinal disease, so that the death rate was not higher than in non-epidemic years. Evidence had long been established that poliomyelitis was an acute infectious disease of microbic origin. Recently Peabody, Draper and Dochez had laid great stress on the edematous appearance of the brain and cord and concluded that the damage to the nerve cells was from direct pressure, by hemorrhage, edema and exudate. The report of the Committee of the Neurological Society on the epidemic of 1907 had evidently been forgotten in New York, but neurologists were familiar with this work and had noted greater virulence and higher mortality in the present epidemic. Since 1907 the work of Flexner and others had brought the possibility of treatment by immune serum nearer. The examination of the cerebrospinal fluid also had been found a valuable diagnostic aid. In some cases with intense infection the respiratory and cardiac centers were affected and the disease was rapidly fatal. In other, less severe, cases the gray matter of the cord only was affected, and in others the infection was so slight as not to produce paralysis. As regards treatment, the neurologist should always be chiefly responsible, as well as in early diagnosis, when the laboratory worker could not be relied upon as infallible. Furibund forms always showed diminution of deep reflexes and muscle hypotonia, and a detailed neurological examination of the entire body was necessary. In the better known forms of the disease there was rapidly developing paralysis, which subsided in intensity, with first slightly increased, and then loss of deep reflexes. Electrical reactions here were of great importance. Irritability was excessive in the first two days, followed by some degeneration. The neurologist should make the differential diagnosis between poliomyelitis and transverse myelitis, which was often difficult. In the early stages of the disease, care in feeding and bathing of children, and the manner of disposal of the limbs, called for expert care and handling. Immune serum injection should be resorted to. Artificial respiration was of aid in cases with respiratory involvement. In after treatment electrical examinations with faradic and galvanic stimulation should be made of all groups of muscles. Galvanic stimulation could be used to exercise muscles that could not be exercised by the will. Patient reëducation of the muscles by the mother or visiting nurse was highly valuable, also massage after warm baths. The crying need in these cases was for good visiting nurses; this was more necessary than spending public money on ambulances to convey children to the clinics. The neurologist should coöperate with the orthopedist as to the necessity of orthopedic appliances. Too early or too persistent use of braces was to be condemned.

Dr. Charles L. Dana said that with regard to the general management of the late epidemic, it was only fair to remember that nobody knew exactly what to do at its inception. No preparation had been made, because no one knew exactly how to prepare. He thought that the authorities did the best they knew how, acting on the best advice they could get. They made some mistakes and one was undoubtedly that of ignoring the work and possible help of neurology. The speaker said that it was not now too late to introduce their services for the therapeutic work, since the victims of this epidemic will require treatment for a long time. He said that the public, and perhaps some of the faculty, did not realize that a considerable percentage of these victims will not need much treatment anyway. They had the infection, but no, or very slight, paralysis and promptly got well. Another percentage of cases,

viz., those with single and moderate paralysis involving only one segment of one limb, did not require elaborate treatment and largely improved under simple measures. There was another, a small percentage, in which the patients suffered enormously, having quadriplegic and triplegic paralyses, often with involvement of the trunk. These required the most careful supervision and humane attendance, but were often hopeless, so far as cure was concerned. There was a fourth group of cases which included thirty to forty per cent. of the whole, in which the paralyses were of considerable or moderate severity and distribution. These were the cases in which the very best treatment of every possible kind should be employed. It was this phase of the question which was largely being debated to-night. In further discussion the speaker said that there were two phases of the subject to be considered: one, that of the general management and organization of the institutions and individuals concerned in treatment; and the other that of the technical methods of treatment. With regard to the first, he thought that the New York Committee on After Care of Infantile Paralysis Cases was working earnestly and would, he believed, gradually bring matters into an efficient state. The speaker then went over the various measures used in treatment. Everyone, he said, agreed that warm baths, exercises, muscle training and educational methods in general were definitely helpful. Some doubted the value of electricity, others acclaimed it. The speaker said that he did not give his opinion but simply his experience, which was that it was helpful in properly selected cases and he considered it not only wrong, but rather silly, to take the position that it was useless when properly applied. He had never seen any direct benefit from massage, but thought it might be a useful thing indirectly if done carefully. There was no question as to the value of warmth or of the utility of exercising in warm baths. The same was true of the measures which give support to the paralyzed muscles by approximating the ends and relieving the tension. There was a distinct difference of opinion between some neurologists and some orthopedists as to how much support by braces should be given and as to its extent and duration. Neurologists, and the speaker, believed in allowing as much as possible normal physiological movements, allowing the child to lie on the bed or the floor and kick about, rather than to lock up the joints in positions of perfect anatomical adjustment. Practically, however, he said that he had never had any difference of opinion, when it came to individual cases, between himself and the orthopedist. Referring to the matter of prognosis, the speaker said that a physiological fact, perhaps not generally known, but of hopeful significance, is that the motor cells of the spinal cord practically increase in number from birth to adult life. Kaiser had shown that in the anterior horn of the cervical spinal cord at the time of birth there were about one hundred thousand cells, and at the age of fifteen years about two hundred thousand cells. This did not mean that nerve cells actually divided and multiplied, but that minute nucleated nerve cells developed into full-sized functioning cells. Thus there was always hope in these cases of young children that nature was going to assist enormously the work of the therapeutist. The speaker concluded: "On the whole it is better for us to take the position that all these therapeutic measures be allowed under wise supervision. We do not, any of us, know enough to stand up and say: 'Massage is of no use; electricity is of no use; vibration is of no use; and braces are of no use.' This attitude would be unjust to the child and to our art. The essential thing is a sane judgment of what should be used in every individual case. We can only be absolutely sure that good comes from wisely applied treatment, and bad comes from neglect or stupid and unintelligent treatment, whether this be boluses or braces. We may be sure also that the general profession which both looks on and takes part in this discussion, will eventually pass final judgment, and the care of poliomyelitis will

be taken to or stay with the pediatrist, the neurologist or the orthopedist in accordance with the final test of experience. I believe it will come about that the cases will be assorted to each department in accordance with individual indications and the stage of the disease. But now, while we wait, it is only right that we urge upon those who have any authority in dispensary therapeutics to the crippled children that they give the child *all* the measures known to be probably helpful when wisely applied, and surely this means that they should secure the coöperation of good and soundly trained neurologists, for they are persons trained in dealing with paralyses, familiar with the anatomy and physiology of the disease and able to give help in diagnosis and prognosis as well as therapeutics. I make the qualification of 'good' neurologist, because, of the neurologist who deals with the delicate mechanisms of the soul as well as of the body, it is especially true what Horace said of poets and poetry—'In some specialties mediocrity and tolerable endowments may properly be allowed, but neither gods nor men give any indulgence to middling neurologists.'"

Dr. M. Allen Starr said he could only add that every suggestion made by Drs. Sachs and Dana met with his approval. They had every right to use every method that they knew of as a therapeutic aid. He agreed with Dr. Sachs in regard to electricity. He had opposed its indiscriminate use for many years, but he thought that the use of electricity for the purpose of exercising muscles which could not be exercised by the will was certainly beneficial. A great many children could not use the muscles voluntarily. For two years after the onset of the disease constant improvement was possible. Exercise could be given by one kind of electrical current only, that was the galvanic. Faradism did nothing but scare the child. The sinusoidal current was the most efficacious. He thought electricity could be given properly with intelligent training by anyone and six lessons to a careful and intelligent mother in the use of the galvanic battery should enable her to give it properly. This could not be done with the tenement-house population and with this element it was well to bring the child to the clinic for electricity. As Drs. Sachs and Dana had pointed out, visiting nurses should be employed by philanthropic individuals and this recommendation should be made to them. There was great benefit in graduated exercise under direction. Some years ago Dr. Fraenkel pointed this out and instructed them in the improvement to be gained in locomotor ataxia by adjusted series of movements. With the patient working by himself there was not much result, but with a trained instructor to carry out the training and help and encourage the patient, very remarkable results were obtained. In educational exercises there must be someone to understand the object of the work. Dr. Starr had seen some work of Dr. Lovett with a Harvard student and he had succeeded in reëducating the muscles of his arm. This was done with the intelligent coöperation of the patient. As regards massage, he thought it could be best done under water, and any mother could be instructed in this. He thought the Zander instruments were very important. As regards braces, out of 404 cases there were 280 with paralyzed legs, 84 arm cases, and 40 of the face and neck reported in the epidemic of 1907. Orthopedic appliances would then benefit the 280 cases, but the remainder they would not affect. Thus, a great many cases were not open to orthopedic treatment. The mind of the public had been unnecessarily directed to the question of braces, and it should be borne in mind that the brace which keeps the muscle from recovering function was doing harm. Braces should not be kept on all the time.

Dr. E. D. Fisher said that he could hardly agree with the point of view that had been expressed that there had been any antagonism between neurologists and orthopedists. He had seen many cases of poliomyelitis during the past summer and in the hospitals and the opportunity was open to others.

In regard to the treatment of the cases, it was not necessary for the neurologist to treat the case in the early stage. The neurologist could not take the credit for the discovery of the early stages; that work belonged to the laboratory. As regards the future of these cases, they must agree heartily with all the remarks of Drs. Starr and Dana. The combination of treatment should be by the orthopedists and the neurologists. He did not think that they had to blame themselves in this epidemic. Very careful work had been done and the results would be made clear later.

Dr. Walter Timme read the following resolutions compiled at the special meeting of the New York Neurological Society:

WHEREAS, Anterior poliomyelitis and its concomitant polioencephalitis are intrinsically neurological diseases, and

WHEREAS, Anterior poliomyelitis and polioencephalitis have been managed in all stages in the recent epidemic practically without the supervision and control of neurologists in the institutions of Greater New York, and

WHEREAS, In order to avoid faulty diagnosis, inadequate treatment, and poor methods of gathering important statistics, resulting not only in detriment to the present patients, but also in a final loss to scientific medicine of valuable data of great service in future epidemics; be it

Resolved, That it is the sense of the New York Neurological Society that anterior poliomyelitis and polioencephalitis being neurological diseases, the sufferers from such diseases ought at an early period to come under the care or supervision of neurologists, with the cooperation of orthopedists and other specialists as the cases may require; and, in consideration of the unprecedented number of cases in the recent epidemic, in all public institutions and clinics where these diseases are treated, there should be a standardization of equipment and method. And be it further

Resolved, That the New York Neurological Society petition the Committee on Public Health of the New York Academy of Medicine that it consider the advisability of appointing at once a commission on poliomyelitis which shall take into consideration the ways and means best calculated to meet and combat a future epidemic similar to the one we have just experienced and make definite recommendations for same. This commission shall consist of four sub-committees, as follows:

First, a committee on communicability and quarantine, comprised of bacteriologists and epidemiologists;

Second, a committee on the criteria of diagnosis and clinical management, to consist of neurologists, pediatrists and orthopedists;

Third, a committee on pathology and serology, to consist of pathologists, who shall devise the best means of caring for such pathological material as is obtained as a result of the epidemic;

Fourth, a committee on treatment and immunization, to consist of neurologists, orthopedists, pediatrists and bacteriologists. This committee shall consider the therapeutic means best adapted to the acute stage and also to the after treatment.

Dr. Virgil P. Gibney, by invitation, said that he felt that this had been exclusively a neurological banquet, and while listening to the various experiences, he was reminded of a story of a young man who committed suicide by hanging himself to the limb of a tree, and the question arose why he did it. It was said because he was criticized. But if he were not criticized it were better that he commit suicide, as he would be a dead one already. The doctor said he agreed with many of the views that had been expressed there that evening. At one time he was a member of the society and was even at one time put up as a compromise candidate for president. For many years he employed faradism and galvanism and applied it to the treatment of paralyzed limbs. He got patients in the early stages and took measurements of the

limbs, recording the results faithfully, and after thirteen years he came to the conclusion that Dr. Starr had expressed and he felt that galvanism was good as a diagnostic measure in obtaining the reaction of degeneration. He had referred many patients to neurologists and had also carried out the treatment they suggested. He had found the galvanic current was useful in a certain number of cases during the first year or two. He always told patients they could have electricity and massage if they wanted, but he did not assure them that the treatment would yield them the results they expected. He thought that paralyzed patients had a right to all kinds of therapeutics, that is, not harmful, and holding out relief, however little. Warm baths could be of use, and in the treatment of deformity they employed braces and plaster of Paris for a while, and when the deformity recurred, after allowing the limbs to go free, they used the braces again. He felt that though they were orthopedic men they did practise neurology just as faithfully as did the neurologists. In reference to Dr. Starr's remark as to the inapplicability of appliances to the upper extremity, he found that the deltoid had been paralyzed very frequently in this epidemic and they were constructing an appliance to lift the arm up and rest the deltoid muscle. He believed firmly in the theory that had been advanced, not to overtire a weak muscle. He remembered that Dr. Lewis A. Sayre used to say that you must not whip up a tired horse and one must apply this to the tired muscle. As regards drop foot, they had to correct that deformity, and in spite of all treatment they were still working on the cases that occurred in the 1907 epidemic. They had given them electricity and massage; they had stiffened joints; and they had implanted tendons. The present epidemic was the most serious they had had, and the orthopedic men were willing to coöperate heartily with the neurologists.

Dr. R. H. Sayre said that it seemed to be taken for granted that the orthopedist did the patient up in plaster of Paris and left to God his improvement. However, the orthopedist made use of all the means used by the neurologist.

Dr. A. H. Cilley asked if the strictures passed upon the health department in not using the services of neurologists were really well taken. Was it true that these services had been offered and refused? He knew of two neurologists that had been asked and they both were away.

Dr. Wm. M. Leszynsky said that he had made the above remarks with deliberation and had every reason for his statements.

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY

OCTOBER 19, 1916

The President, DR. EDWARD B. LANE, in the Chair

THEORIES CONCERNING THE EPIDEMIOLOGY OF ANTERIOR POLIOMYELITIS

By Mark W. Richardson, M.D.

According to the generally accepted theory, infantile paralysis is transmitted through the infected secretions and excretions of patients during the acute stage of the disease and convalescence, or of healthy intermediate carriers. Many of the epidemiological facts, however, do not support such a theory, nor is there reason to suppose that water, milk, or other food supplies are involved in the transmission of the disease. Unlike most contagious diseases, infantile paralysis is least prevalent in the winter, when schools are

open and contact generally is most intimate. The disease occurs most in the summer months, when the opposite is true. In some important respects, the virus of infantile paralysis resembles that of rabies. In the latter disease, although the virus is present in the saliva, a punctured wound is necessary for infection. The disease fails to spread in hospitals or asylums; it is rare among doctors and hospital attendants and unknown among laboratory workers. It does not spread in schools and it reaches its maximum prevalence in the country. The occurrence of more than one case in a family is rare despite the most intimate contact.

That the disease is insect-borne has much theoretically to recommend it. Inasmuch as, however, the disease occurs in the wintertime occasionally, even to the point of small epidemics, such insects as mosquitoes and biting flies can with difficulty be regarded as intermediate hosts. The epidemiology of infantile paralysis has a number of resemblances to bubonic plague and the protection given by the rat to the flea would account for the persistence of winter cases. Indeed, the cat flea curve, as determined by Brues and Lyon, is practically identical with that of infantile paralysis in its seasonal character. Paralyzed animals oftentimes and indeed paralyzed rats rarely have been noted in neighborhoods infected with infantile paralysis. The disease occurs in foci, but its spread is too slow and regular to be explained by human agency. Rats migrate individually and en masse over long distances in comparatively short spaces of time, especially along modern routes of communication. In one instance at least, human cases seem to have had a very definite relation to a particular sewer system. Two children played with a dead rat and came down with infantile paralysis eight and ten days later. Such a history is characteristic of bubonic plague, which is known to be transmitted by the rat and flea.

Animal experimentation with rodents makes it highly probable that if rats are responsible for infantile paralysis only the young rats are markedly affected and they probably rarely reach the surface. Infected fleas, however, from such young rats could easily be carried by healthy adult rats.

Whether the rat and flea theory offers the correct solution for the problem of infantile paralysis will depend upon an immense amount of laboratory investigation. The unsatisfactory character, however, of the older contact theory of the transmission of the disease is becoming more and more established.

EARLY DIAGNOSIS OF POLIOMYELITIS

By Francis W. Peabody, M.D.

With the occurrence of acute poliomyelitis as an epidemic disease, the medical profession has come to regard the disease as an acute general infection, which may or may not involve the central nervous system. In fact, such an involvement may be regarded as a complication. The most important stage is the preparalytic, both from the point of view of the public and of individual treatment. In the epidemic form of the disease, there is generally a prodromal stage of from one to four days before paralysis sets in, and it is in this period that diagnosis is necessary. The symptoms are: (1) Fever. This is almost always present, is generally not high and may be fleeting. (2) The child is drowsy and irritable. (3) Frequently there are gastrointestinal upsets, but these may not be striking. (4) Tenderness on flexion of spine or neck, and a tendency to hold the head back a little. All these symptoms may be very slight, and, when not occurring in the midst of an epidemic, would not necessarily suggest poliomyelitis. During an epidemic, however, it is surprising how often a case is suspected, and the diagnosis subsequently verified.

The most important diagnostic aid is the spinal fluid examination. In the majority of instances, this is pathological. It is generally under high pressure and contains, in their recent series of cases, from 34 to 1,980 cells average about 300) from 60 per cent. to 90 per cent. of which are polymorphonuclear leucocytes. Within a week after the onset of the paralysis, this cell count has diminished, and mononuclear leucocytes have largely replaced the polymorphonuclears, and in two or three weeks the cells disappear. The globulin is slight at first and increases in inverse proportion to the cells up to the third or fourth week.

There are other conditions in which the spinal fluid shows a picture closely resembling that of poliomyelitis, but if stained specimens of the spinal fluid sediment are examined to rule out the various forms of bacterial meningitis, and if the clinical picture is carefully considered, the error in diagnosis will be very small.

Dr. Peabody says the Harvard Infantile Paralysis Commission has had excellent success in using the method of lumbar puncture for diagnostic purposes, and he believes that in the preparalytic stage, it should be done quite generally, especially during an epidemic. When more efficient treatment is found, he believes very general use should be made of this method.

SECONDARY INFECTIONS—RELAPSES—ATTITUDE OF THE LAITY TOWARD THE DISEASE

By Edward W. Taylor, M.D.

According to a recent definite statement by Dr. Flexner, one attack of poliomyelitis confers permanent immunity. Dr. Taylor's personal observation, with a review of the literature, appears to show that this is not necessarily the case. He detailed the history of a boy who, at the age of three, had a typical attack with subsequent severe paralysis, affecting chiefly one leg. He recovered in great measure, with, however, considerable persistent weakness of the affected leg. Three years later he had a precisely similar attack with paralysis affecting chiefly the leg not previously involved. The evidence is strong in this case that the child had a definite reinfection.

In general, the weight of opinion has been against the theory of a secondary infection, following the analogy of certain well-understood infectious diseases, but sufficient cases are on record to render it altogether probable that in rare instances a true second attack may occur. For purposes of classification, cases may be grouped roughly as follows: (1) Paralysis occurring suddenly without definite prodromata or prodromata of a vague sort; (2) acute illness, such as tonsillitis, with apparently complete recovery, followed in a week or ten days by a recrudescence of symptoms and paralysis; (3) relapses, or cases in which the original paralysis is followed in weeks to months by extension of the paralysis; (4) definite second attacks occurring at least one year and perhaps many after the original infection. This last type appears to result from a definite reinfection rather than from a recrudescence of the activity of the virus. Reinfection appears, therefore, in rare instances to be a much more likely hypothesis than the persistence in the body of the original infecting agent and especially is this true of the instances in which years elapse between the two attacks. The case reported by Drs. Osgood and Lucas in 1913 was discussed at some length. In this case there was evidence that the virus was harbored in the nasal pharynx for upwards of two years and appeared to give rise to a secondary attack without reinfection. This case is unique and tends to support the theory that under certain circumstances the virus may retain its activity for long periods of time, even to the point of inducing an apparently secondary independent attack.

In respect to the attitude of the laity, Dr. Taylor pointed out the grave apprehensiveness with which the laity regard the disease, and raised the question of how far it is advisable to curb this attitude. Many believe it wise to take every conceivable precaution, because we know little about the transmission of the disease. We do, however, know much about the disease, though in a negative way. We know there is little evidence in favor of the direct transmission theory by contact, and because we do know this, many of the precautions now taken are absurd. If we really do believe the disease to be highly contagious, we should urge much greater precautions; if we do not believe it contagious, we are inconsistent and are not doing justice to the community when we lay down restrictions in which we do not believe. We should attempt to mould public opinion into accord with our knowledge and beliefs.

OBSERVATIONS DURING THE PRESENT EPIDEMIC

By Edwin H. Place, M.D.

Dr. Place read statistics compiled from 200 cases of poliomyelitis during the present epidemic. Figures regarding incidence according to age showed that 90 per cent. of cases were under 5 years of age, 6 per cent. from 5 to 15 years of age, and 4 per cent. over 15 years. The mortality was highest in the 4 per cent. group, being 45 per cent., next highest in the group of 1 to 5 years, and next highest in cases under 6 months. The total mortality has been 19.5 per cent. The mortality figures were notably higher during the first half of the epidemic than during the second half. Lately it has been 15 per cent. Dr. Place then analyzed the cases according to the site of paralysis. There were 16 cases of facial paralysis, 7 of upper arm alone, 10 of one arm alone, 10 of lower leg, 18 of one whole leg, 20 of both whole legs. In 5 cases the palate was involved, in 2 cases there was both facial and palatal involvement. There were 6 cases of faucial paralysis, one case of abducens paralysis, one of ocular motor paralysis among these cases. There was ataxia without paralysis in 2 cases. Several cases showed spasticity without paralysis. The fifth and twelfth nerves were not involved in this series of cases. There were no polyneuritic cases. Dr. Place spoke of the negative results in the treatment of the disease by adrenalin, horse sera, salvarsanized serum, and diphtheria antitoxin. Of the 16 preparalytic cases which were not treated, 1 developed paralysis. Of 8 cases treated with immune serum 3 developed paralysis. The serum was given in 10 c.c. doses 2 to 3 times in 24 hours. Of 40 cases treated with immune serum, 52 per cent. died; in 33 per cent. there was extension of paralysis, and in 15 per cent. there was no extension. However, chiefly the most desperate cases were treated with serum, which may explain the poor results.

Dr. Robert B. Osgood stated that Dr. Lucas and he had been unable to transfer poliomyelitis from monkey to monkey by most intimate contact. He mentioned a personal case referred to by Dr. Taylor which would seem to show that a child who had harbored the virus in a profuse nasal discharge for several years had transferred it to his sister through contact from bed linen soiled by the nasal discharge. While believing thoroughly in the wisdom of taking every precaution against contagion by contact, he said he saw no reason why we should forsake an impression gained by years of clinical experience, that the disease was rarely contagious in the ordinary sense. He emphasized the needlessness of many of the deformities following poliomyelitis if preventive measures were instituted and urged early orthopedic supervision for the prevention of these deformities.

Dr. Eli Friedman spoke of the importance of the examination of the

spinal fluid in poliomyelitis. An increased cell count with prodromal symptoms present, though not pathognomonic of the disease, is as good a reason for isolating a case of poliomyelitis as is the argument for isolating cases supposed to be diphtheria on account of diphtheroid bacilli in the nasal discharges, until the non-virulence of the organisms is demonstrated. He suggested two explanations of the poor results obtained with serum treatment, mentioned by Dr. Place. First, it is given too late, he thinks, and secondly, it does not come into contact with the gray matter of the cord, where it is needed. Whenever any foreign substance is injected into the spinal cord, an increased meningeal reaction is noted, but this is entirely local. Dr. Friedman recited a case in which respiratory paralysis had apparently been checked by an intraventricular injection of serum.

Dr. H. F. R. Watts, who has been seeing a large number of cases for the Boston Health Department, in discussing the value of lumbar puncture as an aid to diagnosis, pointed out that suspicious cases, children who have been febrile for forty-eight hours, showing no paralyses and whose lumbar fluid yields a cell count of forty or fifty per cubic millimeter, cannot rightly be labelled poliomyelitis, inasmuch as a considerable number of such children recover completely, leaving no trace of paralysis. Possibly they belong to the class of the so-called "Abortive Type." This term, however, is too vague to merit a place in scientific classification until we have some laboratory means of establishing the presence or absence of the disease irrespective of the occurrence of paralysis. Dr. Watts believes that at the present time the diagnosis cannot be established in the absence of paralysis.

Dr. George A. Waterman considered the question of attitude raised by Dr. Taylor a most important one. He thinks that inasmuch as the evidence points so strongly against contact infection, it is absurd to place such rigid restrictions on communities. He told of a recent experience of his in Maine, where the extremes of apprehension had led to serious results, which as told were very humorous.

Dr. John L. Morse considered the arguments against the contact theory better than the arguments in favor of the rat-flea theory. He believes it can not be assumed that an increased cell count without other evidence of poliomyelitis is sufficient for diagnosis. He has seen rigidity of the neck and spinal tenderness more often in this epidemic than ever before. Decrease in cells of the spinal fluid and no paralysis after serum treatment does not prove the serum has cured, for many cases evidently poliomyelitis have recovered without serum and without paralysis.

Much should be done by the medical profession to minimize the dangers of this disease and chance of infection, and to stop the hysteria so spread by the newspapers. He advises wealthy people inquiring what preventive measures to take, to remain in uninfected areas. On the other hand, those people who must remain in infected areas should allow their children to attend school.

Dr. P. C. Knapp stated that of 250 cases in the South Department of the Boston City Hospital, mentioned by Dr. Place, there were only four instances in which it attacked more than one member of the same family. He considered the contact theory well disproved by Dr. Richardson, but his rat-flea theory was not well established. Fleas bite us all, but this disease attacks children almost wholly. Moreover, no one has ever explained why infantile paralysis, known for more than forty-five years, has become so virulent in the world in the past decade, or why epidemics of poliomyelitis have not occurred among the Latin peoples. There had certainly been much hysteria with both the medical profession and the public in dealing with this epidemic, as shown by the attitude taken in regard to the schools and the senseless and useless methods of quarantine.

Periscope

MISCELLANY

THE REACTIONS OF THE MELANOPHORES OF AMBLYSTOMA LARVÆ—THE SUPPOSED INFLUENCE OF THE PINEAL ORGAN. Henry Laurens. (Jour. Exper. Zoology, Vol. 20, No. 2, 1916.)

Laurens's study attempts to obtain some light upon the relation between the physiology of the pigment cells and the nervous system. The reactions to various stimuli of the chromatophores of many animals are too diverse to admit of a general rule. Therefore he confines himself to the reactions to light and to darkness of the melanophores of *Amblystoma* larvæ. He cites Babak's ('10) explanation of the results of his observations of the behavior of these melanophores. Those of seeing larvæ contract in diffuse light, while those of blinded larvæ expand. In darkness the reaction is just the reverse. These observations were recorded from larvæ in which the retinæ had reached a certain stage of development, so that he concluded that the contracting and expanding are governed by the central nervous system, conditioned, however, by the effect of the retinæ upon the nervous system which differs in light or darkness, the retinæ being still positively active in darkness, but of course inactive when destroyed. In each case of the active influence of the retinæ the impulse originating in them is strong enough to overcome the opposite tendency of the chromatophores to react directly to the stimulus of light and darkness, causing thus expansion instead of contraction in the dark, and contraction rather than expansion in the light (pathway of opposites). Fuchs ('14) objects to these conclusions chiefly on the basis that the condition of expansion is one of rest and no matter what the origin of the tonus, the condition of contraction is one of tonicity. This stimulus he thinks arises probably from products of inner secretion, perhaps of the parietal organ, the presence of which only experiment can prove. The melanophores contract under the influence of the internal stimulus, when external stimulus such as light is removed, but light applied to the parietal organ itself inhibits this contraction and expansion results. The gradually developing power of the retinæ over the pigment cells finally overcomes the inhibitory influence of the parietal organ, so that the melanophores are contracted in light. Blinding the larvæ restores complete control to the parietal organ and expansion results. This theory would claim that the pigment motor function of the eyes is developed merely to counteract the effect of the parietal organ, disappearing after this has been accomplished.

Laurens therefore directed his experiments first of all to discovering whether the parietal organ does exert such an inhibiting influence upon the melanophores of young larvæ, which later disappears under the influence of the pigment motor function of the eyes, but still exists in eyeless larvæ. It was found that the parietal organ as such does not exist in *Amblystoma*. Nevertheless in this region of the brain though the epiphysis even was but poorly developed, there might be a "center," the stimulation of which would have an inhibitory influence on the melanophores. Experiments were carried to final success which gave evidence of the response by expansion of the melanophores to direct stimulation by light wherever they were locally stimu-

lated. On the other hand, no expansion of the melanophores over the whole body followed the throwing of a beam of light upon the region of the epiphysis of the normal seeing or of eyeless larvæ. Expansion merely of the melanophores illuminated by the beam of light was the result whether the epiphyseal region of the head or the brain itself was exposed to illumination, or even when the central nervous system had been completely removed. It is shown thus conclusively that the expansion of melanophores of the larvæ of *Amblystoma punctatum* caused by light are due rather to the direct stimulation of the pigment cells themselves than to the inhibitory action of the nervous system, although this assists in producing the expansion, as it does in the contraction of the melanophores in darkness. For it is found that the reaction time of the normal larvæ is shorter than that in those deprived of their eyes. The relative anatomical insignificance of the epiphysis in the Urodeles would exclude its influence upon the melanophores. Its higher development in the teleosts and particularly in the reptiles suggests its influence there, but experiments by Von Frisch led to the conclusion that there are light-perceiving cells in the region of the diencephalon, which function as an inhibitory center, and that these may be more numerous in the parietal organ. It is, however, a question for future research how far in other animals the parietal organ influences the pigment cells. The nervous system, Laurens says, certainly exerts an important influence upon the chromatophores of any animal, conditioned for the most part upon the eyes, which play a very important part in the color changes of many animals. He believes that it is the general function of the chromatophores to expand under illumination and contract under darkness. But various environmental conditions, psychic factors, and the like, acting through the nervous system reverse the reaction to a light stimulus and contraction results. Contraction in darkness may be due to chemical causes or in some cases to a simple relaxation, while expansion of the melanophores in darkness is probably due to lack of the nervous impulse set up in light. The reactions of the chromatophores to light is probably adaptive, in regard to the color and intensity of the animal's background. Hence the pigment cells must be under the control of the eyes through the nervous system. Where the pigment cells do not show the primary reaction of expansion in light of ordinary intensity, but contraction occurs, the eyes have exerted a controlling regulatory influence, for adaptive reasons.

Laurens summarizes briefly:

(1) The epiphysis of *Amblystoma punctatum* larvæ has no influence on the reactions of the melanophores to light and darkness. There is no parietal organ.

(2) The view is expressed that the reaction to light of ordinary intensity of the pigment cells in the skin of animals is to expand. When this does not take place it is due to the controlling regulatory influence of the eyes.

(3) The reactions of the chromatophores are believed to be adaptive in that they either respond to the relative intensity of the light or to the color and intensity of the background.

(4) The control over the melanophores which the eyes possess is, of course, most important, for by this means the reactions of the melanophores are able to be adaptive.

(5) Indirect stimulation of the melanophores through the eyes is not by any means always opposite in effect to direct stimulation, but only so when the conditions are such that it is necessary that the chromatophores contract in the light in order that the reaction be adaptive.

JELLIFFE.

TORULA INFECTION IN MAN: SUMMARY. James L. Stoddard and Elliott C. Cutler. (Monograph Rockefeller Institute, No. 6.)

The authors find, in their attempt to distinguish the various diseases included in the term blastomycoses, that coccidioidal granuloma was one of these to be distinctly separated clinically, pathologically and biologically. Their experiments bear out the evidence of the biological distinction worked out by Wohlbach, and MacNeal and Taylor, who described the life cycle of the organism of dermatitis coccidioides, never present in the other cases; also those of the clinical differences contained in the summaries of Ophuls, Ryfkogel, Hektoen, and Brown and Cummins. The lesions produced by *Coccidioides immitis* are not to be easily confused with those of blastomycosis, or torula infection.

The literature in regard to the blastomycoses gives two cases of skin and general infection produced by a true yeast, with endospores in culture. Both cases were observed by Buschke, and appeared to be distinct from the American cutaneous disease. Frothingham had discovered torula infection in a horse, which indicates another type, one not yet reported in human beings.

The early study of blastomycosis probably revealed such cases as are described here, but their nature was not recognized, for the authors' cases are distinct in their clinical histories and pathology. They found that nearly all the cases of systemic blastomycosis were similar to each other, as far as they could find from the printed reports, except those involving the brain. Among these there were obvious differences. First there were six cases like the other systemic cases, but in which the brain became involved as part of the general infection, which included skin manifestations and often bone lesions. The symptomatology was not perceptibly influenced by the brain lesions. The pathology of the brain lesions resembled that of the other lesions. Then there were four cases in which there were no skin lesions, but in which a general infection occurred with brain lesions which caused the predominating symptoms. Pathologically the lesions were distinct in many ways; but principally in the extension by solution of tissue, the always chronic reaction, and the production of a gelatinous material in the lesions.

The first case was evidently identical with the latter group. The second case could not be identified through the literature alone, because of the absence of the peculiar intracerebral lesions, and the greater number of small forms in which the parasite occurred. Such forms occurred in the meninges of the first case, but not in the intracerebral lesions, and were not described in the literature. The two cases, however, were proved to be alike in origin, by producing experimental meningitis in a mouse through the injection of a culture of the ventricular fluid from the second case, when large organisms were produced, identical with those of the first case, and intracerebral lesions of the same type were seen in process of formation.

The animal experiments with torula resulted in the production of all the variations in lesions and organisms seen in the cases. Both forms of the parasites were present in the lesions in varying proportions according to the extent and activity of the process. In a very active lesion enormous numbers of small organisms similar to those of the second case occurred; these were seen especially in the meningeal lesions. In older lesions, tending toward recovery, or in those slowly progressing, and in the higher animals, the larger forms predominated. In sections of the original horse lesions small forms are entirely absent. These experiments thus provided the necessary steps for the clear correlation of all the human cases as cases of torula infection. Frothingham's case was evidently the type of infection of these cases. With the three organisms studied there were no lesions where confusion as to the cause could exist after careful examination. Each variety of organism had

a characteristic appearance in the tissues. The consideration of the histology and the distribution of the lesions, also, contributes enough factors to make full identification possible. Many other cases probably exist in nature not yet studied, for which other forms of torulæ or yeasts may be found. The present classification aims merely to prevent confusion and to make clear the distinctions possible up to this time. The term blastomycosis has resulted in confusion of different diseases in the past and will continue to do so if used in the future, on account of its insufficient biological significance. Oidiomycosis is the proper name for the diseases occurring near Chicago and caused by the organisms budding in tissues and producing mycelium in cultures. Torula infection, coccidioidal granuloma, and yeast infection sufficiently designate the other diseases studied.

JELLIFFE.

CLASSIFICATION OF NERVOUS DISEASES. S. E. Jelliffe and W. A. White. (Journal A. M. A., March 11, 1916.)

The authors suggest that the present classification for nervous diseases in our textbooks is somewhat unsatisfactory, especially in the division of nervous and mental diseases, as not properly showing the interrelation of the two. Recent developments of physiology and internal medicine show the way to the needed change. Reference is made to the development in knowledge of the vegetative nervous system and the endocrine glands which have served the twofold purpose of bringing the several functions of man into a closer knit harmony and at the same time correlating that harmony with the manifestations of the organic activities as found in the lower animals. This last, they say, has been the result because the developments have had to do with what are called lower, simpler or, more properly, phylogenetically older forms of activity or forms of reaction. The expression "phylogenetically older" is the key to the principle of the classification which has long governed in the biologic sciences, the simpler and older merging by insensible gradations into the more complex and more recent. After a long period it can now be perceived from our physiologic data how the integration of the human unit as a whole has come about, and Sherrington has illustrated how this integration has been accomplished through the nervous system "in the simple reflex with its innervation of agonists on the one hand and antagonists on the other, and the channeling of final common pathways for nervous discharge. The conflicting tendencies, the ambivalency, the path of opposites—the final issue in high integrations made possible by tension of reciprocal innervations at sensorimotor levels—is found also to be the rule in the vegetative nervous system, that phylogenetically older division, with its double set of pharmacodynamically demonstrated opposed elements mediated, at least in part, by equally opposed, exciting and inhibiting chemical substances secreted by the endocrine glands, the hormones. Finally, an analogous ambivalent mechanism is seen working at the highest, the most complex levels, the psyche, which determines conduct with the assistance of the phenomena called consciousness, in which a psychologic symbolism is found replacing sensory and motor neurons, and exciting and inhibiting hormones." The nervous system may be divided into these three levels of activity, the vegetative or physicochemical, the sensorimotor and the psychic or symbolic. The lowest and earliest biologic activities are physical and chemical, and the portion of the nervous system controlling them can be classed with the vegetative nervous system and that part of neurology concerning them be properly designated as visceral neurology. Here we find the disturbances of the glandular, gastro-intestinal, genito-urinary, vascular, respiratory, muscular, cutaneous and bony systems, also certain complex clinical groups involving mostly the

glands of internal secretion—the endocrinopathies. These have been largely studied in recent times, especially in connection with what are usually reckoned as other specialties of internal medicine, but can be adequately explained only through visceral neurology. Some parts of this field are yet but little elucidated and some are only known as symptoms in other systems, and much that is false is now being taught in regard to them. Sensorimotor neurology is that part of the general subject which is usually considered as if it included the whole. The field is pretty well cultivated and the classifications pretty well accepted. The third, the psychic level, is the most complex. Its function is no longer simply one of integration of the various parts of the individual, but has to do with the relation of the individual as a whole to his environments. It has been usual heretofore to consider only the phenomena of consciousness regulated by intelligence, but the error of the psychologists has been to suppose that the matter stopped here. It has been clearly well established that lying back of consciousness is a broader and more important territory furnishing motives of conduct, and the greatest deficiency in the psychology of the last century has been the neglect of the importance of the unconscious. With the help of the hypothesis of the unconscious it has come to be recognized that the psyche has its embryology and its comparative anatomy just as the body has; in short, its history which must be utilized. The two concepts of body and mind have originated from the nonrecognition of the unconscious, but now it has come to be recognized that the psyche is the end-result of an orderly series of progressions in which the body has used successively more and more complex tools to deal with its integration and adjustment. The hormone is the type of tool at the physicochemical level, the reflex at the sensorimotor level, and finally the symbol at the psychic level.

Taste, Peripheral and Central. Kappers. (Psychiatrische en Neurologische Bladen, 1914, Nos. 1, 2.)

Kappers has been able, in his own researches and those of others, to follow the course of the taste organs in their distribution and development throughout the vertebrate series. Experiments show a very close relationship between the tactile and taste sensations. This functional correlation forms a basis for demonstrating the anatomical structure which serves the taste sensibility, both peripherally and centrally. The sensory taste fibers arise from the facial, glossopharyngeal, and the vagus. The vagus in man is much limited in the taste area, while a few fibers of the superior laryngeal are also concerned. In lower forms the vagus and glossopharyngeal innervate the caudad portion of the mouth cavity and the gill pockets, where these are present. The glossopharyngeal is acceded by all authors as the nerve supplying the hindmost third of the tongue and the pharynx in man. But the innervation of the forward two thirds of the tongue is still a matter of controversy. It is claimed by some that the trigeminus, fifth, supplies the proximal taste area. However, there seems to be more abundant evidence in favor of attributing this function to the facial nerve. This evidence can be followed in the lower vertebrates where the wider distribution of the taste buds, particularly in fishes, gives opportunity to observe the anatomical correlation of touch and taste. It is found that hypertrophy of the proximal area accompanies hypertrophy of the facial but never of the trigeminus nerve. Where taste buds extend over various parts of the body it is again the branches of the facial rather than of the trigeminus that are likewise extended. Again atrophy of the taste area in birds is accompanied by atrophy of the seventh sensory root. Moreover, the peripheral course of the proximal fibers is generally accorded to the chorda tympani, and this receives its fibers from the facial ganglion, the ganglion geniculi, the cells of which do not

appear to send fibers into the trigeminus. Also, the chorda tympani is derived from the facial branch in the lower vertebrate series. There is, however, a close relation demonstrable between the peripheral sensory fibers of the trigeminus and of the facial, that is, between the tactile fibers belonging to the fifth, and those of taste belonging to the seventh. It has been proved that the tactile sense, the general chemical sense, and taste are so correlated that a disturbance of the first two must cause disturbance of the third as well. Moreover, disturbances of taste that arise from excision of the gasserian ganglion or paralysis of the trigeminus are more or less secondary in nature and may result from failure of supporting reflexes, and are therefore no evidence of innervation of the taste area by the fifth nerve. The peripheral correlation of the tactile and taste fibers can be traced to the descending fifth root, where fibers of the seventh, ninth and tenth join this root in the medulla oblongata. The seventh, ninth and tenth sensory roots are found to be composed of three parts, sensory skin fibers, sensory mucous membrane fibers and taste fibers. The peripheral correlation of these fibers also finds throughout the vertebrate series its analogous correlation centrally. The skin branches also join themselves in the medulla oblongata to the descending trigeminus root, while also the mucous membrane fibers and those of taste can scarcely be separated from one another centrally. It is in the medulla that all of these fibers are united and which is thus the taste center, where the taste fibers are localized, for higher as well as lower vertebrates. The dorsomedial nucleus of the medulla is particularly this taste center, and is most highly developed in mammals, where the tongue is most perfected as the organ of exploration, while it is absent in those forms without a tongue and but little developed where the tongue serves only to a slight extent as the organ of taste.

JELLIFFE.

HEMIPARESIS. H. Crenshaw and C. M. Remsen. (Journal A. M. A., January 22, 1916.)

A rather interesting case of hemiparesis, ataxia and astereognosis, associated with arachnoidal edema, is reported by the authors. The patient was a man, aged 49, who had had suppurative otitis fifteen years before and had been a hard drinker in former years. About eighteen months before coming under their care he had been suffering from dizziness, which became so severe that he fell, striking his head and rendering him unconscious. The fall ruptured an abscess in the left ear in which the previous one had occurred and he was taken to the hospital, where he gained strength and was able temporarily to return to work. The symptoms came on again, however, with severe headache, occasional nausea and vomiting, impairment of sight and memory and muscular spasm in the limbs. The stereognostic sense was deficient in the right hand but there was no anesthesia. Laboratory investigation was uniformly negative. A diagnosis was made of a lesion on the left side of the brain involving the motor area for hand and leg. The dizziness, headache, etc., indicated increased pressure, but the eye grounds did not show it. It is thought an accumulation of fluid existed on the left side as far forward as the prerolandic region and backward to the angular gyrus. Brain abscess was suggested, but a diffused cyst was more confidently expected. Finally a localized traumatic meningitis was considered and exploratory craniotomy revealed chronic leptomeningitis, arachnoidal edema and pseudocystic formation, associated with superficial focal cerebritis, situated principally on the posterior border of the rolandic fissure. The edema was relieved by multiple scarification of the outer leptomeninges and a small temporary drain inserted. The convalescence was uneventful and the patient left the hospital on the seventh day and has since returned to work.

Vomeronasal Nerves and Accessory Olfactory Bulb in Opossum and Mammals. R. E. McColter. (Anatomical Record, Vol. 6, No. 8.)

It will be seen from the author's descriptions of the accessory olfactory bulb that it is a ganglionic mass for the reception of fibers from the vomeronasal organ of Jacobson and that centrally it gives off fibers that join the lateral olfactory tract. It is entirely separate from the olfactory bulb, though it is contiguous to it, being always situated on its dorsocaudal surface. Its size varies directly with the size of the vomeronasal organ.

It is evident that Balogh's "Jacobson's hill," Smith's "Ganglion of Jacobson's organ," Döllkin's "Ganglion terminale," and probably also Herricks's "median ganglion mass in reptiles" are the same thing as the accessory olfactory bulb.

The olfactory nerve filaments may be divided into two distinct groups: (*a*) ordinary olfactory fibers, terminating in the olfactory bulb; and (*b*) vomeronasal fibers, terminating in the accessory olfactory bulb. It is probable that a third group may be added to include the nervus terminalis, the description of whose central connections are entirely different from either of the first two groups.

Throughout the text of this paper an effort has been made to conform to the nomenclature that is at present in most general use. The reviewer suggests, however, the substitution of the term "tuberculum vomeronasale" in the place of "bulbus olfactorius accessorius." We would then have the vomeronasal organ, the vomeronasal nerve filaments and the vomeronasal tubercle as the component parts of this apparatus.

Jelliffe.

A Further Analysis of the Hereditary Transmission of Degeneracy and Deformities by the Descendants of Alcoholized Mammals. II. Charles R. Stockard and George Papanicolaou. (American Naturalist, February, 1916.)

Some very significant results have been obtained from the authors' experiment now continued for more than five years in regard to the influence upon the offspring of alcoholizing either or both of the parents. It is demonstrated with guinea pigs that the parental germ cells are so affected chemically that they are no longer capable of producing normal offspring. The fact that the great grandchildren, *i. e.*, the F_3 generation, are more decidedly injured than the F_1 offspring, suggests that it is the chromatin, the bearer of hereditary qualities, which is pathologically affected.

The study then is one of diseased chromatin in heredity, and the light obtained here upon chromatin activity may illumine the normal methods by which complex developmental and structural changes consistently recur from generation to generation. In the F_3 animals there is almost without exception incapacity for reproduction and there are many other indications of degeneracy and subnormality. Inhalation of alcohol, the method of experiment that has proved most practicable, seems to have had little effect upon other tissues, none that interferes with activity. The chromatin, therefore, is the object of the pathological injury, as is manifest through the quality of the offspring and the cumulative pathological effect. The descendants of alcoholized males include a larger proportion of degenerate paralytics and grossly deformed individuals than those from females, *i. e.*, the spermatocytes or spermatozoa respond more acutely to the changed chemical condition of the tissues. Comparison with the results of normal controlled matings reveals in the offspring of the alcoholized a disproportionate occurrence of abortions, deformities, early death of the young that do reach full term, and a progressive accumulation of these results, while sterility begins to manifest itself in those which survive.

The structural defects are confined chiefly to the central nervous system and special sense organs. There are frequently present gross tremors, paralysis agitans; paralysis of the hind legs, fore legs or both legs of one side; eye defects, as opaque cornea, opaque lens, monophthalmicum asymmetricum in varying degree, and there have been cases of complete anophthalmia and entire absence of eyeballs, optic nerves and optic chiasma.

The alcoholic effect accentuates the difference in strength present also in normal animals between members of large litters or small. The alcoholic effect is intensified by inbreeding, whether or not, on the other hand, inbreeding is an ill in itself.

It is very significant that female offspring of alcoholized males suffer more seriously than male offspring, while the reverse is also true, that male offspring from females are more affected than females, and this distinction in inferiority is consistently manifest in the female and male offspring of further matings of affected individuals. This seems to confirm the theory of the heteromorphic existence of the chromosomes in the spermatocyte, which distributes one form of chromosome to the spermatozoa which will determine the female sex and the other form to those determining the male, and the further theory that the ovum contains homomorphic groups of chromosomes. Thus from the alcoholized father a greater amount of pathologically affected chromatin is brought to the normal chromatin of the ovum and the resulting female offspring are more seriously affected than the male to which a smaller amount of pathological material was contributed. In the same way on the other hand, the ovum which contains the pathological material receives a larger proportion of normal chromatin in the spermatozoön which produces the female than is brought in the male-producing spermatozoön. The possibility of an unequal distribution of chromosomes in the female ovum is a complicated question reserved for further investigation.

The data here furnished are of great importance in demonstrating the transmission through several generations of artificially induced changes in the germ cells of one generation, and in the questions of the pathological behavior of the chromosomes as well as the differences in behavior between the germ cells containing heteromorphic chromosomes.

JELLIFFE.

ACTION OF EPINEPHRIN ON SECRETION OF SWEAT. Muto. (Mitth. Med. Fak. Tokio, May 27, 1916.)

Muto's sixteen mostly two-page charts show the increase in sweat production when epinephrin, atropin, chloral or pilocarpin was injected intravenously or subcutaneously into twenty horses, four sheep, three calves and two cats. Photographs are also given showing the pools of sweat under one of the horses under the influence of epinephrin, and the pool of saliva under pilocarpin. He collected the sweat with a large funnel-shaped leather bag extending under the entire body and neck of the horse. The total amount of sweat from one horse under the epinephrin was 1,230 c.c. The research was undertaken to ascertain whether or not the sweat glands are innervated by the sympathetic system exclusively. The findings indicate that both the sympathetic and the parasympathetic systems are involved. The latter predominates in man, cats and cattle, while the former is chiefly involved in the horse and sheep.

PSYCHOPATHIC CLINIC. Stewart Paton. (Journal A. M. A., March 11, 1916.)

The city's need of a psychopathic clinic is put forward by Stewart Paton, Princeton, N. J. The best practical illustrations of such institutions are the Henry Phipps Clinic in Baltimore and the Psychopathic Clinic in Boston,

which is closely affiliated with Harvard University. These are modern hospitals in the fullest sense of the word. The old asylum no longer exists in the modern conception of psychiatry. As to the reason for their establishment, he first quotes the statistics of the numbers of patients in hospitals for the insane and of their necessary cost which in the same period of time would call for the expenditure of $150,000,000 more than the sum expended in building the Panama Canal. When we add to this the expenses incurred in the prosecution of persons of unsound mind, there would seem to be ample reason for the support of any measure that would diminish the number of these dependents. Psychiatry, Paton says, has not received the attention it deserves from the medical profession and public. It is a field practically unstudied and unknown by the great majority of physicians. Patients with psychoses come under observation through failure to recognize the initial symptoms only at an advanced stage of development of their disease, and if the conditions were allowed to continue the menace to us as a nation will become greater than that of war. We must attack the problems from a point that gives us some prospect of success. Paton's experience at Princeton University has convinced him that teachers should be trained to attack the problems of education from the broad biologic and not the scholastic point of view. He has had the privilege of talking to students who have had difficulties in adjusting their lives satisfactorily, and in a small university community the number was a large one. It has brought to his mind as nothing else could the necessity of the practical realization of the fact that life is a process of adjustment, and education should be a process of assisting human beings to the successful adaptation of their activities. Many of us use the phrase "life is a process of adjustment" without appreciating its applicability to the activities taking place in the higher levels, such as consciousness. All our conscious activities are mechanisms for adjustment, and if we desire to understand the human machine we must be familiar with the functions of the different organs, analyze the mutual relationships and finally study the integration of the different functions as shown in behavior. Many of the interesting cases of "forgetting" which we observe illustrate the intimate dependence of the higher on the lower level. The experiences in the study of abnormal phenomena may be largely utilized in solving the great problems of civilization, and there should be better opportunities offered to physicians for applying the facts discovered by experiment in regard to the nature of the mechanisms conditioning the emotions to assist in the interpretation of human behavior. The establishment of a psychiatric clinic not only aids the study of the abnormal mind but marks an intelligent desire to study human beings. Paton thinks that it will be one of the aids in remodeling our entire educational system, and he asks, Is not the present crisis one in which civilization is paying for man's failure to take an intelligent interest in the study of his own activities?

Epsom Salt in Tetanus. S. J. Meltzer. (Journal A. M. A., March 25, 1916.)

After some theoretical considerations in regard to the phenomena of inhibition, S. J. Meltzer, New York, describes his results from his studies of the inhibitory action of magnesium sulphate. After a long experience, he says he can say to-day that the dominant action of magnesium salts on the living body, no matter how administered, is depression or inhibition. Chemically, calcium and magnesium are closely related substances but biologically they are strikingly antagonistic, and he repeats his explanation of this fact, as given at the international physiologic congress in Groningen (1913), which assumes that the magnesium solution introduced into the lymph bathing the synaptic membrane connecting the motor nerve and muscle interrupts the passage of

nervous afferent impulses from one neuron to the other. Moreover, the synaptic membranes between two neurons offer less resistance to the entrance of the magnesium solution than the more solid membranes between motor nerves and muscle, and the same is true of calcium, which interrupts the obstructing and inhibiting magnesium. When the magnesium, however, has by a long presence in the lymph managed to enter the nerve cell the calcium cannot readily dislodge or neutralize it. He has studied the effect of magnesium salts on animals and to a considerable extent also on human beings by different modes of administration: by intravenous, intraspinal, intramuscular and subcutaneous injections. In all the effect is depressing. The effect is rapid but of short duration in intravenous application and when so used it must be guarded against possible harmful incidents. The action of an intraspinal injection sets in fairly early and may last even more than 24 hours. Intramuscular injections have a fairly early attack of comparatively short duration. Subcutaneous injections act slowly, but have a cumulative action. Soon after the publication of the inhibitory action of magnesium salts, reports of its use in cases of tetanus began to appear. Study of the literature has convinced Meltzer that in many instances the writers were unfamiliar with the pharmacologic principles underlying the use of the salts, or with their contraindications or indications, and that their conclusions were hastily and uncritically drawn. In the following, he lays down some rules for the employment of magnesium salts in tetanus: There are advanced and dangerous forms that cannot be cured and the treatment of tetanus by magnesium in no way precludes the use of antitetanic serum. He says: "The best general plan for treatment of tetanus would seem to be as follows: In each and every case of tetanus, 1.2 c.c. of a 25 per cent. solution of magnesium sulphate should be given by subcutaneous injection three or four times a day throughout the entire disease. When the disease is complicated by severe tetanic attacks, 1 c.c. of a 25 per cent. solution for every 10 kg. (20 pounds) body weight (in adults) should be given by the intraspinal method. When the disease is attended by immediately dangerous tetanic complications, from 2 to 3 c.c. per minute of a 6 per cent. solution of magnesium salts should be given then by an intravenous injection until dangerous symptoms, or the respiration becomes shallow or too slow When the respiration seems to become impaired in consequence of the administration of magnesium salt by the intravenous, intramuscular or subcutaneous methods, calcium chlorid should be injected in the manner described above. It is advisable to have at hand an apparatus of intrapharyngeal insufflation ready for use, whenever the respiration becomes slow or shallow. Finally, the simultaneous treatment by antitetanic serum should not be neglected."

Brachial Plexus Paralysis. William Sharpe. (Journal A. M. A., March 18, 1916.)

The author discusses the subject of palsies from injury to the brachial plexus which are frequent at birth and are also produced at all ages by traumas. He describes the anatomic conditions, and says the types of brachial plexus paralysis depend on the site and extent of the injury of the nerve roots. Total paralysis of the arm persisting for a year after birth indicates an extensive injury involving the whole plexus. The nerve roots are either completely severed or are torn so as to involve those that are not injured in the adhesions that follow, and these fibrous tissue formations make the results of surgery problematic. There are many variations of incomplete arm paralysis. The upper arm type is the most common, in which the trouble is due to a lesion of the fifth and sixth cervical nerve roots near their union, with frequent involvement also of the seventh root. The lower arm type is very infrequent alone, and is usually associated with the upper arm

type in varying degrees. In it the hand and some of the forearm muscles are paralyzed by a lesion of the lower nerve roots of the plexus and there may be ocular symptoms from involvement of nerve fibers of the sympathetic. Then there are mild types of the brachial plexus paralysis from overstretching of the roots, with only a small amount of connective tissue formations Various degrees of awkwardness may be the only clinical symptom. The atrophy of the arm muscles is rarely as extreme as that occurring in the severe form of infantile palsy. The impairment of sensation varies, and anesthesia and even marked hypesthesia is unusual. Dislocation of the shoulder joint is a common occurrence, and Sharpe contends that it is to be differentiated from the cases of brachial paralysis due to lesion of the plexus. It is frequently said that brachial birth paralysis is cured either by immobilizing the affected arm and elevating the adjacent shoulder or by reducing the shoulder dislocation and treating the arm and shoulder. This may be true in the mild cases mentioned, but he thinks that a total paralysis indicates operative treatment at one month and gives his reasons as follows: (1) The child will stand the operation at that age better than at an earlier date, and as well as at any time several months later Little if any anesthesia need be used at 1 month of age, and, in most operations on children under 1 year of age, the danger of the anesthetic is the greater risk. (2) The earlier the anastomosis of the nerve roots, the more perfect the union of the nerve fibers and consequently a greater improvement ultimately. (3) The earlier the operation, the less the formation of fibrous tissue, so that the operation of plexus exposure and nerve anastomosis is less difficult technically. The surrounding connective tissue resulting from the rupture of the plexus and the neighboring tissues with the associated hemorrhage of varying degree, and so forming the future scar tissue, can at this early date be dissected away with comparative ease and safety. Less resection of the nerve ends is necessary to remove the fibrous tissue formation and future scar tissue within the nerve sheaths—a very discouraging factor in peripheral nerve anastomoses after long duration and the one most frequent cause of poor results. (4) There is little or no retraction of the nerve ends at 1 month, but it may be considerable later. In one case he was obliged to bisect the clavicle to expose the distal nerve end in the axilla. The exposure of the brachial plexus is made by a transverse skin incision in one of the natural horizontal folds or creases of the skin just above and parallel with the upper border of the clavicle. The technic of the operation is described in considerable detail. It is only within the past year that he has had the opportunity to operate at the age of 3 months or younger. All his patients before that were over 1 year old. The children operated on at 3 months of age made excellent recoveries, but if they had been operated on at 1 month, still better success would have followed. The operation itself is not a dangerous one, and he has had no deaths in his series of fifty-six treatments. He offers his article to emphasize the advisability of early diagnosis and anastomosis and early repair of the injured brachial plexus, with the knowledge that unless the injured nerve roots are so treated, a normal arm cannot be obtained, whereas with the early operation, the child has the chance of a useful arm, or at least of an improved one.

Bullet Lesion of Cauda Equina. G. B. Hassin, K. L. Johnstone and A. M. Carr. (Journal A. M. A., April 1, 1916.)

The authors remark that while gunshot wounds of the cauda equina may be a frequent occurrence in time of war, they are unusually rare in time of peace. The literature of gunshot wounds of the cauda equina is very scanty. The authors report a case of a man, aged 28, who had been shot in the back six years before. At the time an operation to remove the bullet was at-

tempted but failed, but his suffering was such that he had made five different requests for another trial, but the operation was refused. The pain was felt in the left lower extremity from the buttock to the toe, and occurred about every five or ten minutes. In addition to the pain he felt weakness in the left foot, beginning about ten months before, which made him afraid to walk on a slippery day. He was paralyzed in both lower extremities immediately after receiving the wound, combined with anesthesia and loss of sphincter control and a month later cystitis developed, persisting for two years with loss of sexual power. Latterly he had been able to walk. The earlier symptoms were probably due to a traumatic myelitis, but later he presented a picture of lesion of the cauda equina, somewhat peculiar in some respects. The operation was followed by numbness in the genitals, buttocks, about the anus, and retention of urine for about six days. Four weeks after the operation the wound cleared up and for about seven weeks there was severe pain in the leg which gradually disappeared, and two months after the operation the gait became practically normal, the atrophied muscles increased in volume and he was so much better that he insisted on resuming his work. The bullet was lodged in the upper portion of the cauda where all the roots are massed together. Some of them, however, were not involved. It was lodged within the canal, its neck having been caught and surrounded by the dura and two large solid scars were compressing the latter. It is suggested that they may have been the cause of the symptoms more than the bullet itself. The remarkable improvement in the case is worth noting, especially so, considering the lapse of time since the injury. There is only one case that is at all comparable found by the authors, one of Raymond's, but in that the injury had existed only three months, and the operation was less difficult.

Emotional Glycosuria. F. S. Hammett. (Journal A. M. A., May 6, 1916.)

The author gives a summary of the recent literature of emotional glycosuria since Cannon and others demonstrated that glycosuria was produced in animals from emotional excitement in the form of pain, fear or rage, and reports his own investigation of the subject with different stimuli. The different types of stimuli studied were four. The first was the effect of participation in a decisive football game, in which it was found that nine out of the seventeen subjects developed a glycosuria. A second type of disturbance was the effect of watching the game with a possibility of participating. Six of the seven substitutes developed glycosuria. The third type of excitement was observation of the game without prospect of participating. Six of the thirteen spectators examined developed the condition. The fourth and last type of stimulus was a short but difficult written examination given to first year medical students, and sugar was found in eleven of the twenty-seven examined. That of every one of the subjects tested was free from sugar before the test had been demonstrated. Hammett believes that physicians in general should recognize this potentiality and not rely on diagnostic sugar tests too implicitly. Further observations to test the duration of the condition were made four hours after the excitation on eleven of the students examined, and in only one was urinary sugar demonstrable. He concludes therefore that emotional glycosuria is only transitory in nature, soon disappearing after the exciting cause.

Book Reviews

Treatment of Congenital and Acquired Cerebral Diseases by Puncture of the Corpus Callosum. By Anton, G., and F. v. Bramenn. Berlin, Karger.

The medical treatment for increase in pressure on the brain is already based on practice covering a century, and on innumerable experiments upon animals and human beings. In spite of this medical skill does not yet suffice to meet the many sorts of demands.

The authors have therefore tried, first of all, to give an historical and critical sketch of the nature and conception of increased pressure on the brain, next, to present the appreciable advances which have been made through the new technique in cranial trepanning which was practised in olden times, and in palliative trepanning. They have been able, by reason of their own experience covering a long stretch of time, to portray the manifold indications of puncturing of the skull, as this has been developed since the work of Payr, Schmidt, Spitzka, and especially through the work of Neisser-Pollak, Pfeiffer, Krause, Borghardt and others.

In regard to the success of trepanning, they cannot, to be sure, with years of personal experience to back them, deny the conviction, that the cases cited in literature cause the total success of trepanning to seem more favorable than is actually the case.

The persistence of skull malformations has already been diagnosed by many as a bad sign. The necessity for puncturing the dura is for many reasons an undesirable complication. Decompressive trepanning, as well as extensive craniectomy, can in no wise be considered simple operations. Finally, however, it often happens that the increase in pressure raises the tension of the fluid in the cerebral ventricle, and this increase in the pressure on the walls is only slightly lessened by trepanning.

The more common puncturing of the brain can, on the other hand, give temporary relief. But it has been seen that this relief only continues for a short time. More frequent brain-puncturing has, however, serious objections to it.

For this reason they propose to lay bare the corpus callosum at the roof of the ventricle, and, by increasing the size of the opening, to keep this passable for some time. For this purpose the following mode of procedure has been briefly outlined.

The cranial cavity is opened about 1 cm. behind the coronary suture by means of the Sudeksher Fräse. The opening should be about ½–1 mark in size, in order to avoid the veins.

At a suitable place a little slit is made in the dura, 1½–2 cm. from the sagittal suture. A probe or a spatula is used to see whether the way to the falx cerebri is clear. Next, by means of a perforated, hollow, silver sound, one probes, in the direction of the falx, downwards in the longitudinal fissure until the sound touches the corpus callosum.

The hollow sound is provided with the mandrin. The corpus callosum is pierced through and the mandrin removed.

The serous fluid of the ventricles pours out, in a stream or in a quick succession of drops, with or without appreciable pressure. With the increasing

amount of fluid, it also flows past the probe. By pushing the probe backwards and forwards the size of the opening in the corpus callosum may be increased.

The presence of the probe in the ventricle enables one to ascertain whether the ventricle has been appreciably enlarged, whether the walls are markedly resistant, whether an appreciable resistance can be found on the floor of the ventricle; in short, serves for the probing of the whole ventricle.

After drawing out the probe, the small slit in the dura mater is sewed up, and the skin wound as well. Owing to the increased pressure, fluid often flows out through the suture afterwards, but this is unimportant.

The operation can usually be performed without a narcosis, with a local anesthetic (Novocain-Adrenalin). During and after the operation, intelligent patients described their sensations while undergoing it.

The fact that two cavities of the body, namely, the cerebral ventricle and the subdural space, were again permanently connected, and that new and larger spaces as well as more perfect partitions were present for the disturbed absorption of the fluid, seemed particularly valuable.

As a matter of fact in most cases it is seen that the lacking or decreased cerebral activities after the removal of the fluid (5–10 c.cm.) became regular again, corresponding to the heart-beat and the respiration.

While in the beginning they operated only on the most difficult and hopeless cases, the indications of treatment for cases at hand increased considerably.

In this book they have reported on the following cases:

1. Seventeen cases of simple or complicated hydrocephalus.
2. Five cases of pituitary tumors.
3. Twenty-three cases of tumors in the ventricle of the brain, in the brain adnexa, and when cysticercosis was present.
4. Four cases of epilepsy.
5. Two cases of non-purulent meningitis.
6. One case of Turmschädel with a choked disk.

These researches have, since the publication of the book, been enlarged and confirmed.

The report on the results may be briefly summarized as follows:

In the first place, no patient died during the operation, a fact which must be emphasized, since in the beginning they only treated difficult cases of hydrocephalus and brain tumors.

Out of seventeen cases of hydrocephalus, mobility could be favorably influenced in twelve cases. In milder cases the motor disturbances improved quite markedly. Further psychical development was also unmistakable in many cases. It was also admitted with older hydrocephalic children that the headache disappeared permanently. Note that the milder cases of hydrocephalus (numbness of the skull-cap), which could be clearly recognized first at the time of puberty (13–15 years), justified interference, as did also reasons of prophylaxis in normal or premature puberty.

Also in the cases of pituitary tumors, this relief of pressure works favorably as a prophylactic measure. The progressive visual disturbance was favorably influenced in at least three cases. Most of these were cases suffering from pituitary disturbances of diverse sorts, in which no results were expected from a radical operation. One of these patients has been under observation for five years.

No favorable results were attained in two cases of tumor of the corpora quadrigemina, because a radical operation was entirely out of the question (sarcoma).

The results were much better in the cases of tumors in the fourth ventricle, which are not, however, described at length in the book. In the cases of tumors of the ventricle itself, in one case noticeable freedom from pain was

achieved, and in this case the hollow sound was able to indicate surely for the first time the presence of tumors in the ventricle. At all events the experiment can be made on the patient where the diagnosis shows hypertrophy of the plexus and hypersecretion in the ventricle (lateral ventricle).

In cases of cysticercus also, lasting relief from pain could be vouched for. In none of the cases did the experiment completely lack results, although a radical operation was not possible.

In cases of serous meningitis the choked disk quickly decreased and all the subjective trouble as well.

The same may be said of syphilitic meningitis. In this case, however, it has not been determined to how great an extent the antisyphilitic cure has worked. The authors vouch for the favorable result in Turmschädel by means of a more recent case in which there was uniform clearing of the choked disk.

TABLE OF THE RESULTS

	External Tumors	Ventricle Tumors	Pituitary Tumors	Corpora Quadrigemina	Hydrocephalus	Hydrocephalus with Choked Disk	Cysticercosis	Epilepsy	Syphilitic Meningitis	Turmschädel	Total
1. The liquid emptied with high or moderately strong pressure	8	4	3	2	13	1	3	2			37
2. With slight pressure	1	3	2		4		2	2	1	1	16
3. The choked disk of the optic nerve improved visibly	8	4	2		1	1	1	1	1	1	20
4. The choked disk was not influenced	1	3		2			2				8
5. Stupor disappeared during the operation (not counting the drowsiness of hydrocephalic cases)	9	4	4		4	1	4				26
6. The choked disk was not present or else had already flowed off			2		15		2	3			22
7. Motor disturbances (paralysis, ataxia, contracture) were favorably influenced	7	4	2		12	1	2				28
8. Headache was avoided for a long time (not counting little children)	9	5	5	1	4	1	5	1	1		32
9. Vertigo and vomiting have ceased	7	5	5	1	4	1	4				27
10. Vertigo and vomiting still markedly present	7	5	5	1	4	1	4				27
11. Convulsions were no longer observed, or else not for a long time	2	1	3					3			9
12. Convulsions soon returned							3	2			
13. *Deaths during the operation*	—	—	—	—	—	—	—	—	—	—	—
14. Deaths a few days after the operation (without complications)			1								1
15. Deaths owing to further complications (tumor)	5	4	3	2	2		3				19

Perhaps the accompanying tables will be of service in demonstrating the results.

As to the results in cases of external tumors, in general only the severe cases were operated on. In three cases the tumor was at the base of the skull. In individual cases the local diagnosis could only be made *after* the pressure was relieved, and after putting aside the general pressure phenomena. In eight cases the choked disk improved noticeably. In nine cases the headache was done away with for a long time. In seven cases the motor disturb-

ances were favorably influenced and vertigo and vomiting considerably improved. In one case heavy coma with unconsciousness vanished immediately after the operation. In another case, in spite of the persistence of a huge tumor, good health continued for a long time, so that the relatives of the patient could not be persuaded to allow a further operation. Unfortunately in four cases of later radical operation on the tumor the result was three times spoiled by thrombosis of the veins (drainage). Perhaps with newer methods this means, namely, the radical operation, will in the end be more successful. There is no doubt, however, but that the progress of the choked disk in individual cases was retarded.

The number of those operated on by means of puncturing the corpus callosum has mounted now to over a hundred and the indications have increased noticeably.

The authors feel justified in treating different cases of interrupted development and of epilepsy by means of this operation, after the medical treatment has been ended.

They believe that in all cases of acute or chronic increase in brain pressure, puncturing the corpus callosum is a questionable procedure, but also, that in the most varied forms of arrested development the arrest in development can be favorably influenced by this operation. This is true as well of the interruptions in development which become steadily evident during puberty (rigidity of the skull-cap), and also in individual cases of epilepsy. In the latter they could very often state that the lessening cerebral movements themselves were helped by the operation, which permits one to conclude an improvement in the general circulation.

They mention briefly the following dangers and counter-indications: Tumors of the dura mater, tumors of the corpus callosum, formation of numerous vessels in the bones themselves (X-ray photographs), abnormal vein formation, particularly of the pacchionian body, also absence of the corpus callosum. In cases of basal tumors one must take into consideration the raising and displacement of the surface of the brain itself. Also in cases of cerebral swelling a tumor can be simulated, whereas the ventricles are almost compressed.

They believe that in the course of the year the opposition to this simple operation has lessened considerably.

JELLIFFE.

TEXT BOOK OF NERVOUS DISEASES. By Numerous Authors. Edited by H. Curschmann. English translation edited by C. W. Burr. P. Blakiston's Son & Co., Philadelphia.

We have had occasion to say of the German edition that this work contained some masterly monographs which should be rendered available in English. This is now made possible and we would draw particular attention to the chapters on Diseases of the Brain by Liepmann, on the Spinal Cord by Rothmann, Encephalitis by Lewandowsky, and that on Hyperkinetic Disorders by Pineles. Other chapters are strangely insufficient, such as Müller's on the Sympathetic, concerning which few modern students are as well posted. The chapters on the psychoneuroses hardly rise to the level of even adequate description, much less any idea of interpretative comprehension. The translations are adequate.

WHO IS INSANE? By Stephen Smith, A.M., M.D., LL.D. The Macmillan Company, New York.

The terseness of this title arouses attention. It prepares the reader for a somewhat unusual treatment of the problem of the effectual care of the mentally ill. The form of presentation is such as to appeal to the popular

reader and contains nothing new for the psychiatrist. Yet it is based on sound principles of brain structure and function and its striking manner of setting forth the practical problems is instructive and stimulating to all.

This is manifest particularly in the contrast the book dramatically portrays between conditions the author found when he began his work of inspection as commissioner of lunacy in New York State some years ago and modern methods, to whose initiation he devoted his efforts and the marked success of which he shows where such ideal principles of reasonable and humane treatment, curative rather than custodial, have been intensively developed.

We need not be misled by the prominence given to the term insane. The title of the book arose from the insistence of this question, which amounted, the author confesses, to a controlling obsession as he first undertook his duties and led him to distrust former group classifications and wholesale conceptions and methods of approach to the care and treatment of the so-called insane.

He insists upon the indefinable distinctions between grades of mental illness, while emphasizing the therapeutic value of a recognition of the functional as distinct from the degenerative disturbances which exist, and lays great stress upon the ability to influence the mental condition through processes of nurture.

However, the simplicity implied in this emphasis on the anatomical and physiological basis is misleading. It is not all so plain. The complicating psychical background is neglected theoretically, though in the methods recommended and illustrated that great factor is taken into account, but in a chance way as it were, not with sufficient consideration of its paramount importance nor of the definite, effective psychical methods it is compelling us to adopt.

The book has a value, nevertheless, historical as well as suggestive and inciting.

JELLIFFE.

SOCIAL HEREDITY AND SOCIAL EVOLUTION. THE OTHER SIDE OF EUGENICS. By Herbert William Conn. The Abingdon Press, New York, Cincinnati.

No modern student of biology or sociology would deny the general conclusions which this author attempts to establish. Perhaps, however, too great emphasis upon the merely organic inheritance on the part of the eugenists demands that our attention should be thus directed more upon our social heritage and the possibilities of control and alteration which that presents to us in distinction to the former.

Nevertheless the author's mode of approaching the question is far from convincing. In the first place these general conclusions bring nothing new. Then they are restated so many times that one fears the author himself is laboring under the lack of definiteness which oppresses the reader, when, for example, he tries to separate out the ethical and moral sense which has played an important part in social evolution without making it clear whence this has arisen, leaving the reader with an obscure sense of its implantation from without.

The further indistinctness, too, in the consideration of other forces working to build up civilization seems to rest on the failure to conceive clearly the fundamental origin of all in the organic inheritance, the development of intellect and its subsequent constructive activity, which based on expediency gradually attained even present high altruistic levels, and which also created language and all the tools which are now so essentially a part of society. A

failure to recognize forcibly the development of structure, individual as well as social, through function causes this confused attitude.

The book contains an instructive review of social achievement not unmindful, to be sure, of the evolutionary aspect of its growth. It, moreover, emphasizes the opportunity which all this puts into the hands of man. It sets forth clearly also the difference between that freedom which belongs to extreme individualism and that limitation of this, which, however, means vastly greater freedom through the opportunity which social organization makes possible.

JELLIFFE.

THE INVOLUNTARY NERVOUS SYSTEM. By Walter Holbrook Gaskell, M.D., F.R.S. Longmans, Green & Company, 1916.

This posthumous work represents the labors of over a quarter century. It is a delightful review, concisely put, of the most important facts of the anatomy and physiology of the vegetative or involuntary nervous system.

The twelve chapters deal with the following: Embryology, the motor fibers of the thoracicolumbar outflow or sympathetic system, the motor fibers of the bulbo-sacral outflow or autonomic system, the motor fibers of the midbrain outflow (autonomic), the inhibitory fibers of both systems with additional chapters on the inhibitory nerves to the blood vessels and eyes, the rhythmic (heart) and peristaltic (gastro-intestinal tract) movements of involuntary muscles, the glandular innervations, the connector neurones of the involuntary nervous system, the phylogeny of the sympathetic system with a final summarizing chapter.

Gaskell has made the function of the individual neurones of the involuntary system very clear. He uses the same terms as are applied to the voluntary nervous system. In the reflex arc of the voluntary system there is a sensory or receptor neurone to the posterior horn and a connector neurone thence to the anterior motor or excitor neurone. These three units of the reflex arc of the voluntary system are identified with the sensory neurone, the preganglionic and the postganglionic fibers. These are respectively the receptor, connector and excitor elements. This conception gives more orderliness to the anatomy of the vegetative.

There are many other valuable observations which those desiring a systematic knowledge of visceral symptomatology may read to advantage. The book is recommended to all members of the profession, for it contains the fundamentals of visceral neurology.

W. M. KRAUS.

INSTINCTS OF THE HERD IN PEACE AND WAR. By W. Trotter. The Macmillan Company, New York.

The matter of this book had been treated in two essays published about ten years previously. Here, however, the subject is amplified and discussed with a view to its practical bearing upon the future of the human race, biologically considered in psychology and morale, with particular reference at the close to the existing struggle between two great units of the human group or herd.

Starting with the assumption of three primary human instincts, sex, self-preservation and nutrition, it is necessary, the author conceives, to discover a third as evidently at work and a factor in the earliest periods of primitive history as well as developing with man and forming always his undeniable psychological environment. This is the herd instinct, his gregariousness.

Extreme sensitiveness to the control and opinion of the herd conditions man's marked suggestibility and it has developed in him also as a secondary

instinct the presence of altruism. Intellectualists have tried to prove the altruistic and moral sense as a product of man as a rational being, which to a biologically grounded psychology is untenable. In fact an examination of the gregarious instinct and its manifestations reveals the blind following on the part of the majority of an exaltation of the rational as a most irrational and unreasoning feature of this tendency to follow the lead of the herd. And this leadership belongs, too, largely to minds which constitute the majority of humanity, those who are satisfied, unquestioning, placidly acceptant of an order of things somehow secure and all right in the end. The increasing number of individuals, however, who cannot adopt such an attitude and rest in such a state of affairs makes it imperative to examine into the origin and development of the herd instinct with a view to its future possibilities for the continuation and expansion of the race.

Therefore the author makes an analogical study of its growth by comparing it with the evolution of the unicellular form into the group form of the multicellular, with its sacrifice of individual capacity and function to some extent for the advantage of the protection and more varied opportunity in the larger group, where the original cell must occupy a more specialized capacity. Similarly man receives the same advantages in an extended form and because of the great variety of reactions open to him suffers but little in comparison with the larger possibility open to him.

The degree of intercommunication marks the degree of association possible between the individual and the group and in this man, though in advance of other groups, has by no means reached his limit. The three forms of gregariousness are typified among the lower animals, that formed for aggressive action, preëminently that of the wolf, the protective, belonging peculiarly to grazing animals, and the highly specialized social form of the ants and bees. Man's varied possibility of reaction prevents the fixed limitation of the specialized type which is reached by the insect colonies, but this is distinctively the type to which man belongs.

At least it is the ideal type for man and most nations have attained it. When the author turns the application of his thesis to the present war, he excludes Germany from this type, utilizing her as the great illustration of the "lupine" grouping for aggressive attack only and its reactionary influence upon the national morale. This form of herding must be stamped from international society and this lupine spirit can be affected only by drastic force, crushing defeat. He admits before entering upon this part of the discussion that he cannot write without passionate partisanship, but even so his own fang is so envenomed and so tears its way into wholesale narrowed condemnation and blinded partiality that facts are distorted and interpretations impossible and his argument fails of its force.

His book on the whole makes a restating of certain facts which brings them instructively to the attention of men, yet their full biological significance is somewhat obscured by the setting of the four instincts side by side. He denies an active faith in a permanently existent unconscious life and this prevents perhaps that deeper unity of instincts in origin and potentiality to be found in a more truly biological psychology. His comparison with animal psychology, as an example, is superficial. The Freudians have not neglected this, as he objects, but their psychology seems more fundamentally concerned with origins and expressions which pertain to both human and animal psychology. Likewise this more fundamental unconscious psychology is also building for the future, notwithstanding the author's criticism on this score, and it seems with more definiteness of background and more unity of forces toward the better use of the raw material of society and regard for mental environment, for which the author pleads.

JELLIFFE.

Notes and News

Obituaries

LOTHAR RITTER VON FRANKL-HOCHWART

The death of this distinguished neurologist on Dec. 19, 1914, at the early age of fifty-two, removed from the scientific world of Vienna a rare personality as well as a devoted exponent of his country's achievement in neurological advance. As the son of the poet and philanthropist, Ludwig August Frankl-Hochwart, he was born into a circle of literary and artistic culture whose influence was manifest throughout his life. His native character eminently fitted him to contribute his much to the spirit of such a society.

His student days were passed under such men as Langer, Strickner and Meynert, each of whom directed his interest to some branch of neurological work, but he attached himself most completely to Nothnagel, whom he particularly acknowledged as master. This leader early took him into his clinic and entrusted to him the conduct of the Nervenambulatorium, the first clinic of its kind in Vienna, and connected with the Polyclinic there.

His interest in science was recognized even in his student days, and he early qualified for a position on the faculty, and in a few years was appointed to a professorship, attaining the degree extraordinary, on the ground of his valuable contribution to his field of work.

His long period of service in the Ambulatorium, for nearly twenty-four years, demonstrated what such a man might accomplish under unfavorable conditions. He had to carry on his work in a limited space, yet these narrow quarters became a radius for world-wide influence and inspiration. Pupils came to him no less eagerly from abroad than from his own country, and it was his privilege in his work with them to advance the rank of Austria in the scientific world as well as to impress upon all the hospitality which his land so fittingly accorded through him.

His pupils found in him a sympathetic teacher who maintained a helpful interest in each one, modestly willing to learn also from them. Though primarily a clinician himself, he was ready to discover in each pupil his special interest and adaptability and guide

him to follow these. All his work was stamped with a thoroughness, a breadth of view and an exactness which impressed themselves lastingly upon his pupils, and made the work of value, moreover, to other specialists working perhaps in a more limited field.

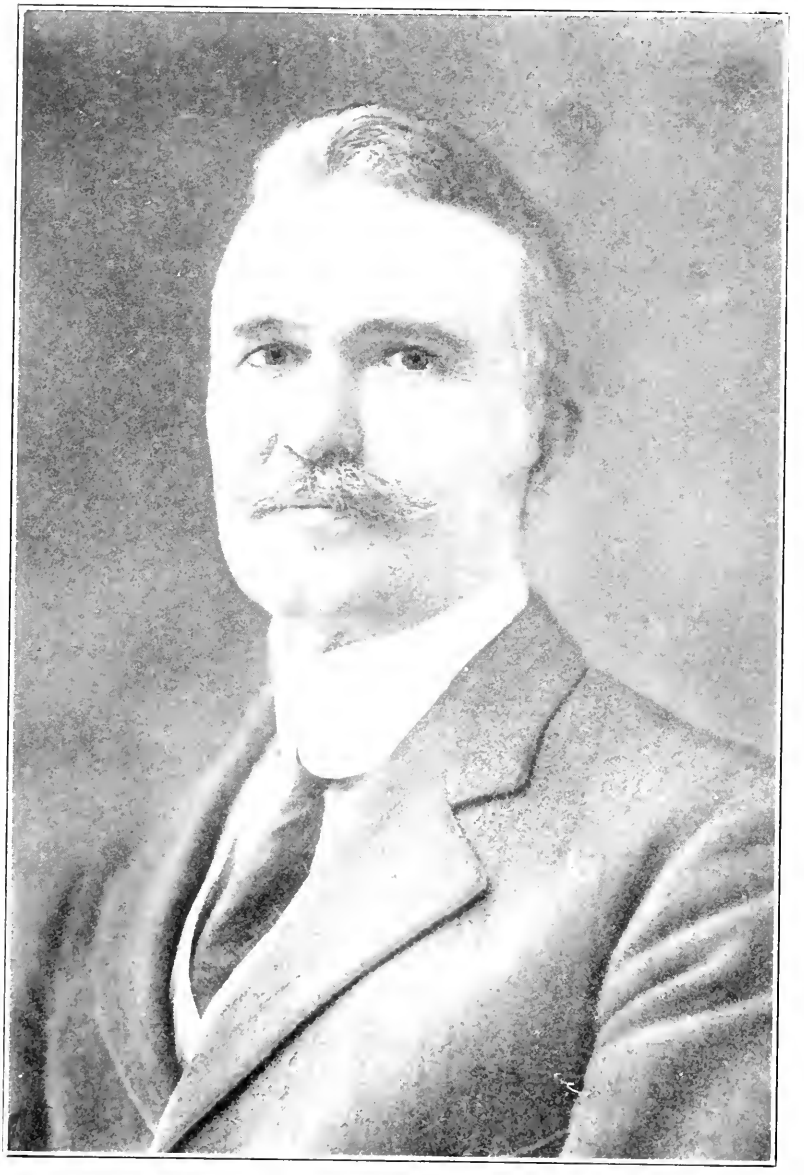
Some of the more definite results of his work in the clinic were of great importance. The disease picture of dystrophia adiposa genitalis was here established together with its relation to disease of the hypophysis. He established, with Fröhlich, the significance of the pituitary body and he diagnosed the first case of tumor of the pineal body *in vivo*. His writings on the diagnosis of epiphyseal and hypophyseal tumors are classics while surgical work upon tumors was carried on with marked success. He also accomplished fundamental work on tetany, and in the diagnosis and prognosis in Ménière's disease, which prognosis he discovered could be generally favorable. He had worked from his student days in almost every branch of neurology. His work in anatomy had been carried on upon the mole (*Spalax typhlus*). He published a number of special works on the innervation of the sphincters, acroparesthesia, the effect of nicotin upon the nervous system, and interested himself in serology and its place in neurology.

As a practitioner he commanded the affection of his patients through his sympathy and high personality as well as their thorough confidence through the character of his method and manner of treatment. His patients were to him always first of all sufferers and only secondarily of scientific interest.

His recognition outside of his own country perhaps exceeded that at home. He was an early foreign member of the German neurological society (Gesellschaft deutscher Nervenaertze), being even a charter member. In fact he was largely instrumental in the establishment of this society. He was welcomed at all international conferences and asked to lecture wherever he went. He had a brilliance and rhetorical facility which utilized the material gathered from his ever ready observation in his work in such a manner that it gave life to his lectures and enabled him to present his own specialty to the interest and clear understanding of larger audiences than merely those of students or colleagues.

It was always the advance of neurology that he sought rather than his own honor. In 1912 he was appointed to a larger opportunity at the Polyclinic and he hoped to establish there a department for nervous diseases. His premature death of brain tumor, however, interfered with the accomplishment of this desire.

SMITH ELY JELLIFFE



WM. P. SPRATLING, M.D.

WILLIAM P. SPRATLING

On December 22, 1915, William P. Spratling was accidentally killed at Welaka, Florida, and thus there was ended suddenly a career of activity and usefulness, which had, as it were, had a new beginning in a new field of labor.

His earlier distinguished services in the north had been interrupted a few years before by a serious nervous breakdown, which necessitated his giving up his practice in Baltimore and going south. He arrived at Welaka in the summer of 1911 and in the autumn of that year took up his residence in the home of Dr. D. C. Main, practicing physician there. He found in Dr. Main a warm personal friend and medical advisor, through whose assistance he was enabled to regain in large measure a normal condition of health with a promise of still greater improvement and ability to enter actively once more into professional work, when his death occurred.

He had thrown himself again with interest into his special department of medicine, coöperating with Dr. Main in practice and in theory, sharing with the latter his own specialized knowledge and skill. He was found out by former patients who wintered near him in order to have the benefit of his advice. He was widely sought as a consultant by physicians both within and without the state, who sent him patients, and he traveled on several occasions about the state on the same errand. He also responded to the recognition of his worth accorded him by Florida physicians when he addressed the meeting of the State Society in DeLand in May of the last year of his life and the Duval County Society in June.

The limited social life of Welaka could furnish many an evidence of his kindly personality and ability to win the affection of those among whom he had come to live. He contributed to the society of the resort, and, moreover, a lover himself of nature and of the out-of-door world, he gathered about himself a crowd of boys to whom he not only imparted a knowledge of nature lore, particularly of birds, but encouraged them to bring their own share of first-hand knowledge from the woods.

It was his love of the woods combined with a true sportsmanship which led to his death. His gun was accidentally discharged while on the way to hunt and he died a few hours after the accident occurred.

Dr. Spratling was well known in the north through his long years of service, particularly in the field of epilepsy, and his many publications upon that subject. He was born in Alabama in 1864. After

receiving his diploma in medicine he served a term in the United States Marine Hospital Service. He then became superintendent of the Morris Plains Asylum in New Jersey. His longest term of service, however, and the one in which he greatly distinguished himself was in the fifteen years spent as the medical superintendent of Craig Colony for Epileptics at Sonyea, New York. He left this position finally to take up private practice in nervous diseases, particularly in epilepsy, at Baltimore, Maryland. He was here also a member of the faculty of the College of Physicians and Surgeons of Baltimore. He remained in this city until his broken health compelled him to give up his practice four years before his death and retire to Florida.

Epilepsy is the subject that has chiefly occupied his ready pen, although his experience and knowledge in nervous and mental disease in general led him to publish a goodly number of other papers in this field, while also a few publications in other medical subjects have appeared. His papers have been published in a number of the leading American medical journals in various parts of the country, the Journal of Nervous and Mental Disease among others, while The Treatment of Epileptics and Imbeciles appeared in the British Medical Journal in 1899. He was the author likewise of a book entitled Epilepsy and Its Treatment. His renewed interest in his work with his recovery of his health evinced itself also in the recent publications which appeared in the Florida Medical Journal, in which he again took up the subject of epilepsy, partly in collaboration with Dr. Main.

Smith Ely Jelliffe

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Original Articles

PITUITARY TUMOR WITH GENERAL EDEMA IN TWO CASES OF NANISM, ONE OF THE PALTAUF TYPE, THE OTHER OF THE PITUITARY TYPE

By Walter M. Kraus, A.M., M.D.

The two cases whose account follows, are in many ways very puzzling. So many things are combined and so much can be said that in the end one feels that an accurate and complete diagnosis of the entire situation is impossible at the present state of our knowledge.

Case I. He was admitted to Bellevue Hospital on September 21, 1915, complaining of swelling of the hands, feet and face. He is single, aged 48, Irish, cigar-clerk by occupation; family history: parents, sisters and brothers normal. Past history: measles at 8, mumps at 9, gonorrhea at 17; states that he was always well otherwise. Always was small in stature, though active.

Present illness: The first attack of swelling of the hands and feet occurred at Gouverneur Hospital in July, 1910, six years ago. The records were not found and the patient's mental equipment is such that an accurate account of the extent of the edema is doubtful. There was some difficulty in opening the eyes (severity of edema). During the attack, sudden blindness occurred in the left eye, which was cured, the patient says, by drops. The attack of edema lasted three weeks. The second attack occurred at the City Hospital in 1913, two years ago. Though this attack lasted only three weeks, the patient was in the hospital for four months. The legs and feet were swollen. The third attack was at Bellevue Hospital in December, 1914. The patient complained of swelling of the legs and chills and fever. The *temperature* on admission was 103.6° but it dropped to normal in two days. There was *leucocytosis* of 19,000, of which 76 per cent. were polymorphonuclears, 17 per cent. mononuclears, 4 per cent. eosinophiles and 4 per cent. mast cells.

Hemoglobin was 100 per cent. r.b.c. 4.8 millions. The patient stated that he had a chill on the morning of admission and felt very thirsty. He had *no pain,* either in the head or elsewhere.

Physical examination showed edema of upper and lower eyelids and of the extremities. There were sonorous and sibilant râles over the chest and a soft systolic murmur at the apex transmitted up to the pulmonic area, louder and rougher there than at the apex. *Blood Pressure:* systolic 88, diastolic 64. On January 11 his sugar tolerance was *over 450 grams of dextrose. X-Ray examination* of the head showed a *large sella turcica with no evidence of erosion. Urine:* Sp. gr. 1,018, very faint trace of albumen, occasional hyaline cast. *Wassermann* of the blood was negative. *Weight* was 112.5 pounds.

Since his admission to Bellevue Hospital there has been no swelling until one month before admission in September, 1915, when the swelling began to come on slowly. At this time he complained of swelling of the hands, feet, legs and face. His past history was gone into again and it was found that he had been slightly short of breath for three years. He had no headaches, vomiting or other gastro-intestinal disturbance. There was a slight pain in the left breast for a month prior to admission at which time he said that it was absent. The sight is poor, particularly on the left, from which practically nothing is seen. He eats a great deal of candy, buying a pound at a time when he has the money. He feels drowsy even on rising in the morning; this varies from day to day. He says that he falls asleep in the ward during the day without wishing to and adds: "I go to sleep very readily." He perspires very little and says that in the warm summer weather his face swells. He has had no sexual power for quite a few years, but is reluctant to speak at length upon this subject. He partakes of little alcohol for a man of his class—two or three glasses of beer a day.

Physical Examination.—The patient is a small man lying quietly in bed. His eyelids, face, hands, body and legs are very markedly swollen—edematous, but this does not pit to the usual degree. His eyes show no evidence of inflammation; no cataract; sight poor on the left. The face is cretinoid; the upper lip very long. The heart is normal except for the murmur noted above. Radials are not felt. Cervical and axillary lymph glands are felt. Thyroid not felt. The penis is rather small as are the testes and epididymes. The breasts are more pronounced than in the normal male; the tissues are readily graspable and soft; the left breast is slightly tender. *Skeletal System:* Skull is normal in size and shape. The teeth are normal in appearance and in *exceptionally* good condition; *no sign of pyorrhea* and *practically no caries.* The length of the trunk (suprasternal notch to pubis) is 20 inches; the entire length is 58 inches; the upper length (top of head to pubis) is 29 inches, exactly half the total. There is stooping, due to a slight kyphosis in the cervical and upper thoracic area, not limited to one or two vertebræ. The hands are large, thick-skinned (after edema had gone) of the female type (fourth finger longer than second) and pigmented on the dorsal aspect. The arms are exceedingly long, span is 60 inches (150 cm.).

The feet are stubby and short. The normal curve from the malleoli to the tarso-meta-tarsal joints is absent. There is a trident hand (photograph 1) on both the right and the left side, greatest on the right. The general body-shape is infantile (photographs 2 and 3). The hair is present only on the head, eyebrows and eyelids. It is

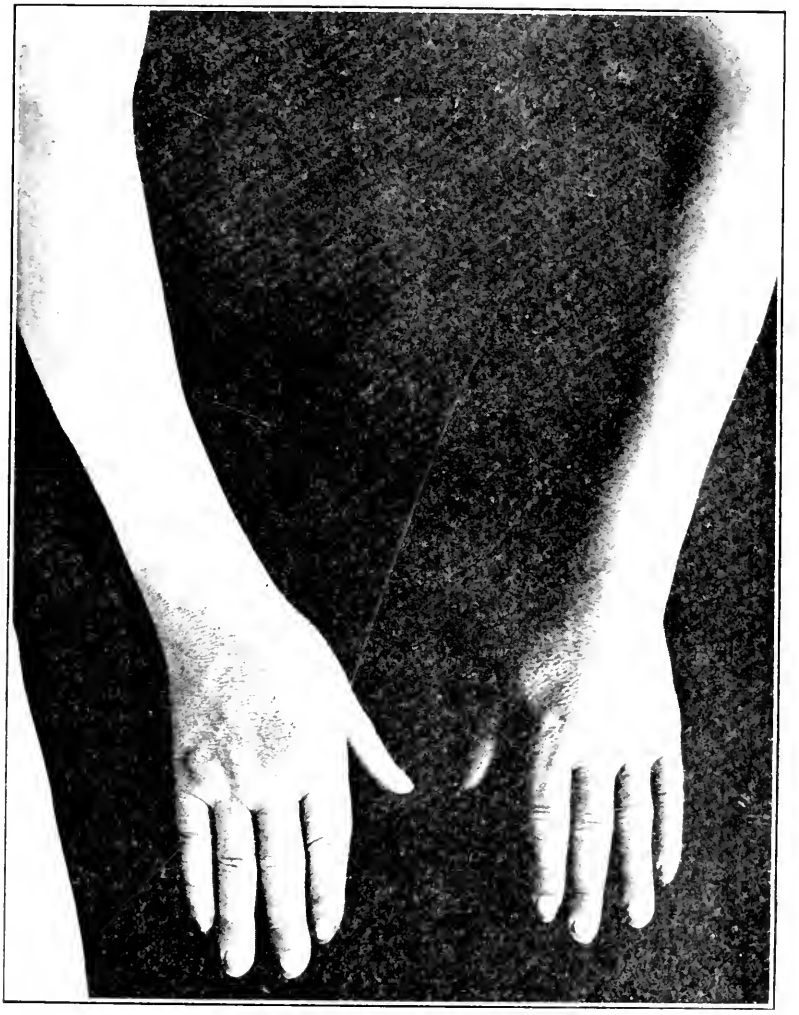

FIG. 1. Hands of G. F. Note size, trident form, tapering fingers and pigmentation.

dry, of moderate texture and somewhat greyed; there is none on the face (photograph 4), under the arms or on the pubes; a few long hairs are on the shins. The skin, after the edema had gone, was yellowish, dry, much wrinkled and redundant.

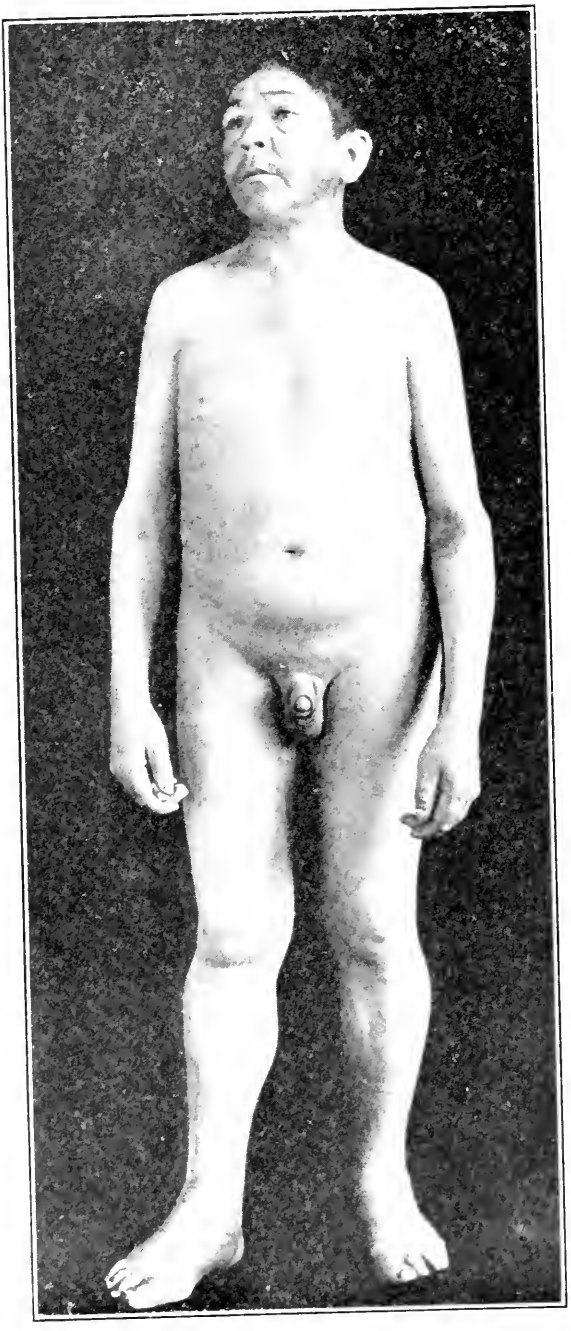

FIG. 2. G. F. Note infantile form, absence of hair and length of arms.

FIG. 3. G. F. Note stooped, anthropoid-like posture, long arms and facial profile.

Evidence of disease of the central nervous system consisted in impaired visual acuity, double neuro-retinitis with atrophy, more on the left than the right; contraction of the color fields, more on the left and interlacing of the fields (Fig. 5); poor hearing on the right and a curious unsteady gait; no Romberg; no real ataxia. On

FIG. 4. Face—G. F. Note coarse hair, absence of beard, wrinkling of skin and cretinoid appearance.

his previous admission to Bellevue, Dr. Norrie noted that his posterior leg muscles seemed short, as he could not raise himself with his heels; he could not bring his foot to right angles with his legs (shortening of posterior leg muscles). This probably accounts for his gait. The edema left slowly, being entirely gone in six days.

Since then there has been occasional swelling about the feet and hands of a mild degree. Urine absolutely negative on January 6, 1916.

Mentally, the patient acts like a well-behaved, obedient child, doing what he is told, always agreeable, and very simple in his ways. There is no guile in him, but he is sneaky as some children are, though always in a harmless way. For example, he will steal crackers from the kitchen when no one is looking.

Clinical Examination.—Phenolsulphonephthalein excretion on the day after admission was 55 per cent. in two hours (edema very

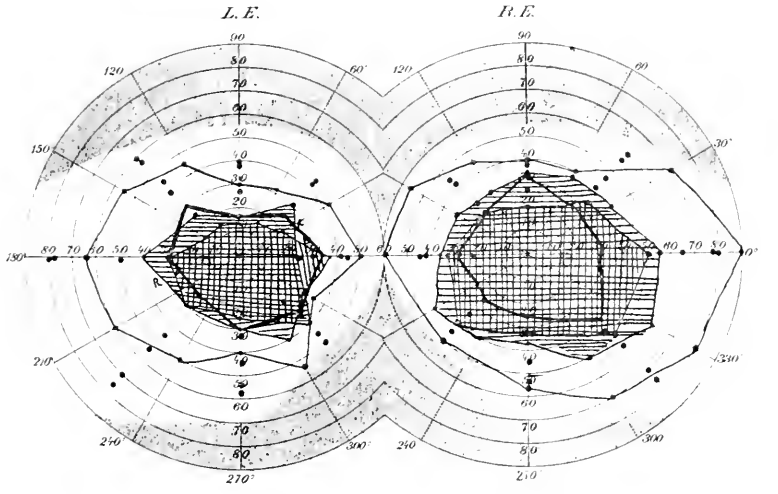

FIG. 5. Form and color fields of G. F. Note contraction of form fields and interlacing of color fields.

marked). Blood Wassermann negative. X-Ray examination showed large somewhat eroded sella turcica (photograph 5). The sugar tolerance was over 400 grams of cane-sugar.

Urine on admission showed a very small amount of albumen, a few granular casts, spec. grav. 1,012. On the 24th, and while the edema was marked, there was no albumen nor was there any on a number of subsequent examinations. Once there were a very few granular casts. The specific gravity after the first examination ranged between 1,022 and 1,028. W.b.c. on admission 5,100, polys. 56 per cent., basophiles 4 per cent., mononuclears 34 per cent., eosinophiles 6 per cent. (!); r.b.c. 4.3 millions. Phenolsulphonephthalein test on December 3 was 63 per cent. in two hours (42 per cent. the first). Weight after disappearance of the edema was 125 lbs. Examination of the water excretion showed that 4,000 c.c. daily caused no edema or gain in weight. This was tested for 10 days.

The patient has been in the wards since, having no desire to leave the hospital. Everyone likes him, as he is both agreeable and

a very useful ward-helper. This same thing was the case when he was previously in Bellevue Hospital.

Case II. O. T., age 37, vaudeville actor. Admitted November 11, 1915. Family history: parents normal; no further findings.

Past history: On February, 1915, had a severe infection of the left upper canine (?) tooth; those behind were also involved; face was swollen on that side. Was in a hospital in St. Louis for one week. The teeth were cocainized and removed; patient was delirious from the effects of the cocaine.

Pneumonia six years ago. Had swollen hands and feet for a few days about six years ago. Says that pressure raised a lump instead of a pit. Only lasted a few days.

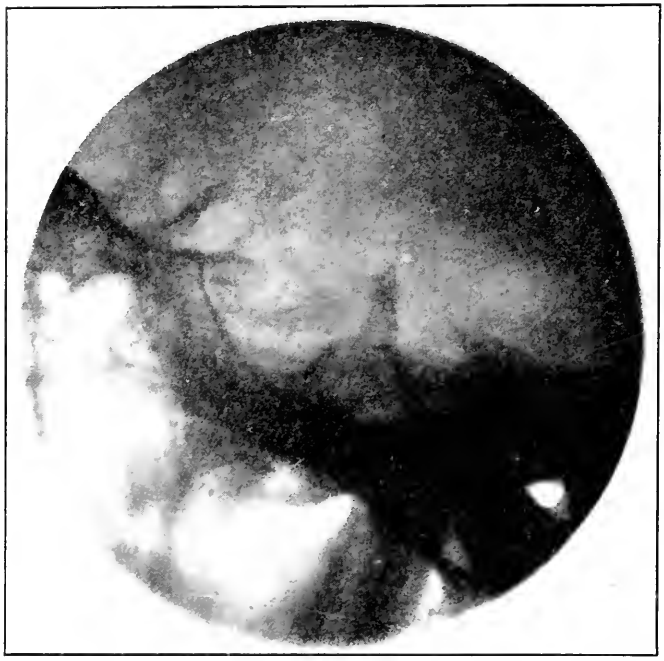

FIG. 6. Sella turcica of G. F. Enlarged and eroded.

Present Illness.—On November 10, 1915, the patient was perfectly well. On the 11th, at noon, on being awakened, he was confused and could not dress himself. He lapsed into a state of semiconsciousness in which he remained until the Friday of admission to the hospital. Before admission, he had a slight general convulsion. While in the the hospital the first day the patient spoke a few words, but soon lapsed into a comatose state which persisted until death.

Physical Examination on Admission. A small male, 40 inches tall, well nourished. Lies quietly in bed. Pupils equal, regular and

reactive to both light and accommodation; no nystagmus, exophthalmos or strabismus. Teeth: many gone, bridge of four in place of the upper incisors, caries of the molars, pyorrhea alveolaris. Breath foul in odor. Heart normal. Arteries not felt. Pulse 82 per minute, regular in force and rhythm. Fair tension. Respirations slow, deep and occasionally stertorous, 16 to the minute. Abdomen negative except for a palpable liver felt about a finger's breadth below the costal margin. Skin dry, yellowish in hue, wrinkled and devoid of hair except that of the head and eyebrows; the hair on the head grows abnormally far forward on the temples. No edema, no knee jerks obtained. Genitals: penis very small, testes small.

Daily Notes.—On the 12th, at 12.05 A.M. patient had a convulsion lasting two minutes. He had another at 10.30 A.M., one at 3.40 and another at 9.45 P.M. Vomited both medication and milk. Voided 300 c.c. of urine. Incontinent. Still in coma.

Urinalysis: Acid reaction. No albumen, sugar or casts.

Blood analysis: W.b.c. 18,000, polys. 90 per cent.

Nov. 13: Coma continues. Einhorn duodenal tube passed. Urinalysis, acid, no sugar or albumen. Acetone + +, few hyaline casts. Fundi examined: normal.

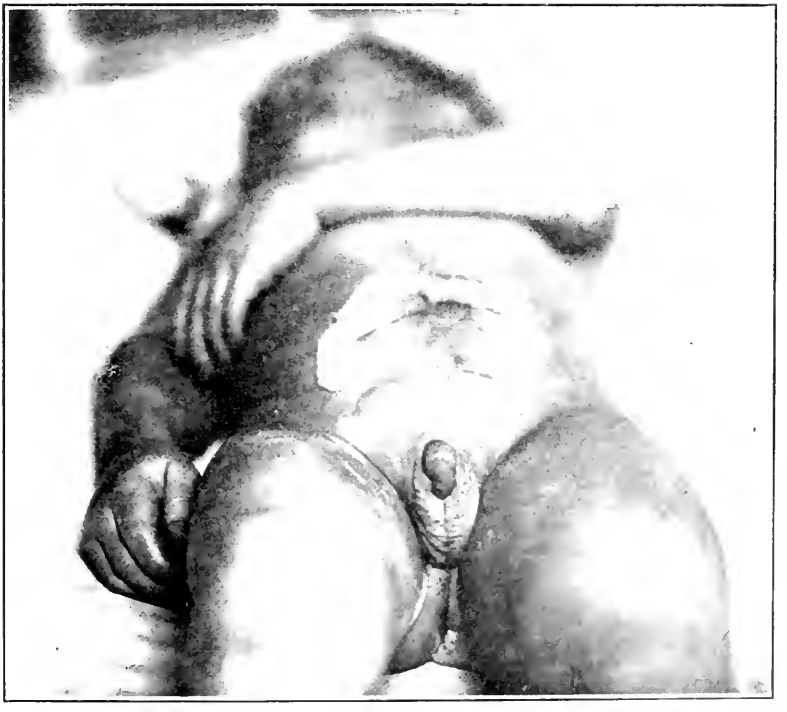

Fig. 7. O. T. Height of edema.

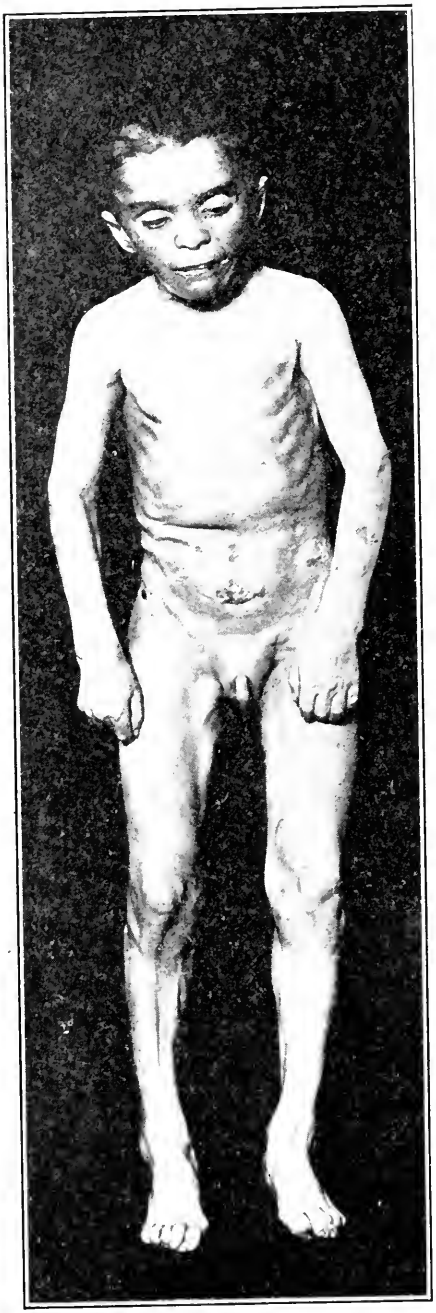

FIG. 8. O. T. Postmortem. No edema. Note genitals and cretinoid face.

Nov. 14: Convulsion at 6 A.M. lasting ten minutes. Slight edema of hands, feet and face. Convulsion at 10 A.M. W.b.c. 16,800, polys. 86 per cent. Urinalysis same except for a small amount of albumen. Still in coma. Intake 2,200 c.c. Output 550 c.c.

Nov. 15: Moves legs now and then. Yawned. Einhorn tube removed, cleaned and replaced. Convulsion, tonic in character and of seven minutes' duration at 11 P.M. Some abdominal distension. Stupes applied. Rigidity of body (convulsion) 2.30 A.M. lasting ten minutes. Intake 3,000 c.c. Output 600 c.c. Still in coma.

FIG. 9. Feet of G. F. Note shortness and thickness.

Nov. 16: Phenolsulphonephthalein 52 per cent. in four hours (patient could not be catheterized). Coma continues. More edema of face to-day (Photograph 7). Moves hands and feet oftener.

Breathing better. Sighs and yawns oftener. Intake 2,700 c.c. Output 105 c.c. Urinalysis same as before except that acetone was absent. W.b.c. 16,800. Polys. 85 per cent.

Nov. 17: Less edema during the night. Sneezed and yawned frequently. Urinalysis same as before except there were no casts. Intake 2,275. Output 105. W.b.c. 12,400. Polys. 82 per cent. Edema seemed more marked during late afternoon. Coma continues.

Nov. 18: Expression of pain when hypodermic was given. W.b.c. 9,200. Polys. 76 per cent. Hemoglobin (Sahli) 70 per cent. R.b.c. 3,904,000. Phenolsulphonephthalein test 50 per cent. in four hours. Seems at the point of coming out of coma, though the coma continued all day Intake 1,000 c.c. Output 95 c.c.

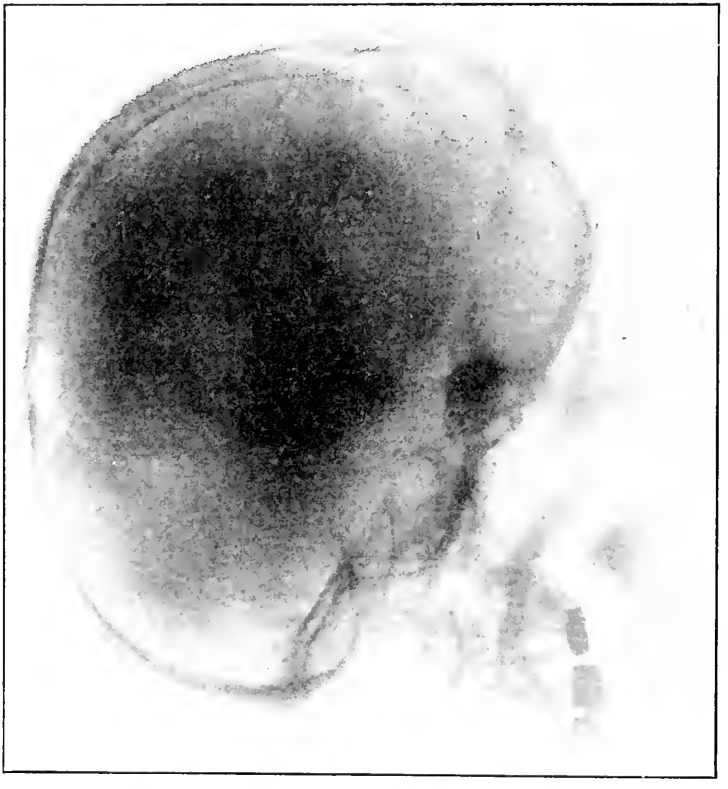

FIG. 10. Skull of O. T. (Note sella turcica.)

Nov. 19. *No edema. Anuria*, intake 600 c.c. Eyes sunken in appearance. No abdominal distension. Moans on being handled. Moves eyes occasionally. Blood analysis: urea-nitrogen 27.14[1] (normal 12–15[1]); ammonia-nitrogen 6.66[1] (normal 1–2[1]); uric acid

[1] Milligrams per 100 c.c. blood.

4.[1] (normal 1–2[1]); creatinine 2[1] (normal 1–2[1]). Chlorides 50 per cent. Corpuscular volume 23.05 per cent. (normal 50 per cent.). Sugar .875 per cent. W.b.c. 10,400. Polys. 81 per cent. Urinalysis the same.

Nov. 20. No edema. Urinalysis the same except for no albumen and many granular casts. Intake 1,000 c.c. Output 95 c.c.

Nov. 21. No edema. Intake 1,000 c.c. Output 95 c.c.

Nov. 22. Seems weaker. No edema. Intake 1,000 c.c. Output 195 c.c.

Nov. 23. No edema. Moans on being moved. Intake 1,000 c.c.. Output 125 c.c.

Nov. 24. Unchanged. Fundi again found normal. Intake 1,000 c.c. Output 125 c.c. Still in coma.

Nov. 25. Still in coma. Moans constantly. Tube removed. Vomited at 2.05 A.M. (oz VIII) at 4 A.M. (oz X) (projectile) and at 2 A.M. Vomited at 8 A.M. (II oz) (note projectile). Intake 650 c.c. Output 0.

Nov. 26. Tube reinserted at 1.30 A.M. During the morning the pulse grew weaker; respiration rose to 32. The patient died at noon. 1 c.c. pituitrin was given every fourth hour for six days before death.

Autopsy Report. (Abstract)

Macroscopic.—Dwarf (photograph (post-mortem) 8) aortitis with yellow placques. Focal liver necrosis. Ununited epiphyses. Degenerated posterior lobe of the hypophysis. Infantile genitals, internal and external.

Microscopic.—Pituitary. Posterior lobe replaced by colloid. Anterior lobe not definitely made out. Thyroid normal but infantile. Testes: interstitial large in amount. Seminiferous tubules infantile. Adrenal not conspicuously abnormal. Liver shows focal fatty necrosis. Kidneys normal except for an extremely slight degree of chronic fibrosis, and infantile structure.

X-Ray—Head. Sella normal.

There are a great many things in both cases which deserve comment. First let us take what is common to both.

I. Arrested Development. Nanism

There is little doubt that both of these cases are instances of arrested development, starting very early in life, exactly when is a matter which we cannot ever discover accurately. O. T. is said to have stopped growing at the age of 8. His height was 40 inches (102 cm.). The age corresponding to this height is 5, while at 8, the length is 118 cm.[2] His pound per inch index also corresponds to about 5 years.[3] G. F. does not know exactly when he stopped

[2] Friedenthal. Physiol. des Menschen, p. 121.

[3] Paltauf's dwarf had a skeleton of a child of seven.

growing. He is 4 ft. 9 in. tall (142 cm.). This corresponds to 13 years. His pound per inch index corresponds to about adult normal, which would indicate that he is over weight, since he is not adult in form.

The question arises are they both of the same type? If not, what type do they most closely resemble? O. T. corresponds to the Paltauf type.[4] In 1891, A. Paltauf described a case of nanism in a man 49 years old. Falta[5] defining the Paltauf type states as follows: "The individuals are of normal size at birth and develop normally at first. It is only later, in early youth that their growth becomes arrested. The epiphyses remain open. Further growth is exceedingly slow in all cases, it being but rarely that the inhibition to growth is overcome at some later time. The development of the centers of ossification is but slight in almost all the cases. The intellectual development is normal. On the other hand the development of the genitalia and the secondary sexual characteristics are almost always arrested. The etiology of this arrested development is not known at the present time."

The size of the case has been observed. The genital hypoplasia needs no further comment than to say it always existed. The lack of ossification was startling.

The appearance of O. T. was certainly cretinoid, as everyone who saw him remarked. The photograph emphasizes that. This is remarked by Falta in discussing the Paltauf type of dwarf. The skin was yellowish, dry to an extreme, with a curious wrinkled look, as in Case I. The distribution of fat in O. T. was not abnormal nor did he present any feminine characteristics as to hands, hips or muscle development. The absence of hair on the entire body excepting the head, eyebrows and eyelids was a not unexpected finding and falls in line with the genital hypoplasia. What the low blood pressure signified, I cannot say.

From this description it will be seen that O. T. is a very typical dwarf of the Paltauf type, whose arrest of development began about the fifth year. G. F. is certainly not of the Paltauf type. He resembles the pituitary type. That he is not eunuchoid but rather infantile in form is shown by the relations of the upper to the lower length. This is nearly the same in the infantile, while in the eunuchoid the lower length is much greater. The photograph shows the infantile relations. That the pituitary is at fault is shown by the findings—enlarged sella turcica and fundal and eye-ground changes.

G. F. has had no sexual power for some period; the exact limit

[4] Paltauf. Über den Zwergwuchs, Wein, 1891.
[5] Falta. Die Erkrankungen der Blutdruse, 1914.

is not known. The photograph shows that the genitals are rather small. Ossification is not quite complete in him as may be seen at the lower ends of the radii. His cretinoid appearance is readily noticed. His low blood pressure cannot readily be accounted for unless it be due to some adrenal deficit; a rather venturesome opinion.

Thus to start with we have two quite different types of cases, both of unknown etiology.

II. Paroxysmal Generalized Edema—Adiabetes

You may wonder why two such different cases should be described together. The reason is that they both showed a very curious condition, generalized edema *without* renal involvement,—or as I prefer to call it, *adiabetes*. This condition has not been described in the case reports as emphatically as it should. The swelling was very marked.

Before going further, however, I wish to call your attention to the relation of the pituitary gland to excretion in general. Posterior lobe extract increases the excretion via the intestinal tract, kidney,[5a] bladder, uterus, breasts, skin and meninges. The last was shown by the work of Weed and Cushing.[6] The others are familiar to you all, though you may question the diaphoresis; this is very frequent in acromegaly, very infrequent in hypopituitarism though I have described a case in which it occurred.[7] It is rare. Thus the pituitary distinctly acts like the autonomic in so far as excretion goes and increases it wherever it occurs.

As to the occurrence in acromegaly, Falta[8] states as follows: "Transient conditions of very marked sweating occur, no hyperirritability of the sweat-glands being present during the attacks. Sweating attacks are well known to be a frequent symptom of acromegaly; Magnus-Levi and Salomon consider the sweating in their cases of acromegaly as a symptom of hyperthyroidism, but it seems certain to me that the sweating in acromegaly has a different origin than this, for it is found in cases having none of the symptoms of Basedow's disease and especially not the cardinal symptom of hyperthyroidism—tachycardia."

One more question seems worth considering, one which these

[5a] Recent work, both experimental and clinical, has again made this statement uncertain.

[6] Weed and Cushing, A. J. P., V, 36, No. 2, 1915.

[7] Kraus, W. M. Pilous Cerebral Adiposity. Am. Jour. Med. Sci., V, 147, No. 5.

[8] Matthews, S. A. Experimental Diabetes Insipidus in Dogs. Arch. Int. Med., Vol. 15, 1915.

words of Falta certainly suggest. What is the relation of the skin condition of myxedema to the edema of posterior lobe hypopituitarism? Is it not quite possible that what seems to be myxedematous skin changes are sometimes due to hypopituitarism, mild to be sure? There are hypothyroid states which are not myxedematous which implies that all thyroid abnormalities do not change the skin. Yet removal of the thyroid causes myxedema and one of the best known facts concerning endocrinous gland correlation is that thyroidectomy produces hypertrophy of the entire pituitary. But this does not necessarily prove that hypothyroidism and hyperpituitarism always go together. In fact, Falta emphasizes that they do not always do so but are often both below normal in activity, due to a disease common to both.

The occurrence of a condition which in many ways resembles myxedema is of no small interest from a theoretical as well as a therapeutic viewpoint. Cushing[9] has not failed to make note of mild instances in many cases. He also observes upon the condition in the general discussion. In one case there is little doubt of its etiology. It did not pit like ordinary edema in the case of O. T. and did not pit at all in G. F. It was unaccompanied by any involvement of the kidneys worth considering. Pathologically O. T.'s kidneys were practically normal. The phenolsulphonephthalein tests were normal in both cases, which is additional evidence. The accumulation of nitrogenous waste products in O. T. was due to renal insufficiency, not to nephritis. His total intake during thirteen days was 19,500 c.c. and his output one-tenth of this. *The edema disappeared on the day that a total anuria occurred.* It would seem that water secretion had stopped. The posterior lobe was inactive. Furthermore it seemed that the posterior lobe inactively caused an oliguria (one tenth output).

Parenthetically, a quotation from Rischbieth's[10] authoritative article is of interest in this connection. He quotes from Paltauf's original article as follows: "He had twice suffered from rheumatic affections of the knees and subsequently on two occasions from *general edema*. In both instances this was relieved after a few weeks. Three weeks before coming under notice, however, the *general edema* returned and for it he was admitted to the hospital. He died 12 days later." This description is, I feel, very pertinent to the *general edema* in the two cases here reported.

When water production exceeded the excretory capacity of the

[9] H. Cushing. The Pituitary Body and its Disorders.

[10] H. Rischbieth. Dwarfism. Treasury of Human Inheritance, Section XV*a*, 1912.

kidney, edema occurred. When the posterior lobe arrests the kidneys and skin excretion pituitary edema occurs; the amount is of course in proportion to the intake of water and the capacity to excrete it. G. F. noted that he swelled more readily in the summer than in the winter; summer is the time when we use our skin most for elimination and in G. F. it could not do the required work, consequently swelling resulted.

All that can be said is that myxedematous as well as edematous states may sometimes be due to posterior lobe hypopituitarism.

In our cases we had what I consider to be the opposite of diabetes insipidus, adiabetes and pituitary edema.

Diabetes insipidus, which corresponds to the diuresis resulting from posterior lobe injection, is a frequent complication of cerebral disease. In all probability it is *almost* always of pituitary origin. The experimental work of Matthews[8] shows how near the truth this is. He found polyuria after operative injury to the pituitary. Frank agrees with this viewpoint. Of course one can readily see that the nervous centers affected by the pituitary secretion can of themselves be affected.

What seems of the greatest interest is that in two cases of pituitary tumor showing hypoactivity of the intermediary part and posterior lobe, there occurred an edema of very great severity unaccompanied by renal disease, not pitting as an ordinary cardio-renal hepatic edema and not amenable to cardio-renal therapy. This condition may well be defined as *adiabetes* in contrast to the *diabetes* which so often occurs in pituitary disease.

Discussion of Conditions Occurring Only in Case I

I. The general contour of G. F. is worth noting. The photograph certainly suggests a cave-man, something between an anthropoid ape and a normal man. There certainly is something curiously non-human in his form; the stoop, protruding abdomen, long arms, long upper lip and facial expression.

II. His hands are one of the reasons for this report. The photograph shows a trident hand. This condition was described by Pierre Marie[11] in 1900; in that description he emphasizes the depression of the fourth finger and its first metacarpal bone. Siegert[12] also points out this curious deformity. This you will see is present in our patient. The curious thing is that this trident hand is *characteristic of chondrodystrophy,* though not pathognomonic. Cush-

[11] Pierre Marie. La Presse Medicale, 1900.

[12] Siegert, F. Der Chondrodystrophische Zwergwuchs. Ergebn. d. inn. Med. u. K. derkeilk., 1912, p. 64.

ing[9] on page 181 shows a very good example in a case of hypopituitarism to which he draws no attention. Falta[5] shows one in a case of late castration (p. 323). None are so marked as G. F.'s. Besides the trident hand, G. F. shows the female type—fourth finger longer than the second. The fingers taper very considerably, the lunulæ are nearly absent. But with it all there is a degree of acromegaly; this is limited to the soft parts. Such a limitation is commented upon by Falta[5] who says that sometimes the soft parts of the hands are thickened and due to this the metacarpal bones are pushed apart. Whether this soft tissue change is due in G. F. to the edematous condition, which is probably more or less chronic, or to the irritation of the acute attacks, or to something more obscure I cannot say. The pigmentation of the hands is worth noting.

III. The feet are curious, thick, foreshortened, puffy, with the same curious edema. There is no curve on the dorsum as there should be. There is webbing between the third and fourth toes. That the leg muscles may not be quite normal is shown by G. F.'s inability to raise himself on his heels; he cannot bring his foot at right angles with his leg. These points are emphasized by photograph 9.

IV. Sugar tolerance is always increased in posterior lobe hypopituitarism. G. F. took 450 grams of dextrose on one occasion and 400 grams of saccharose on another without any glycosuria.

V. The blood showed the usual mononucleosis.

VI. Studies on basic metabolism were very kindly done in the Russell Sage Laboratory at Bellevue by Dr. DuBois. He found a low level, 19 per cent. below normal, a condition found in hypothyroidism; thus there is a hypothyroid state in addition to the hypopituitarism.

VII. G. F.'s mental state is certainly not normal. He is too childlike in his good humor and complacency; *i. e.,* he is somewhat infantile mentally.

VIII. The tumor signs and symptoms are clear cut; enlarged sella turcica, contracted and interweaving color fields and partial optic atrophy. In addition there is some hypersomnia which I shall not discuss; suffice it to say that it may be primarily pituitary. We do not know as yet.

Before leaving G. F., a brief analysis of the case seems in order. First, there is evidence of a deficiency in the posterior lobe of the pituitary, high carbohydrate tolerance, mild obesity and edema. There is a moderate deficiency of the anterior lobe, dwarfism. Second, there is evidence of a deficiency of the interstitial glands,

undeveloped sex organs, unclosed epiphyses, absence of secondary sexual characteristics (hair), infantile fat distribution and infantile form. Third, there is evidence of a deficiency of the thyroid, dwarfism, obesity, carbohydrate tolerance, metabolism. Fourth, there is possibly a deficiency of the chromaffin tissues—low blood pressure and pigmentation. The adrenal cortex may also be deficient, sex organs, growth. There is no evidence of disease of the parathyroids, pineal, thymus or pancreas. The origin of the condition may be either a primary hypopituitarism from tumor, perhaps a teratoma, with secondary changes in the thyroid, sex and adrenal glands; or it may be a polyglandular disease originally of non-endocrinous origin. I am inclined to believe in the tumor hypothesis.

Discussion of Conditions Occurring in Case II

1. The question of the relation of temperature regulation to pituitary disease is not settled as yet. I should like to call your attention to the curious difference in O. T. between the effect of a hot pack with mild sweating and one without sweating. In the former the temperature dropped to 96°; in the latter it rose to 103.5°. This implies that the skin alone regulated the effect of temperature. Changes in temperature in pituitary disease have been emphasized by Cushing who believes that the posterior lobe raises it; many others have noted rises in temperature after operative irritation of the gland.

II. The signs of tumor in this case were all pressure signs; slow respiration, slow pulse, coma, convulsions, but there was *no tumor which could exert pressure,* nor was the cerebro-spinal fluid at a high pressure on tapping, or increased at autopsy. The coma was remarkable. It lasted just two weeks, was not so deep as to prevent eye-movements when a light was flashed at the patient, or even an occasional movement of the legs. Cushing[9] records a similar case (XVI) of somnolence lasting for several months at a time. *He suggests hibernation as an analogous condition. Certainly O. T. seemed to be hibernating, with slow pulse and respiration, low blood pressure and a fairly profound sleep.*

III. Acidosis might be considered as a part of the cause in this case, for there was a focal fatty liver necrosis and acetonuria. We know that the liver does destroy the acetone bodies. We also know that acidosis in children is often complicated by coma and convulsions and finally we know that O. T. was certainly childlike in many respects. One point which Klose and Vogt[13] bring out is the im-

[13] Klose u. Vogt. Klinik u. Biologie der Thymusdruse, 1910.

poortance of the bones as a neutralizing alkali storehouse; they believe that hypothymism causes a shift of the body reactions to acidity and the bones furnish alkali to counteract this. Could the infantile state of O. T.'s bones have had anything to do with the acetonuria, given a poorly acting liver; *i. e.,* one which could not take care of an excess of acid bodies, and no thymus, as was found at autopsy? Tempting as it is, I shall not go further, for at present we can reach no definite conclusion.

And now to attempt an analysis of O. T. There was certainly no posterior lobe at autopsy. Clinically there was a lack of sweating, and edema with a history of abnormal liking for sweets (high carbohydrate tolerance). As to the anterior lobe, it was defective pathologically and clinically; there was defective growth. The interstitial glands were not defective, yet there was failure of ossification, general hypoplasia, hair distribution. The thyroid showed no large amount of colloid, yet the skin and cretinoid appearance are suggestive of hypothyroidism. The adrenal cortex did not show much abnormality, in how far it played a rôle I fear cannot be said. Certainly there were defective genitals, hair and growth. As to the chromaffin tissues, clinically there was low blood pressure, slow pulse and slow respiration. The thymus was absent, the parathyroid, pineal and pancreas were not involved clinically. Here we have defective pituitary, infantile sex glands and thyroid. What was the underlying cause of it all I cannot say definitely. The evidence at autopsy inclines me to lay the blame on the pituitary gland.

Speaking of the cause of ateliosis (the Paltauf type is one of this group), Rischbieth[10] states as follows: "There remains as the possible primary cause of ateliosis, abnormality or defect of the pituitary body or hypophysis cerebri; and this at the present time seems on the whole the most probable. On the one hand the condition seems to represent the opposite pole of abnormality as regards *growth* to that shown by pituitary gigantism . . . while in other features, such as infantilism, defective or delay of union of epiphyses, persistence of growth after normal growing years, asthemia, somnolence, etc., the two conditions appear to show similarity. On the other hand, in Paltauf's case it is clearly stated that the cavity of the *sella turcica* was much enlarged (due to a cyst?). . . . It is to be supposed, therefore that in this case the pituitary body was considerably enlarged; but *there is no note of the pituitary itself having been examined. This is the only definite evidence there is upon this aspect of the subject.* The number of autopsies made has been very small, and in none of them except the above instance was this

point investigated." The case of O. T. is therefore the first in which the pituitary gland was examined.

The Paltauf case was not obese, possibly due to the general glandular involvement. Falta observed the same lack of obesity in polyglandular sclerosis. No adequate explanation is at hand. In both carbohydrate tolerance was increased, edema of a severe nature occurred, there was no sweating, there was dwarfism. Both showed some signs of hypothyroidism; cretinoid appearance, metabolism. Both had low blood pressure, both had no secondary sexual signs and both had genital hypoplasia. In both the epiphyses were unclosed. Both had pituitary tumors.

They differ in that the body form of G. F. is infantile and he is overweight while O. T. was more of the adult proportions and not overweight.

Since reporting the above two cases, another instance of nanism has come to my notice.[14]

CASE III. A woman, 25, single. F. H. neg. No other instances of arrested development. P. H., the patient, was always small. Otherwise the history is quite negative. Present Illness: She is nervous and sensitive and has a gastric neurosis of psychic origin. This had been cleared up by psychotherapeutic methods.

Physical Examination.—A small woman, normal except for size. 52 inches tall. Upper length 26 inches. Span 52 inches. Well proportioned. Hirsuties normal, which is confirmed by a normal menstrual history and closed epiphyses. Weight 78½ lbs. Pound per inch index 1.5 (this is that of a child of 13). No micromelia. Lymphatic system normal. Thyroid normal. Mentally normal.

This case is added as a contrast to the Paltauf dwarf. It is an example of primordial nanism. It also belongs in the general group of ateliosis, but differs from the Paltauf type as the following definition of Falta[5] proves: "The primordial dwarf is characterized by the fact that the dwarfing is present at birth, that excepting the smallness, development goes on normally, that the genitals, bony ossification and intelligence are normal." Transitional types between this last and the Paltauf type occur. They are all to be grouped under the heading—*Ateliosis.*

I wish to express my thanks to Dr. Alexander Lambert and Dr. Cyrus J. Strong for permission to report these cases and to Dr Chas. Norris for the autopsy report.

[14] I am indebted to Dr. A. Richard Stern for permission to report this case.

AN ANOMALY IN THE PYRAMIDAL DECUSSATION WITH REMARKS ON HELWEG'S BUNDLE*

By Thomas G. Inman, M.D.,

SAN FRANCISCO, CALIFORNIA

During the study of newborn, human medullas in the collection of the Institute of Neurology, Frankfort a/Main, there was observed in one series two nonmedullated areas, more extensive than usual, lying, one on each side, antero-lateral to the inferior olives. They continue in this position below the crossing of the pyramids and appear to be the result of an unusual out-spreading of the pyramidal tracts into the antero-lateral columns,—that is,—an increase in the bulk of the uncrossed pyramidal tracts. Accompanying this is a degeneration, involving, approximately, one tenth of their volume, of the external portion of both inferior olives, a fact which may be not without importance in connection with the bundle of Helweg which must lie within the nonmedullated zone.

That the pyramidal decussation is not infrequently asymmetrical is commonly known, the most usual type of deformity being a preponderance of fibers in one or the other tract.

The different varieties are as follows (1): (1) Total decussation of both pyramids; (2) Total decussation of one pyramid with partial decussation of the other one; (3) Partial decussation of one pyramid; the other totally uncrossed; (4) One pyramid totally uncrossed; the other completely crossed; (5) Both pyramids totally uncrossed.

Since Flechsig (2) in 1876 drew attention to the variations in the pyramidal decussation not much attention was bestowed upon these irregularities until Pitres in 1881 (3) and '82 (4) found in a case of one-sided cerebral lesion, in addition to the degeneration in the crossed pyramidal tract, a noticeable degeneration in the homolateral one. Since this time quite a number of investigators have reported similar findings, Hoche (5); Hallopeau (6); Homen (7); Bikeles (8); Muratoff (9); Durante (10); Dejerine and Thomas (11). "Remarkable in this connection are the cases of Russel (12); Hadden (13); Hoche (14) and Brissaud (15) in which after

[1] From the Frankfort Institute of Neurology, Frankfort a/Main, Germany, Prof. Dr. Ludwig Edinger, director.

a one-sided cerebral hemorrhage both anterior and both crossed pyramidal tracts showed a secondary degeneration" (16).

More to the point in connection with this report are the cases of Spiller, Zenner, Barnes and Yamakawa. In 1889 William G. Spiller (17) reported the examination of a brain with recent hemorrhage in the left external capsule and lenticular nucleus in which "Very slightly below the level of the exit of the fifth nerve from the pons a band of fibers could be seen distinctly separating from the outermost and lateral portion of the pyramidal tract." "At the junction of the medulla and pons it took a position lateral to the uppermost portion of the inferior olive. As the inferior olive increased in size the bundle passed backward and where the olive had its greatest width the bundle was on the posterior and lateral side of the lower olive, at the periphery of the medulla oblongata. The bundle remained on the left side below the motor decussation but it could not be followed below the level of the first cervical segment as the spinal cord could not be examined." In 1902 the same author (18), in an article partly in reply to Obersteiner's (19) suggestion that the case was one of degeneration of Helweg's bundle, refers to the contributions of Mott and Tredgold (20); Mme. Dejerine (21) and Purves Stewart (22) as probably being degenerations of the same bundle as he had described and suggests that there is then, "A direct pyramidal tract, a direct ventro-lateral pyramidal tract and a crossed pyramidal tract."

Philip Zenner (23) reports a case in which death occurred from gliosarcoma of the left central convolution with left-sided paralysis and examination of the medulla showed complete absence of pyramidal crossing.

Stanley Barnes (24) "Was able to trace in four cases of hemiplegia in man a tract which descends with the pyramids from the cerebral cortex or basal ganglia, at least as far as the pons, and which in the spinal cord is situated in the ventro-lateral pyramidal region near the periphery." For it he suggests the name "Ventro-lateral pyramidal tract as showing both the immediate origin and ultimate position of the tract."

Yamakawa (25) describes a case of chronic disseminated encephalitis in which numerous microscopic encephalitic foci localized in the right inner capsule and both subthalamic regions occurred and in which, among other changes, he was able to trace in the ventral area of the brain stem and cord a high grade fiber degeneration on the same side as the central lesions. This degenerated tract he divides into a head and tail portion, the former being the direct

pyramidal tract. The so-called tail portion, he says, belongs to a peculiar, not yet sufficiently characterized fiber system which he identifies as the ventro-lateral pyramidal tract of Barnes.[2]

However, in none of the cases here referred to, where photographs or diagrams accompany the articles, is there shown a degenerated area of such extent as the nonmedullated tracts in the case presented here. Mestrom shows in his figures one direct pyramidal tract closely resembling in configuration the left one shown in figure one. Of the figures which accompany this report Fig. 1 taken at the lower part of the pyramidal decussation shows the direct pyramidal tract somewhat wider antero-posteriorly than usual and extending laterally, on the left (V. L. T.), a distance equal to two-fifths of the whole distance between the anterior and posterior median fissures. On the right side this field is broken by some fibers of the first cervical nerve. Higher in the series the same separation occurs on the left side. The separated portion probably contains Helweg's bundle (H. B.). Part of the pyramidal crossing can still be seen.

The lower extremities of the inferior olives show no degeneration nor is any present as yet in the section represented in Fig. 2. A

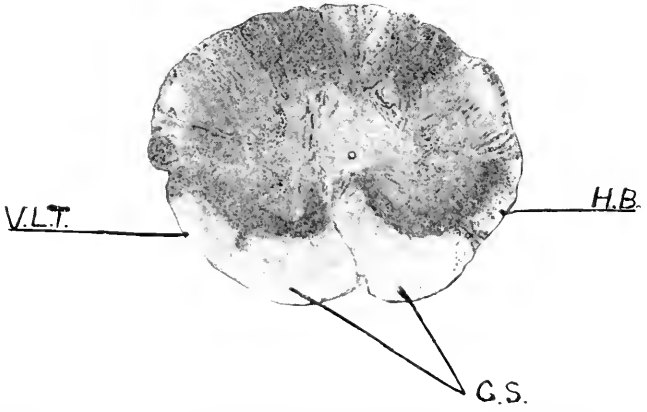

FIG. 1. V.L.T., Ventro-lateral pyramidal tract; H.B., Helweg's Bundle; C.S., Cortico-spinal tract.

few sections higher in the series the degeneration becomes visible in the external lamina. In this section (2) lateral to the direct pyramidal tracts (C. S.) are seen the ventro-lateral tracts (V. L. T.)

[2] In the "Review of Neurology and Psychiatry," December, 1913, inaccessible to me at the time this report was written, Dr. William G. Spiller has described another case in which "the pyramidal tract fibers extended around the lower olive in its upper part, and spread out in a triangular shape immediately posterior to the olive at the periphery of the medulla oblongata."

occupying the space between the inferior olivary nucleus and the ventro-lateral margin of the medulla. At (N. A.) is a detached portion of the nucleus arcuatus.

In Fig. 3 the ventro-lateral tract is again shown at V. L. T. not

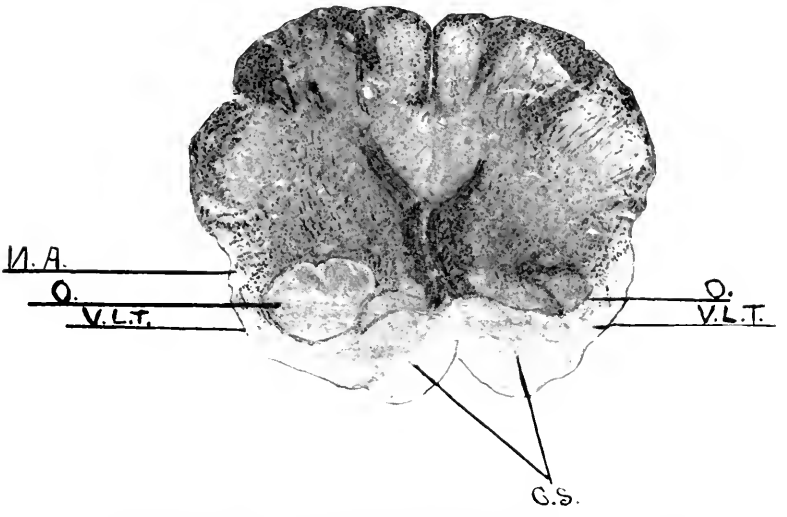

FIG. 2. V.L.T., Ventro-lateral pyramidal tract; C.S., Cortico-spinal tract; N.A., Nucleus Arsuatus; O., Lower end of inferior olive.

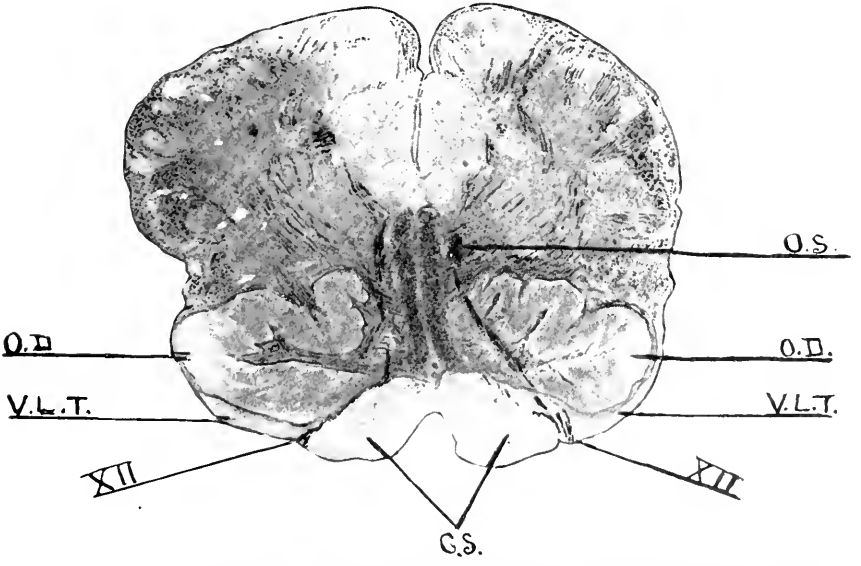

FIG. 3. V.L.T., Ventro-lateral pyramidal tract; C.S., Cortico-spinal tract; O.D., Degenerated area in inferior olive; O.S., Detached segment of inferior olive; 12, Hypoglossal nerve.

of the same thickness antero-posteriorly as in Fig. 2 but extending laterally to the same extent. Higher in the series it gradually passes into the general mass of the pyramid in the pons. At XII some fibers of the hypoglossal nerve are seen and divide the medial from the lateral portion of the mass. This is mentioned by Yamakawa as being the dividing line between the head and tail portion in his preparations. The olivary degeneration is well seen at O. D. and occurs to the extent shown in the figure until the lamina becomes normal shortly after the olive begins to decrease in size. Rarely does the degeneration extend further into the olive than here shown.

At the point O. S. in sections higher up a detached segment of the olive is seen. It occurs throughout a dozen sections with one slight interruption.

The massive accumulation of uncrossed fibers in the antero-lateral column would serve to explain cases of hemiplegia occurring on the same side of the body as the central lesion. Whether or not these fibers ultimately crossed in the cord could not be determined for no preparations lower than the medulla had been preserved. That such crossing does take place in cases where there is an irregular disposition of the pyramidal tracts in the medulla is generally believed (26) but a sufficient number of cases have been observed to prove that this is not always the case. Such extreme cases as the one reported here must be extremely rare for Professor Edinger (27) does not remember having seen one in his institute where during the past twenty years many medullas have been sectioned and examined.

Another point of interest lies in the several tracts so often described as lying in the antero-lateral fasciculus. Here, of special moment in connection with the olivary degeneration, is the spino-olivary bundle, the function and disposition of which have given rise to so much discussion since first accurately described by Helweg (28) in 1888 as the "Dreikantige-bahn," a wedge-shaped area composed of fine fibers lying lateral to the direct pyramidal tract. Later observations have confirmed his findings and have with some definiteness placed the bundle as coursing between the first four or five cervical segments and the inferior olive. Various names have been given to this bundle or to the combined fiber system of this region, namely — "Oliven-bundle"; "Fasciculus periolivaris"; "Fasciculus circumolivaris"; Tractus spino-olivaris"; "Helweg-Westphal bundel"; Helweg-Bechterew bundel." It is not improbable that under some of these names fibers other than those forming

Helweg's bundle proper, are included. It is possible that in those cases where fibers in the antero-lateral region of the lower medulla have been traced above the inferior olive they were fibers belonging to the antero-lateral tract mentioned above. In so far as Helweg's bundle is concerned the following of the bundle in a normal Weigert series speaks against the continuation of the fibers above the inferior olive. The staining is so characteristic that it is relatively easy to follow the fibers in such a series.

In the case here reported the whole conformation of the antero-lateral fasciculus has been changed by the unusual nature of the pyramidal decussation. The tractus spino-olivaris must have been pushed aside and it may be possible that there is some connection between this displacement and the olivary degeneration.

At any rate there are some points of special interest connected with the anatomy of the lower medulla oblongata, important both from an anatomical as well as a clinical standpoint, and it seems, therefore, not superfluous to add the present case to the existing material on the subject.

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SOME UNUSUAL FEATURES OF JACKSONIAN EPILEPSY[1]

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and E. Murray Auer, M.D.

PHILADELPHIA

In a study of some clinical and pathological cases in which the chief phenomenon present was a partial convulsion of what is commonly known as Jacksonian epilepsy, we have noted what seemed to us some unusual features.

While Bravais in 1827 was probably the first to fully describe and appreciate unilateral convulsions, it was in reality the work of Hughlings Jackson that showed the association of this phenomenon with lesions of the motor cortex. The importance of this effort may be more clearly understood when one considers that the Flourens theory of the physiological equality of all parts of the brain was still in vogue. Numerous observations were reported thereafter until the firm conviction was established that a sharp differentiation could be made between the general epileptic convulsion and the Jacksonian, as a convulsive type significant of a cortical lesion.

Pritchard in 1822 first described local convulsions and in 1827 Bravais called the condition hemiplegic epilepsy because of the paralysis following the attacks. Abercrombie described in 1828, as a class, certain cases "distinguished by convulsions without any affection of the senses," where he said "the convulsions may be confined to one side of the body," and he noted that in one case there was a tumor on the opposite cerebral hemisphere and in another case a portion of the opposite hemisphere was indurated. This was the first report of pathological findings associated with localized convulsions, but the author did not ascribe the convulsions as due to his findings. Elliotson in 1831, designated the condition as partial epilepsy. By his remarkable paper on this subject, Hughlings Jackson, in 1861, set on foot a train of investigation by different workers which culminated in the localization of the motor areas of the brain. Fritsch and Hitzig, in 1870, were the first experimentally by means of the application of electrodes to map definite areas of the motor cortex. Jackson described three modes

[1] Read before the American Neurological Association, May 8, 9 and 10, 1916. From the Department of Neurology, University of Pennsylvania.

of onset of the convulsions; those in the hand; those in the face and tongue; and those in the foot. Charcot described a form of partial tonic epilepsy, another of vibratory epilepsy, and a third of partial sensorial epilepsy, where a severe ophthalmic headache accompanied the convulsive seizure.

Broadbent, in 1883, described well localized and unilateral convulsions in Bright's Disease. A year later Ballet and Crespin described partial convulsions as occurring as part of hysteria. In 1885 Fournier added another classification which he called syphilitic epilepsy. Laborde was the first to ascribe alcohol as an etiological factor. Hirt, lead; Raymond, Chantemesse and Tenneson, and Chauffard, urea; and stated that in uremia the toxic substance was capable of exerting a selective influence on the motor area and producing typical unilateral convulsions. In 1890 Bonhoeffer called attention to the fact that localized convulsions could be the manifestation of an idiopathic epilepsy. A. Fuchs, in 1887, stated that the phenomena of sensory Jacksonian attacks alone or as an accompanying symptom of the motor attacks were found in the following conditions: (1) in the prodromal stage of progressive paralysis where they may appear as the first somatic symptom of the disease; (2) in diseased conditions of the brain which were limited in extent, such as tumor, abscess, etc.; (3) in encephalo-malacia; (4) in hemicrania symptomatica (migrane) and concluded that sensory Jacksonian attacks were always an indication of an anatomical central lesion. Rausier, in 1893, classified Jacksonian epilepsy from an etiological standpoint according to, (1) affections of the bone, (*a*) tumor, (*b*) exostoses, (*c*) splinters; (2) affections of the meninges, (*a*) tumor, (*b*) acute, sub-acute and chronic meningitis, (*c*) hemorrhage, (*d*) blood extravasations in pachymeningitis; (3) affections of the brain, (*a*) old encapsulated abscesses, (*b*) cerebral sclerosis, (*c*) tumor of the brain, (*d*) hemorrhagic foci, (*e*) areas of softening; and special stress was laid on trauma and syphilis.

Dr. Hughlings Jackson further described a variety of tonic spasms which occurred in cases of tumor of the vermis, and also the uncinate tasting group of fits due to an area of softening in the uncinate gyrus. At about this period efforts were made to distinguish between Jacksonian epilepsy originating from lesions in the frontal and rolandic regions by the presence or absence of psychical manifestations. Dieulafoy and Raymond were among the first to deny this. Collier, in 1904, reported several cases in which lesions (neoplasms) located in the cerebellum produced Jacksonian convulsions and advanced the idea that the late onset of Jacksonian convulsions indicated a lesion distant from the motor cortex. Bonhoeffer,

in 1906, in a study of Jacksonian epilepsy, stated, (*a*) "If it is true that Jacksonian epilepsy is a frequent symptom of a lesion of the rolandic convolution it is no less certain that it may result from a lesion situated distant from this region, even on the opposite side. (*b*) Cerebellar lesions produce convulsions generally on the same side. (*c*) Jacksonian epilepsy sometimes occurs in individuals with generalized epilepsy, due to another lesion. (*d*) Jacksonian epilepsy might be due to hydrocephalus. (*e*) It might appear spontaneously without explanatory findings. (*f*) There might be with signs of Jacksonian epilepsy signs of tumor or abscess and the autopsy negative.

While diphtheria has been described as an etiological factor in the causation of general epilepsy, we have been unable to find any association of diphtheria with Jacksonian epilepsy, other than the following case which came under our observation at the University Dispensary.

CASE F. Y. Aged 16 (?). The patient had diphtheria at eight years of age, following which she was confined to her bed for two months, probably with encephalitis, as she was unconscious a great part of the time and later was left with a paralysis of the left side. During the illness she suffered convulsions confined to the left side and they still occur. The attacks occur at intervals ranging from six weeks to six months. Patient loses consciousness in the attack and sleeps following it. On examination the pupils are equal and respond to light direct and consensual and in accommodation. There are no cranial nerve palsies and the tongue is protruded in the median line. Patient can raise the left arm above her head and manifests athetoid movements. The left side is much less developed than the right and there is spasticity in both upper and lower limbs on the left side. The gait is hemiparetic in character; the intelligence is good.

The occurrence of unilateral sensory phenomena has been reported in several instances, probably most commonly in tumors encroaching upon the sensory area. The following case is important in its association with unilateral sensory phenomena occurring in hydrocephalus.

CASE H. W. Male, age 9. His family history and previous medical history were negative. At two years of age he had two or three general convulsions of unknown etiology, but has had none since. He was backward and dull at school. On July 15, 1915, he had an attack in which all of the right side, including the face and one-half of the tongue, felt numb and queer. He did not lose consciousness but stood still five or ten minutes. On examination the

patient showed well-marked bilateral choked disc, without any involvement of the other cranial nerves. There was no nystagmus and the conjunctival reflexes were present. He had attacks of vomiting at night. His gait was uncertain with a tendency to pitch and stagger to the right and backward, and a marked inclination towards festination. There was no loss of sensation to touch and pain. The patellar reflexes were exaggerated but equal. There was ataxia of the upper limbs. Without warning the patient would complain that his right foot felt numb and he rested his weight on the left limb. The right upper limb seemed heavy and dropped to his side. There was "something biting the right side of his face and tongue." He understood requests but only shook his head in reply. This attack lasted five or ten minutes, when he continued as before. He had no headaches, and there was no paralysis or disturbance of sensation. The Wassermann examination was negative. The patient died and at autopsy there was found a marked internal hydrocephalus with apparently equally dilated ventricles.

The association of thalamic pain, unilateral in character, with Jacksonian epilepsy, has not been noted and was found in one of our cases where the lesion present was a scar in the optic thalamus. While pain of thalamic origin is recognized, its possible occurrence in Jacksonian epilepsy has hitherto not been considered. This pain must not be confounded with the pain due to early muscular contraction and the various paresthesias commonly associated not only with local but also with general convulsions. It does seem improbable that a stimulus irritating at the same time the thalamus and motor cortex should bring about this phenomenon with Jacksonian attacks either before, during or following the attacks.

CASE M. C. G. Female, aged 69. She suffered a stroke at 64 years of age, following which there was partial recovery with no contractures. At intervals she suffered excruciating pains in the left lower and upper limbs. Previous to her death she had clonic convulsions of the entire left side with involvement of the right brow and eyelids. There was conjugate deviation of the eyes to the left. At necropsy there was found an old scar in the right optic thalamus extending into the internal capsule. The right anterior pyramid showed some degeneration. Following the occurrence of sensory attacks anesthesia, analgesia and other sensory phenomena have not been sufficiently studied to warrant a statement of the frequency of their occurrence.

Unilateral spasm of the face involving chiefly the muscles of the forehead and eyes without involvement of the opposite side has long been considered as a differential diagnostic point between spasm

of peripheral and central origin. That such spasm can be of cortical origin is seen in this case in which it is probable that the irritation was not of sufficient intensity to cause bilateral involvement.

J. M. Male, age 7. Left-handed. Instruments were used to turn the child in utero but not to deliver it. Without any previous illness or history of trauma, in September 1915, he had the onset of the present convulsions. He suffered no aura. The entire body became tonic and there was conjugate deviation of the head and eyes to the left, followed by clonic movements of the left face and eyelids. There was no clonic movement of the right brow or eyelids or any of the limbs. During the attack the child attempted to talk and laugh in a foolish manner. He was conscious during the attack which lasted from one to two minutes and he had fifteen such attacks within a period of thirty minutes. The neurological examination was negative. Vincent, in the description of a case in which the attack began in the left shoulder spreading to the left lower lip, face and frontal region, with conjugate deviation of the head and eyes to the left, stated the well-known facts that progression was characteristic of cortical spasm and that in a peripheral spasm all muscles entered into play simultaneously. In peripheral spasm, closure of the eyelids and wrinkling of the brow were limited to one side, while in cortical spasms these movements were bilateral but asymmetrical. In these convulsions, the left sterno-mastoid did not contract, but the right did enter into action to produce conjugate deviation of the head, which was not a paradox when the action of the neck muscles was considered. Cooleville described a case of Jacksonian convulsions limited to the left sterno-cleido-mastoid and trapezius in Bright's Disease. At autopsy he found edema of the brain and a small area of softening in the right prefrontal region. In a general convulsion the head would be pulled forward and downward, owing to the action of both sterno-cleido-mastoid muscles or possibly a trifle more to one side or the other, owing to a greater intensity of the action of one or the other muscle. Whereas these muscles when acting singly will tend to draw the head and at the same time to rotate it towards its own side, so that in reality the rotation of the head and not the position of the chin is the point of diagnostic importance.

General convulsions may appear as local convulsions owing to the fact that part or the whole of one hemisphere is thrown out of action due to another cerebral lesion, as seen frequently in the cases of infantile hemiplegia associated with epilepsy where the paralyzed limbs are in a state of spastic contracture and in which the general convulsion makes itself more apparent on the sound side. Karpus

early observed that in the dog when the corpus callosum was divided and the motor cortex of one side was excised and the motor cortex of the other side was irritated, general convulsions then ensued, but there were no clonic movements of the limbs whose motor cortex was excised. Beevor stated that there was no epilepsy obtained on the same side as the cortex stimulated when the opposite cortex was removed. Brunet reported the case of a woman with hereditary epilepsy of fifty years' standing with entire cessation of the attacks after an apoplectic stroke. There were no autopsy records. From this case one might infer that an impulse originating in a part of lessened resistance and through its intensity spreading to the opposite hemisphere was productive of a general convulsion, and that with the loss of function of this weaker portion of the brain convulsions ceased due to the destruction of the conducting paths.

This apparent Jacksonian phenomenon is in reality an abortive general convulsion, and must be distinguished from the true Jacksonian convulsion. We would place it with the pseudo-Jacksonian convulsions distinct from the interpretation of the term as used by Vogt, Ballet, and Crespin, who applied the term to the unilateral seizure of idiopathic epilepsy. Pseudo-Jacksonian epilepsy should not include, however, the localized manifestation of hysterical origin, inasmuch as in the former it is of organic origin while in the latter it is a result of a morbid psychical factor and in reality a simulated Jacksonian convulsion. In the case of C. S., with right hemiplegia and general convulsions, the involvement was greater on the left side. At autopsy there was found an extensive hemorrhage into the left ventricle.

In other cases of localized attacks from cerebral lesion frequently only one portion is involved. This may be explained by loss of function earlier of the part not showing clonic convulsion, rather than a limited distribution of the irritated region. In the case of Laignel-Lavastine, there was a left hemiplegia with Jacksonian convulsions of the left face not involving the limbs and due to a subcortical softening of the right ascending frontal convolution. In the following case, observed by one of us, following a circumscribed purulent meningitis, with partial paralysis of the arm and complete paralysis of the leg of the same side, clonic manifestations were present only in the partially paralyzed limb. The necropsy showed complete involvement of the upper rolandic area with only partial involvement of the arm and face area. It is possible to include under pseudo-Jacksonian attacks the conception of Vogt and others where the localized convulsions are not due to a destruction of the opposite tracts, but rather to a disturbed equilibrium of the two

hemispheres, such as is found in those cases of genuine idiopathic epilepsy with localized manifestations. The following case is evidently of such a character.

CASE W. F. Male. At ten years of age he had localized convulsions limited to left side. On an average of once a month he had general convulsions beginning in the left arm during which he was unconscious, bit his tongue and soiled his clothing. At present observation, seven years later, he still presents the convulsive phenomena with no further manifestations than greater mental deterioration.

While instances have been recorded of Jacksonian convulsions from lesions distantly located from the motor cortex, it is by no means common and the following case is interesting in this connection.

CASE W. L. S. Male, age 33. In 1913 the patient fell from a scaffold and was unconscious for ten minutes, after which he resumed his work. In 1915 he began to have attacks which he described as a "drawing" of the left side of his face and later of the left sterno-clavicular articulation. These were of a few minutes' duration and occurred once or twice daily. There was twitching of the eyelids of both sides. He crumpled up and fell to the ground, but was not unconscious. His sight began to fail in the right eye, and later in the left. He complained of headache. On examination, he showed no Romberg and no disturbance of gait. The pupils were equal and reacted to light direct and consensual and in accommodation. The extra ocular movements were normal and there was no contraction of the visual field. There was subsiding choked disc. He showed weakness of the left side of the face. The tongue was protruded in the median line. There was hypermetria of the left hand in the finger-to-finger and finger-to-nose tests. The deep reflexes were active and equal, and there was no Babinski. The sensory examination objective and subjective was negative. Bárány tests by Dr. Jones located the lesion in the left pons. The patient died, and at autopsy a large fibro-sarcoma was found on the left side of the pons, pressing greatly on the left cerebellar lobe.

Sometimes a Jacksonian convulsion may be the initial symptom of a cerebral syphilis. This was strikingly illustrated in this case.

CASE D. Y. Age 42, male. Previous medical history and family history were negative. He denied alcoholic and luetic histories. On February 24, 1916, he had an attack of numbness in the left arm and his attention was called by the hotel clerk to the fact that his left hand and arm were jerking. He was taken to a physician's office and while relating the occurrence, he fell over unconscious.

Since then, and until his admission into the hospital, he has had numerous Jacksonian attacks, having had as many as seventeen in one day. There was no history of headache, vomiting, bladder or bowel disturbance. His examination on admission to the hospital showed the right pupil to react poorly to light, while the left could not be tested because atropine had been used. Both eyes and the head were turned to the left, the brow was wrinkled equally well on both sides, but he could not draw up the left side of his face. The tongue was protruded to the left. There was no rigidity of the neck. Hearing as tested by watch-tick, was good in both ears. There was complete left homonymous hemianopsia and flaccid paralysis of the entire left side. There was loss of tactile and pain sensation and the senses of motion and position in the left upper extremity. There was astereognosis of the left hand. There was no disturbance of sensation on the right side of the body. The right patellar reflex was present and not exaggerated; there was no Babinski. In the left limb the patellar reflex was not obtainable. There was no Babinski. The Wassermann reaction of the blood was strongly positive.

In another case of cerebral syphilis which recently came under our observation, practically the only symptom present over 4 years was the Jacksonian convulsion. The convulsions occurred at irregular intervals during this period. They showed at times the picture of a status epilepticus. There was no progression in the severity or frequency of the attack. The eye-grounds showed a choroiditis. The Wassermann of blood and spinal fluid was negative, but the globulin test was positive and there was a cell count of 20.

DEMENTIA PRÆCOX ASSOCIATED WITH UNCINARIASIS[1]

By Dr. Eugene D. Bondurant

of Mobile, Ala.

We in the South have long since learned to regard the hookworm as a possible causative factor in the psychoses and other nervous disturbances of childhood and early adult life. We see the anemia and toxemia caused by this parasite exert its uniformly unfavorable influence over mental development; we see it contribute toward the production of epilepsy, hysteroid states, confusional psychoses, and other nervous disturbances, and we see these nervous disease syndromes disappear when the parasites are driven from the intestinal tract.

It is, however, not often that a hookworm infection constitutes the sole exciting cause of a genuine dementia præcox. Such an instance is nevertheless offered by the case herewith briefly recorded:

C. W. J., a young school girl, 16, previously healthy and mentally sound, of above the average intelligence. Family history alleged to be free from taint of neuro-degeneracy, but her mother has been "nervous" at times.

The girl spent the summer visiting in the country. She went without her shoes part of the time and "had ground itch terribly."

Shortly after this she began growing pale and weak, became listless and indifferent and had shortness of breath. When she came home she was mentally dull and "seemed different."

Upon returning to school in the autumn she found that her work was too hard for her and that she "could not learn." Whereas during former years she had been bright, intelligent, active, attentive and had stood near the head of her class (third year high school), she was now dull, apathetic, inattentive, given to dreaming, and at times seemed dazed and confused. She soon grew worried and despondent and cried a good deal.

As the days passed she grew steadily worse, became more apathetic, completely unable to learn anything or to fix her attention upon her tasks; she grew slovenly in her habits, talked to herself and was silly and feeble-minded to the last degree. Six weeks after the school term began her teacher requested the parents to take her out of school, as she was unable to learn and her "mind was affected."

[1] Read by title before the American Neurological Association, May 8, 9 and 10, 1916.

Rest at home did no good and she was then brought to me for examination and advice. The condition shown at this time was a fairly typical hebephrenic dementia præcox. The girl would sit immovable, staring at vacancy, noticing nothing. She would not converse, would rarely answer questions and then in monosyllables or irrelevantly. Now and then she would smile or giggle foolishly. At times she would move aimlessly about and whisper to herself meaningless words. She would make no complaint and did not seem distressed—merely apathetic, dull and devoid of mental activity. She was said to be entirely indifferent to her personal appearance, would not put on her clothing, nor undress herself at night; was unclean in her personal habits; would at times not take the trouble to eat, although she would chew and swallow food put in her mouth.

There was a partial anesthesia over entire cutaneous surface. There were no cataleptoid symptoms.

She was well nourished, but pale, flabby and cachectic; extremities cold and blue; circulation, sluggish; heart sounds, weak; blowing anemic murmur; blood pressure, low; temperature subnormal; hemoglobin percentage 40; marked eosinophilia. Examination of feces showed the presence of hookworm ova in unusual numbers.

She was constipated; had not menstruated in four months.

The patient was put in bed and given no food for one day. That night she received five grains of calomel and the next morning one ounce of Epsom salts. After free movement from the bowels she was given ten grains of powdered thymol in a capsule every twenty minutes until sixty grains were taken. Two hours after the last dose of thymol she had a second dose of Epsom salts. About fifteen hundred (1,500) hookworms were expelled. She was ordered a liberal dietary, an iron tonic and rest in bed for ten days. Improvement was immediate and recovery rapid and complete.

Before the ten days rest was finished all symptoms of mental retardation, instability and defect had completely disappeared and the memory, reasoning powers, power of attention, as well as the emotional state, were practically normal.

One month later the child returned to school, made up her deficiencies and completed the work of the year with her class and with credit.

The patient has remained perfectly well to the present time (three years), there being no trace of mental or nervous instability, peculiarity, nor defect to suggest the occurrence of a former severe psychic disintegration.

NOTES ON GOLD SOL DIAGNOSTIC WORK IN NEUROSYPHILIS (PSYCHOPATHIC HOSPITAL, BOSTON)*

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After preliminary trials of the gold sol test of Lange upon cerebrospinal fluids, which had proved to us (1) as to other workers its remarkable reliability for routine work, endeavor was made to apply the method to cerebrospinal fluid obtained post mortem. Fortunately for the purpose of anatomo-clinical correlation, it was proved that post-mortem fluids were quite capable of yielding important and valuable results (2). A third step in this work consisted in the bringing of proof that the gold sol test would vary in different loci of the cerebrospinal fluid system (3).

After this initial study of 28 autopsied cases, further work was done by way of routine in 25 cases of all sorts of mental disease as these came to autopsy in the state-wide service of the Massachusetts Commission. Variations of the test in different loci were again characteristically found, and an endeavor has been made by us in association with Dr. Canavan to determine the significance of these variations when compared with the histology of the underlying tissues. This latter work, not yet published in detail, yielded some conclusions of interest.

We deal with gold sol curves that have received designations, "paretic," "syphilitic," "chronic inflammatory" (including tuberculous meningitis, brain tumor, etc.), and "acute" (including sepsis). These designations have been applied on a basis of clinical experience with fluids withdrawn by lumbar puncture without any

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very extensive collection of post-mortem verifications. In our recent series of 25 cases with histological parallels (that is, a study of the tissues underlying the point of the pia mater where the fluid was withdrawn), there were but two cases in which the gold sol curve was characteristically paretic. One of these cases was characteristic of paresis histologically. It was interesting that, whereas the cerebral fluids yielded a "paretic" reaction, the spinal fluid yielded a "syphilitic" reaction, and the only factor presented in the cerebrum, not in the spinal cord, was a parenchymal change. There was a meningitis with plasmocytosis, both over the cerebrum and over the spinal cord, but the cerebrum showed characteristic intracortical perivasculitis, whereas the spinal cord showed little or no parenchymal change.

Another case which yielded a "paretic" reaction in the post-mortem fluid does not appear to be a case of paresis at all, if we are to make the diagnosis on plasmocytosis and other features. These features were all absent in this presenile dement, who died at 80 years. Now, in this case there was a cerebral hemorrhage and there were pial petechiæ. Of course we took the precaution of excluding from consideration all test fluids containing any tinge of blood, just as we habitually exclude such bloody fluids from examination when they are withdrawn in ordinary ante-mortem puncture. The fluids which yielded the paretic reaction from this case were *not* bloody when withdrawn. Is it possible, however, that hemorrhage and petechial processes will serve to nullify the value of the gold sol test even when there is no gross blood evident in the fluids? We are inclined to question the value of the positive gold sol test in fluids withdrawn for the purposes of clinical diagnosis when there has been a previous apoplexy or other hemorrhagic process, and if the Wassermann reaction is also negative. Of course, no one now-a-days would attach extreme significance to a positive gold sol test if no other of the five tests now ordinarily used (Wassermann serum, Wassermann fluid, albumen, globulin, cell count) were positive. But this work seems to suggest that occult blood in cerebrospinal fluid may modify the gold sol reaction.

We had eight cases with "syphilitic" gold sol reactions. Not all of these cases showed mononucleosis of the meninges upon histological examination. One of the cases—an old asylum case of chronic dementia, whose proper classification is in doubt, dying at 60 years—had a process of cerebrospinal atrophy and sclerosis of moderate degree, and an appearance of combined system disease in the cervical spinal cord. But this case again was one of an old in-

tracranial hemorrhagic process—in this instance an old internal hemorrhagic pachymeningitis. Possibly occult blood or the remains of hemorrhage may have altered the gold sol reaction so that the results should be thrown out. Another case with "syphilitic" gold sol reaction, but without meningeal mononucleosis, did show a strongly localized meningitis about the third nerves, which suggested that special study should be made to reveal other microscopic evidences of focal change. On the whole, we question whether one should attempt to parallel the gold sol results with mononucleosis. The gold sol reaction indicates one sort of physicochemical situation in the cerebrospinal fluid; the lymphocytosis or plasmocytosis indicates another type of reaction on the part of the nervous system. There is no genuine need for discovering an exact parallel, or any parallel whatever, between the gold sol reaction and mononucleosis. On the whole, we do find far more of a correlation between cerebral or spinal atrophy and sclerosis, on the one hand, and the gold sol reaction on the other, than we do between mononucleosis and the gold sol reaction. We consider, accordingly, that the gold sol reaction is probably based upon the appearance in the fluid of substances produced in the process of atrophy and sclerosis. Mononucleosis of the fluid is perhaps a spill-over from mononucleosis about the blood vessels, while primary mononucleosis is a reaction of a chemiotactic nature. What little is known concerning the chemistry of the gold sol reaction (see, for example, the work of P. G. Weston (4)) may be regarded as consistent with our view of the relation of this process to the process of atrophy and sclerosis of the parenchyma.

It is sometimes inquired, whether non-nervous syphilis can yield the "syphilitic" gold sol reaction of the spinal fluid. One of our cases we hoped could be used in this connection. The case was one of extensive gummata of the liver and yielded a "syphilitic" gold sol reaction of the cerebrospinal fluid. However, upon histological examination, we proved the existence of a mild but distinct meningoencephalitis.

One case was particularly interesting since the clinical diagnosis of general paresis had been regarded as certain on the basis of somewhat elaborate clinical work, and since the lumbar puncture fluid in life, from time to time, yielded characteristic "paretic" reactions. However, at autopsy, the fluids withdrawn from various parts of the nervous system failed to yield a "paretic" reaction. Some of the fluids did exhibit a characteristic "syphilitic" reaction. The autopsy showed exceedingly little brain atrophy and even less

sclerosis, and there were no gross meningeal changes except over the cerebellum and about the olfactory bulbs. Histologically, there were intracortical vascular infiltrations with mononuclear cells, and there were deposits of mononuclear cells in the spinal meninges. There were no cell deposits over the surface of the cerebrum. The histological diagnoses have to be summed up as chronic encephalitis and spinal meningitis,—a combination of lesions which topographically at least suggests that distribution of lesions which we get in a full-blown case of so-called paresis. This case had been extensively treated by salvarsan. A question arises, whether the cortical paretic process occasionally retreats into a process which is syphilitic in some simpler sense of the term. It has, in fact, been the endeavor of the laboratory to show that a "syphilitic" gold sol reaction is in some sense a *forme fruste* of the "paretic" reaction (5). If this be the case, then it may well be that at times the tissues produce a substance for a given period that allows the "paretic" reaction to develop, whereas before and after this period, the tissues are producing a substance that allows merely the "syphilitic" gold sol reaction to be produced.

We had one case that showed in places a "syphilitic" gold sol reaction in the post-mortem fluid that never was regarded in life as paretic or even syphilitic. The case was, in fact, one of Korsakow's psychosis, dying of miliary tuberculosis. There was a focal intravascular polynucleosis in the spinal cord, and it may be that hemorrhages in connection with the miliary tuberculosis in some way interfered with the values of the gold sol reaction.

Summing up the situation with respect to the "syphilitic" reactions, we found eleven cases. We felt entitled to remove from the denominator three cases of ante-mortem hemorrhage, since although the fluids tested showed no gross blood tinge, yet we thought of occult blood therein as destroying the reliability of the tests. Of the eight remaining cases, three were undoubtedly syphilitic, two strongly suggestive of syphilis and entirely consistent with that diagnosis, two more qualified by localized lymphocytosis and focal cerebrospinal sclerosis only. The remaining case was the one just mentioned of miliary tuberculosis. We regard these results as fairly conclusive of the value of gold sol tests on post-mortem fluids and of the clinical correlation-value of carrying on histological examinations alongside the gold sol tests of fluids from the overlying tissue spaces.

The results seem to lend further strength to the idea of the chemical differentiation of different parts of the cerebrospinal fluid

system. We have since had some instances of fluids withdrawn in the process of intracranial salvarsan treatment simultaneously from the pial spaces and from the ventricle, which have likewise shown a difference in gold sol reaction, as also a difference in the Wassermann reaction and in other chemical tests. We regard as at any rate established the idea of the chemical differentiation under different conditions of disease of the ventricular fluid and the pial fluid. Of course the condition of disease are such (what with the gluing together of membranes by exudate, and the local fibrosis) that it would be not unlikely that a compartmental situation would develop even if the entire fluid system were freely anastomotic under normal conditions. We have collected authorities on both sides of this question, as to the free intercommunication of fluid in different parts of the cerebrospinal fluid system. There are excellent authorities on both sides of the question, even when that question touches normal conditions. It would seem, however, that not much doubt should attach to the assumption of compartmental conditions in a disease like general paresis. We have occasionally found differences in the gold sol test from sub-pial spaces in coördinate parts of the pial membrane on the two sides.

We commented above upon the fact that the gold sol reaction did not seem to parallel the amount of mononucleosis as found in the meninges or brain tissues in the different parts of the brains studied. Our studies in fluids clinically taken seem to afford proof that several other of the routine tests for the fluid are not exactly parallel in their significance, and do not represent different aspects of the same kind of process so much as they represent different and independent processes. P. G. Weston has apparently given a chemical proof of the non-identity of the albumen and the Wassermann-test-producing bodies from the substance that precipitates the gold in the gold sol reaction. Our own clinical material shows that several of these substances may be found independently of one another, both in untreated cases and treated cases. The treated cases show the non-concomitance, or lack of parallelism, in the tests much more clearly than do the untreated cases. It is very rare in our experience to find a positive Wassermann reaction in a spinal fluid which does not yield some of the other tests also (exception: congenital syphilis). As is well-known, the blood serum Wassermann reaction does not necessarily parallel the spinal fluid reaction. We had an interesting case of paresis in which all the five tests were positive in the spinal fluid, but in which a negative Wassermann was obtained

in three successive samples in the series. After two injections of arsonobenzol, the action of the serum in this case became positive and has remained positive in ten successive samples drawn during the course of treatment. As to the globulin reaction, globulin is, of course, one of the most constant findings in all inflammatory processes, and we have found it not very rarely in the absence of a gold sol reaction, a pleocytosis, and a Wassermann reaction. As for pleocytosis, it appears to be the most variable of all the abnormal findings in the fluid. We have even occasionally found it when other tests have been negative.

The wife of a paretic showed in two counts, 12 and 16 cells per cmm. without showing any other fluid features. A 20-year-old man with signs of congenital syphilis and psychotic outbreaks showed a pleocytosis of 56 per cmm. without other reactions. We have so far never seen a gold sol reaction negative in neurosyphilis when the Wassermann fluid reaction and the globulin reaction were both positive.

Among treated cases, we have a number of observations of the usual sort to show that pleocytosis may disappear and all other tests remain positive. We have instances to show a Wassermann reaction remaining positive in which all other tests became negative. Again, the gold sol reaction may remain positive and all the other tests become normal or the gold sol reaction and the Wassermann reaction may remain positive with all other tests negative. Three cases especially studied showed the gold sol becoming negative while the other tests remained positive. The Wassermann reaction may become negative and other tests positive. We have at times observed a blood serum to become negative, whereas the spinal fluid tests remained unchanged; or, on the other hand, the Wassermann reaction in the blood serum may remain positive whereas the spinal fluid tests all become negative. We can abundantly confirm the observations of others to the effect that the changes in the tests do not parallel changes in the clinical conditions of the patients. In short, these various tests occur under natural conditions, in untreated conditions independently of each other. They are, in short, separable by chemical means (Weston and others) and they disappear in treated cases at different rates.

The above findings are here reproduced in abbreviated form for the sake of record in the transactions of the American Neurological Association. We hope to publish some of the protocols underlying some of the more important features elsewhere.

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HEREDITY IN ST. VITUS'S DANCE

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As a rule direct heredity plays no part in the causation of St. Vitus's dance. Were it an important causative factor the affection would frequently occur in two or more generations; how rare such an occurrence is is shown by the records of The Orthopedic Hospital and Infirmary for Nervous Diseases. Less than one per cent. of the hundreds of patients who have been treated there in the last thirty years have given a history of the occurrence of the disease in either parent and the only instance known to me of seven cases occurring in three generations in one family is here reported. The influence of indirect heredity in predisposing to St. Vitus's dance, *i. e.*, the effect upon the descendants of nervous, visceral, and vascular diseases, the infectious fevers, alcoholism and other drug habits, and degeneracy of one kind and another in parents and grandparents, is very difficult to determine and the diseases affecting the offspring are not direct inheritances but merely the resulting visible signs of defective protoplasm, the effect of illness in the forebears. The thing inherited, carried over from generation to generation, is not the particular disease but a predisposition to it. The great difficulty in determining the influence of indirect heredity is that studies of ancestral health cannot be exhaustive and thorough. To prove that any given child attending a clinic and suffering from St. Vitus's dance has a clean family history is well nigh impossible, because there is always the possibility that something has been forgotten. Careful and tactful questioning will usually reveal the existence of insanity in a parent, less certainly in an uncle and aunt, but when it comes to discovering neuroticism, eccentricity, hysteria, organic nervous diseases and borderland states the quest is almost hopeless. When we come to investigate the occurrence of other diseases in the family the problem is still harder. To discover whether any one or more of the large list of non-nervous diseases has occurred in a family is practically impossible and hence we know little of their influence as predisposing causes. My experience has, however, led me to conclusions at variance with what is usually laid down in the text-books not only as to the influence of heredity in St. Vitus's

dance but also as to the type of child prone to be affected. Many writers state that some kind of nervous disease is rather common in the parents and the patients themselves are said to be most often nervous, excitable children who lack mental and emotional poise. My own conclusions, based on years of experience in public and private practice, and always having in mind to study especially the influence of heredity, are that direct inheritance plays practically no, and indirect only a very small part; that "nervous" children are but little more prone than others to St. Vitus's dance and that among the so-called functional nervous diseases common among children it ranks low, far lower than tic, as a danger signal of nervous or mental breakdown later in life. If St. Vitus's dance were really a product and sign of biological degeneracy its victims would in later life succumb in large numbers to such affections. As a matter of fact a surprisingly small number of the sufferers from true hysteria, dementia præcox and manic-depressive-insanity, all of which have as their fundamental cause congenital degeneracy, seen by me have had a history of St. Vitus's dance in childhood. One reason for the common opinion that nervous children are more prone to it than others is the fact that all choreic children are nervous, fretful, peevish and emotionally unstable. The physician often looks upon this emotional instability as part of the child's temperament, though really it is a symptom of disease. It is surprising how rapidly the emotionalism present in even the mildest cases passes off during convalescence.

I report the following family, not as a proof of the great influence that heredity has in St. Vitus's dance but as an interesting exception proving the rule that heredity plays little part. I have never seen so many cases in any other family. So far as I have been able to discover, the general health of the family has in all other regards than chorea been good. There have been no cases of acute inflammatory rheumatism even in the victims of chorea. I have purposely made the case reports brief because none of the patients showed anything more than ordinary, not very severe symptoms, and none had complications of any interest.

Case I. E. E. Applied to Dr. S. Weir Mitchell's clinic 12–3–'84. She was a ten-year-old school girl suffering from her first attack, which had begun a couple of weeks before. The right side of the body was most affected. The movements were moderately severe. The last visit in this attack was on 12–24–'84, at which time she showed no signs of any twitching. The second attack began Nov. 7, 1886. The right side was again chiefly affected.

There was some disturbance of speech. The heart was normal except for a soft systolic murmur heard over the body of the heart and at the apex. By the end of December she was well. The third attack (the one in which I first saw her) began in September, 1890, in the left arm and leg. Later it spread to the right side and speech became affected. The movements were quite severe. She was peevish and fretful. She had not yet begun to menstruate. Her knee jerks were increased and there was some weakness in the right arm and leg. She still had the cardiac murmur. By the end of October, 1890, she was well. When she brought her son to my clinic in May, 1916, she reported that she never had had a recurrence of the trouble and examination proved her to be normal mentally and physically.

CASE II. C. S. (niece of the first patient) came to my clinic 10–4–'14, complaining of twitching in the head, arms and legs which had begun in her tenth year and had recurred at irregular intervals ever since, each attack lasting six to ten weeks. She left school at fourteen to go to work but has never been able to continue at work more than a few months on account of the recurrence of the chorea. The movements affect mainly the arms and head and are not very severe. There is a soft murmur over the body of the heart. The jerking did not entirely cease till Feb. 15, 1915. May 22, 1916, she returned to the clinic and stated she had gone as long as three months without any twitching but never longer. There are slight choreiform movements present now (May, 1916.)

CASE III. N. M., 10 years old (son of the first patient), came to the clinic 5–22–'16 suffering from his first attack. The movements are general but not severe. Though fretful and peevish his intellectual power is good, indeed his intelligence is rather above the average. There is no cardiac murmur. The knee jerks are capricious. There is no error of refraction or other ocular trouble. Previous to the present illness his health has always been good. He has three sisters and one brother living and well. One brother died in infancy of marasmus. The attack lasted about nine weeks.

The patients whose cases are briefly noted above are the only ones in the family I have seen, but C. S. (Case III) has given me the following family history and E. E. (Case I) has verified it. C. S.'s maternal grandfather's two sisters had the disease. Her maternal granduncle's two daughters both suffered. Her mother's sister (Case I) had it in childhood. Her mother's sister's son (Case III) is now under treatment at the clinic. Case III is the only male who has been affected in the seven cases which have occurred in three

generations. Case III and his mother (Case I) is the only instance of parent and son both being affected.

Mere chance will not account for the frequency of St. Vitus's dance in this family. Certainly something has created a strong predisposition, but what it is remains unknown. It is something carried by persons who, with one exception, have not themselves been victims. It is something that does not show itself by causing other nervous diseases, because none such have appeared in this family. The absence of rheumatism in the family is noteworthy because it is the one disease which more frequently than any other precedes an attack of chorea and endocarditis is the one constant gross lesion found at necropsy. All that we can feel sure of is that there is something which in very rare instances continues to act in families over several generations and shows itself by the occurrence of St. Vitus's dance and that in such cases the disease may be regarded as hereditary. In the majority of children such an influence is absent and heredity plays no part.

Translations

VEGETATIVE NERVOUS SYSTEM

By H. Higier, M.D.

Authorized Translation by Dr. Walter Max Kraus, A.M., M.D., New York

(*Continued from page 156*)

Isolation of the stomach from the central nervous system. In the former method, the influence of the mind is retained, in the latter it is lost. In the animals operated by Pawlow's method, atropin gradually stops the acid secretions of the stomach until the reaction becomes alkaline, while in the Bickel method this does not take place (Ehrmann).

On a former page, in discussing the sensory activities of the vegetative system, we have noted that it is not at all unlikely that the vagus carries sensations to the antrum without the assistance of any spinal tracts.

Vomiting, which is due to antiperistalsis, belongs to the realm of pathology, even though there is in all probability a bulbar center controlling it. This center is stimulated by feelings of nausea, increased intracranial pressure, cerebral concussion or intense pain (renal and liver colic). The act of vomiting is, moreover, not infrequently accompanied by manifestations of increased tone in neighboring parts of the autonomic system, as facial pallor, sweating, salivation, tachycardia and diarrhea. Centrifugal impulses pass over both the vagi and the splanchnici, not only in producing peristalsis but also antiperistalsis, yet, it is only in connection with the act of vomiting that the abdominal wall is brought into activity.

There is also a form of cerebral vomiting which is characterized by lack of any gastralgia or gagging and by the presence of headache, dizziness, somnolence and bradycardia.

The physiology of nervous dyspepsia and of vomiting in diseases of the liver and kidneys, in motor and secretory neuroses as achylia, hypersecretion or hyperacidity, in neurogenic insufficiency of the pyloric musculature, in rumination and in diseases of endo-

crinous gland origin, as Graves' and Addison's diseases, is yet unsettled. Functional disturbances of the gastro-intestinal tract, as paralysis of the colon, seldom are of local diagnostic value.

The vagotonic manifestations of the stomach will be considered in connection with those of the intestinal tract.

7. Small and Large Intestine

The vagus either directly or through the solar ganglion exerts a stimulating effect upon the peristalsis and secretion of the small intestine, while the splanchnic acts as an inhibitor.

The mesenteric vagus nerves are non-medullated. The paravertebral ganglion cells contain wide dendrites and the ganglia are contained in a capsule. The splanchnic nerve in spite of its post-ganglionic nature contains medullated fibers.

Langley and Jacobsohn have shown that the small pear-shaped unipolar cells which give rise to the splanchnic nerves lie in the lateral columns of the spinal cord between the levels of D6 and L2.

The ganglion cells between the longitudinal and circular muscles —Auerbach's or the mesenteric plexus—seem to be sensory in nature. No fibers which could stimulate this sensory reflex arc have been shown to pass from the intestinal epithelium to these ganglia. The intestine, like the heart, has its impulse production also in its own walls. Section of the mesenteric nerves has no conspicuous influence upon intestinal peristalsis. The question of whether the stimulus to activity is myogenic or neurogenic in character has been studied by Magnus. When the longitudinal and circular intestinal muscles are pulled apart, the former, which retains Auerbach's plexus, remains normal in activity, while the nerveless circular musculature loses its automaticity, rhythmicality and refraction period of contraction.

Two groups of reflexes are supposed to take place in the intestinal tract, one tactile, mechanical, the other chemical. The first act as stimuli for peristaltic activity and continue to act even when indigestible substances are present in the gut. The chemical reflexes on the other hand have to do with changes in the tonicity of the pendulum movements. The reflex continues as long as there are any absorbable substances left in the intestine and the effect varies with the character of the substances. In gastro-intestinal disease the resorptive pendulum activities cease and only the coarse mechano-peristaltic activities remain (L. Müller).

The various types of intestinal activity (pendulum and rectopetal) depend upon rhythmic contraction of the longitudinal and

circular musculature. These may go on without the interference of the cerebrospinal axis, as experiments show, which completely isolate the intestine at the same time transecting the spinal cord and severing the vagi, thus isolating the abdominal ganglia. The intestine, is, however, regulated by the nerves passing to it (vagi, splanchnics), for stimulation of the sympathetic splanchnic causes vasoconstriction and inhibition of peristalsis, stimulation of the autonomic vagus causes vasodilatation and increase of peristalsis.

The small intestine and the ascending colon are innervated as follows:

(*a*) *Sympathetic.*—N. splanchnic superior, which passes from its nucleus in the lower dorsal cord to its peripheral ganglion, the superior mesenteric.

(*b*) *Autonomic.*—N. vagus, which passes downward into the solar plexus.

The rest of the colon, the sigmoid and rectum, are innervated as follows:

(*a*) *Sympathetic.*—N. splanchnic inferior, which passes from its nuclei as the upper lumbar segments to the peripheral ganglion, the inferior mesenteric.

(*b*) *Autonomic.*—N. pelvicus (Langley) (called N. erigens by Eckhardt), which passes from its nuclei in the lower sacral segments and comes to the pelvic ganglion in the plexus hemorrhoidalis.

The entire intestine therefore obtains two sets of antagonistic impulses:

1. Inhibition of muscular activity and blanching of the mucous membrane from the superior and inferior splanchnic nerves.

2. Increase of muscular activity and congestion of the mucous membrane from the vagus and pelvic nerves. The latter might be called the "inferior vagus."

Each of these two sets of nerves acts independently of the other. Thus the "conditioned" reflex of Pawlow or the "associative" reflex of Bechterew, *i. e.*, the psychoreflex, acts by means of the vagus upon the beginning of the digestive tract (flow of gastric juice caused by appetite, cessation of gastric activity through worry) and by means of the pelvic upon the end of the tract. There is a diminution of the tone of the terminal musculature of the digestive tract when one approaches the house in which an undisturbed evacuation can take place. "It frequently happens that after having bared the buttocks and become seated upon the toilet an evacuation takes place without any assistance from the abdominal press, while on the other hand when the attention is diverted or under the stress of business there is often no inclination to defecation" (L. Müller).

Various peripheral sensory stimuli, particularly the inhibitory effect upon intestinal activity caused by irritation of the parietal peritoneum, are entirely independent of the vagus nerve. They travel from the sensory part of the spinal cord to the motor ganglia of the intestine via the splanchnic nerves. A fact of considerable significance is that this reflex is independent of pain stimuli. Section of the vagi or of the spinal cord or ablation of the cerebrum has no effect upon the inhibitory function of sensations, while section of both splanchnics allows quiet intestinal activity to go on without any noticeable influence of pain sensations.

Section of the splanchnics or extirpation of their prevertebral ganglia not only causes increased peristalsis but also marked hyperemia of all abdominal organs, which is accompanied by outpouring of serous fluid into the lumen of the intestine. Emotional diarrhea is due to a paralysis of the splanchnics. Yet many authors maintain that this and psychic vomiting are parallel activities, one being due to increased activity of the pelvic, the other to increased activity in the vagus nerve.

The abdominal blood vessels, as least those that have a vasomotor control, behave in opposite fashion to the blood vessels of the periphery. This allows them to play a conspicuous part in the distribution of the blood in the body.

So much for the innervation of the intestine. The review shows that it is an automatically acting organ, the most important part in its activity being played by the ganglia lying in the wall of the organ, a condition similar to that of the relations of the ciliary ganglion and pupils. Every exteroceptive sensation, every psychic activity, every emotion, every change in the distribution of blood causes the ganglia to initiate changes in the intestinal activity and in the tone of the intestinal blood vessels.

The need for the coördination of the abdominal blood supply and that of the rest of the body, and of rapid changes in blood distribution in response to the nervous control of temperature is quite apparent, an observation which L. Müller has justly emphasized. At least the means by which fear and anticipation influence the activities of the intestines can be appreciated.

Returning to the consideration of separate parts of the intestine, peristalsis in the small intestine is started not only by the presence of food in the stomach, but also by the mere swallowing of food and even when the food reaches the mouth (Cash). At the very beginning of eating "psychic" secretion and motility begin in the stomach —demonstrable by sham feeding in esophagectomized dogs—and at

the beginning of gastric digestion, bile and pancreatic juice are secreted and intestinal tone is diminished. The activation of movements of the large intestine by activity of the small is readily demonstrated in animals with small intestine fistulas. Cathartics affect the small intestine but do not reach the large intestine for they are excreted through the fistula. Yet the large intestine becomes active.

In diseases of the colon, antiperistaltic activity (Böhm) is increased (x-ray examination). The antiperistalsis and peristalsis cause considerable mixing and thus water absorption. As a result the feces become quite dry and compact (constipation with chronic colitis).

The consideration of the lower intestinal tract, not innervated by the vagus, will be taken up in connection with the bladder and external genitalia, which with this part of the intestines are all supplied by the pelvic nerve.

For a discussion of the effect of intense pain (crises), drugs or hormones upon gastro-intestinal activity, the reader is referred to the general considerations. This much, however, may be recapitulated. Adrenalin causes inhibition of intestinal activity by way of the splanchnics, physostygmin and pilocarpin cause increase of intestinal activity by way of the vagus, nicotin breaks impulses at the synapses in the large prevertebral ganglia. Of the hormones, hormonal or the peristaltic hormone deserves mention. It is possibly similar to gastrin or the gastrosecretion of the English and to the other internal secretory products of the intestinal tract, proteolytic ferments and enterokinase. It was used therapeutically by Zuelzer. Some of the endocrinous glands produce substances, as for example the thyroid product, thyreo-iodoglobulin, which affect the intestine. Of late years it has been shown that the gastric mucous membrane at the height of its digestive activity produces a substance which injected subcutaneously or intravenously initiates intestinal activity. It is spoken of as the peristaltic hormone. Zuelzer's opinion of its action is that it stimulates the abdominal ganglia specifically and that thus peristalsis is begun. This peristalsis differs from physostygmin peristalsis in that the latter is lasting, not stopping with the individual peristaltic movements, while the former, the hormonal peristalsis, is like natural physiological peristalsis. If this be excessive, it stimulates the secretory glands of the intestine and thus produces a movement after meals. Popielski does not credit the hormonal theory. The extracts of all organs, not alone the stomach, contain a substance, vasodilatin, which intravenously injected causes two main phenomena, (1) diminution

of the coagulability of the blood, (2) dilatation of the abdominal blood vessels with drop of blood pressure. Popielski claims that Zuelzer's results with hormonal are due to its content of vasodilatin, and that the increase of peristalsis is secondary to autonomic drop of blood pressure and is not specific. A similar nucleoalbumin, "hypotensin," has been described (Abelous and Bardier). They isolated it from several excretions and secretions. Its main property is the lowering of blood pressure.

Secretin, which has been mentioned, is probably a product of the "chief" cells and also stimulates the motor and sensory activity of the stomach, causes digestion, leucocytosis and through venous paths, vasodilatation and a drop of blood pressure.

8. Recto-urogenital Tract

The diagram of Meyer and Gottlieb and the older one of Müller will be followed. This demands a discussion of the excretory organs, descending colon, sigmoid and rectum, bladder and genitalia, which will deal generally with these organs and first particularly with the descending colon, etc., since this would naturally follow the discussion of the gastro-intestinal tract just preceding.

The pelvic organs are not only supplied by sympathetic hypogastric nerves and the autonomic pelvic nerve, but also by those of the cerebrospinal group. If one starts with the first sacral vertebra, where the metamere relations of the intervetebral ganglia are scarcely discernible, one finds running caudalward three large sympathetic ganglia, the superior mesenteric, the hypogastric and the hemorrhoidal. The white rami communicantes all connect to the spinal cord. The gray rami supply the uropoetic, genital and rectal organs. The comparative relations of the vegetative and somatic tracts will be clarified by the following:.

1. The former, as a rule non-medullated fibers, supply smooth muscle and mucous membranes. (The hypogastric supplies the longitudinal and circular muscles of the descending colon and bladder including the internal rectal and bladder sphincters, the cavernous plexus and the N. erigens supplies the genital vasomotor nerves.)

2. The latter, as a rule medullated fibers, supply the cross-striated muscle and skin of the region with branches which are carried by the spinal N. pudendus communis (M. sphincter internus recti, M. sphincter internus vesical or compressor urethrae, MM. peronei profundi).

Vital staining with methylene blue shows multipolar sympathetic

ganglion cells in all the vegetative organs mentioned in this section. However, the significance of the mesenteric, hypogastric and coccygeal plexi is by no means understood. The production of involuntary movements, quite independent of the voluntary movements of contraction and relaxation of the openers and closers of the organs concerned, may be mainly due to the ganglion cells lying in the wall of the organs.

Most of the reflexes in this region can be produced without the intervention of the central nervous system. There is a noteworthy difference, however, between the energetic reflex contractions of a cross-striated muscle and the slow contraction of smooth muscle.

TABLE

Reflex	Stimulus	Result
Scrotum	Repeated stroking or application of cold to the perineum.	Contraction of the tunica dartos.
Bladder	Stretching or stimulation of the bladder or posterior urethra.	Contraction of the bladder wall.
Rectum	Stretching or stimulation of the upper rectum.	Contraction of the rectum.
Genital	Psychic or peripheral stimulation.	Erection and hyperemia of the corpus cavernosum.
Uterus	Stretching or stimulation of the uterus.	Contraction of the uterus.
Internal anal	Stretching the anus with the finger.	Contraction of the sphincter.

9. RECTUM

The rectum is supplied by the hemorrhoidal plexus and the inferior mesenteric nerves. Centripetal fibers pass from the plexus to the spinal cord which bring to consciousness the degree of fulness of the rectum and the feeling of need of defecation. The mucous membrane of the rectum is neither sensitive to increase or decrease of weight of contents or to cold or heat, but does register the degree of stretching, so that there is an impulse to defecation as soon as the fecal mass in the sigmoid begins to be pushed into the rectal ampulla. Voluntary striated muscles do play a large part in defecation for they both begin and end it, leaving the reflex part of the act to the vegetative nervous system. The fecal mass is pushed outward with the help of the abdominal press (NN. hypogastrici). The sensory stimulation of the rectum thus produced brings about peristaltic contraction of the rectal musculature and relaxation of the sphincter internus, following which the feces are expelled from the body. Following this the voluntary muscles, levator ani and sphincter externi ani raise and close the anus.

In transverse lesions in the cervical or dorsal regions, there is absence of the activity of the abdominal muscles. If the lesion be in the lower part of the cord, the sphincters alone are inactive. There is this big difference between lesions of the upper and lower cord regions in that, though defecation becomes regulated a while after the lesion occurs (automatism of sphincter internus), it is only in the sacral lesions that the nucleus of the sphincter externus is affected. As a result the external configuration of the anus is changed, the anus is wider, no longer radiate, closure is not so firm and insertion of the finger or stimulation of the adjoining skin does not call forth a strong sphincter contraction (anal reflex). According to L. Müller the anal reflex is the only certain diagnostic point in intestinal diseases which will localize the spinal cord lesion, for the simple reason that presence *rules out* disease of the lower sacral and coccygeal segments. Other disturbances of intestinal activity are as a rule independent of the localization and type of the spinal disease. The usual sequence is first retention, then incontinence.

The tone of the internal sphincter, as that of all other sphincters, may increase due to the activity of the ganglia in its wall after section of the nerves passing to it. After a short period the intestinal tract is again closed. Opening of the intestinal tract by inhibition of the tone of the sphincter may take place even after the spinal cord and its sympathetic nerves are destroyed.

The spinal center for defecation in the dog lies in the lumbosacral area, the cortical, posterior to the gyrus sygmoideus. In man Bechterew puts the cortical center between the arm and leg centers and the subcortical in the corpus striatum and optic thalamus near the centers for erection, ejaculation and uterine activities. The denial by Müller, Dahl and others of the existence of cortical vegetative centers has already been discussed.

The neurological disturbances in diseases of the spinal cord are typical, constipation when the stool is formed, incontinence when it is soft. The reason for this is the feeling of fulness of the ampulla recti is not brought to consciousness due to the interruption of nerve fibers and thus the impulse to defecation does not pass downward from the brain. There results therefore a lengthy retention until the *vis a tergo* causes an involuntary expulsion of the hard fecal masses (incontinence).

(To be continued)

Society Proceedings

THE PHILADELPHIA NEUROLOGICAL SOCIETY

NOVEMBER 24, 1916

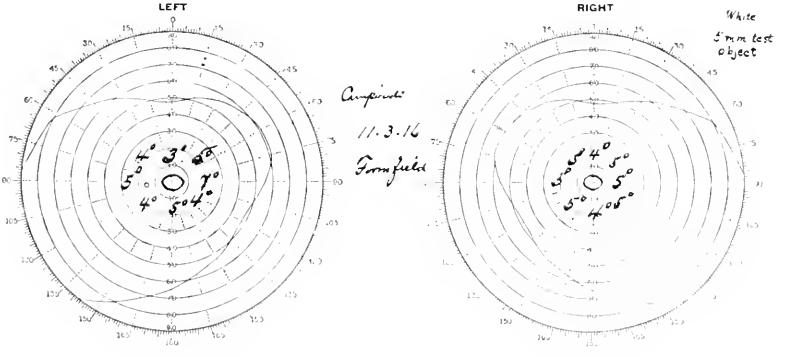
The President, DR. FRANCIS X. DERCUM, in the Chair

A CASE OF MACULAR VISION WITH LOSS OF PANORAMIC VISION

By T. B. Holloway, M.D., and William G. Spiller, M.D.

P. McG., æt. 44, complained of poor vision. The patient gave a history of three attacks of vertigo associated with unconsciousness, which lasted fifteen minutes or longer; the first of these occurred fifteen or sixteen years ago, the second eight years ago, and the third three years ago. Following the third attack the vision was unimpaired until two weeks later, when the patient suddenly became blind while reading the newspaper. After the second day there was a gradual return of vision, but no improvement has been noted since three months after the attack.

Until a year ago the patient used alcohol to excess, and had worked as a whiskey blender. He was a moderate user of tobacco. The essential points in his medical findings were marked pyorrhea, a trace of albumen and a few hyaline casts; poor quality of heart sounds, but no murmur; low blood pressure and a negative serum and spinal fluid Wassermann.



The pupillary reactions to light were slight and not well maintained. There was also but faint reaction to accommodation and convergence. There were no ocular palsies. Both discs showed a decided greenish-white atrophy, both sets of vessels being much reduced in caliber. Delicate perivascular lines accompanied some of the arteries, especially near the disc. The fields showed a marked contraction, being essentially macular fields, *i. e.*, the form fields were contracted to almost 5° all about fixation, with retention of the

blue, red and green fields. There was no scotoma. The distant vision of each eye was 6/6—. He could read .50 type.

Dr. Holloway referred to the possibilities of various intoxications, especially methyl alcohol, uremia, hysteria, simultaneous obstruction of the central artery of the retina, and true cortical blindness with macular preservation. He thought the latter condition was the only one he was aware of that could explain the field phenomena, although it was not so easy to explain the optic atrophy.

Dr. Spiller spoke of the case reported by Bramwell, Bolton and Robinson (Brain, vol. 38, part 4), and said that the case reported by Dr. Holloway and himself was very similar, except that it was without necropsy. As the man had been without panoramic vision three years, the optic nerves deprived so largely of function probably were less vascular than normal nerves, and might be more susceptible to alcohol. In this way the optic atrophy might be explained. It should be emphasized that two weeks after the third attack the man suddenly lost sight completely, so that he could not distinguish light from darkness. Complete blindness lasted about two days and then improvement in vision began. Four months after the attack of blindness he began to drink again and sight became impaired. As he has not been drinking for a year or more, sight gradually improved until six months ago, and since this time it has remained as it is at present. The influence of alcohol on the vision seemed to be evident.

Dr. J. Hendrie Lloyd said that the cortical center for the macula had been the subject of much debate. Ferrier's experiments on monkeys led him to believe that the region of the angular gyrus was especially the cortical center for vision. He claimed, however, that a lesion here did not cause hemianopsia, but a complete amblyopia of the opposite eye and possibly partial amblyopia of the eye of the side of the lesion. But he also claimed that in order to obtain hemianopsia the occipital lobe must be impaired along with the angular gyrus.

It has always seemed to Dr. Lloyd that Ferrier's conclusions were not warranted by his experiments. It is impossible to measure the visual fields in a monkey. The animal seems more blind in the opposite eye because the temporal field is involved on that side; and the temporal field being the larger, it presents a degree of amblyopia which may be mistaken for complete blindness. The same thing is seen sometimes in the human subject, the patient with hemianopsia giving the appearance of total blindness in the opposite eye. The exact state can only be determined by measuring the visual fields, and this can only be done in the human being.

Following Ferrier, attempts have been made to distinguish the center for macular vision from the center for panoramic vision, and some neurologists still claim that the macula is represented in the angular gyrus, and the center for panoramic vision in the neighborhood of the cuneus. Dr. Lloyd did not believe in this wide separation of these two centers. It seems improbable that nature would have placed them so far apart. The cases of bilateral hemianopsia, in which a small macular field for vision is retained in each eye, are probably best explained by Bramwell's recent case, in which the patient went about for twenty-five years as though he were peering through a knot-hole. At the autopsy a small normal area was found in each cuneus, surrounded by an area of cortical degeneration in the occipital lobes. Dr. Holloway and Dr. Spiller's case is much like Bramwell's, although of course not confirmed by an autopsy. It is possible that the small macular center has a partially independent blood supply, thus escaping when the surrounding occipital cortex suffers from some vascular lesion, for the macula and its cortical center were probably the earliest parts of the visual apparatus in the scheme of evolution. Dr. Lloyd suggested that the optic atrophy might be a form of retrograde degeneration, starting in the cortical lesion. This explanation

would presuppose that such a degeneration could pass from one order of neurons to another.

Dr. Charles K. Mills said he did not think it was positively proved that the macular region was not in the angulo-occipital region as held by Ferrier and himself in times past. Dr. Mills said he remembered one or two instances of double hemianopsia with preservation of the macular field, as that of Dr. Dunn referred to in his (Dr. Mills's) book. He recalled to the Society that he had reported briefly two cases of macular hemianopsia. This would only bear upon the subject as indicating the probability of a separate and special macular representation in the cortex.

Dr. Mills said in regard to double hemianopsia, that after all is not a case of this kind equivalent to the simultaneous or quickly succeeding occurrence of two hemianopsias of the variety in which the macular field is unaffected?

Dr. Francis X. Dercum asked whether Dr. Holloway or Dr. Spiller had formed any theory as to the lesion; whether there was a vascular crisis; what really happened when this blindness so suddenly supervened.

Dr. Holloway said that he should have stated at the onset that he was connected with this case through the courtesy of Dr. Spiller, who had referred the patient to Dr. de Schweinitz's clinic for ocular examination.

He did not know whether Dr. Spiller had determined any loss of orientation, that has been found so frequently in cases of so-called double hemianopsia. Personally, he had failed to elicit any history pointing to this condition, and had failed to determine it in a very hasty examination. He knew of three cases of double hemianopsia that had been observed in this city, the one already reported by Dr. Mills; Dunn's patient, who was also examined by de Schweinitz; and a patient observed by Dr. Carpenter, who has not as yet placed his data on record. In reference to the case under discussion, the fields were the most unusual Dr. Holloway had ever seen, being typical of loss of peripheral field with macular preservation. The form fields amounted to about 5°, with preservation of color sense, the patient being capable of recognizing 2 mm. test objects. As to the optic atrophy, Dr. Holloway said he thought Dr. Spiller's suggestion was a valuable one.

Dr. Spiller regarded the lesion as a sudden occlusion of the vessel supplying the visual cortex of each cerebral hemisphere. It is indeed striking that two vessels supplying similar areas in the cerebral hemispheres should become occluded simultaneously, and more remarkable than the occlusion of one vessel followed by occlusion of the other days or weeks later. Bramwell had emphasized the simultaneous implication of the two cerebral hemispheres in his case, and the time element was worthy of note, even though the resulting disability was the same as in double hemianopsia.

In the case reported by Dr. Holloway and himself the sudden blindness came on while the man was reading. His cerebral vessels probably were sclerotic, and while he was using his eyes his vessels in the visual cortices probably were more supplied with blood than at other times. It may be that the employment of the function of sight at the time of the onset of the blindness had some part in the occlusion of the vessels similarly situated.

Dr. T. H. Weisenburg read a paper on Unusual Forms of Infantile Paralysis.

Dr. H. Maxwell Langdon asked whether optic neuritis and optic atrophy were very prevalent in that type of infantile palsy which Dr. Weisenburg called meningeal, or whether they occur indiscriminately in the various cases.

Dr. Spiller said he had seen some very interesting cases of poliomyelitis during the recent epidemic. A child was brought to the seashore and one week after he arrived became ill and had a temperature of 103°. This attack

was supposed to be gastrointestinal. Two days later he was apparently well. One week later he had a similar attack and three or four days later was found to be paralyzed in a part of one lower limb. The first attack, which Dr. Spiller believed was poliomyelitis, did not produce any paralysis.

Dr. Cadwalader said that he had recently seen a case of probable poliomyelitis of the cerebral type. The child was thirteen years old. The constitutional symptoms during the onset were said to have been severe. Stupor and drowsiness were very marked and headache was complained of. At present, eight weeks after the onset, the child presents typical left-sided hemiplegia with moderate spasticity and increased tendon reflexes.

Dr. Alfred Gordon said he saw during the epidemic a child of five to six years of age suddenly taken with fever and gastrointestinal disorder and it had difficulty in swallowing and breathing and developed almost the same day facial paralysis of peripheral type. He injected serum obtained from a patient seven years old and deglutition and respiration cleared up very rapidly, but the facial paralysis remained. There was no evidence of involvement of the extremities. The child still has Bell's palsy. Dr. Gordon said he had seen in the last epidemic paraplegic types in which he found the Babinski sign. There was no question of hemiplegia. The tendon reflexes were lost. As to the question of treatment by serum, he could not say definitely that it cured, because he has seen cases cured without serum, although the above case is rather corroborative of Netter's excellent results.

Dr. F. X. Dercum asked in what proportion of cases Dr. Weisenburg had noted pain.

Dr. Weisenburg replied that pain was always present in the acute stage of poliomyelitis, although its appearance differed. In some instances the pain would appear with the onset of the disease, in others not until two or three days later. The pain was described as numb or aching and sometimes as sharp and shooting. The limbs were exquisitely painful, the pain being confined to the involved limbs. It was taken for granted in examining poliomyelitis children that the painful limb was the paralyzed limb. One interesting observation about the pains was the onset. The nurses repeatedly called Dr. Weisenburg's attention to the method of onset and disappearance of pain, showing him for example patients whom it was possible to dress only to find that an hour later the slightest touch would cause the most exquisite pain. Again they would show him children who resented anyone coming near them, while perhaps an hour later it was possible to handle them with the utmost ease. After the cessation of course all patients have a certain amount of pain in the paralyzed limbs even after their discharge from the hospital at the expiration of about four weeks, but the extreme tenderness complained of never lasted more than ten days or two weeks. Dr. Weisenburg was of the opinion that this pain was entirely meningeal in origin and was not neuritic in type.

Dr. Weisenburg stated that Dr. Spiller was right in saying that there are cases in which the white matter is diseased, but in the great majority in which the Babinski reflex occurred its presence was not due to degeneration of the lateral tracks but to the general pressure on the spinal cord caused by the increase in spinal fluid.

Dr. Weisenburg did not see any cases of optic atrophy or optic neuritis. As to the serum treatment, he was positive that it did no good. This was possibly because the amount of the serum injection was not large enough, the usual dose being about from 7 to 10 c.c., given possibly once or twice. He was under the impressoin that this treatment should not be given up but should in future be used, but in larger doses, and he recommended that as much as 30 or 40 c.c. should be injected intraspinally daily. He stated that he had three cases in which the serum was used before the paralytic stage and yet in

each instance the paralysis came on and in two death occurred. The serum used was chiefly from older cases.

In reply to Dr. Dercum's question Dr. Weisenburg was inclined to agree in the main with Wickman's classification. He did not, however, believe in the neuritic and ataxic types. He was under the impression that the pains were not neuritic but meningeal. Besides, of the ataxic types, by which undoubtedly Wickman meant the cerebellar form, he saw only one in which this distinction could be used. While there were many cerebellar cases, such symptoms were always in conjunction with pontine and spinal cord involvement. He was of the opinion that the disease was not transmitted by personal contact and if so not to a great degree, basing his opinion largely upon the fact that the multiple cases occurred within a day or two of each other, this arguing for an infection of the same source. The same thing is true of the abortive types.

Dr. Dercum said that in his experience this epidemic had varied considerably from previous epidemics. While he had at present a group of cases of poliomyelitis in his clinic, there were very few who answered the old classical description, *i. e.*, cases with one or both legs involved. There were quite a number of cases in which the arms had suffered and at times cases in which the face had been involved. Further, this epidemic was not characterized by the same degree of pain as was noticeable in the poliomyelitis of seven or eight years ago. According to his recollection the pain in the previous epidemic was in many cases very severe. Dr. Dercum asked Dr. Weisenburg whether in the present epidemic he had met with any cases of superior polioencephalitis in the adult.

Dr. H. Maxwell Langdon said he had not seen a case of superior encephalitis. He had a chance to examine the eyes of three adults, and in none was there encephalitis.

Dr. Dercum remarked that he had employed the term of encephalitis as applied to lesions of the nuclei of the various ocular nerves.

UNUSUAL LOCALIZATION OF AN EPILEPTOGENOUS ZONE IN A CASE OF ORGANIC EPILEPSY

By Alfred Gordon, M.D.

After reviewing the ideas of Marshall Hall, Brown Séquard, Fritch and Hitzig, Meynert, Chaslin and Bleuler, Gordon discusses the three-level view of Hughlin Jackson concerning organic epilepsy. He then reminds of Gowers' case in which an epileptic suddenly had an attack of hemiplegia with permanent cessation of convulsions, of Prus' work concerning the painting of the motor cortex with cocaine with cessation of convulsions. He speaks of Ferrier's experimental work, also of that of Corville and Duret. Analysis of cases of organic epilepsy leads him to the conclusion that a great multiplicity of lesions in the cerebrum may be considered as epileptogenous zones and that stimulating surfaces may be localized in any portion of the central nervous system and the reception of the stimuli and the discharge of motor power are the province of the motor cells of the cortex. Not one of the lesional foci described can claim pathognomonicity. Gordon reports an unusual case with autopsy showing that the lesion was in the anterior cornua of the lateral ventricle. The ependyma was covered with nodules thickly crowded, more on one side than on the other. During life patient presented unilateral convulsions confined to one arm with unconsciousness, also continuous twitchings during conscious state in the same arm. As to the character of the nodules, they were probably miliary gummata, which view is

substantiated by the fact that many vessels in the vicinity have mononuclear cells in their walls.

Dr. Charles K. Mills said he thought Dr. Gordon's position was well taken, that irritation of zones situated in different parts of the brain may through transmitted stimulus to the motor cortex lead to these attacks.

A CASE OF UNUSUAL TORSION SPASM WITH FACIAL MOVEMENTS

By T. H. Weisenburg, M.D.

The patient presented an unusual type. First of all there is no history of Jewish blood in the family, whereas most of the cases reported with one or two exceptions have been in persons of this religion. Secondly, there has been for many years distinct involvement of the muscles of the face in the distribution of the motor cranial nerves. In a recent paper by J. R. Hunt in the Journal of American Medical Association, this subject was reviewed and Hunt made the statement that he doubted that such cases exist. Lastly, this case is unusual in the sense that there is very little spasm in the muscles of the legs and hip, most of the movements being confined to the head, neck and chest.

The symptoms began at the age of six, the physical and mental development up to that time being perfectly normal. At this time a twitching began in the right arm, this extending to the muscles of the right and left shoulder, and then there developed a tendency of the whole trunk to twist from the right to the left. In a short time the neck began to twist to the left and now at the age of twenty-six he has all the well-marked symptoms of a torsion spasm, this consisting of a torsion of the whole trunk from the right to the left. The head is mainly twisted from the right to the left, there being constant jerking spasms of all of the muscles of the upper chest, shoulders and neck and the muscles of the jaw. The twitching in the muscles of the jaw are so severe that the patient is unable to talk loudly, he being forced to whisper, and there is also constant grinding in the teeth which are very much worn. He also has difficulty in chewing and swallowing. There are very few if any torsion movements in the hips and legs.

Physical examination shows no atrophy but an over-development of the muscles on account of the constant spasm. Tendon reflexes are increased. Mental development is normal. Wassermann and Abderhalden tests are negative.

Dr. Cadwalader stated that Dr. Weisenburg's patient had impressed him as resembling in certain respects other cases that had been presented before the Society under the title of progressive lenticular degeneration. Dr. Cadwalader stated that he was inclined to believe that dystonia musculorum as described by Oppenheim was a true organic condition and that it might be attributed to a disturbance in the functions of the lenticular nucleus. There is a distinct group of cases that resemble one another, characterized by muscular spasm, hypertonicity, tremor and contracture that differ somewhat in degree of intensity and in distribution. Nevertheless in all probability they represent merely clinical types that are referable to disturbance of the lenticular nucleus.

Dr. Cadwalader stated that in his opinion Dr. Weisenburg's case of torsion spasm belonged to this group of cases.

Dr. A. A. Eshner said that the case resembled some of those that had been at Blockley, presenting athetoid movements of the hands and face, disorder of speech, and in some instances contractures. At one time these cases were looked upon as due to deficient development of the lateral tracts.

Later they were considered as due to some cerebral lesion, traumatic, hemorrhagic or otherwise. Although in the history of these cases it is sometimes stated that the disease comes on suddenly, Dr. Eshner said he had no doubt that often symptoms have been present for some time, but have passed unobserved. It would appear as if there were all gradations of cases, with varying distribution and severity of the lesions and a corresponding variation in the symptomatology.

Dr. Weisenburg said he regarded the case as one of dystonia musculorum deformans. It seemed to him, however, that the name torsion spasm fitted the symptom complex better. Dr. Eshner referred to a patient in Blockley by the name of Albert Weissman, he being a case of diplegia with athetoid movements and not at all like the patient presented.

NEW YORK NEUROLOGICAL SOCIETY

DECEMBER 5, 1916

The President, DR. WILLIAM M. LESZYNSKY, in the Chair

A CASE OF MYASTHENIA GRAVIS

By C. E. Atwood, M.D.

Dr. Atwood presented the same patient to the Society in December, 1910, but, as there had been no case of this disease shown to the Society since that time and the case had progressed somewhat, he thought it might prove of renewed interest. Patient was first seen by Dr. Atwood in 1909. A previous diagnosis of diphtheritic paralysis had been made on account of a history of sore throat. Examination, however, showed the characteristic reaction of myasthenia gravis and there was no indication of muscle atrophy. The first symptom was of fatigue of the tongue. Patient said he could not talk after chewing. Later the lips and face were affected. He could not blow the cornet. Later, again, sustained effort of his occupation as engraver became less and less possible and in 1911 he gave it up. He has taken intelligent care of himself and is able to keep about, but he now shows more involvement of the muscles of the spinal system. The cranial nerves involved are the motor branch of the fifth, the right sixth, the seventh, ninth, eleventh, and twelfth. The involvement of the palate is such that in swallowing fluid it is regurgitated through the nose. The eyes can not be closed more than half. The patient is unable to wrinkle his forehead, to blow out his cheeks, or to pucker his lips. The voice is affected, being nasal in quality, and there is also the nasal smile of Gowers. Extreme movements of the upper and lower limbs are impossible and the partial movements made cause quick tiring. This is especially noticeable of the proximal muscles. There is no sensory defect or bladder or rectal trouble. There are no atrophies. The reflexes are present. He has had one or two attacks of difficulty in breathing and artificial respiration was resorted to. On tetanizing with the faradic current the muscles soon cease to contract, but still respond to the galvanic current and also, though feebly, to voluntary control. Dr. Atwood said that he had been under some difficulties with the case presented, as the work had been done mostly by correspondence. He had not gone into the family history since the first interview. He had not seen the family. He knew there was no diabetes or goiter. If the patient could be placed in a hospital he could be given more thorough analysis and treatment. Suprarenal and pituitary extract had been used by some with a great deal of benefit and recovery had been reported by their use in one or more cases.

Dr. F. Tilney asked Dr. Atwood whether he had observed any visual disturbance or whether there had been any progressive auditory fatigue. In several cases he had found that to be the fact. In one particular case if the patient concentrated on the object he entirely lost the power of vision, but after rest in a dark room was able to see as before. The same sort of phenomenon was observable in connection with the auditory nerve. Both cases showed pathological changes in the brain stem and both in connection with the two nerves mentioned.

Dr. Walter Timme asked whether there were any hereditary factors in this case, such as diabetes or goiter in the history. That would point out the line of therapy. The only treatment that had been efficacious was that of internal glandular extracts. No one kind could be said to be specific. It depended upon the nature of the etiology of the case. The hereditary history would point this out. Laboratory examinations of the metabolic processes were often necessary in such a question. Some cases were found to have a hypoglycemia. If the blood were tested and found to be deficient in sugar the suprarenal gland extract given with pituitary would give the best results. He had had one case, of an elderly man, treated for one and one half years on this basis and the condition had improved. The treatment must be based largely upon laboratory examination, and upon the clinical aspects of other possible deficiencies in the internal glandular mechanism.

Dr. S. E. Jelliffe said that Dr. Timme had emphasized what he would have asked in regard to the hereditary history. In endocrinal pathology heredity plays a large rôle. For instance a case might occur in which the father's family shows thyroid deficiency and the mother's side gonodal deficiency systems and these deficiency factors had to be considered as essential. Treatment would depend upon these findings.

Dr. I. Abrahamson asked Dr. Tilney his opinion on the sensory fatigue in myasthenia gravis. His conception of the disease was that it was essentially a muscular fatigue. Could not the sensory phenomena be explained by an involvement of the motor portion of the auditory and ocular innervation, rather than by the sensory portion of the arc?

Dr. F. Tilney said that as far as tension went, he was sure that this was not the case in the visual fatigue. The man was absolutely blind. It was a spiral visual exhaustion. He was able to see less and less. The deafness upon listening to the fork might be explained by a paralysis of the auditory muscles, but the ear man believed that it was a true sensory disturbance.

Dr. Wm. M. Leszynsky said that he reported a case a few years ago. The first symptom was temporary weakness in the deltoid. The patient was sent to him as a case of deltoid paralysis. She was twenty-four years of age. He found that she complained only of general weakness. He had the patient raise her arm four times and she could not raise it again. There was complete deltoid paralysis. This was the earliest manifestation. She went on to involvement of the functions relating to the cranial nerves and died from respiratory paralysis.

A CASE FOR DIAGNOSIS

By L. Casamajor, M.D.

The patient, a stenographer, female, aged 24, had a squint of the right eye. The eye muscles turned in and became fixed. This occurred over night. She had had in all about thirty-five attacks since the age of two years, when she had had measles. The attack is always preceded by a violent headache on the right side, sometimes with chills and fever and vomiting. The headache lasts two days. Intervals between the attacks are from six to thirteen

months and the eye remains well five weeks to six months, and paralyzed for seven to nine weeks. Formerly it turned back suddenly over night, but recently more gradually. The present attack had lasted four and a half weeks. There was a paralysis of the sixth nerve. All other movements of the eye were normal. There was a high-grade myopia in both eyes and an irregularity of the outer capsule of the lens of the right eye. No lumbar puncture had been done. The Wassermann was negative. The case was offered with a diagnosis of migraine ophthalmoplegia. These paralyses nearly always affected the third nerve. Sixth nerve paralysis was rare. Only four cases had been reported of sixth nerve lesion. The case was interesting from the point of view of pathology. What was the type of lesion which affected the nerve for many months before recovery took place? Stewart attributed this to infiltration of the dura. The pain was dural. One would expect that the cranial nerves would be more often affected. The fifth, seventh and eighth are at times involved. One would expect involvement of the short third nerve less often. The sixth was long and hence should be more liable to involvement.

Dr. I. Abrahamson said that Dr. Carl Koller, of New York City, recently called his attention to the fact that when a detachment of the retina existed without the patient being aware of the limitations of his field of vision, the condition was most likely an infiltrating tumor of the optic nerve itself within the bulb of the eye as opposed to other pathological states causing the separation of the retina. In the case presented by Dr. Casamajor, the question of a tumor so located must be carefully considered. He also asked if the patient ever complained of diplopia in the attacks.

Dr. Wm. M. Leszynsky asked Dr. Abrahamson what he meant by the patient being unconscious of a retinal detachment.

Dr. Abrahamson said that the patient would not know there was any disturbance of vision in the affected eye.

Dr. F. Tilney said that in the case presented he thought the diagnosis offered was perhaps the most tenable one. This recalled the work of Dr. Jelliffe on involvement of the vegetative nervous system. He thought the symptoms in this case could be attributed to vasomotor instability. It was very interesting to see the way in which the sixth nerve had been picked out. This affection of the sixth nerve was no doubt due to intracranial pressure. The sixth nerve passes through the cavernous sinus and comes into relation with the carotid artery. Payne had described the course of this nerve extending backwards and following the petrosal sinus, and it was quite possible to believe that transitory pressure and engorgement would have an effect on the sixth nerve, so that more and more, and for longer periods, the recurring paralysis would persist. From an anatomical standpoint the most likely point of attack would be the cavernous sinus. Another point would be the ponteal system, but that would show an increased pressure in the cerebrospinal fluid, and in this case there was no evidence of such increase of pressure. Dr. Tilney did not consider this case one of the periodic palsies, but he thought it was one of vasomotor instability, giving rise to palsy of the sixth nerve.

Dr. Casamajor said in regard to the patient being conscious of visual disturbance, this patient was conscious of the fact. She knew she could not see well with either eye. She had no diplopia. She seldom indulged in binocular vision. She could not count fingers at more than four feet with the left eye.

THE RELATION OF MUSCULAR DYSTROPHY TO DISTURBANCE IN THE INTERNAL GLANDULAR SYSTEM

By Walter Timme, M.D.

The speaker stated that practically all investigators for the past forty years had mentioned, in connection with progressive muscular dystrophy, various clinical manifestations seemingly irrelevant to the disease, but which were now recognized as disturbances in the internal glandular system. Some of the more important of these were mentioned. A series of cases of progressive muscular dystrophy occurring in one family through three generations was reported with detailed examination of one of these cases, and X-ray examinations of the skulls and other parts in five cases. These skiagraphs showed indubitable evidence of a diseased endocrine system, notably in the pineal gland. Since many of the findings in pineal tumor cases showed changes which were strongly suggestive of the changes in progressive muscular dystrophy, and since the skiagraphs in these cases of progressive muscular dystrophy showed pineal gland involvement, the conclusion that the relationship between pineal gland disease and progressive muscular dystrophy was a very close one was unavoidable.

In discussing this paper Dr. B. Sachs said that for a number of years neurologists had the idea that the muscular dystrophies were by no means diseases of the muscular system alone. The idea was expressed that there must be some deep-seated glandular disturbance in the body to account for the progressive muscular disturbance and also for the symptoms associated with them. Many years ago Dr. Sachs had been impressed with a fact, not mentioned this evening, that an idiocy, which took the cretinoid form in some, and in others a truly myxedematous form, was associated frequently with muscular dystrophies. This gave the idea that the thyroid gland had a causal relation in the development of the progressive muscular symptoms and with the emaciation and atrophies affecting the osseous system. The case showed this evening was not a purely muscular dystrophy, but belonged to the class in which an osseous dystrophy was as marked as that of the muscular system. Dr. Sachs said he was encouraged to believe that there was some relation between the thyroid gland and some of the cases, but he was careful to say that all of the cases were not related. He was confirmed in this belief by the successful results of thyroid feeding, if persisted in for months or years. As for the relationship of the pineal gland to these cases, he felt that there must be better proof forthcoming than was shown by these plates. These same shadows in the pineal region had been offered as evidence for so many diseases that he had doubt of their special significance. He felt that if evidence of relationship were to be established that autopsy evidence should be added to X-ray proof. So far as his own experience was concerned he believed that muscular dystrophies would have to be explained by some glandular disturbance, but he was not ready to state that this was the pineal gland. The whole subject needed very careful study.

Dr. S. E. Jelliffe said that the present trend of thought was to ally the different members of this group with disorders of the vegetative nervous system. They were disturbances at the physico-chemical level of the nervous system. He had hoped that Dr. Timme would say something in relation to the dynamics underlying the pathology of the disorder. How would he explain the disorder in terms of the vegetative nervous system? What was the cause of the serous infiltration and of the increased cellular infiltrates? He would like to know something of the pathogenesis of the fatty replacement in terms of the disordered muscle metabolism through the reciprocal

activity of the autonomic and sympathetic stimuli. He said he was still in doubt that the pineal gland was the seat of a secretory glandular activity. From the phylogenetic point of view he felt that we had yet to be convinced. Certain feeding experiments had seemed to show such, others had completely negatived the previously reported findings.

Dr. M. Mailhouse said he had under observation in the New Haven Hospital a case of a boy of nineteen years with hypertrophic muscular dystrophy. The boy has a bilateral talipes equinus, pads over the scapular, large deltoids and calf muscles, small hands with contractures. There are no sexual abnormalities. There is a large head, shown by the circumference. X-ray pictures showed some interesting phenomena, as follows: *Thorax* curve of ribs abnormal; spaces between ribs greater than normal; whole thorax abnormally large from apex to base; clavicles massive and markedly deformed. *Humerus* heads large and flattened, but with necks small; shafts abnormally thin; corticalis dense. *Radius and ulna* nearly equal in size; radius curves outward. *Hand*, shortened metacarpals. *Pelvis* bones small and undeveloped; os pubis and os ischii thin and small. *Spine*, vertebræ massive and apparently normal. *Femur*, head, neck and shafts of bones extend outward and undeveloped, corticalis dense. *Tibia and fibula:* fibula larger in proportion to tibia; tibia shows outward curve and thickening of corticalis. *Epiphysis* ends of all long bones show osteoporosis. *Diaphysis* corticalis denser than normal and dimensions of femur, humerus, radius and tibia less than normal. *Ankle* bones thin and small; os calcis and astragalus markedly small and latter abnormal in shape. *Metatarsi* bones nearly normal, but phalangeal bones smaller and abnormal in shape and substance. *Skull* tables increased in width, inner table on interior surface rough and irregular in outline. Sella turcica increased death. Mastoid portion of temporal bone markedly increased in density. The patient presented rather a dwarfish appearance. He felt that there was some relation between glandular disturbance and this disease and that the sella turcica abnormality had some connection with it. His blood pressure was 115 70. The sugar metabolism tests showed an alimentary glycosuria and the findings were as follows: Blood sugar—fasting, .117 per cent.; one hour after taking 100 grams glucose, .272 per cent.; urine showed, one hour after taking 100 grams glucose, 5.5 per cent. sugar; urine showed, six hours after, in 300 c.c., 16½ grams sugar; control, blood sugar—fasting, .119 per cent.; one hour after 100 grams glucose, .217 per cent.; urine after six hours, slightest possible trace of sugar.

Dr. F. Tilney said that with regard to the relation of the pineal gland to muscular dystrophies, he felt the same as did Dr. Jelliffe and Dr. Sachs about this structure. He was not convinced at all that they were dealing with the pineal gland. The pineal eye and the pineal gland were two very distinct structures and bore no relation. They were developed from a common sac in the brain, but the pineal eye developed into another form as was seen in the reptile. In amphibians there was an enormous glandular structure developed which was undoubtedly glandular in its activity and sinusoidal circulation, so that the ectoderm giving rise to the brain was pluripotent and could give rise to the gland and to the brain, so that the difficulty of explaining this gland as related to the brain was not so great as might at first appear.

Dr. B. Sachs said that for seven years he had had under observation a family of three brothers with curious hereditary affections: one boy had an hereditary ataxy; one had universal lipomatosis; the third had pseudomuscular hypertrophy with universal lipomatosis. These three forms of family degeneration were of different types, but it suggested the idea that there was some inherent glandular or metabolic disturbance which had produced disease in all three cases, although of distinct clinical types.

Dr. Timme said in reply to Dr. Sachs's question as to idiocy, he should have mentioned these types which were due probably to deficient thyroid. So far as the criticism as to the shadows in the pineal gland went, he was very careful about these. He had examined 500 skulls and in 2 per cent. were found shadows of the pineal gland. These were largely in patients over forty with arteriosclerosis. In his cases the shadows occurred in adolescence at the ages of 19, 20 and 22 years, and he thought it might be safely assumed that this was a pathological condition, especially when four out of five showed the shadows. McCord fed pineal gland extract to rabbits with fairly uniform results in the sex glands. Fed to tadpoles it made them become translucent, and clearly affected some metabolic process. In rabbits the testicles of the male became smaller. Dr. Timme felt therefore there was no doubt that the pineal gland was secretory. In regard to progressive muscular dystrophy, he did not mean to say that the cause was in the pineal gland alone, but he felt the syndrome was due to glandular disturbance, and that the pineal gland was one of the prime movers in this. In regard to cases of lipomatosis, there were frequent combinations of pineal gland and bone marrow disturbance. Suprarenal extract as well as thyroid had marked influence on fatty deposits. Dr. Jelliffe's question as to the dynamics of the disorder was a very deep one; whether the difficulty was in the neuromuscular synapse or due to actual affect of the nucleus of the muscle cell, he did not know enough of the matter to state. But he believed it was due to change in the nucleus. His cases were improving under treatment and he did not hope nor expect to be able to examine them at autopsy for a long time. Dr. Mailhouse's case was interesting as to the change in the sella turcica. It was probable that there was a cyst or tumor of the sella turcica which deprived it of its active properties. If the epiphyses were not united as yet, the patient might be helped. He could not return further answer to Dr. Tilney's remarks than those he had given to Dr. Sachs, namely, that the pineal gland did have an active secretion.

JOINT MEETING OF THE CHICAGO NEUROLOGICAL SOCIETY WITH THE WEST SIDE BRANCH OF THE CHICAGO MEDICAL SOCIETY

October 19, 1916

The President, Dr. Harold N. Moyer, in the Chair

Clinical Meeting

A CASE OF MULTIPLE NEURITIS

By G. B. Hassin, M.D.

The patient, aged forty years, entered the hospital complaining of weakness and pain in the feet. He had been drinking large quantities of beer for thirty years. Up to the age of ten he was perfectly well. After a series of three accidents, in the last of which thirteen years ago he sustained an injury of his feet, wrists and spine, a sore developed on the great toe of the left foot and later the right great toe also became affected. Thus for the last eleven years he has been suffering from ulcers of the toes, for which five years ago the left great toe, and not long after, the right great toe were amputated; otherwise he was perfectly well, except for some weakness of memory for recent events. He could remember events of his early life.

Examination showed a dorso-lumbar kyphosis and a marked deformity of the toes of both feet: they were red, swollen, and two of the toes of the left foot were covered with ulcers. There were also ulcers on the right toes but they were healed. There was some power in the feet, but hardly any in the toes, a bilateral foot drop and a steppage gait were present. The motor and trophic disturbances were associated with marked anesthesia of the toes and feet, the lateral surfaces of the feet and legs being merely hypesthetic; a little higher up there was hyperesthesia. The calf muscles and the large nerve trunks were tender. The ankle reflexes were lost, the patellar was markedly diminished on the left, normal on the right. The plantar reflex was almost absent on the left, totally absent on the right. The cremasteric was absent on the right. The abdominal reflex was lost above and below the umbilicus was very inconstant. The internal organs, genito-urinary apparatus, the cerebral nerves, the serologic and urinary findings were negative. The combination of trophic, sensory and motor disturbances were thus almost exclusively confined to the feet and could be caused either by a pure peripheral lesion, a multiple neuritis, by a posterior root lesion—tabes, or by a spinal-cord lesion of the two lowest lumbar and two upper sacral segments. These four segments make up what Minor described as the epiconus.

Tabes could be easily excluded, as the lumbo-sacral seat of this disease usually gives pronounced root symptoms (shooting pains, ataxia, genito-urinary disorders) which were absent. Epiconus lesion was represented by the bilateral peroneal paralysis, steppage gait, lost Achilles jerks, integrity of the knee jerks, of the genito-urinary organs and anesthesia in the lumbo-sacral segments. The lumbo-sacral kyphosis and the injuries also spoke in favor of epiconus lesion, but the alcoholic history, the peculiar amnesia and the tenderness of the calf muscles and nerves of the legs spoke rather for a multiple neuritis. The ulcers and mutilations of the feet and toes of thirteen years' standing must therefore be ascribed to the latter. Such marked trophic disturbances are very uncommon in neuritis where the trophic symptoms are usually rarer than the sensory or the motor ones and do not attain the degree of severity as shown in this patient. In the case of Lepine and Porot they were equally severe—on the hands—but were of shorter duration, while in this patient they existed many years and were for a long time the only sign of polyneuritis, and for this reason this is a unique case.

CASES FOR DIAGNOSIS

By G. W. Hall, M.D.

Case 1. The patient, whose case Dr. Hall wished to present for diagnosis, had died and the gross pathology of the brain was demonstrated. He reported a case of a man who came into the hospital in a comatose state which had developed suddenly, three weeks after the onset of loss of memory, some headache, emotional instability, and on one occasion vomiting.

The examination showed all the deep reflexes to be exaggerated, a double Babinski and Kernig were present, and at first a slight hemiparesis on the right side was demonstrated. The pupils were fixed. He ran a temperature ranging from 99° to 102° F. The pulse, at first very slow, 54 to 56, increased to 116 to 124. The spinal fluid showed a cell count of 147 with a negative Nonne and Noguchi on one occasion and slightly positive on another. There was no optic neuritis. On section a glioma in the region of the basal ganglia on the left side was found.

Case 2. Dr. Hall presented a case of a man who for fifteen years complained of shooting pains in the epigastrium and of vomiting. The pain was worse in the morning and associated with vomiting which at times was quite

severe. Examination showed diminution of both knee jerks with irregular pupils which reacted very sluggishly to light. The spinal fluid showed a cell count of 10 lymphocytes on the first and 40 lymphocytes on the second examination with a faintly positive Nonne and Noguchi. The Wassermann reaction was negative upon the serum, but three plus positive on the spinal fluid. The patient gave a history of drinking liquor to excess for a great many years. Dr. Hall thought the case one of both gastritis and gastric crises of tabes.

Dr. Grinker said that the specimen which was passed for examination reminded him of the fact that in gliomata hemorrhages are not at all uncommon. In his own experience he recalled a case which was almost as interesting as this one, in a patient who was secretary of a labor organization. He received a trauma from a brick which fell upon his head, causing a scalp wound, and what was considered at that time an abscess of the brain was the result. He was treated and a month later developed a rightsided hemiplegia with aphasia. He was in a stuporous condition and the diagnosis in that case appeared to be a cerebral abscess, considering the fact that only a month previously he had sustained the trauma to his head, which was suppurative in character. He was operated upon but the surgeon failed to find the abscess and the patient died. A post-mortem was obtained and a hemorrhage was found which involved the internal capsule, the motor tracts, and extended outward to the speech centers, so that he had a complete motor aphasia. The hemorrhage occurred in a glioma which was traced to the anterior horn, where there were evidences of two old hemorrhages. It appeared that not until the third hemorrhage when the motor areas had become involved were there any symptoms. In examining the history of the case, the only evidence of something wrong was that two or three months previously this secretary, who had always been prompt in collecting the dues for his organization and giving the members credit, had forgotten the names of those who paid him and made mistakes in his books. He had never complained of headache and had no other symptoms of brain tumor. The specimen was interesting because it showed three kinds of hemorrhages of different age; the first was probably two years old, the next one year old, and the last one was quite recent.

Dr. Patrick wished to know whether Dr. Hall had carefully examined for sensory disturbances on the abdomen, as cases with gastric crises usually showed something there when they failed to show anything elsewhere.

Dr. Hall said he had examined carefully and had found no sensory disturbances.

A CASE OF DERCUM'S DISEASE

By Julius Grinker, M.D.

The patient, a man of about fifty years of age, came to the hospital for nervousness and incipient delirium tremens.

He was weak and nervous, complained of failing vision and was short of breath, especially on exercise. He entered the hospital for the first time in 1909 for a pronounced mitral lesion. Even at that time he related that shortly after he had developed heart trouble he had noticed several small lumps on his body which were very painful and tender on pressure and occasionally caused spontaneous pain. In 1906 appeared the first nodule on his left arm. Later a second one developed on the opposite side, but not in symmetrical order. Then nodules appeared on the trunk, abdomen and thighs. These were small tumors under the skin which had the peculiar feel of fatty tumors. No evidence of their existence was seen on the skin itself. In many cases there has been noticed a peculiar whitish spot over the skin

before a nodule develops. In general the patient had the feeling of soreness, rather a paresthesia than pain, unless the nodule was being pressed.

He admitted having had a chancre twenty-two years ago and had been a heavy drinker for many years, principally whiskey. Was married but no offspring. There was double optic neuritis, the pupils were sluggish to light and both Achilles jerks were lost, though the knee jerks were still present. Wassermann reaction strongly positive. There were lues, alcoholism and adiposa dolorosa in the same patient. This may be important when considering the etiology of adiposis dolorosa.

Dercum in 1888 and 1892 first described this disease. It consists of the formation of fat nodules in various parts of the body either in circumscribed or diffuse distribution. There is a variety of the disease in which the discrete nodules become almost generalized. This variety resembles general obesity more than anything else, but the characteristic point is that the nodules are painful to the touch. In many of these cases there is even a relative degree of objective anesthesia. In other cases there is hyperesthesia. Dr. Grinker's patient had hyperesthesia over a great part of the skin of his back. The pain is variously described by different patients as burning, paroxysmal, spontaneous, or may only be elicited on pressure. The lumps never occur on the hands, face or feet, but are found on the trunk, thighs and abdomen, as well as over the arm. A not rare symptom is some degree of mental weakness. Many patients have suicidal tendencies and others mere dementia. Dr. Grinker's patient was not mentally weak but rather emotional which might in this instance be due to alcoholism.

As to the pathology we are still ignorant. The thyroid and hypophysis have been found enlarged in many cases. There was no thyroid enlargement in Dr. Grinker's case and the radiogram showed a normal hypophysis. There was a suspicion, however, of calcified pineal gland, according to the radiograph.

Dercum believes this disease belongs to those caused by glandular disorders, but pathological findings have thus far been indefinite. Increased connective tissue and fat have been found among the contents of the nodules.

In the treatment thyroid tablets have been recommended but thus far no cures have been recorded. For the syphilis the patient was given antisyphilitic treatment.

HYSTERICAL HEMIPLEGIA WITH HEMIANESTHESIA

By Julius Grinker, M.D.

The patient is married and has two living children. Two years ago she was operated on for a perineal tear. She left the hospital well, but later developed gonorrhea and then gonorrheal arthritis, for which complaint she returned eleven months ago. Her right knee was placed in a cast and she recovered. After the cast had been removed she fell in the ward one day and the next day her left side was paralyzed. This paralysis has remained about the same. The left arm and leg were involved but not the face. The gait is typical; a dragging gait, and it does not correspond to any known organic gait, neither to the spastic, the steppage or the ataxic stamping gait; it is the typical hysteric gait described long ago by Charcot. Diagnosis can almost be made from a glance at this gait. Of course, there is no Babinski sign, nor spasticity, nor other evidence of pyramidal tract lesion.

An interesting feature is the combination of hemiplegia with hemianesthesia and hemialgesia beginning exactly in the middle line. This is true hemianalgesia.

In addition there is a contracted field of vision, so-called tubular vision.

The diagnosis in such a case can be made by excluding symptoms of organic disease. Hemianesthesia beginning exactly in the median line and a paralysis that involves only arm and leg, and the fact that this difficulty came on after a slight trauma not sufficient to cause lesion of the brain, leave no room for doubt in the diagnosis.

SYPHILIS OF THE MIDBRAIN

By R. C. Hamill, M.D.

The man is a bartender by occupation, aged twenty-six years. He came into the hospital on the 27th of September complaining of headache and weakness. He first had headache two years ago. It was most pronounced at night, began in the occipital region and passed to the front of the head. During the last attack he had nausea and vomiting, not projectile in type. There were no eye disturbances and no scotoma before the attack. Previous attacks were not accompanied by vomiting. The attacks lasted two or three days at a time.

He had a primary syphilitic lesion three years ago. He has had left middle ear disease for many years and had pleurisy three years ago.

Physical examination at the time of entrance showed that although he could move his eyes in all directions there was a nystagmus in all directions with the slow component towards the position of rest.

On the second of October he complained that his left arm and leg had been gradually getting weak and that he still had a severe headache. At that time the interne poticed a paralysis of the right external rectus with anesthesia and paresis of the left side of the face. Dr. Hamill saw him later in the day, at which time he had a marked diminution of the sense of movement in the left toes and fingers. Both eyes were held to the left, and marked nystagmus was present upon attempting movement to the right.

Lumbar puncture the day of entrance showed 170 cells to the cm. The Wassermann reaction on the spinal fluid was strongly positive; on the blood negative.

Examination October 10. All movements of upper facial are invariably accompanied by bilateral movement of the eyes up and to left. He has left hemiplegia, paresis of movement of the eyes to the left, and paralysis of the right sixth nerve. He smiles more on the left than on the right face. He has complete loss of the sense of movement in the toes and a diminution of the sense of movement in the fingers, and diminished touch sense on the left side.

The reflexes on the right side of the body are much increased.

Smiling is under poor control; he smiles too easily and frequently. The lesion is in the pons, is vascular and syphilitic. It involves the sixth nucleus, the dorsal longitudinal bundle, the lemniscus and the pyramidal tract.

Dr. Charles J. Lewis suggested the possibility of the thalamus being involved. He thought there was less opportunity for a lesion in the fibers of the fillet than in the cell bodies of the thalamus.

Dr. Moyer asked if there was any involvement of the lenticular nucleus.

Dr. Hall thought that if the sixth nerve is involved at the nucleus the seventh might also be involved. Why could not a meningeal involvement account for the sixth nerve on one side and why has he not a multiple lesion?

Dr. Grinker thought of the emotional involvement and the center for mimicry which is pretty generally conceded to be in the thalamus. This man has this to a certain degree, as is manifested by his forced smiling. Inasmuch as he is syphilitic, could we not assume that he has a lesion in the thalamus which may account for his involuntary mimicry?

Dr. Hassin thought that if we assume a central lesion of the nucleus of the sixth nerve he would have a marked lesion of the seventh nerve which passes around this nucleus before emerging from the pons.

If we assume a lesion on the base of the brain where the pyramidal tract comes in contact with the sixth nerve we can explain the case easily, we would have what is known as Raymond's syndrome: a paralysis of the sixth nerve on one side and contralateral hemiplegia, without a facial paralysis.

Dr. J. Leon Meyers fully agreed with Dr. Hamill as to the diagnosis of this case. The fact that the nystagmus took place in all directions would indicate that the lesion involved the posterior longitudinal bundle, that it was not merely a paralytic nystagmus—due to a palsy of a certain ocular nerve. It would be very possible for a lesion in the location indicated by Dr. Hamill to involve the median lemniscus without involving the tegmentum, and thus produce disturbances in appreciation of the point of contact, which, as we know now, is one of the main functions of the posterior columns, without producing other sensory disturbances, such as anesthesia or analgesia. It appears to him that there is not sufficient evidence in this case in the way of involuntary movements and sensory disturbances of any involvement of the optic thalamus.

Dr. Hamill, in closing the discussion, said inasmuch as there is syphilitic disease in the vessels at the base, it is perfectly possible to assume some disturbance of thalamic function, but it may be that the smiling too easily may be due to lesions in the bulb involving the bulbo-thalamic tracts. That the lesion is in the pons rather than in the meninges is evidenced by the involvement of the posterior longitudinal bundle, the lemniscus and the pyramidal tracts, well within the bulbar substance.

THE CHICAGO NEUROLOGICAL SOCIETY

November 16, 1916

The President, Dr. Harold N. Moyer, in the Chair

A NOTE ON BRACHIAL NEURITIS AND SCIATICA

By Hugh T. Patrick, M.D.

Dr. Patrick said that his records showed that of the cases which came to him or were referred to him as brachial neuritis, only about one in ten was really a case of this disease. About four fifths proved to be cases of arthritis of the shoulder joint. The other one tenth was made up of cases of bursitis, syphilis, neoplasm, cervical rib, cervical arthritis, cervical caries, osteomyelitis and post herpetic pain.

One of the most striking features of arthritis as distinguished from neuritis is that some movements of the shoulder joint, particularly against resistance, are painful. The best test movement is crossing the forearms behind the back. Frequently the pain of arthritis is not felt at the joint but about the insertion of the deltoid. Dr. Patrick particularly emphasized the value in diagnosis of repeatedly taking the temperature and of frequent examinations for leukocytosis.

More than thirty years ago Dr. Putzel, of New York, called Dr. Patrick's attention to the frequency with which arthritis of the hip was mistaken for sciatica and this mistake in diagnosis still seems to be very frequently made. Dr. Patrick believed sciatica to be a rare disease, whereas arthritis of the hip joint is exceedingly common. The principles of diagnosis of arthritis of the

hip from sciatica are the same as those of the differentiation of arthritis of the shoulder from brachial neuritis. The best movement for discovering an arthritis of the hip is what the author for convenience called the *fabere* sign, the letters of the word standing for flexion, abduction, external rotation and extension. With the patient supine the ankle of the side to be tested is placed above the patella of the opposite knee and the knee of the leg thus flexed is depressed toward the table or couch upon which the patient lies. In many cases of arthritis flexion, abduction and rotation of the thigh may be free and painless, but when this test is used either the knee can not be depressed to the normal degree or such depression causes pain. In these cases also repeated examinations are very apt to show a slight rise in temperature and 8,000 to 9,000 leukocytes.

Dr. Peter Bassoe said the subject was very important and very timely, as we all make mistakes. He would like to ask whether Dr. Patrick thinks it possible that in addition to an arthritis and neuritis producing symptoms of this sort myositis alone might not produce it. We know that the muscles are often very tender and that in the extensive work that has been done with animal inoculations in connection with local injections hemorrhages into the muscles have been frequent; particularly in cases of sciatica, so called, we often get a history of an attack of lumbago just preceding and then the history of the pain going down the sciatic nerve, and he has been of the opinion that we are often dealing with myositis which has extended deeply enough to give great pressure on the sciatic nerve. Dr. Bacon related a case which he considered one of arthritis of the shoulder. The patient returned to her home and some months later he received a letter from her doctor saying that she had developed Hodgkin's disease and died. When he examined her there were no enlarged glands. Evidently the glandular enlargement had started deep enough in to cause the pressure in the cervical nerves.

Dr. Rogers would like to have Dr. Patrick make some remarks in closing as to the relation of Goldthwaite's disease.

Dr. Moyer said that his experience had been similar to that of Dr. Patrick in relation to sciatica and neuritis of the brachial plexus. Many years ago a patient had come to him with a painful and stiff shoulder which he had diagnosticated as neuritis. Treatment extending over several weeks giving no relief, the patient had finally gone to an osteopath who promptly relieved the trouble. An investigation of the means employed taught him that the difficulty was not with the nerves but was a bursitis, the most common cause of stiff and painful shoulders. The pain so commonly complained of at the insertion of the deltoid is usually due to involvement of the subdeltoid bursa. A difficulty in raising the arm above a right angle is due to an involvement of the subachromial bursa. A simple test is to have the patient stand with the arms hanging by the side and bend forward so that the arms swing of their own weight. In this way they will fall on each side of the head; then the arms are fixed and the patient rises to an erect position when the arms will be alongside of the head, usually greatly to his surprise, as this little maneuver is accomplished without pain. If this can be accomplished, it is quite certain that one is not dealing with a neuritis. He would emphasize the importance of a rectal examination in all cases of pain about the hip joint or suspected sciatica. In three consecutive cases of supposed sciatica this method of investigation revealed that two were due to carcinoma of the rectum and a third to an easily palpable arthritis of the hip.

Dr. Mix said there was a point in the differential diagnosis of brachial neuritis that was of importance. Many patients have an aortitis and such attacks should always be thought of in people from thirty-five to fifty years of age. If one makes a careful examination in these cases one frequently finds the aorta a little spread out, with a little dulness in the second space.

In many of these cases there is not very much in the way of precordial pain. Many complain of pain only in the arm. The pain is generally on the inner margin of the arm and if it comes down into the hand follows the ulnar nerve. It is a good rule that when a systolic murmur is found a Wassermann test should be made on the blood and if negative one on the spinal fluid should be made as well.

Dr. Patrick, in closing the discussion, said he was not making any attempt to cover all kinds of pain in the arms and legs and sciatic nerve. He only wished to call attention to a few points.

As to whether myositis is somewhat a part of the picture, he entirely agrees with Dr. Bassoe that it sometimes is. In his experience a myositis has been exceedingly frequent in the neck. Sometimes the musculature about the neck is tender in cases of indurative headache, which is closely related to arthritis.

He thinks that very frequently a good many of the so-called chronic lumbagos, not the acute cases, are cases of arthritis in the lumbar spine.

For the reason that he did not speak of rectal examinations nor consider the possibility of tumors, Pott's disease etc., he did not mention sacro-iliac joint trouble which he does not think is particularly apt to be confused with sciatica. The symptoms in such cases are quite characteristic and the tests very simple.

Dr. Patrick was glad that Dr. Mix mentioned aortitis. He meant to put that in with the one tenth of the cases neither arthritic nor neuritic.

XANTHOCHROMIA AND SPONTANEOUS COAGULATION EN MASSE OF THE CEREBROSPINAL FLUID

By Charles L. Mix, M.D.

Dr. Mix briefly reviewed the literature of the cases which have been published since 1903 and reported a new case of a man now under his care.

This patient is a Catholic priest who was taken ill early this year. He was examined first at Rochester but no lumbar puncture was done, and a diagnosis of neurasthenia was made. He then went to a sanitarium in Milwaukee where a lumbar puncture was made; a peculiar fluid was found and Dr. Mix was asked to see him there. The trouble had started exactly like a meningitis. Two guinea pigs were inoculated but they showed nothing. Early in the course the man had head symptoms, then eye symptoms with a little choking of the discs from a good deal of intracranial pressure. The knee jerks were somewhat toned down but not absent; there was a left Babinski, a Kernig and some rigidity of the neck. The condition resulted in a complete recovery of normal function in the whole upper part of his anatomy above the sixth dorsal segment, and he then passed into a secondary stage of spastic paraplegia without much pain. The chief disturbances were the clonuses, which were very severe. Dr. E. W. Andrews operated upon him; a very definite idea of the pathology was obtained. Dr. Andrews opened the eleventh and twelfth dorsal and the first and second lumbar vertebræ and there was a complete agglutination of the meninges in all that region, and nothing but an agglutination could be found. This case proved the general law of a cul-de-sac below separated from the normal space above. In this case the agglutination probably extends from where he has a mild girdle sensation at the level of the sixth dorsal down to the lower end of the cord.

Since the operation the patient has regained his bladder control and his sense of localization. His posterior columns are conducting satisfactorily. He has very little pain. After the operation he had a complete loss of the knee

jerks and the first improvement was recovery of involuntary movements. Then the right knee jerk came back and later the left knee jerk. The stage of hyperexcitability of the pyramidal tracts is now lessening. Dr. Mix thinks that later enough separation of his arachnoid pia from the dura will take place to lead to a partial return of his normal condition. There is no evidence of anything other than an intense irritability of his lateral cord. It is not too much to expect a complete cure in this case because other cases have made complete recoveries.

Dr. Holmes said he had seen four cases in Wesley Hospital. One case, a child with hydrocephalus, had three ventricular punctures done. The first fluid showed a very marked xanthochromia and spontaneous coagulation and the presence of a large number of cells, mostly lymphocytes and endothelial cells and with a marked increase in globulins. The second fluid was not nearly so yellow, and the third fluid was normal in color. The amount of albumin and globulin decreased with each fluid. There was no spinal puncture to find out if the fluid from the canal was different from the ventricular fluid.

Dr. Holmes agreed with Dr. Mix in regard to the Wassermann test. He has made about 13,000 tests in the past five years and has some rather fixed ideas regarding them. Like Dr. Mix he does not think that a 1 plus Wassermann amounts to anything. Either a patient has syphilis, or he has not syphilis, or we don't know. The report should be either positive, negative, or doubtful.

REPORT OF A CASE OF MULTIPLE SCLEROSIS WITH A DELUSIONAL STATE AND TERMINAL DELIRIUM. NECROPSY

By Peter Bassoe, M.D.

Dr. Bassoe reported the case of a student who at the age of twenty developed a staggering gait, later slurring slightly scanning speech, slowness of micturition, intention tremor and nystagmus. The tendon reflexes were increased, there was a right Babinski sign. At first the abdominal reflexes were present, though weak on the right side, but they soon disappeared. There was occasional diplopia and blurring of vision, but there was no definite palsy and the eyegrounds were normal. During the last month or two mental symptoms came to the foreground. He imagined he had made important inventions. After several weeks of a happy and harmless, mild delusional state he suddenly became delirious and noisy. After two days the temperature rose to 101°. During the night he was extremely noisy, received two doses of veronal of seven grains each without effect, and then 1/100 of a grain of hyoscine hydrobromate hypodermically. He died one hour later.

Necropsy: Slight hypostatic congestion of lungs; slight cloudy swelling of the viscera; distinct acute splenitis; the brain showed considerable pial thickening, especially in the frontal and parietal regions, and the amount of cerebrospinal fluid was small. After formaldehyde hardening the brain was sectioned and distinct grayish areas without any delimiting capsule or hyperemic zone could be seen here and there in the subcortical white matter, most numerous in the frontal lobe. In the pons, bulb and cord irregular islands of degeneration could also be made out by the naked eye. Pal-Weigert specimens showed typical patchy degeneration most abundant in the white matter of the cord, bulb and pons, also large patches in the optic chiasma, tracts and nerves. The patches in the brain substance visible to the naked eye were very sharply outlined in the Pal-Weigert specimens. Of particular interest

is the occurrence of small celled infiltration in the pial meshes of the brain, as well as about the cortical and subcortical vessels. These findings, which are not unlike those of general paresis, are of interest in connection with the expansive delusional state which had supervened in a previously typical case of multiple sclerosis.

THE PHILADELPHIA NEUROLOGICAL SOCIETY

DECEMBER 15, 1916

The President, DR. F. X. DERCUM, in the Chair

Dr. Sherman F. Gilpin presented a case of cervical pachymeningitis greatly benefited by operation and a case of hypochondria.

Dr. P. A. McCarthy presented a case of osteitis deformans.

Dr. C. W. Burr said he had recently seen a woman with this same condition as revealed by necropsy. In her there was a positive blood test and curiously enough the shin bone was of the same size as in the man presented by Dr. McCarthy. The pathologist regarded the bone changes in the skull as those of specific osteitis.

Dr. McCarthy said his patient had been given pituitary extract, pancreatic and thyroid, with no result. He took suprarenal extract of his own accord. He has taken since August 6th 6 to 9 grains of suprarenal extract a day.

Dr. Charles K. Mills and Dr. Isaac H. Jones reported a case of subcortical parieto-temporal abscess indicating the mechanism of the control of the quick component of vestibular nystagmus.

Dr. Michael A. Burns presented a case of tic douloureux. Four operations, final operation upon the Gasserian ganglion. Subsequent return of pain.

Dr. T. H. Weisenburg said that about seven or eight years ago he showed a patient before this Society. At first the pain was typically that of tic douloureaux. Many operations were done. The nerves were twisted out, alcohol injections made, the Gasserian ganglion was removed and finally the lingual and cervical nerves cut, but the pain returned. The man died and Dr. Weisenburg found that he had a cerebello-pontine tumor, growing from the fifth nerve and pressing upon the pons and so separated the pons and medulla from the cerebellum as to stretch the ninth nerve. The ninth nerve showed degenerations. The interesting point about this man was that in the beginning the pain was localized in the upper and middle part of the face. After the removal of the Gasserian ganglion the pain in the upper and middle part of the face disappeared, leaving pain only in the lower part of the jaw, radiating down the neck and throat which Dr. Burns said his patient did not have. Dr. Weisenburg came to the conclusion that the pain his patient had in the lower jaw and neck was due to the ninth nerve disease. The fifth nerve and ninth nerve supply contiguous areas and it is possible that irritation in the ninth nerve may give pain in the jaw radiating down the neck. Following this case Dr. Weisenburg saw several similar patients with Dr. Harvey Cushing.

Dr. Burns said he brought his patient before the Society for an opinion on account of the unusual length of time after which the pain recurred. The last operation gave relief for several years. No Wassermann test had been made.

A CASE OF PERSISTENT SUBJECTIVE MANIFESTATIONS IN THE DOMAIN OF THE FIFTH NERVE WITHOUT PAIN OR MARKED OBJECTIVE SENSORY DISTURBANCES.

By Alfred Gordon, M.D.

Patient, a middle-aged man, developed a year ago without an apparent cause a numbness over the left side of the face. At present he shows the following symptoms: There is a sensation of coldness, numbness, "dead feeling," also a sensation of pulling and especially of "breaking" in the distribution of the left fifth nerve. The latter sensation is so distressing to him and so persistent that it interferes with his sleep and it has produced a total anorexia. The torture and suffering are intense. He feels at times that the skin is frozen and sometimes on awakening in the morning he finds the face actually drawn to the right side, but upon a vigorous rubbing the deviation is rectified. At no time did he experience actual pain, neuralgic or otherwise. He compares the torturing sensation to a breaking in two of a hard object, such as leather. Examination for objective sensibility reveals the presence of a slight diminution of sense of pain over the lateral aspect of the nose (left). Over the rest of the left side of the face the sensations are like those of the sound side. There are no sensory disturbances over the mucous membrane of the nose, mouth and tongue or conjunctiva. The motor portion of the fifth nerve is normal, as the masseter and temporal muscles contract perfectly. Finally pressure on the points of exit of the branches of the fifth nerve does not provoke pain, otherwise speaking the tender points common in neuralgia are absent.

An X-ray examination, as well as a laryngological, otological and eye examination, are all negative. The taste is preserved and the hearing is normal. There is no involvement of the seventh nerve. Reflexes—tendon and cutaneous over the entire body—are all normal. The circulatory, motor and sensory apparatuses are all normal. The case is quite unusual, inasmuch as during the whole year the patient has been suffering intensely from the uncommon paresthesia over the area of distribution of the sensory portion of the fifth nerve and at no time had he had pain of a neuralgic or of another character. At no time had there been objective sensory disturbances except the small area of hypesthesia described. Is it not possible that the disorder is totally cerebral, but not at all that of a fifth nerve lesion?

Dr. A. A. Eshner asked whether Dr. Gordon had compared the electrical reactions of the two sides of the face.

Dr. Gordon replied that he had not. The patient has had the condition for a year and not the slightest trace of pain. Although the condition is strictly limited to the area of distribution of the fifth nerve on the face, nevertheless it is exceedingly doubtful whether the lesion is a peripheral nerve affection.

Dr. Charles S. Potts said that a man was coming to his dispensary who has similar symptoms, though not as severe as in this patient. This man also has Argyll-Robertson pupils, sluggish knee jerks and examination of his cerebrospinal fluid showed a positive Wassermann test, increased proteid and an increased number of cells. The man has had these symptoms for years and works every day as a street car conductor. He has no difficulty excepting the discomfort. The symptoms are similar to those of which Dr. Gordon's patient complains.

Dr. Gordon said he had an x-ray made and there was some rarefaction of the bones of the left side of the face.

Dr. Milton K. Meyers said he had seen this patient at one of the dispen-

saries and it was his impression that the torturing sensation was a true pain. He thought it was a case of tic douloureaux and advised injection of the Gasserian ganglion with alcohol. Whether that is the case, whether it is some unusual form of tic douloureaux he could not say. At all events, the Gasserian ganglion, he thought, would be affected in this case, since the torturing sensation seemed to be limited to the Gasserian distribution and at the same time the tic is fairly characteristic of a fifth nerve involvement, *i. e.*, it is the facial spasm usually seen in tic douloureaux.

Dr. Gordon said there was no doubt about the impression being psychological. He thought at first it was facial neuralgia, but repeated examinations revealed an entirely different condition. The ear is not involved. The aurist, the laryngologist and the oculist went over him thoroughly.

Dr. J. Hendrie Lloyd presented a tumor of the membranes of the spinal cord in the mid-dorsal region.

Dr. Cadwalader stated that Dr. Weisenburg had asked him to refer to a case he (Dr. Weisenburg) had recently observed in which there was a tumor in one occipital lobe causing hemianopsia. The patient complained that after he had looked at a bright light or object with the hemianopic field he afterwards had the impression of seeing bright lights on the side that corresponded to the blind field. This impression continued some time. In other words, the patient had visual hallucination in the blind field.

Dr. Cadwalader stated that Dr. Weisenburg had said this was a new phenomenon in his experience and he was anxious to know if other members of the Society had ever observed this condition.

Dr. Spiller said a number of years ago he had reported a case of occipital tumor in which visual hallucinations were in the fields of the same side as the tumor, he had later had a similar case, and had called attention to the fact that irritation of the calcarine cortex may cause visual hallucination not projected into the fields of the opposite side. The irritation of the calcarine cortex is an abnormal condition and the brain has not learned to project such irritation into the opposite fields. The condition is not comparable with retinal irritation, as for example of the left halves of the retinæ from irritation in the right fields, transmitted to the left calcarine cortex.

Dr. Alfred Gordon said that the communication of Dr. Weisenburg reminded him of another observation that he had opportunity to see a few days ago. A patient came to him with the following complaint. He said for a number of months he had been suffering from this peculiar phenomenon. All of a sudden, without any warning, he would see two dark spots before his eyes in the center and immediately afterward a number of concentric rings would surround that spot and when they reached a very large extent a reduction of these rings would commence gradually, ring after ring would disappear until these two spots would remain, then the spots would disappear and the man would see again well. After this attack he would feel exhausted He is frightened, for this reason, that his father, who was a physician in one of the hospitals, suffered from Jacksonian epilepsy. Putting aside this remark about his father, in going over the case in detail, Dr. Gordon found that the man presented asynergia, his trunk would not follow the limbs, he staggered. His knee jerks are normal, but the eye phenomenon together with the asynergia was so marked that it carried Dr. Gordon's mind to the possibility of the occipital lobe being involved on both sides. Since then he looked over the literature, among them Gowers' book, and he has not been able to find anything similar to that.

Periscope

THANATOPHOBIA AND IMMORTALITY. G. Stanley Hall. (Amer. Jour. Psychology, 1915, 26, p. 550.)

This study shows an advance on Hall's earlier Synthetic Genetic Study of Fear, in that it penetrates straight into the deeper dynamic of the will to live, or the libido energy. Death, the interference with this, becomes thus from earliest conscious experience an object of fear, the fear itself being but the counterpart of desire which then is the fundamental source of this as of every phobia. This links death and the fear of death perhaps even more closely with the intensest pleasure of the reproductive instinct in a still more fundamental degree than Hall's analogy between them has done. Hall begins at their point of deviation, where they run in an almost parallel analogy. Each represents a fact so intense that about it must be built all the mechanism which will divert attention from it and mitigate its pressing demand upon individual and social life. The fear of death represents the intensity of pain, the sex act the culmination of libido energy along the path of pleasure. The sex life, as Freud has shown, has its expression during childhood in numerous deviating channels. They are not centrally focused until puberty, when the sexual instinct becomes centered and felt as such. Just so it is with the fear of death. It only finds its focus when the meaning and value of life assert themselves at puberty. Before this the child has manifested a superficial attitude toward death, which has been more occupied with the accessories and in this has recapitulated the earlier experiences of the race. The strange appearance of some loved one cold and still, the tears of the mourners, all these things claim and fix their attention. Only a simple curiosity about the departure is experienced. The strangeness and excitement of it all makes them regard death even as an occasion of interest or even amusement. A sense of the child's increased importance in the absence of the departed one is evident, especially with neurotic children, where the unconscious death wish may early make itself felt in demanding some corrective process familiar to psychoanalysis.

This component of the death wish and its ambivalent counterpart is present even with adults in every instance of death, mingled with the most sincere grief or the most implacable hatred. It is not until puberty, as has been said, that the real meaning of death is realized. Even then it is the intensity of life that is foremost. A positive interest in death with a desire for it belongs rather to old age when the will to live is declining. It is life to which the young cling, and yet there is an insistence in the death fear by which it thrusts itself before youth and inspires dreads, phantasies, even obsessive complex reactions.

The interest excited by the accessories of death, upon which children especially focus the attention, serves to rob the phobia of the intensity which would turn the individual back upon regressionary reactions. The race has followed a wholesome instinct in elaborating social laws and customs and multiplying external trivialities which delay sex development and sex activity. In the same way it has concealed the central fact of death and lessened its horror. Various religious beliefs and cults have been the chief factors in accomplishing this end. The Nirvana cult has met this fear most boldly

Christianity has taken the other extreme in abolishing death and substituting for it the joyous resurrection—life. Death becomes merely the kindly agent to pilot the soul into that better, unending life. Therefore Christianity, Hall says, has developed one of the greatest psychotherapies for this arch enemy of mankind. "It is the supreme demonstration of the *Allmacht* of the folk-soul to minister to its own gravest diseases." He alludes to the danger of transcendental selfishness which it has fostered, but one questions whether there has not been greater evil accompanying this supreme conviction. There can be no doubt of its tremendous moral restraint, nor that the sense of assurance it gives have enabled and inspired mankind to perform heroic deeds and more important still, to accomplish a steady and progressive achievement in racial culture. And yet it has tended to overemphasize the *Allmacht* as it expresses itself in this gigantic wish phantasy, making reality so much harder to attain.

All the nations of the ancient world were occupied with this phantasy. It was associated with the changes which they observed in nature, marked by death and reappearance. They seem to have urged themselves by all the outward manifestations of grief to the very intensity of the pain of fear and then by a sudden reversal have realized the hope and joy of renewed life in all its fulness. Hall sees in this the endeavor to ensure themselves against being led captive by either pleasure or pain, by keeping wide open the way from the extremest depression to the maximum of exaltation.

We really know very little of the fate of the dead body. Our thanatophobia has prevented the dwelling in imagination upon the changes that must occur, much less has it allowed any true scientific investigation which may, if we ever overcome this, throw valuable light upon the process of evolution by a study of physical devolution, or upon our knowledge of the disease germs in their relation to a dead host. It is this excessive shrinking from the postmortem conditions, Hall thinks, that have contributed largely to the manifold and elaborate burial customs, which are so many cover phenomena to cover up the unbearable thoughts rather than to preserve the body to be again at some future time the habitation of the soul. Hall is silent upon another determinant which seems to have been active in primitive customs and which must have borne its part in the preservation of the body as well as in the devolution of some part of it to special uses, the ritual eating of relative or foe, and the like, which he attributes here in large part to repression of the repugnant. Surely the animistic association of the life principle with even the dead body and its parts was a strong motive factor, however much this may have been mingled with the former motive and in part perhaps determined by it. (See Frazer, The Belief in Immortality and the Worship of the Dead, Vol. I, p. 340; The Golden Bough, Part II, Taboo and the Perils of the Soul, pp. 188–190.)

Hall goes back to the very primitive death fears wherein lie the neural predispositions to repugnant shuddering out of which will develop later the higher complex reactions. But the desire which lies even behind the earliest primitive fear perhaps finds its explanation in this early association of the life principle with the body, and here lies the origin of nekrophilism, which Hall admits must have its germs in infantile experience, and which also has contributed to the preservation and beautifying of the dead body. This conception adds, moreover, to the significance of the tremendous repression which the death fear meets along with the sexual instinct. It explains also the displacement in the one instance to the artistic exhibition of the nude body or the elevation of sex to the sacred phallic cults, and in the other the idealization of the dead body mentioned above. To-day this displacement manifests itself largely also in diversion to the many accessories which accompany funerals and marriage or death and the sex act.

It is the idea of the life still existing beyond the body, the difficulty of accepting annihilation, that makes man adhere to the belief in the existence of souls in some other world after death. This provides a compensation for the crude fact of bodily death, just as love finds its redemption from mere passionate gratification in immortality in its offspring.

The fear of death, and the love of life, which are but manifestations of the same impulse, have driven man to all those achievements by which he has sought to realize the fulness of living. Hygiene and science as well as religion and art, with all else that mark man's achievement, owe their products to this desire and endeavor to avoid every degree of death and attain the maximum of life.

The genesis of the persistent sense of ghosts surviving the body and manifesting themselves as more often hostile than friendly Hall finds in man's contact with the mysterious atmosphere with which he is surrounded from birth to death. Its reality is our earliest experience in our contact with the external world. It is invisible, without form, yet full of varying moods and apparently endowed with most diverse power. All this has led to manifold personifications of the mysterious element or to the conception of it as the abode and medium for divine and demoniacal beings, and no less for departed souls. The ghosts who partake of this airy nature and inhabit or traverse these regions of air are the products of our desires, but more often it would seem of our dread and fear arising from a troubled conscience. Hence they are the ghosts who must be placated or whose influence and activity is still a source of awesome mystery. On the other hand this aerial domain is the heaven of all his unfulfiled desires, which are here idealized, purified, eternally fulfiled. Our faith in it, Hall says, "has been the world's great resource where all who seek refuge find it. . . . It has made heroes and fanatics. It has been the world's greatest bulwark against crime and vice wherever its sanction has been on the side of morality. It is the world's greatest system of psychotherapy, both moral and physical, though had we been completely normal physically, mentally and morally it would never have existed at all, because unnecessary. . . . It is now the light and hope of the world, but when the day of immanence comes, that of transcendence will be done away."

Men fear ghosts because they are inevitably suggestive of death and its repellant aspects, because also they partake of these mysterious properties of the incorporeal yet under the control of a personality. There is also a sense of suspicion, a certain reserve toward even our closest friend in life, now enhanced by the unrestrained power which the dead have, and aggravated by our troubled consciences. Moreover, our thought of the dead concentrates itself upon his psychic part and for each friend there is a constellation of associations from whose vividness we protect ourselves by all those accompaniments of death and funerals which dissipate this.

Modern thought is tending away from this earlier conception of the soul, but the old impulsions persist in neurotic thought, even in some of the pseudo-science which finds it hard to banish the thought of subtle energies or what not, which seek to fill up the vacuum beyond this life, so abhorrent to the mind.

It is plain enough that the belief in this spiritual immortality is a dream wish and not a reality, or we should be ready at once to desert this life for that vastly fuller one. Instead, we cling to this life and pray for its continuance. This is the substantial world, the other but a projection of man's demand for all that he desires, tenuous, unreal, inferior, therefore, to what we actually possess. The factors which have thus over-determined the desire and belief in immortality find expression in various forms which tend more and more to displace the merely projected wish-fulfilment. First of all, we

wish to be thought well of, to continue to live in the memory and esteem of our friends, and the belief in an existence beyond reinforces the tendency to keep green here the memory of a departed one, while at the same time this desire has its moral influence in concentration upon one's activity here. A second factor which finds a substitute for transcendental immortality is that which seeks perpetuation in monumental works of one sort or another, which shall have a lasting influence upon the race. The desire is not to have lived in vain, a less selfish form of immortality, whether a distinctly egoistic impulse is present or not. To live in one's children brings a satisfaction of the immortality wish, and removes the sting of death. Contemplation of their future may even enter into the happiness pictured in the life beyond. The prevailing attitude to-day is a practical denial of personal immortality, but no less do we seek the banishment of the fear of death. We concentrate, however, more and more upon this life. Our phobia of death depends, moreover, on the abundance of life within us. The more intensely we live the more we put death from us, while conversely all that depresses this sense within us tends to make us careless, more unguarded against death, less eager to avoid it. Hall names these four forms of immortality, the nominal, the influential, the plasmal and the orthodox. Any one of them, he reminds us, may vicariate for one or all of the others. In fact, something of any one of the first three at least is possible to every one of us.

The plasmal, though not attained concretely by all, lies really at the foundation of all the others. Immortality began with the first protozoan and we know not how far beyond, and the impulse reaching infinitely into the future of the race is irradiated and sublimated through countless trends, whose origin and dynamic source pass unrecognized. The therapeutic value of orthodox immortality has been noted. It over-emphasized individuation for a while, but in so doing it stored up and conserved that psychic promise and potency which is now utilized in making a paradise of this world and in striving for the best development of those who are to inhabit it. The greater life of the race soul was comprehended by this transcendental valuation of the individual soul. It has still this service to perform for the young. A fifth view of immortality may so absorb our thought as to banish the fear of death. This is a modern, scientific form of ancient absorption doctrines. The lowest and the highest forms, organic or inorganic, are but aggregations of infinitesimal elements, which are again disintegrated into the larger whole, and perhaps the abatement of the ancient desire for a personal immortality is due to the influence upon our consciousness, still unperceived by us, of deep phylogenetic tides. In such a conception of death and immortality, our long-used religious modes of thought and expression, our symbols of death and immortality would prove themselves foreshadowings of a profound and more embracing conception than we have even suspected. Back of our limited lives are the elemental forces and powers ready to receive us, as it were, in their everlasting arms. This scientific conception is modified and variously apprehended by many thinkers. To some it resolves itself into the preëxistence of an absolute mind behind the universe, a soul that transfuses ours and transmits itself through our personalities. We in turn form an over-soul to beings below us, less complex than we, and so on, all of which presupposes a consciousness behind the universe, forming both the source and the goal of the individual, and thus differs in direction from the above scientific form of this immortality.

A sixth form of immortality is fixed in the belief in ultimate and attainable ideas, definite and abiding norms in nature or mind. It is the noetic apprehension of these transcendental verities, thoughts of God, which wings the soul far above mortality. This has all the inconclusiveness of idealism, which assumes what it cannot demonstrate and only begs the whole question.

Immortality is likewise assumed upon the wish for it and the fact that a belief in it, resulting from this wish, has served as the great moral stimulus in the past. This too fails to prove. We surely cannot argue from desire to reality, and the service of the desire has also varied. The argument that reason demands the highest good, and that this is immortality and therefore must be attainable rests on another undemonstrable assumption that the universe is built upon this principle. It fails also to recognize that immortality has not been thus considered by the whole of the race. Men have not agreed upon what is the highest good which reason should demand. Various other views Hall groups together, a pluralistic doctrine which postulates an eternal republic of God, a world of many self-directive minds; another regards individualities as basal and teleological aspects of the absolute, whose real conscious expression is reserved for the future, is but hinted at here. All these theories represent gropings after assurance for our own soul of its continued existence, and are based on a presumptuous self-consciousness born of our innate desire.

Again, there is an attitude of questioning which throws doubt on the generality and strength of every desire of man for immortality. As man begins to know more of the complexity of his being, both within and without, in relation to his environment, he begins to discount the value of another life. Yet the fear of death rests largely on the fact that man dies so young, when his senescence is only partially completed. Immortality must be found in the attainment of the fulness of life here. The desire for immortality, then, is the best guarantee that man as he exists to-day is full of promises for the future. He is only at the beginning of what he shall become and as he realizes his desire in this perfection of life his temporary dreams of immortality will fade away before the actual reality.

There does not seem to be at present any real thanatophilia corresponding to the universal thanatophobia. The desire for personal immortality has produced a greater desire to prolong and enlarge existence here, to attain here and now the true immortality.

JELLIFFE.

CELL STRUCTURE AND FUNCTION IN MAMMALIAN BRAIN. E. A. Malone. (Anatomical Record, Vol. 7, No. 3.)

This interesting study shows:

(1) The cells of the visceral (or sympathetic) motor centers of the mammalian brain have a structure different from that of the cells of the somatic motor chain.

(2) The lateral group of motor nuclei of the cranial nerves (ninth, tenth, seventh and fifth) are from a functional and structural standpoint somatic, since they are composed of cells whose structure is identical with that of the cells of other somatic motor nuclei, and since they supply muscles which cannot be distinguished from other somatic muscles either in structure or function.

(3) Those nerve cells in the mammalian brain which belong to the somatic motor chain, *i. e.*, those cells whose function is exclusively (or at least primarily) to transmit impulses to striated muscle or between different motor centers, are characterized by a fundamental similarity of structure, which differs according to the position of the cell in the motor chain. Such cells can be recognized by their structure with the use of comparatively low powers of magnification (100 to 200 diameters).

(4) No trace of this structure is present in cells outside the motor chain, *i. e.*, cells which are concerned in receiving and correlating incoming impulses.

JELLIFFE.

RAYNAUD'S DISEASE. E. F. Weeks. (Journal A. M. A., Feb. 26, 1916.)

Weeks here reports a case of Raynaud's disease following a series of convulsions in an epileptic. It was the first attack of the sort that the patient had ever had and was accompanied with high temperature, and involved both lower limbs. The case terminated fatally in twenty-three days. Hyperesthesia to touch was a prominent symptom. The blood examination on the eighth day showed a leukocytosis of 10,000 and hemoglobin 65 per cent., the red blood cells not being counted. No edema was shown by pitting on pressure and no necropsy was made.

THE PHILOLOGY OF HYSTERIA. Trigant Burrow. (Journal A. M. A., March 11, 1916.)

The philology of hysteria is the rather striking title of an article by Trigant Burrow, Baltimore, which he explains as an a priori study of the neuroses in the light of Freudian psychology. The origin of language, according to his argument, is mimetic, the primitive language of a race was gesticulatory, and it is essentially prehistoric, inherent, unconscious and physiologic. As we use it, it is full of indications of this origin. We judge the characters of men through their use of such unconscious mimetic expressions The connection between inner thought and outer action is inherent and inseparable. It is full of usages bearing organic implications in such phrases as "broken hearted," "dumb with amazement," "burning with shame," "choked with rage," "breathless with suspense." Observing closely we see that the furthest stretches of metaphor exist where moral and social prohibition enters most forcibly into the thought content. It takes courage to call things by their true names and a principle of disguise is its very backbone. We know it to be the characteristic of hysteria that it defies definition and systemization and basing his thesis on the principles derived from researches into the psychology of this disorder as introduced by Freud, Burrow contends that the same dynamic factor obtaining in the development of language—the tendency of the human mind to disguise whatever is unpleasant—is the same principle which actuates the development of what we call hysteria and the attempt to conceal the underlying purpose of one's conscious desire explains the exaggerated manifestations constituting the so-called symptoms of hysteria. These are the concealed expressions of vital outlawed trends. When the manifestations of such a disordered mental state as hysteria are subjected to psychanalysis we find that these expressions contain a remote association with some unseemly tendencies which are hardly consciously recognized by the patient himself or herself—that we have underlying the mental pathology of the neuroses the same mechanism of unconscions association as is found in the metaphoric substitutions of language, and because of this Burrow has ventured to interpret hysteria as an expression of organic philology. Regarding hysteria, then, as an expression of organic philology—as a straining of metaphor in the organic sphere analogous to the strained figurative usage obtaining in the social sphere, the rationale of a method of correction which seeks, through the gradual reducation of the will, to reconvert those distorted expressions now existing under the symbols of diseased symptoms into their original elements, becomes clear. If the symptoms of hysteria represent in reality the distorted expressions of the racked human soul, whose features have been twisted out of their natural semblance through the pain of inherent discord and denial, clearly the logical course is to reconvert such disguised equivalents into their original terms, by reëstablishing in consciousness the true meanings which these figurative compromises have replaced. Burrow believes that in clearer realization by parents and educators, as well as physicians, of the dynamic causes underlying hysteria

and of its essentially human psychologic basis lies the hope of successfully combating this anomalous product of our artificial civilization.

Endocrinopathic Inheritance. Walter Timme. (Journal A. M. A., May 6, 1916.)

The family history showing what is considered by the author as probably an endocrinopathic inheritance is reported by Walter Timme, New York. He attempts to account, according to the Mendelian hypothesis, for a case of disordered pituitary function. In 1850 a moderate giant, 6 feet 2 inches in height, married a woman of diabetic tendencies who later developed true diabetes from which she died. This marriage gave rise to a family of three apparently normal daughters, of whom one still lives, one died at the age of 62 of carcinoma, and the third died of pneumonia following the puerperium. None of the three showed during her life any tendency, so far as we can now recognize, toward internal glandular disturbance. All three of them married. The oldest had a family consisting of six individuals, of whom one, No. 9, had exophthalmic goiter, No. 11 harelip, and No. 12 chalky degeneration of the teeth with a tendency to diabetes. No. 14, who was born blind and puny, developed a sarcoma of the face, and died in his first year of life. No. 12 married and had two children, of whom one is distinctly hyperpituitary in character, while the other one is normal. No. 11, who had a congenital harelip, begat a family of three children, of whom the first born, No. 18, had osteomalacia resulting in a deformity of dwarflike character, while the other two are seemingly normal. No. 13 married, and has a family of two apparently normal children, one of whom, No. 23, is beginning to show an exophthalmos. A second older daughter of the original parents had a family of three children, two of them showing moderate giantism and the third a fairly normal girl. The third child of the original parents had two children apparently normal who died early of diphtheria. The details of the argument cannot well be abstracted, but the author suggests the importance of such investigation of inheritance in possibly enabling us to forecast with some probability the characteristics of the offspring of certain marriages, and of advising parents of the probability. It forces on us the necessity of closer study into the nature and treatment of endocrine disturbances. An interesting observation in this series is that all the abnormal growth zygotes were male and the abnormal metabolic ones female, showing seemingly that abnormal growth is dominant in the male and recessive in the female, while the opposite may be the case as regards abnormal metabolism.

Book Reviews

Our Knowledge of the External World as a Field for Scientific Method in Philosophy. By Bertrand Russell, M.A., F.R.S. The Open Court Publishing Company, Chicago and London.

Philosophy, we are coming to know, reveals in its various systems and their methods the fundamental traits of their authors. This book is an illustration of one type of intellectual necessity which must find its satisfaction in this particular scientific approach. It is a method of approach and a manner of dealing with philosophical thought which the author believes belong to the new realism and furnish a science of philosophy impossible to the ancient and medieval classical systems or the philosophies of the modern evolutionary school. In his opinion this method "aims at results independent of the tastes and temperament of the philosopher who advocates them."

He attempts to outline the form of this science of philosophy, which shall be able to discover philosophical truth and verify it not by the authoritative absolutism of one form or another of the classical traditions nor the intuition of the Bergsonian system, but rather by submitting to a detailed analysis the facts of experience combined with certain abstract hypotheses conceived by a fertile imagination belonging to certain geniuses. This would be a scientific method applied to constructing as well as verifying philosophical truth. This, he believes, can profitably make use of the forms of logic used in physics and mathematics and in its exact application of scientific testing of data and construction of truth constitutes a very different effective logic from the "scholastic collection of technical terms and rules of syllogistic inference" of the Middle Ages.

His method, however, as his ideal of philosophic truth, seems to so far abstract from general human interest, that is, from human life in its concrete and vital problems, which after all we must believe are the province of philosophy, that his purpose seems divorced from actuality into a special form of the abstract or ideal. This is felt in the application of this logic to the data and problems of experience which he employs in illustration throughout these lectures and so he misses the effectual vitality of truth. He would apply modern scientific methods but apart from humanity in its depths, which plays upon reality and must be left there in all reckoning with it.

Jelliffe

The Treatment of Infantile Paralysis. By Robert W. Lovett, M.D. P. Blakiston's Son and Company, Philadelphia. 1916.

Dr. Lovett's book is as thoroughly practical as it is timely. He has briefly outlined the pathology of infantile paralysis, its symptoms and types with reference to its diagnosis and prognosis. Most of the pages, however, he has devoted to that phase of the disease in which he is particularly fitted to speak with authority. It is an authority based upon a thorough personal experience in the treatment of the disease, especially the orthopedic treatment of the utmost importance after the successful passing of the initial acute stage.

This orthopedic work indeed begins at once, for Dr. Lovett emphasizes the necessity and the importance in this earliest period of watchfulness and care to prevent or lessen the possibility of the appearance of fixed deformities.

His discussions are based principally upon his personal observations and the result of his own work in the Vermont epidemic of 1914 as well as with cases due to the earlier epidemic in Massachusetts. He reviews also the literature and the work of other men upon treatment but the methods which he personally advocates bear certain marks which are their own recommendation.

Generally stated, their chief value lies in their close adherence to what is most natural and reasonable. There are no arbitrary or dogmatic schemes of treatment. Each child is a problem in himself, demanding individual examination and adaptation of treatment, operative, educative or whatever it may be. Not the least important suggestion lies in the recognition of the slighter damage to muscles, which detected by finer devices than the more obvious paralysis calls for, forms fruitful soil for successful after treatment. He lays emphasis upon scoliosis among other deformities which are to be watched for as beginning in the earliest acute stage and guarded against.

There is a comprehensive summary of the forms of treatment to be carried out at all the stages, whether purely preventive at first or corrective, while caution is advocated throughout against too great haste in after treatment or excessive treatment of any sort, which will defeat its own purpose. The muscle test devised for examination of the damage done and the exact determination and recording of progress in treatment is given at length. There is also an excellent section on muscle training, freely illustrated, as is the entire book, from the author's own cases.

The book must be of value not only to physicians but constitutes an excellent manual for intelligent parents who would wish to coöperate intelligently with the surgeon in the treatment of their children, which must necessarily be extended over months or often years, when with the skilled methods now in use complete restoration may ultimately result.

JELLIFFE.

A MECHANISTIC VIEW OF WAR AND PEACE. By George W. Crile, M.D. Edited by Amy F. Rowland. The Macmillan Company, New York.

The contents of this book come direct from the war zone. They set forth war stripped of all but its destructive reality. It is studied for the sake of the scientific laboratory, in order to know better the physico-mechanical reactions of man, which have made war a necessity to the race, and to find a way toward lasting peace through such an understanding.

The book was not executed in the cold calculation of the scientific workshop. It is red hot with the human disaster wide in extent, inconceivable in intensity, physical and mental, which the exercise of such archaic reaction patterns are capable of working to-day. Scientific progress has so outstripped our psychic development that it has usurped to itself the conduct of war to such an extent that the original mechanistic reactions still dominating find here no longer a natural outlet but turn upon themselves to the intensive destruction of life, mental and physical soundness and economic well-being, whether of combatants or non-combatants.

Crile discusses the physical preparation in the body for the various phases of action which war would naturally call forth, the effect of the emotions aroused upon the inner secretions and the stimulation or inhibition of the normally functioning organs of the body. Thus old phylogenetic pathways are activated and sometimes there is adequate discharge; more often

this is wanting, with the resulting disturbance as a serious consequence. He illustrates the withdrawal from one field of ordinary stimulus and activity in order to accentuate another more necessary for the abnormally exacting conditions at hand, such as the absence of pain stimuli during the intensity of action and the oblivion to wounds and exaggerated conditions of environment when, for example, for a period of days the need of sleep is the one paramount physical demand.

The action patterns which make war possible and even necessary are as old as the race itself. Yet they are possible of slow modification. The fact that they are still ceaselessly in the process of formation and modification has prepared for the outbreak of this war and the "vivisection of Belgium." In it, on the other hand, lies also the hope of an alteration through a new direction of the reciprocation of impulses and mechanistic adjustments to adequate but peaceful means of discharge, and thus a gradual transformation of the reactions themselves.

There is an apparent over-emphasis on the purely mechanistic side of behavior in regard to the war. This, we believe, is merely to give emphasis to the physical mechanism at the disposal of the psychic nature of man and the possibility of the higher nature to conform it to the constructive service of peace.

JELLIFFE.

DEFENSIVE FERMENTS OF THE ANIMAL ORGANISM AGAINST SUBSTANCES OUT OF HARMONY WITH THE BODY, THE BLOOD-PLASMA AND THE CELLS; THEIR DEMONSTRATION, AND THEIR DIAGNOSTIC SIGNIFICANCE FOR TESTING THE FUNCTIONS OF DIFFERENT ORGANS. By Emil Abderhalden. Third Enlarged Edition. Translated by J. O. Gavronsky, L.R.C.P., M.R.C.S., M.D., and W. F. Lanchester, M.A. William Wood and Co., New York.

This book here made accessible in English has a distinctively authoritative value. This lies in the carefully detailed exposition on the part of the distinguished investigator of his experiments as to their significance in aim and result, and also in the cautiousness of his method and his insistence upon it as of utmost importance in this study. Mention is made of the activities of the cells in appropriating to themselves material for the maintenance of their structure and function and of reducing this material to the proper form for this purpose, but particular attention is directed to the discovery of those ferments which protect the organism against substances out of harmony with its well-being. The author describes his experiments with the serum of pregnancy in which he has discovered a reaction of specific ferments directed against products due to the increase and alteration of metabolism incident upon the appearance at conception of new tissue and its exceptional demands upon the maternal organism. Substances are thus present in greater number than the ordinary decomposition activity of the cells can control. They pass into the blood plasma, where definite ferments appear to render them harmonious with the organism. These disappear again shortly after the termination of pregnancy.

Not only is this appearance of ferments a most accurate means of diagnosis of pregnancy, but it affords proof also of the response of such definite ferments in the blood plasma in case of the introduction into the blood of other substances disharmonious to the organism, substances which, owing to pathological or other unusual conditions, have been beyond the reducing power of the ordinary cells.

Such specific ferments have been discovered active in the presence of carcinoma. This fact as well as others of similar nature, which are under

investigation, point to the immense value of these principles in problems of diagnosis, of infection, with its varied disturbances of metabolism, of anaphylaxy, in fact to the unlimited field opening up to the practical investigator. Yet the extreme caution against hasty conclusion and the careful exactitude which the author urges, and which this presentation of his work exemplifies, emphasize the magnitude of the task, and direct attention to its extreme importance. The contribution of this form of investigation to a fuller knowledge of somatic disturbance bears directly upon mental disease, as is shown by the work already undertaken upon metabolic changes in dementia præcox, here mentioned.

JELLIFFE.

PHILOSOPHY OF THE PRACTICAL. ECONOMIC AND ETHIC. Translated from the Italian of Benedetto Croce by Douglas Ainslie. Macmillan and Company, London.

Croce represents in his thought the dynamic, creative principle underlying reality. Reality can be such only through becoming. His attitude of criticism toward all preceding philosophical systems, which he reviews in a comprehensive summary, is true to the principle of his own system. For he recognizes the incompleteness which they have shown on one side or another in their failure to comprehend and explain real values and their place in life and thought. He points out the confusion in terms or the mistaken premises which have obscured the vital meanings from the authors themselves or led them to untenable or barren conclusions. Yet in the true spirit of his own philosophy he values each system as a measured grasp of the truth, each contributing, however incompletely, yet no less appreciably to the fuller knowledge and more perfect making of reality toward which all tend. This is in one sense an unattainable goal, an ascent toward heights "without a summit" just because philosophy is conceived as creative of new truth.

Thus Croce's philosophy is a Philosophy of the Practical. The will is action, at once free and determined. It is determined by the situation which calls forth the action and yet free to perform, to choose the one course which by being put into activity proves itself the volition. What has been thus performed, the act of the will, must thus as the volition be the good. Evil cannot exist as a negative entity. Evil is rather a tendency toward the good which has not succeeded. It can "only exist in the good, which opposes it and conquers it, and therefore does not exist as a positive fact." The judgments that we form are based on the existence that might have been but was not and so are not literal and precise.

The discussion of the place of the passions in regard to volition and their control sets forth the multiplicity of indeterminations which surround the act of the will and savors of a recognition of the rôle of the unconscious in its influence upon the freedom of this will. Yet there is no clear recognition accorded the unconscious psychology. We feel that the author has in mind the formal static mechanistic psychology when he scorns the psychological approach to philosophy, and not the psychological valuation of that multiplicity of elements which he takes into account in considering the action of the will in the face of these multiple possibilities and its control of our inherited "habits."

Knowing and willing, or better practical activity and the theoretical, must presuppose one another. In order to know there must be a will to know, while at the same time there can be no will without previous knowledge. Knowledge itself contains a similar unity in duality, which Croce calls the esthetic and the logical. There must be first an esthetic intuition which

apprehends reality before philosophical reflection upon it is possible. Likewise, activity manifests this dual character. There is first the utilitarian or economic which implies the ethical. The economic is not necessarily ethical but the latter must always be economic. Thus he avoids the pitfalls of the utilitarian school which denies the moral, or the morality which rules out the economic.

A great deal of space is devoted to a refutation of casuistic forms of reasoning and the establishment of broader principles of logic. His own philosophy based on the apprehension of reality through becoming has no room for such limited interpretations and forms of reasoning. The concept of his logic is the synthetic concept of the spirit or reality, which includes the actualized reality and its opposites. Each individual act in this includes the universal. The relations of subject-object and individual-universal are in this logical concept. This reality is immanent rather than transcendental, penetrable by thought, but thus an uncompleted reality, always a beckoning goal of achievement.

Yet this is only a modern form of idealism which denies much of reality. There is no room in his negation of all but the act of the will for the duality which includes the material world, and which recognizes also the actual existence of pain, the opposite pole of the pleasure which he makes a quality of the act of will, and which accords existence to evil. For him there is only spirit. It satisfies him and his translator as well to "shake" themselves "free from the obsession of matter," which the latter says in his elucidating preface, Bergson never does. Neither perhaps can most of us, so long as we must accept reality as it meets us face to face. Yet with Croce as with Bergson the spirit is the creative force, and through it reality is our implement as well as our goal of achievement.

JELLIFFE.

NERVOUS CHILDREN. PREVENTION AND MANAGEMENT. By Beverly R. Tucker, M.D., Richard G. Badger, Boston. The Copp Clark Co., Ltd., Toronto.

This book enters a field of recognized importance. It presents an appeal to parents and others who are seeking assistance as never before in the more complete understanding of the possibilities of their children for good or for ill in their nervous and mental development. Dr. Tucker outlines the most salient features of the anatomy and physiology of the nervous system and briefly discusses psychology. There is also a brief review of the relative influence of heredity and environment and of the meaning and importance of the development of habit. Eugenics and sexual hygiene are touched upon. Various distinct forms of diseases of the nervous system are described, including mental defect and "forms of insanity." A short chapter on Puberty and Adolescence closes the discussion.

This forms a convenient manual of elementary information serviceable to those to whom it is addressed, and offers suggestive guidance in watchful care, particularly in prevention of neurotic disorders with children. It seems, however, that the treatment is too purely descriptive and even there too hurried. There is after all no very definite practical course of action presented. Something that would be explanatory of the many neurotic manifestations of childhood, particularly the functional ones, which would give meaning to the symptoms which they are warned to observe is what parents are looking for and what would provide a basis for the surest prophylaxis. The slight appreciation of the interpretative attitude is evidenced by the author's summary acceptance of the sexual trauma theory, left behind by psychoanalysis for some years now. His paragraphs on hysteria, "neurasthenia" or on the "forms of insanity" prove that he has not followed the

course of psychoanalytic interpretation or applied it to the understanding of the child's mental life.

JELLIFFE.

GENETIC THEORY OF REALITY. BEING THE OUTCOME OF GENETIC LOGIC AS ISSUING IN THE ESTHETIC THEORY OF REALITY CALLED PANCALISM WITH AN EXTENDED GLOSSARY OF TERMS. By James Mark Baldwin. G. P. Putnam's Sons, New York and London.

This volume from Professor Baldwin arouses keen interest from more than one point of view. His application of the genetic mode of approach to the history of the apprehension of reality, following the line of treatment in his three volumes, Thought and Things, which includes a survey of the development and service of logic, presents a consistent picture of the aspiring and creative attitude of the human mind toward this reality.

This survey leaves out of account, or passes over with only the barest suggestion, the vast accumulation of repression which we term the unconscious, which must already have been considerably appreciable as a factor in thought and feeling at the earliest period when we may consider their action in conscious human life. Yet the author's treatment of primitive mental life and the results at which it arrived touch this here and there, as such an appreciative study necessarily must, even though its terms are confined to those of conscious mental life. There is a felt lack, however, of a more complete and comprehensive appreciation of the various outcomes of primitive thought in customs, ceremonials, institutions, as necessary expressions of an inner instinctive urge with its demand under social pressure for substitutions and indirect forms of discharge as well as for the aid of direct taboos. A clearer understanding of this would have explained more fully the earliest relation of the individual and society as well as to have set forth with a more fundamental geneticism the function of religion in the psychical development of the race. The discussion begins when society already is sufficiently formed to exercise a very definite molding influence upon individual thought, while in the discussion of religion it is assumed that religion though a genetic product is yet consciously employed, as it were, relatively speaking to synthesize the elements of thought life. At the same time the emphasis laid upon the objective features of religious experience seems to prevent the deeper genetic interpretation.

Still, these are but certain of the suggestive stimuli to further thoughtful consideration of the whole subject of the morphology of thought processes genetically presented and the final synthesis which the author presents under the name of pancalism, τὸ καλὸν πᾶν, the esthetic synthetic apprehension of reality. The discussion is so clearly developed and presented that we need but briefly indicate its main outline and suggest the interest which it unfolds.

Knowledge, broadly defined as the apprehension and interpretation of reality, has passed through successive stages. Primitive thought is immediate, mystic, but with the gradual development of the mental exercises which culminate in technical logic the processes of apprehension and interpretation become mediate both in regard to the external world and to the subjective internal world. Meanwhile the modes of apprehension must be considered as of two sorts, those which seek practical values, are governed by interest, and issue in all the theories of voluntarism, and those which are cognitive and reflective, the outcome of which are the intellectualistic theories of reality. Neither of the two is complete and both seek beyond the processes of mediation a further new immediacy, the outcome and superstructure of the mediation processes which they have employed. The cognitive or theoretical reaches a rational intuitionism in "the categories of thought and the

rules of pure reason" and the practical attains a higher mysticism. This higher immediacy, however, is no more satisfying than the earlier primitive form. That looked forward to the forming effect of mediacy, the later immediacy would be empty without the filling which concrete experience has brought in mediation. These three stages Baldwin has also called the prelogical, the logical and the hyperlogical.

There is, moreover, an irreconcilable rivalry between the cognitive and the practical even in this higher immediacy which belongs separately to each mode of apprehension. Therefore philosophy seeks a constructive synthesis which shall effect a reconciliation. It is the genetic method of valuing the partial service of each mode, the cognitive and the practical, and recognizing them as only partial factors in the development of logic and of reality which can effect such a synthesis. The genetic method is itself empirical and thus observes intellectual development in its concrete active history and boldly approaches reality through experience as it seeks constructively to synthesize the epistemological value and results of any and all of the mental functions. Thus the author summarizes the result of his method.

This effectual and satisfying synthesis he finds in pancalism or the esthetic, foreshadowed by Kant and by Schelling. In the immediacy effected by the esthetic experience dualisms, antinomies, pluralisms come to rest in a larger unity, which recognizes each for its true value but synthesizes them in a constructive affectivism, which for Baldwin is realized in this esthetic contemplation. This satisfies all the requirements of the absolute, because here all relativity disappears.

His placing of this esthetic synthesis as the completion of such a required unity and his exposition of it lack something of complete conviction. Perhaps it is the circumscribing of this constructive affectivism within the limits defined by a single name which militates against the unity it would denote. The author finds pancalism this higher immediacy which apprehends reality. The full affective apprehension for another might not lie in the "esthetic," but be differently conceived. The unity lies, nevertheless, in each consciousness in the synthesis of its own effective *constructive* apprehension, and it is to this emphatically that the author's genetic interpretation brings us.

JELLIFFE.

THE INFLUENCE OF JOY. (Mind and Health Series.) By George Van Ness Dearborn. Little, Brown and Company, Boston. 1916.

This new volume of this series seeks to direct the popular mind to the close relation of mind and body and the practical importance of this in personal control for the fullest well-being. The control and influence of bodily functions exercised by the autonomic division of the nervous system is the subject of careful and fruitful scientific experiment and observation. The results of these investigations in the knowledge of the influence of the affective or emotional life upon for instance the digestive system as a whole, muscle tone, circulation, upon the various divisions of organic functioning in the body is dwelt upon with a special plea for joy that emotion which most fully releases the autonomic system for its complete functioning and thus gives a freer and more harmonious background for the higher mental functioning of the cortical centers, sending its flood of "cenesthetic" energy toward the well-being and efficiency of the individual.

No one can deny the importance of a fuller knowledge and more effectual appreciation of this fundamental interrelation of affective states and bodily function through the play of emotions upon the autonomic innervation and its reactionary influence and the place of this in both physical and

mental economy. The author, however, in his attempt at popular presentation has sacrificed something of scientific clearness and definiteness of statement. This is due likewise to the peculiar emphasis he lays upon the emotion he has chosen as illustrative and as the goal of attainment as the proper dynamic factor for this euphoristic harmony of mind and body through the nervous system. Too much dwelling on this factor of joy obscures the more precise treatment of emotional influence. It is as if the author sought to lead us back to a more complete fullness of the pleasurable pathway, forgetting the higher path of voluntary endeavor controlled by the interest which follows reality. True, his aim is the harmonious setting of the organism to work at the behest of the higher control, and true also that the dynamic element arises from the affective life. Yet he has made no searching analysis of that life and thus does not clearly find the rightful place of joy and limit it to only its due place as a factor among others of adaptability and efficiency. It cannot be inserted from without nor appropriated by the individual as a final agent for perfect adjustment. The complexity of psychical life demands fundamental and sweeping research and adjustment of all its affective elements, which work in large part obscurely and symbolically beneath the surface, before we can attain that harmony which will make the body the perfect instrument of the mental life.

JELLIFFE.

THE CONTROL OF HUNGER IN HEALTH AND DISEASE. By Anton Julius Carlson. The University of Chicago Press, Chicago.

This very extensive study of the physiological mechanism of hunger embraces the wide literature bearing upon this subject as well as careful experiments in the author's own laboratory to verify or correct or add to the knowledge already gained. He emphasizes the importance of advance in knowledge in this physiological and clinical sphere by linking present-day problems of hunger and appetite and the pathological conditions which arise here with the biological significance and evolutionary development of this fundamental hunger instinct.

The experimental work is given in great detail so that methods and conclusions can be carefully followed. The author admits that "the field of the physiology of hunger is . . . mainly 'gaps and guesses,'" but he has done much to establish certain facts and increase the knowledge which must obviate these. His experiments have added to the knowledge of the conditions of the stomach during hunger, in the presence and periodicity of gastric contractions and the presence of a gastric tonus. These seem to be under the control of a special mechanism which is primarily automatic and independent of changes in the blood or of the central nervous influences. It consists probably in an intrinsic gastric neuromuscular apparatus toward which the vagus and splanchnic nerves exert a merely secondary though important regulatory action. The experiments establish clearly "in the afferent phase of the hunger complex . . . the rôle of the vagi, and the sensory vagi nuclei in the medulla, and the great importance of the thalamus." The distinction is clearly maintained throughout between the hunger contractions and the sensation of hunger as also between hunger and the largely psychically determined phenomena of appetite.

While the relations of the various levels of nervous activity is carefully considered in its relation to the problems under discussion, the purely psychic influence upon hunger and its phases is not entered into extensively. The presentation of actual physiological facts, however, establishes more defi-

nitely and fully a working basis for the gastrologist and no less for the broader rôle of gastroneurologist which he must assume.

LAURENCE.

THE LIFE OF PARACELSUS. THEOPHRASTUS VON HOHENHEIM, 1493–1541. By Anna M. Stoddart. William Rider and Son, London.

This new and cheaper edition of a work printed a few years ago gives greater access to the facts of the life of this misrepresented personality. The author acknowledges the inspiration for the writing of it to Browning's appreciative revelation of the man Paracelsus and its authenticity to the German scholars who have made careful research into the works of this physician and all other sources of knowledge concerning him.

She has written in a spirit of sympathetic enthusiasm, somewhat imbued herself with the mystical faith and attitude of mind which she extols in the hero, and with an evident remnant of belief in certain occult powers, such as telepathic influence, which to a slight extent distorts her actual scientific estimate of this truly great man. This is a fault, nevertheless, too transparent to obscure the facts which she has faithfully presented, together with abundant illustrative extracts from his voluminous writings.

Her fine feelings of appreciation extends itself to the environment of nature and historical event in which Paracelsus lived and makes of the book a charming chronicle of places and events which gave the setting to his work. At once she initiates her reader into the Einsiedeln region hallowed as the ancient hermitage of Meinrad and through the miraculous events which followed his violent death. Here the young Theophrastus von Hohenheim, who later called himself Paracelsus, first received from his father, likewise a physician, that introduction to the secrets of nature which sent him later far and wide to acquire first-hand knowledge from this book which he believed God had opened for the service of mankind. The men of his time were content with the teachings of the ancients, grown lifeless and meaningless. Von Hohenheim was unable to confine himself to the teachings of any of their universities. His unwearied impulse for investigation and application to the need of the sick drove him through years of wandering over a large part of Europe, tarrying at universities long enough to learn that they could not satisfy his independent spirit of inquiry, learning from the diseases which he treated wherever he went, engaged in surgical practice on the battlefield. This controlling impulse was in direct opposition to the fettered learning of the medical schools of the day. His exalted sense of God-given responsibility toward the sick and the adaptation of nature's remedies directly to them aroused in him a courageous hostility which attacked the ignorance of the doctors, their foul and useless remedies and the mercenary exploitation of both to the injury rather than the recovery of the diseased. His own more successful cures also antagonized the medical men of all ranks who fell under his scathing rebuke or failed to cure where he succeeded.

He suffered therefore scorn, contumely and rank injustice even from magistrates in authority, who allowed themselves to be prejudiced against him. He showed no decided partisanship in the religious controversies waging, although his enemies sought to involve him in these. Misunderstanding and want of appreciation of his attitude of mind concealed his true character and worth from all but a few of his contemporaries and shrouded his name in a scornful disrepute which only recent investigation has completely cleared away.

Boastfulness and self-conceit make themselves apparent in his writings quoted by the author as in the descriptions of the attacks upon his enemies. These may be in large measure attributed to the unique position of this

exceptional man pitted against practically the whole of Europe and righteously indignant in his high aim and modern outlook far ahead of his time. His actual contributions to the science of medicine were hindered by the magic and mysticism which still bound him. Yet he distinctly advanced the field which he had to a large extent opened, that of finding specific remedies from nature. His great service lay in the spirit of inquiry and practically directed investigation which he opposed to the empty learning of the medicine of his day. He had not completely outgrown an astrological belief in the influences from the stars or entirely freed himself from the mysteries of alchemy in agreement with which he still retained a perverted conception of the elements of nature. Yet all his energy was turned toward advance and he utilized the science and the modes of investigation so far attained both for the practical service of his fellow men and for pushing forward toward the clearer accuracy of modern scientific knowledge and research.

JELLIFFE.

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Original Articles

THE ANATOMICAL FINDINGS IN A CASE OF PROGRESSIVE LENTICULAR DEGENERATION

By J. A. F. Pfeiffer, M.D.,

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Progressive lenticular degeneration is the name which has been ascribed to a peculiar disease distinguished clinically by a definite symptom-complex, and anatomically presenting certain characteristic pathological changes.

This recently described disease is an affection of an exquisitely familial type, occurring in young persons, usually about the second decade of life and pursuing an uninterrupted progressive course varying in duration from a few months to several years and terminating in death.

Clinically two special types have been differentiated; an acute or subacute form, lasting from a few months to a year, and a more chronic type extending over a period of several years.

The differentiation between the acute and chronic types is distinguished by the rapid emaciation and high irregular fever in the former, whereas in the latter the patient may appear to be in relatively fair health for a year or more before the progressive features of the disease are manifested.

Symptomatologically the disease resembles to a certain degree paralysis agitans, but obviously differs from that affection by its occurrence early in life and more rapid progress.

Regarding the aspects of the disease, the most prominent and characteristic symptoms are disturbances of motor function, especially tremor and muscular rigidity. The other semeiotic features play a somewhat more subordinate rôle; varying in severity and occurring in no definite sequence during the course of the disease.

Tremor is invariably present in all cases, but differs as to its intensity. Frequently in the initial stages of the disease, it is inconsiderable, fine and limited in range, affecting only the distal segments of the extremities, as the finger, hand or foot. In some instances, however, it is quite extensive, and in the final stages a definite tremor is observed involving the entire body. The tremor is further distinguished by its regular, rythmical, alternating character, and is exaggerated by excitement or exertion. These involuntary movements may sometimes be temporarily inhibited for a brief period by the will.

Rigidity or spasticity constitutes one of the cardinal symptoms of the affection. It is a constant feature of the disease, steadily progressive and affects all of the muscles of the body excepting those of the eyes. Contractures occur, as an extreme stage of the rigidity, and increasing as the disease advances, may eventually produce permanently distorted attitudes.

The face assumes a fixed and immobile expression as a result of the muscular rigidity.

Dysarthria and dysphagia are also notable symptoms. The speech defect is characterized by slurring the consonants and abbreviating the last syllables of words. Difficulty in swallowing usually occurs simultaneously with the dysarthria. Progressive emaciation and muscular weakness are present.

Sensory disturbances either of a subjective or objective quality are absent in pure cases of the disease.

The reflexes are active and exhibit no alteration in uncomplicated types of the affection, although difficult to elicit late in the disease.

Physical symptoms are frequently encountered, and may be considered an important factor in the clinical picture. The mental condition is variable in degree, and evidenced by narrowing of the mental horizon; facility, docility and childishness. The chronic forms often display a peculiar euphoric state, associated with emotionalism, while in some cases the mental impairment is but slight, in others it is rather pronounced. No cerebellar symptoms, disturbances of the pupillary reactions or alterations in the optic discs are perceptible.

The course of the disease is progressive; relapses or remissions are not significant, and diagnosis grave.

The anatomical characteristics, according to the original description, consist in a cirrhosis of the liver and a bilateral symmetrical degeneration of the putamen and globus pallidus of the lenticular nucleus.

Following is a résumé of the history and a report of the pathological findings in a case of progressive lenticular degeneration.

J. B., male, unmarried, was born August 8, 1885.

Family History.—The patient was the youngest of a family consisting of three children, one of whom is living and healthy, the other, a brother, died from diphtheria at the age of five. The father died at the age of sixty from pneumonia. He had always been a vigorous, healthy man with good habits. The paternal grandfather had always been healthy, and died in advanced life; the paternal grandmother died when comparatively young from typhoid fever. The other members of his father's immediate family are living and enjoy good health. Mother is still living and seems remarkably healthy. Maternal grandfather died of heart disease; maternal grandmother of nephritis; a maternal uncle of tuberculosis, and a maternal aunt of gastritis; another aunt died from valvular disease, and a third during parturition. Two maternal uncles and one aunt are alive, and in good health. No history of syphilis or diseases of the nervous system could be established.

Personal History.—The early childhood of the patient was uneventful. He began to walk when 18 months old, and during his boyhood was strong, healthy and intelligent. He entered school at the age of seven years, and passed very successfully through eight grades. When eight years of age he had varicella, but never had any other illness whatever, or infantile convulsions. On leaving school he began to learn carpentry, at which trade he continued for about six years. At the age of 17 years he contracted typhoid fever, from which he apparently recovered completely. His habits were good and no history of syphilis, sexual excesses or the use of drugs could be obtained.

History of Present Illness.—In the summer of 1910, the patient observed that he became readily fatigued, and was unable to accomplish as much work as usual. He could not dress himself quickly, his hands seemed unsteady. His handwriting was rather shaky, and he experienced difficulty in using a pen or pencil, and in forming some letters. Very gradually a change in his speech developed, which was so slight at first that it failed to attract much attention. There was no perceptible change in his condition for some months, and then his lower extremities appeared to be slightly affected. His gait was somewhat unsteady and if he attempted to run or walk rapidly, he would stumble or fall. There was no definite onset or fever at any time. He did not suffer from headache or shooting pains in his limbs. In the next six months, the disease steadily progressed, and the tremulous condition of his extremities was more constant and severe. With exertion the tremor became more intense. Stiffness and difficulty in movement were also experienced, and seemed to be more pronounced on the right than the left side. The disturbance in speech was increased and the words slurred, so that he could not be readily understood. In the summer and winter months of 1911, there was but slight change in the symptoms described. He at no time complained of giddiness, cramps or nausea.

His weight, however, was somewhat reduced. No physical disturbance was observed; although during the month of December and the early part of 1912, he displayed some temperamental manifestations of a hysteroid and psychomotor character, which were chiefly distinguished by occasional outbursts of pseudo-ecstacy.

The patient physically appeared fairly well nourished and cheerful. His height was 5 feet 6 inches, weight 115 pounds. The skin was smooth and free from any eruptions or discolorations. No enlarged glands could be detected. There was no evidence of any disease of the respiratory system. His pulse was 78 beats per minute, and the blood pressure normal. The cardiac area and sounds were apparently normal, and no sclerosis of the peripheral vessels could be determined. Examination of the abdominal organs and genito-urinary system was negative. Urinalysis negative. The Wassermann test both in the blood and cerebrospinal fluid was negative. The fluid contained 4 cells per cm. Protein content normal.

The pupils were equal and regular; accommodation was normal; and direct and consensual reactions to light were not affected. Vision was normal, and ophthalmoscopic examination negative. There were no abnormal movements of the eye or nystagmus. No auditory defects were evident.

The disease pursued a slowly progressive course through the fall and winter of 1912, during which period he was frequently examined. The speech defect became more marked, and difficulty in swallowing was apparent. He was unable to write.

He protruded his tongue slowly and tremor was occasionally noted. The jaw and pharyngeal reflexes were active and the larynx appeared intact. There was in general a retardation and decrease in the range of voluntary movement, resulting from the pronounced rigidity, especially in the musculature of the extremities. The rigidity appeared to involve the flexor muscles to a greater extent than the extensors, and persisted during sleep. Subsequently the stiffness and rigidity became more intense, and contracture of the flexors occurred, affecting nearly all of the joints of the extremities, and quite pronounced in those of the wrist, hand, knee and foot. The previously described tremor was constantly present, and frequently became rather coarse in character. He retained considerable control over his movements, but the strength was reduced. The elbow and the wrist jerks were easily obtained on both sides. The knee jerks were present and equal. Ankle clonus was absent. The abdominal and cremasteric reflexes were also equal, and the plantar reflexes were flexor in type.

Sensibility to pain was tested by pricking with the point of a pin. No alteration could be discovered in any part of the body. Heat and cold could readily be distinguished from one another. Tactile sensibility was not impaired. Tickling produced no hyper-reaction and vibration produced no unpleasant sensations. Different degrees of pressure were appreciated without difficulty. No loss of the sense of passive position was demonstrable.

During the latter part of his illness the mental condition of the patient was more affected, and he displayed evidence of disinterest

and progressive fading of insight into his condition, quite different from the mental state which prevailed in the early stages of the disease. He seemed inadvertent and was inclined to become readily amused, but interest in his environment was no longer as intense as formerly.

Orientation did not appear to be disturbed to any extent, and he performed memory tests with considerable accuracy. His attitude gradually became apathetic and dull; and his judgment blunted.

He rarely complained of feeling indisposed, although considerable physical deterioration was evident. On the afternoon of January 28, 1913, he suddenly developed a temperature of 103° F. Next day, bilateral bronchitis became pronounced, which developed towards evening into a pneumonia affecting both sides. He continued to fail, the temperature heightened and death occurred the following day at 4 p.m., nearly three and a half years after the onset of the disease.

Synopsis of Post-Mortem Examination

External Examination.—The body was small and considerably emaciated. The extremities were quite rigid, and the left leg more contracted than the right. Post-mortem lividity was marked.

Internal Examination.—The calvarium was symmetrical, both tables thin and the sutures visible. The grooves for the vessels were prominent. No signs of injury to the skull could be detected. The dura was not adherent and showed no thickening or discoloration. The pia presented a normal appearance, and the cerebrospinal fluid was not increased in quantity.

Brain: Weight 1,185 gm. The hemispheres of the brain were firm, well developed and no pathological changes were perceptible on their surface. The basal vessels were neither thickened, atheromatous nor otherwise diseased. The brain stem showed no abnormalities, and the convolutional arrangement of the cerebellum was normal.

The spinal cord presented a large and well formed appearance. No degeneration was discernible macroscopically in its cross-sections. The meninges were normal.

Thorax: Pericardium normal. Heart, weight 240 gm. Right auricular wall slightly thinned, cavity normal. Right ventricle normal. Pulmonary valve and artery normal. Left auricular wall thickened; mitral orifice admits two fingers; valve slightly thickened. Left ventricular wall somewhat thickened; cavity enlarged. Aortic leaflets thickened.

Lungs: Weight, right 560 gm.; left 490 gm. Pleural adhesions, edema and consolidated areas were present in both lungs.

The thyroid gland showed no visible alteration.

Abdomen: Liver, weight 1,030 gm. The organ was firm and the capsule slightly thickened. An advanced stage of cirrhosis was in evidence. Both the upper and lower surfaces were irregular and presented a nodular and lobulated appearance. The wall of the gall bladder was thickened.

Spleen: Weight, 150 gm. Capsule thickened; surface irregular; pulp soft and of a reddish color. Pancreas normal. Stomach and intestines normal.

Genito-urinary tract: Kidneys, weight, right 135 gm.; left 140

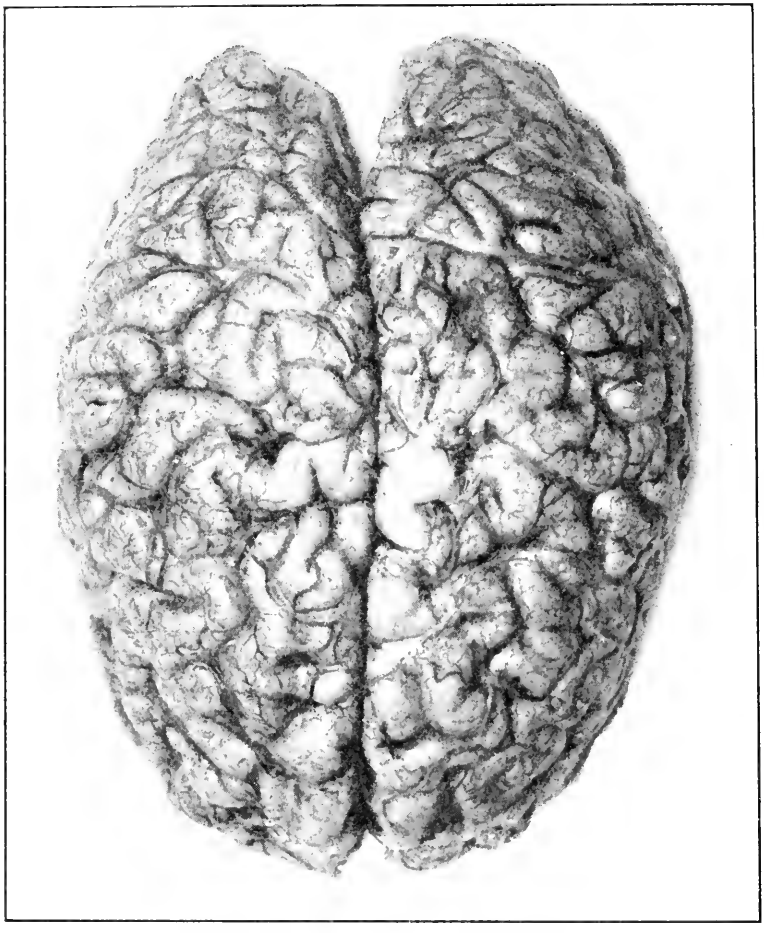

Fig. 1. Upper surface of cerebral hemispheres.

gm. Both kidneys presented a normal condition. Bladder, slight congestion of the mucous membrane. The suprarenal bodies were normal.

Anatomical Study

When the brain (Figs. 1–2) was hardened by formal, the hemispheres were divided by a horizontal incision passing just beneath and contiguous to the extremities of the corpus callosum. The macroscopic appearance of the section was rather striking (Fig. 3), considerable alteration in the lenticular nuclei was quite obvious;

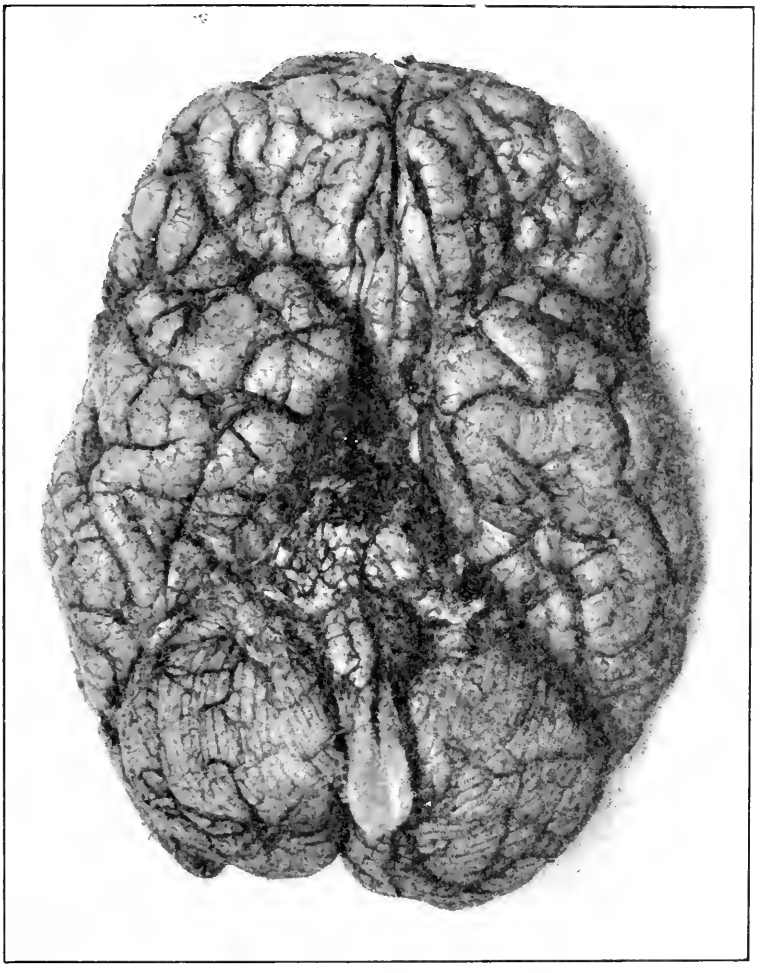

FIG. 2. Basal surface of brain.

but no perceptible change in the cortex or white matter of the hemispheres could be detected. The internal capsules, caudate nuclei and optic thalami were apparently unaffected. The left lenticula was seemingly more intensely diseased than the right; and the outer portion of the putamen was replaced by a narrow cavity, extending almost from the anterior to the posterior extremity of the segment. The ectal outline of the cavity was sharply defined against the external capsule. The external capsule appeared somewhat attenuated in this region, but the claustrum, periclaustral lamina and insular cortex did not present any abnormal features.

The surface of the right lenticula was shrunken and irregular. At this level no cavity was perceptible, but small areas of softening were visible scattered through the nucleus. At a somewhat lower

level, however, a cystic like cavity was subsequently found, involving chiefly the outer part of the putamen. The external capsule and claustrum were unaltered. The capsula extrema and cortex of the island of Reil were apparently normal. The paraceles were

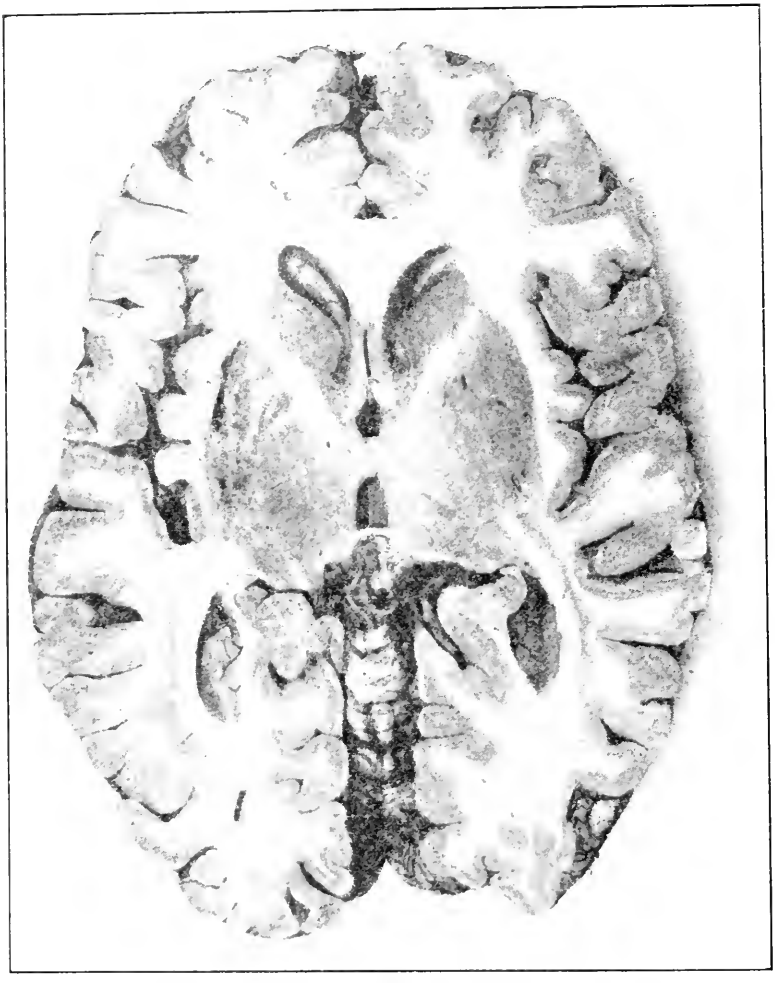

FIG. 3. Horizontal section through hemispheres, showing the bilateral symmetrical degeneration and atrophy of lenticular nuclei. The integrity of the internal capsules should be especially noted.

not dilated and contained clear fluid. No ependymitis was in evidence. The third and fourth ventricles appeared normal.

For the purpose of studying the finer histological changes which obtain in this disease the basal ganglia were examined in almost serial sections, and numerous pieces were also secured from different regions of the brain and spinal cord, together with parts of the

peripheral nerves for microscopical investigation. The following staining methods were used: Toluidin blue, thionin, Van Gieson, Weigert's myelin sheath, Weigert-Pal, Weigert's for neuroglia fibers, Spielmeyer, Alzheimer's for glia, Mann, Mallory, polychrome methylene blue, Mann-Alzheimer, Bielschowsky, Herxheimer, Soudan III, Weigert's resorcin fuchsin, Nissl, Cresyl violet, hematoxylin-eosin, Marchi and others.

The meninges of the brain showed no infiltration or other pathological changes.

The histological alterations occurring in the frontal region of the brain were carefully studied. Different types of cytological disease were discernible, but shrinkage of the cell body was the most frequent and characteristic change encountered. The cytoplasm was shrunken and distorted, and in consequence the cells presented a rod like or elongated appearance. A net like structure varying in distinctness was usually visible in the cell body and not infrequently also in the processes. The nuclei, which stained darkly and homogeneously, were often diminished in size and irregular in outline. The nucleoli were sometimes indistinguishable from the surrounding nucleoplasm and ovoid in contour. Some of the ganglion cells, however, were not shrunken, but the normal distribution of the Nissl substances within the cell was altered. The tigroid bodies were disposed along the periphery and sides of the perikaryon, or only visible near the base. In some cells the substance appeared as a continuous rim, whereas in others it was distributed as small particles. In many of these cells the apical processes presented a greater degree of alteration than the basal dendrites; the nuclei were indistinct and the nuclear membranes no longer visible. A neurofibrillar disintegration of varying intensity was discernible in some instances. Other cells were swollen and pale, and their contour circular in aspect. A marked increase of pigment could be observed in some cases, which appeared as irregular shaped masses enmeshed by the net-like structure perceptible within the cytoplasm of these cells. The nuclei were in consequence usually distorted and eccentrically disposed. Sometimes the nuclei were darkly stained and of a pyramidal or pyriform contour. A hyper-chromophilic condition of the cytoplasm contiguous to the nuclei frequently obscured the limits of the latter. The nucleoli were enlarged and pycnotic. The dendritic processes were tortuous and could be traced for an unusual distance. An abnormal concentration of the stainable substance within the cell body was often discernible. The cells appeared more darkly stained than normal with the silver methods. The mesh-like structure of the cytoplasm was quite distinct, and the nuclei were angular and deeply stained. Those cells which appeared smaller and lightly tinged with aniline stains likewise displayed but slight argentophilic properties.

The cytoplasmic structure was indistinct and the neurofibrils scarcely visible. The nuclei were enlarged, pale, oval in form and often contained groups of small granules. The nucleoli were erratically disposed; in most cases of a light brown color, but sometimes more deeply stained.

Pathological alterations in the neuroglia tissue were discernible. Glia cells with large faintly stained nuclei were in evidence, but were less frequently encountered than the small glia cells described below. The nuclei were distended and metachromatically stained. Several nucleolar-like masses could often be distinguished within the nuclei surrounded by bluish colored chromatin particles. The cell body was quite copious although more or less ill-defined, and when located in the vicinity of diseased ganglion cells, usually contained much granular debris.

Small glia cells with deeply stained nuclei were more numerous. These cells were of the non-fibrous type, and their cytoplasm intensely stained and of an irregular contour. Occasionally vacuoles, or fatty-like cysts of a yellow or yellowish-green tinge lying near the nuclei, were observed. Peculiar cystic formations containing lipoid granules were sometimes seen within the protoplasmic processes of these cells. Glia cells having angular or irregularly shaped small darkly stained homogeneous nuclei were also occasionally encountered.

Increased numbers of glia cells were often visible in the vicinity of ganglion cells, usually occupying a position near the base of the cell body. Ganglion cells which had become swollen, deformed and displayed evidence of advanced degeneration were apparently being replaced in some instances by gliogenous elements. Several glia cells were sometimes discernible within the cytoplasm of such cells.

With the Weigert method for neuroglia tissue the glia fibers were perceived to be somewhat increased. The membrana superficialis was slightly thickened. The increase of the fibers was not so marked in general but more pronounced in the white matter than in the cortex.

In studying sections from the frontal region, embracing several gyri, it was observed especially in areas where the glia cells of the medullary radiations were considerably augmented, that the sulci were widened and the breadth of the convolutions diminished. It was therefore apparent that some atrophy existed, an inference which was further supported by the fact that the elements of the cortex seemed more compactly disposed than normally. Although in general no marked disappearance of nerve tissue was perceivable through the cortex; a pathological decrease was discernible in atrophic areas confirmed by the presence of numerous cell shadows. No definite falling out of fibers could be established with the Bielschowsky and Weigert methods.

The tangential and supraradiary plexus of fibers occasionally appeared anomalously stained in some fields of sections prepared by the medullary sheath methods, but this phenomenon obviously represented no true pathological reduction of the fibers, but was accountable to a capricious action of the differentiating fluid. In other areas, however, small circumscribed foci occurred which, in preparations stained for fat, were perceived to contain considerable lipoid substance, especially within the glial tissue.

The pathological alterations in the vessels were confined to those areas where cellular degeneration was in evidence. No endarteritic

changes or vascular proliferation in any of the vessels could be detected. In these areas the nuclei of the endothelial cells of some of the vessels were deeply staind, shrunken and angular. A reticulum was usually quite perceptible within the cell body of the endothelial cells, although in some cells this structure could not be demonstrated. The meshes of the reticulum frequently contained yellow and green colored pigment. The cells of the muscular coat in some instances contained fatty-like particles. Adventitial cells were also observed which were shrunken, darkly stained and partly filled with products of disintegration. The adventitial spaces of some of the vessels were distended and contained fatty granular cells filled with pigment.

In the pre-, post- and paracentral gyri of the brain, the cytological changes were less intense than those described in the frontal region. The alterations affected the elements throughout the cortex, but in general were not pronounced, and varied in character. The large motor cells did not appear to be perceptibly diseased. Various alterations in the size, shape and staining reaction of many ganglion cells were discernible, confined chiefly to the commissural and associative neurones. Some of the cells were swollen, and their contour rounded giving them a circular aspect. Others were diminished in size, shrivelled in appearance, the cytoplasm was discontinuous and broken, and the nuclei were indistinct. Many of the cells stained faintly and presented a homogeneous aspect. Chromatolytic changes were in evidence and instead of the characteristic appearance of the stainable substance, fine dust like granules were scattered irregularly throughout the cell body. Sometimes the chromophilic bodies appeared elongated or clumped in masses. A decrease or almost a complete disappearance of the Nissl substance could be observed associated with these changes. The pigment content was considerably increased in some cases. Abnormalities in the appearance and contour of the nuclei were evident. Only slight distension occurred in most instances, while occasionally the nuclei were greatly enlarged. The nucleoli of these nuclei were often unusually large and stained metachromatically. Twisting of the apical processes giving them a corkscrew shaped aspect was apparent. Sometimes the dendritic processes appeared atropic and discontinuous.

The majority of the cells which showed morbid changes were affected most frequently by a general shrinkage of the cytoplasm. The contour of the cell was contracted and distorted and the cell body assumed an elongated rod-like aspect. The cytoplasm was deeply stained and a rather well defined net-like structure discernible which was also usually visible in the processes. The nuclei of these cells were darkly and homogenously stained; often reduced in size and deformed. The nucleoli were dense and frequently ovoid in shape. Many of the ganglion cells showed a marked change in the distribution of the Nissl substance throughout the cell. The chromophilic substance was observed at the base and sides of the cell body; or forming a rim around the periphery. In some instances the rim was continuous, and in others it consisted of a number of separate compact masses. In most of these neurones

the basal dendrites were more altered than apical processes. The nuclei were often ill defined and the nuclear membrane was no longer demonstrable. Some of the cells were much more severely altered, and the faintly colored configuration of the cell body was almost invisible. The distinctly enlarged and rounded nucleus contained various sized granules deposited within its intranuclear network of linin, and the nuclear membrane was studded with basophilic chromatic particles. In some instances the basal processes appeared unusually stained, and the axone was plainly visible for a short interval. Near the origin of the axis cylinder process a rather indistinct gap was frequently discernible. This phenomenon is also commonly observed in normal as well as pathologically altered cells, but the hiatus is more extensive in the latter. This morbid condition should not be confounded with vacuolar degeneration of the cytoplasm, or cavities artificially produced in the protoplasm during the process of sectioning.

The Bielschowsky method yields excellent results in demonstrating the endofibrillar elements, especially in those cells showing the changes, which have been designated as acute cellular disease. The neurofibrils, however, in such cells, were with but few exceptions exceedingly well preserved.

Compensatory changes in the glial tissue commensurate to those of the neuronic elements obtained in this region of the brain. Matured gliogenous, fatty granular cells were only occasionally encountered. The neuroglia cells were considerably increased in some parts of the cortex. A number of glia cells presented advanced pathological alterations. The protoplasm of some cells appeared to be of a coarsely granular structure. The nucleus was shrunken and excessively stained and the chromatin increased. The chromatic granules were enlarged, collected around the periphery of the nuclear membrane, or aggregated together, practically occupying the entire nucleus so that it presented the appearance of an homogenous intensely stained blue mass. An accumulation of yellowish pigment was usually seen in the cytoplasm. Glia cells having an angular or rod-like nucleus were also in evidence. The nuclei of these cells were triangular, shrunken or elongated, and the protoplasm disposed as long delicate processes. Other gliogenous cells were met with having greatly distended nuclei. The nuclear membrane was considerably attenuated, the caryoplasm achromatic area a delicate structure was seen uniting the chromatin particles. Several metachromatically stained nucleoli were frequently discernible. The cytoplasm of these cells was quite perceptible, stained a violet shade, and numerous delicate processes were visible extending into the neighboring tissue. Granules of lipoid substance were sometimes observed lying within the cell body. Typical rod-like glia cells were frequently encountered in juxtaposition to or apparently lying within the cytoplasm of the body or processes of degenerated ganglion cells. The relationship of the glial processes to the blood vessels and capillaries could be most beautifully demonstrated in sections stained with Alzheimer's methods for the glia cells. Some of the processes were short and broad while others were thin, long and tortuous. A

corresponding increase of glia fibers was observed with Weigert's stain in areas where proliferation of the glia cells occurred. Regarding the vessels, no abnormalities were evident other than a distension of the adventitial spaces of some vessels.

Granules of a greenish and bluish color were occasionally seen within the lymphatic sheath of vessels in certain areas, but proliferation of the cellular elements of the vessels was not observed. Likewise no pathological connective tissue metamorphosis was discernible with the tannin-silver method.

The pathological changes in the temporal region corresponded to those found in the frontal area, but were less pronounced.

In the hippocampal region the marginal glia appeared somewhat thickened. Some of the ganglion cells were diseased; the prevailing type of degeneration consisted of a shrinkage of the cell associated with an increase of the pigment content. Proliferating glia cells were occasionally seen. No fibrolysis was perceptible by the Bielschowsky method. The alterations in the occipital region were not severe. Most of the ganglion cells were well preserved, a few, however, were swollen and stained faintly, others were shrunken, darkly colored, and in a number of cells an abnormal increase of lipoid substance was evident.

In many of the diseased cells the nuclear membrane was indistinct. A pale ill-defined substance was perceived surrounding the altered nuclei which resembled the latter in structure to such an extent that the nuclei appeared enlarged. The nucleoli were prominent and deeply stained. In those cells which displayed more extensive degenerative changes, the nucleoli exhibited considerable alteration in contour and often contained tiny vacuoles. The cytoplasm of the cell was frequently more intensely tinged than normal and presented an indefinite granular aspect. In certain areas of the cytoplasm a peculiar reticular degenerative change was distinguishable. The chromophilic substance had disappeared and a coarse net-like structure was visible. The fatty material which was evident in a large proportion of the affected cells, was irregularly displayed, and of a yellow greenish tint. The particles of lipoid material varied in size and concentration and assumed no characteristic disposition within the cytoplasm or processes of the nerve cells.

With Herxheimer's selective staining method for fat, these granules obtained a reddish hue, and were most frequently distributed in proximity to the nucleus. In some cells the particles completely surrounded the nucleus, and in others were aggregated in masses near its basal portion. The Bielschowsky method for the neurofibrils revealed only slight modification in the normal disposition of these elements. The usual schematic arrangement of the neurofibrils in those cells, which contained an increased quantity of pigment, was disturbed, but the neurofibrils per se appeared intact.

Cellular disease of a chronic type was encountered in some areas of this region. This alteration of the cells was characterized by deeply stained angular nuclei and swelling of the nucleoli. The processes were attenuated, frequently tortuous and traceable for a considerable distance. A singular fine granular appearance of the

cytoplasm was observed in some cells, while in others small vacuoles were discerned. The type of alteration affecting many cells was distinguished by a general shrinkage of the cell body and processes which were filled with densely stained coarse granules. Such cells presented an elondated aspect when extensive contraction of the borders supervened. This variety of cellular change was more pronounced in some areas, but was encountered in varying degrees of intensity throughout this region.

Progressive neuroglia changes were evident where nerve cell diseases existed. The proliferation of the glia was apparently proportional to the extent of the cellular alterations in the different layers of the cortex. The proliferating glia cells often presented the appearance of small aggregations or nests, surrounded by a copious ill-defined reticular cytoplasmic structure. Small granular-like inclusions were usually perceived within the meshes and not infrequently large angular masses were in evidence, staining a yellow or yellowish green color. Glia cells were also visible with large nuclei, distended metachromatically tinged nucleoli and having a reticular protoplasmic cell body. The nuclei of many cells were normal in size, but excessively stained. Dark granules were visible distributed around the circumference, or scattered through the nucleoplasm; in some cases the granules are densely packed together, giving the caryoplasm a homogeneal appearance.

Basal Ganglia.—The extent of the cavities involving the lenticulæ, and the fiber content of the basal ganglia, the internal capsule and subthalamic region was determined by an examination of sections prepared with the Weigert method. Vertical sections through this region demonstrated the fact that the anterior extremity of the cavity in the left lenticula extended somewhat ventral to the anterior commissure, where it appeared as a small area of softening. Further sectioning disclosed that the anterior extremity of the cavity represented its minimum dimension, and that the greatest degree of destruction obtained in the posterior part of the nucleus. The softenings were practically confined to the lateral and outer portion of the lenticulate, involving chiefly the putamen, whereas the globus pallidus was diseased to a much slighter extent. Sections passing through the region somewhat anterior to the area of softening described showed the marked flattening and general atrophy of the caudate nucleus; and the striking shrinkage of the lenticula. A disappearance of medullated fibers was perceptible, but no softenings were in evidence.

Sections more posteriorly include the anterior extremity of the cavity in the putamen; and less pronounced evidence of deterioration could be observed in other portions of the lenticulate nucleus. The internal capsule appeared intact, and no decrease in its fibers was discernible. The shrinkage of the caudate and lenticulate nuclei conveyed the impression that the capsule was relatively enlarged. The external capsule, however, seemed affected to a moderate degree. In none of the sections could a reduction of fibers in the adjacent cortical areas be detected. The degenerative changes were most pronounced in sections through the latero-posterior part of the

corpus striatum, and the lower portion of the nucleus was extremely atrophic. The internal and external laminæ were markedly affected, and the internuncial fibers degenerated. The internal capsule presented a normal appearance in all sections. The corpus Luysii in the subthalamic region was atrophied, and a deficiency in the fibers of the ansa lenticularis perceptible. Relating to the optic thalamus no softenings or diminution in its fibers content could be determined.

The degeneration of the nervous structure was exquisitely revealed by the Scharlach red method of staining. One was impressed by the fact that practically all the nerve cells contained masses of fat. Different degrees of fatty degeneration were visible, ranging from the presence of a few granules in proximity to the nucleus, to a stage in which the entire cytoplasm seemed converted into a fatty mass. The distal portions of the dendritic processes were invariably free from lipoid granules, whereas the proximal portions contained fat particles. Granules of a fatty character were likewise occasionally seen along the axis cylinder processes. Generally the fat granules in the nerve cells, especially in sections which had been counterstained, contained in addition to large fatty globules, numerous very fine dark red granules.

A sporadic like fatty degeneration of the neurones occurred through the entire diseased area. In the midst of intensely fatty degenerated areas oases were encountered containing numerous normal appearing, or almost fat-free nerve cells. Sections prepared with osmic acid presented a similar picture.

A variety of alterations of the nerve cells could be observed in sections stained with thionin. The manifold changes affecting the nerve cells formed a series varying in degree from an almost imperceptible alteration to a stage representing definite types of cellular disease. Considering first the cells representing only initial structural disturbances, it was perceptible with careful study that considerable deviation from the normal obtained. They presented a varying aspect, partly resulting from the cancellated structure of the cell body, especially in the perinuclear zone. This structure appeared prominent in the early stages of the disease, ofttimes constructing a thick uniformly stained framework, surrounding masses which were scarcely discernible owing to their faint hue. In other instances the framework was palely tinged, more loosely disposed, and the meshes enclosed small, dark and definitely defined granules. Sometimes a fine network was visible within the meshes. When the peculiar structural arrangement was indistinct the cytoplasm seemed to be composed of an extremely fine granular deeply stained substance, containing pale round areas. This singular structural metamorphosis of the cytoplasm was usually confined to the cell body, rarely extending into the processes. The cellular processes were lightly tinged, and while traceable for a greater distance under normal conditions, no distinct structure was distinguishable. Occasionally, however, tapering processes were projected from the converted perinuclear protoplasmic structure into the dendrites. As the cellular disease under description became more advanced it was characterized by a gradual elongation of the spheroidal nucleus ob-

served in the early stages, and an increased angularity and sharpness in the contour of the cell body, so that the periphery approached in similarity the aspect presented in chronic degeneration, although the central part of the cytoplasm retained the peculiar cancellated disposition. A later stage in the process was distinguished by an increased intensity in the staining reaction of the elements. The nucleus was excessively stained and well defined, but less prominent. The dendritic processes were distinctly delineated and assumed an erratic course. Such cells portrayed a state immediately preceding the final stage in the series, represented by typical chronic disease, differing from it, however, by the presence within their darkly stained cytoplasm, of the peculiar structure anomaly previously described. This latter type of cellular change was also found in the cortex.

The metamorphosis designated above as cancellated in appearance was more frequently encountered in this region, than the so called chronic disease of the cell. Groups of chronically altered cells were occasionally seen surrounding foci containing cells displaying the characteristic cancellated change. A coarse vacuolar formation was not infrequently perceived near the nucleus and sometimes the relatively well preserved nucleus was presumably separated from the cell body by a moat. More advanced stages of degeneration were in evidence scattered through the area, and instances occurred where nothing remained of the nerve cell but scarcely identifiable rests.

It seems quite apparent that the peculiar alterations which were observed in thionin stained sections, corresponded to a fatty degeneration of the nerve cells; and that this type of cellular degeneration preponderated.

In those areas contingent to foci of softening in the lenticular nucleus the nerve cells exhibited advanced stages of disintegration and had in many instances completely disappeared.

The progressive changes in the glia cells presented a rather remarkable picture. Some cells were distinguished by a large, oval or elongated nucleus. The cell bodies were irregular with their thick broad processes which appeared to stand out in bas relief from the contiguous palely stained tissue. The entire protoplasm was often intensely tinged, and apparently filled with small cavities. Macrophagic giant types of glia cells were encountered, and large aggregations of fatty granular cells were perceived within the areas of softening.

The neuroglia cells in many foci showed mitotic changes. The protoplasm of cells exhibiting changes of this character was of a pale bluish color in aniline stained preparation, but quite distinguishable from the immediately surrounding unstained area. It would appear as if the perinuclear protoplasm had burst through its syncytium.

The gliogenetic metamorphosis was extraordinarily and beautifully illustrated in some sections. The spindles were not infrequently perceptible, when stained bluish in color, and the centrosomes, which usually do not take up the stain, were occasionally

visible at the poles, as large round formations. Darkly stained bodies of a similar appearance were sometimes discernible within the fibrils of the spindle. In a few instances chromosomes were observed lying free in the protoplasm. The protoplasm often presented a distinctly stained net-like structure.

Regressive changes of the glia were also encountered which may be characerized by pycnosis of the nucleus, hyperchromatosis of the amphipyrenin, and granular disintegration with disappearance of the nuclear membrane; or by a slight thickening of the scanty perinuclear protoplasm, and the presence of darkly stained masses. A few of the so called ameboid glia cells of Alzheimer were in evidence. An unmistakable relationship existed between the frequency and severity of the regressive glial changes and the disease of the nerve cells. This relationship was especially demonstrated in certain degenerated areas within the putamen, where pathologically altered neurons and cell shadows were frequently found associated with gliogenous cells displaying hyperchromatosis and dissolution of the nuclear membrane.

Within the areas of degeneration and softening various products of disintegration were visible and the adventitial spaces of the blood vessels were distended and contained irregular shaped masses of a yellowish tinge and other singular material, which stained with different degrees of intensity with basic aniline dyes. Nuclei were usually discernible lying within the masses. These nuclei of fatty granular cells were most frequently characterized by their polyhedral or triangular shape; a progessive vacuolar degeneration and pycnotic condition. Occasionally no nucleus was visible in consequence of the compactness and deep staining of the pigment. The greatest quantity of this substance was distinguishable, with the Herxheimer method, as fatty material within the cytoplasm of fatty granular cells. Large accumulations of a lipoid character were also observed lying free within the perivascular spaces of the vessels, which usually presented a regular spherical aspect. When closely aggregated, however, they presented an exceedingly irregular contour.

Lipoid granules were frequently visible within the cytoplasm of the cellular elements of the vessel walls. Gliogenous fatty granular cells were often accumulated in large numbers, especially around capillaries, traversing the degenerated areas.

Some fatty granular cells contained metachromatic substance commingled with the greenish colored masses. A number of capillaries and vessels showed an enlargement of the Virchow-Robin spaces, but which contained no infiltrating elements or products of disintegration. Evidence of endarteritis could not be discovered in any of the vessels, and no obliteration of vessels, hemorrhages, proliferation of the vascular endothelium, or sprouting new capillaries could be discovered.

Crura Cerebri.—An examination of transverse sections through this part of the brain, prepared by medullary sheath methods of staining, failed to reveal any defects in the crusta. The fibers of the pyramidal tract were well stained and no deficiency of the fibers could be detected.

No appreciable deviation from the normal could be discovered in the tegmentum of the mid brain.

Some of the cells of the locus niger, however, appeared affected. A number of the cells of the nucleus ruber were considerably altered. Many of them were swollen and the chromatic substance faintly stained. The nuclei were enlarged, pale and of an irregular form. The nucleoli were likewise distended and stained metachromatically. The nucleus membrane was ofttimes scarcely discernible. In other instances, the nucleus was pressed to the periphery of the cells, stained more darkly than usual, and was sometimes difficult to distinguish from the cytoplasm. In some of the cells the chromatin granules appeared as a fine dust in the center of the cytoplasm and in the vicinity of the nucleus, while at the borders the granules were larger and more deeply stained. With the Bielschowsky method the neurofibrils in many cells seemed unimpaired, but in others were discontinuous and appeared as fine granules. Glial changes were in evidence and satellitosis was readily perceptible in the vicinity of ganglion cells.

Pons and Medulla Oblongata.—In the sections from this region stained by Weigert's method no degeneration or disease of the pyramidal fibers was visible. The olivary and restiform bodies showed no pathological alterations, and the motor nuclei appeared normal. A few of the multipolar nerve cells of the nucleus gracilis and nucleus cuneatus were somewhat shrunken; densely stained and their processes tortuous.

Cerebellum.—Alterations could be detected in some of the Purkinje cells, and it should be noted that a number of the neurons in the dentate nucleus showed a typical granular disintegration. The glia cells were increased, especially in the molecular layer. By Bielschowsky's method it was observed that the neurofibrils were discontinuous in a number of cells, and in a few were broken into fine particles.

Spinal Cord.—The membranes of the cord were not perceptibly thickened or turbid, and no cellular infiltration or evidence of any inflammatory process could be detected. The spinal vessels were apparently normal and showed neither thickening of the walls nor endarteritic changes.

The fibers of the cord were investigated by both Marchi's and Weigert's stains in longitudinal and cross sections at various levels of the cord, but no systematic degeneration could be disclosed by either method.

Sections prepared by Marchi's method failed to reveal any degeneration.

In the pyramidal tracts no defects could be detected. Weigert's stain also yielded negative results, and there was no manifestation of shrinkage or disease in any of the tracts of the cord.

The nerve cells of the gray matter were examined in the cervical, dorsal and lumbar regions.

Most of the cells of the anterior horns in the cervical region showed no distinct alteration. In some of them, however, evidences of a degenerative process were observed. A number of these cells

appeared shrunken, elongated and stained more deeply than usual. The nucleus of such cells was as a rule unaltered. In the thoracic region chromatolysis was present in a few cells. A number of cells of the lateral horns were somewhat more extensively altered. Some of the cells appeared swollen, their outlines irregular, the nuclei were eccentrically located and chromatolytic changes in evidence. In a few of the posterior horn cells, pathological changes were observed. The cytoplasm of the cell was frequently more intensely tinged than normal and assumed an indefinite aspect. The nuclei in many instances exhibit alterations in contour. The cells of the anterior horns in the dorsal region were not perceptibly affected. The alterations were more pronounced in the cells of the lateral and posterior horns. The cells were in some cases swollen, their borders indistinct and a slight disintegration of the tigroid substance had occurred. The nuclei were distended and the nucleoli palely stained. Here and there a cell was visible, which displayed considerable alteration, with displacement of the nucleus and extensive chromatolysis. In the lumbar region the cells of the anterior horns presented a normal appearance. In the lateral and posterior horns a few cells were encountered which showed general shrinkage. The capillaries of the gray matter appeared distended in some instances, but otherwise were not altered.

Peripheral Nerves and Spinal Ganglia.—A careful examination of the radialis, ulnaris, medianus, ischiadicus and spinal ganglia failed to reveal any pathological alterations.

Microscopical examination of the other organs of the body revealed no remarkable features, except in the instance of the liver, which showed irregular cirrhotic changes.

Pathological Summary

The meninges of the brain showed no thickening, discoloration or other abnormalities.

The brain was large and firm and the convolutional arrangement of the gyri presented no deviation from the normal.

The hemispheres were divided by a horizontal incision, and the macroscopic appearance of the section was striking. Considerable degeneration was perceptible in the lenticulate nuclei, but the cortex and white matter of the hemispheres were not visibly altered. No disease of the internal capsules, caudate nuclei or optic thalami could be discovered. The left lenticulate nucleus appeared more severely affected that the right, and the outer portion of the putamen was replaced by a narrow cavity. The outline of the cavity was sharply defined against the external capsule, which was seemingly attenuated. The claustrum, periclaustral lamina and cortex of the insula presented a normal aspect. The right lenticula was shrunken and irregular, and small areas of softening were scattered through the nucleus. A cystic like cavity was found involving the outer and

posterior part of the putamen. The capsula extrema and cortex of the island of Reil were normal. The cerebral vessels were not thickened, irregular in lumen or atheromatous. The ventricles were not dilated.

The microscopical alterations in the cortex were characterized by changes involving the neurones and glial tissue. The ganglion cells in the frontal region were more severely affected than in other parts of the cortex. A swelling of the cells was observed, but shrinkage and other types of cellular disease were likewise frequently encountered, limited mostly to the small and medium sized pyramids. In the motor region the giant cells were not perceptibly affected, but the commissural and associated neurones were altered.

The neuroglia tissue was not increased to any extent in the cortex, and its intensity seemed to correspond to the degree of cellular alteration in different regions. The alterations in the glia were characterized in some instances by enlargement of the nucleus and a greater intensity in the staining reaction of the cytoplasm; and in others by a shrinkage, angularity or elongation of the nucleus, with increase of the chromatin granules. No abnormal formation of fibers was observed.

Advanced stages of nerve cell degeneration were encountered within the putamen, and in those areas contingent to foci of softening. Practically all of the cells contained much fatty substance; and in many instances had almost completely vanished. The neuroglia tissue exhibited progressive and regressive changes. The gliogenetic reaction presented a remarkable picture in some sections, and mitotic changes were observed in many foci. Macrophagic gliogenous cells were encountered, and within the areas of softening large aggregations of fatty granular cells were discernible. Various products of disintegration were in evidence, and the adventitial spaces of the capillaries distended. In general, however, no abnormalities of the vessels were perceptible.

The degenerative changes were found to be most pronounced in the lateral and posterior part of the nucleus. The internal and external laminæ were markedly diseased, and the internuncial fibers degenerated. The internal capsule appeared normal in all sections. In the subthalamic region the corpus Luysii was atrophic, and a deficiency in the fibers of the ansa lenticularis discernible. A considerable number of cells in the nucleus ruber were altered.

In reference to the optic thalamus, no softenings or reduction in its fiber content were evident.

The spinal cord was examined by both Marchi's and Weigert's

stains, but no systemic degeneration or other disease could be detected in it by either method.

The liver showed an irregular cirrhosis, but no special abnormalities were found in the other organs of the body.

The case presented the essential aspects of the disease described by Wilson as progressive lenticular degeneration, and the anatomical study affords some interesting features for consideration.

The result of the microscopical examination would indicate that in this disease the pathological process, although extensively involving certain definite areas, may to a greater or less degree affect other regions.

The basal ganglia were most severely diseased, especially that portion of the lenticulate nucleus known as the putamen, in which area an extensive destruction and softening of the tissue occurred.

The remaining part of the lenticulate nucleus, and the caudate nucleus were less severely affected; and the alterations in the cortex were not intense.

The pathological changes were characterized by a degeneration of the neuronic elements, with a compensatory proliferation and hyperplasia of the glial tissue. Many singular morphological gliogenous variations were exhibited. No evidence of inflammation or pathological vascular alterations were discovered.

It is apparent when we compare the anatomical changes found in the case, with those described by Wilson, that they are analogous.

The diffuse alterations in the cortex were obviously associated with the peculiar type of psychical derangement which occurred, and the motor symptoms may be explained by the pathological changes affecting the lenticulate nucleus, especially in the putamen.

It would therefore appear that the semeiological characteristics of this disease result from a disintegrative process, and are not caused by irritation.

There can be no doubt that the clinical features of the disease resemble those of pseudosclerosis, and that a certain similarity exists in the anatomical changes.

The pathological alterations in both diseases present remarkable gliogenous reactions; and the absence of any inflammatory process. An important difference in the pathological anatomy of the two conditions seems apparent in the fact that the process in progressive lenticular degeneration tends to terminate in softening and disintegration of the nervous tissue in the areas most severely diseased, whereas in pseudosclerosis this does not occur. It should be remarked that while in pseudosclerosis the lenticular nucleus is

affected, considerable involvement of the optic thalamus, dentate nucleus and pons also occurs together with other parts of the central nervous system.

The inference that these diseases are related seems justifiable; but that in pseudosclerosis the process is more diffuse, which may account for the variation in the clinical phenomena.

The anatomical findings, however, do not provide a final explanation regarding the etiology of the disease. Syphilis cannot reasonably be proposed, as the negative results of the tests with the blood and cerebrospinal fluid, as well as the histological changes, preclude this conjecture. The assumption by Wilson that the process is toxic in character, which originates from the liver, does not appear to be definitely established. The theory is supported to some extent by those cases which present a rapid progressive course associated with fever, but it should be recalled that not infrequently various neurological and psychical disturbances may be preceded or accompanied by disease of other visceral organs.

He believes that the disease known as icterus gravis neonatorum, cases of which have been described by Beneke, Schmorl, Esch and Pfannenstiel, offers to progressive lenticular degeneration a highly suggestive analogy; but it has not been proven that the former affection results from a toxin elaborated in the liver.

The writer has observed in autopsies among the insane, that cases exhibiting profound general icterus invariably display an intense staining of the lenticulæ. Such instances occurred in individuals suffering from different tpyes of psychoses, and it would appear precarious to surmise a relationship between the mental condition and a metabolic disturbance referable to the liver.

It therefore seems scarcely feasible to accept the inference that the hepatic disease plays a primary rôle and generates the toxin.

A possible basis for the disease might be ascribed to a defective development of the nervous system, as implied in pseudosclerosis, since a similarity appears to exist between these affections.

The anatomical findings, however, in the case here reported, failed to disclose any indications for this hypothesis.

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THE MECHANISM OF PARANOIA[1]

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The one outstanding symptom of paranoia, agreed on by all writers during the last half century, has been delusions. At one time their presence justified the diagnosis of paranoia in from 70 to 80 per cent. of the hospital cases.

With the development of sounder classificatory conceptions the proportion of cases diagnosticated as paranoia rapidly diminished, and after 1904 Kraepelin's definition and estimate of the number of cases—1 per cent.—were pretty generally accepted. He then regarded delusions as "the most prominent if not the only symptom" and he emphasized the absence of "any disorder of the train of thought, of will or of action."

After further study of the 1 per cent. of cases of paranoia, he found that some belonged frankly with other psychoses, and the rest were dubious. In 1912 he thought it possible that the diagnosis of paranoia might have to be given up, and he made a tentative grouping of the dubious cases under a new heading, paraphrenia, which Dr. Strecker has just described to you.

In 1915, while not clearly emphasizing the *absence* of other symptoms than delusions, he finds a small group of cases, of which he has seen 22, in which, besides the insidiously developing delusional system, there may be only such other symptoms as memory falsification and possible hallucinations. If the latter are present, they are not vivid.

Thus the number of cases seems dwindling to the vanishing point. But that it will not actually reach it, and that an irreducible minimum of cases, showing presence of elaborated delusions and absence of other symptoms (except such as are wholly secondary to the delusions) will remain, can be shown, I think, by a case which has been under my own observation.

X. Y. Born Nov., 1873, of remote Jewish ancestry.

Family History.—P. G. M. "hysterical." P. G. F. mentally keen. M. G. M. and M. G. F. normal mentally. M. G. F. had tremor of hands. Father and 3 P. U. normal, able; two artistic,

[1] Read before the Philadelphia Psychiatric Society, May 12, 1916.

intellectual. M. weak, silly, emotional. 1 M. U. "semi-insane"; 1 M. U. "semi-degenerate."

Past History.—Only child. At 6 severe typhoid. At 8 hit on temple by rock; no sequelæ. Hyperesthesia of nose and throat (laryngologist's diagnosis) since 17; 1 nostril partly obstructed by fracture of bone. At 18, crowded teeth in upper jaw treated. At 22 imagined fish bone in throat (hyperesthesia,—laryngologist's diagnosis). Slender till 26, since then fat. Since childhood, tremor of hands, varying in intensity. Occasional exophthalmos in last 7 or 8 years, varying much; no thyroid enlargement. Occasional "oppression of the heart" (smokes much); often eats voraciously and injudiciously.

Brilliant student. As school-boy entered into everything, sports as well as studying, enthusiastically. A.B. Harvard '95, and B.S. (in chemistry) at Mass. Inst. Tech. in '97, at age of 24. Accomplished musician and musical critic (author of books, essays and articles), excellent mathematician; has been champion whist and chess player; excellent golf, tennis and billiard player; imaginative, witty, sensitive, rather shy, active, sociable, gentle, courteous, law-abiding, wishing always to be fair-minded; set in his opinions.

Psychosis.—In fall of '97, at 24, while employed as chemist in Illinois,[2] and living in same boarding house with two rather fast young men, related to the owner of the mill in which they were employed, he went about with them more than he wishes he had. In spring of '98 they brought a mill girl to their room and tried to make him come in, but he refused. They also tried to make him let the girl into his room. They teased him about it and tried to compromise him. The whole household learned of it. A few days later the landlady came to his room for a chat and he thought her manner suggestive of a desire for an intrigue. A long series of incidents occurred from which he inferred that the two men, irritated at his refusal to join in the mill girl affair, wanted to implicate him in some scrape, in order to discredit him and hurt his reputation. At Castine that summer ('98) his father's watch was stolen and never found. He thought he saw there the day before an Illinois physician, friend of the two men. Sometime later an Illinois man who knew the landlady above mentioned, had a watch stolen from his trunk. This the patient interpreted to mean that the two men had got the physician, who may have stolen the watch or had it stolen, to connect the patient through the Illinois man with the landlady, so as to make it appear that the patient was on very familiar terms with her, but that the plans had miscarried. He then went to Atlanta, Ga., and taught chemistry for a year without special incident. Again at Castine ('99) where he continued to spend his summers, a politician was there, and a series of thefts occurred. In the following winter and spring a series of thefts and burglaries occurred in Roxbury, where he then lived, referred to in the papers as being perpetrated by an organized gang. These all happened to persons whom he knew or who had the same names,

[2] Substitute names are used.

or who lived near friends of his, thus connecting them all with him. Again in the summer of 1900 the politician was at Castine, hanging around. Then the patient began to think the two young men had enlisted a whole political gang to arrange these thefts and connect them with him to discredit him.

For the next few years he taught in public and evening schools, wrote and published books, and was musical critic on a large metropolitan daily One day someone telephoned to the newspaper office to ask if "Mr. X. Y., the chemist," was there. He was known as chemist only in Illinois and Georgia. That evening the newspaper building burned. This was the beginning of a series of fires with which effort was made, presumably by the two men in Illinois, to connect him. Innumerable incidents confirmed him, *e. g.,* the omission or inclusion of his name in press accounts of whist games, coincidentally with fires of incendiary origin. In 1905 he taught in a small New England college. There he began to think that the professors' wives and others made illicit advances to him. Next year, having some physical symptoms, he began to smell or taste strong salts or chemicals in his food. Since then he has thought drugs or medicines were introduced into his food or drink, and into that of his friends, at the instigation of these women. Efforts were then made by professors and students to get him to marry; the state governor and senators, and the college authorities were drawn into it. From then on he lived with his parents in Boston where he finally (1907) got into trouble through accusing clerks in stores of putting drugs into his soda water or other drinks or edibles.

In 1907 at the hospital, he told the above calmly, clearly; believing that the two men, trying to injure him, had organized this vast plot, with help of politicians and others, to connect him with thefts, fires and immorality, so that his friends would not want him around, but would even want to destroy him. He was perfectly clear, coherent, logical, with very accurate memory, no evidences of hallucinations, autochthonous ideas, ideas of influence; no stereotypies, no mannerisms. Some of his closest friends and relatives had seen nothing abnormal about him. In the eight years he has been under observation, he has continued to write effectively and authoritatively in his special field, sought after by publishers. He still holds his ideas which have extended somewhat, with absolute conviction. Trivial incidents of his daily life are illustrations and confirmations to him of their truth. Where he used to find such incidents only occasionally, they now are frequent. He has held these gradually growing delusions for eighteen years, yet as one talks with him one has the feeling that if one could instil doubts into his mind of the correctness of his premises, he would correct the delusions. He appears in no way demented except in the direction noted.

A letter he wrote recently to one of the hospital physicians shows his absolute conviction in his delusions and incidentally his clearness of thinking.

"Feb. 24, 1916

"It seems to me that the drug situation in town and here has become somewhat tense.

"I have never admitted that anyone ever had the right to drug my food, either for the sake of impulsive women who try to 'pick men up' on cars or elsewhere, or because someone of the Rockefeller type may have backed incendiarism ever since. Neither can I blame myself because certain men in Illinois, where I started work after college, threatened to 'do' me, and perhaps started the other troubles by their lies. No matter how many politicians of the Lodge type may stand in with crooked magnates, I cannot see that it gives them the right to maltreat me and call me insane without a hearing. The same dishonesty could be applied to thousands of others, now in Boston and elsewhere, but they are spared. So far as I know, none of the guests who has complained of being drugged at our table has ever been drugged in his own home. You will see that there must be something wrong back of this discrimination.

"The past year or two has shown pretty clearly that I am sacrificed to the incendiarism. If an attempt was made to keep the Boston water pure, it was followed (in dozens of cases) by an unexplained fire. The resumption of drugs was always followed by the cessation of the fires. It is not always legal proof to say 'Post hoc, propter hoc.' But if any person is arranging crimes to discredit me, such action, though much to be deplored, is in no way my fault.

"Some weeks ago we met Gov. Blank at a florists' club dinner. I was not greatly impressed by him. After a few words with my father, he asked, 'You are on the Transcript and at the Conservatory?' A day or two later came a new and very drastic drug, or set of drugs, in the water and in drinks sold to me. From the effect of these drugs, I should judge that they played a large part in my father's recent illness, which is partly grippe, but has characteristics which the doctor could not claim were grippe. By noting what symptoms the new drug combination caused in myself, in our maid, etc., and comparing these with my father's trouble, I am led to suspect that someone may have been trying to put him out of business. But even if that object is attained, I should still make Boston my home. I should also have a freer hand to find possible dishonesty, as my father would then have nothing to lose on my account.

"The situation at present, in town as out here, involves also the element depending on the dishonesty of impulsive women who try to cover themselves at a man's expense I think I have alluded to that situation out here. One example will suffice,—that of the sweeper who tried to get me to hug her, or something of the sort, by blocking my way in a doorway. 'You scared me,' she said, backing a foot or so. 'No, you didn't,' she added, encouragingly, standing still in my way. Around the corner, Kimball and another nurse came out of a room. They probably hadn't heard her, but she got scared. I was reported on, and drugged at the next meal or so.

"Outside, this sort of thing seems to arouse something also. A

certain Miss Alden, whom we met at a hotel one summer, seemed self-contained enough until returning on the boat alone with us. Then she made a dead set at me, in a rather suggestive way. We sparred a good deal in a bantering way of talk, but at night I did not go into her stateroom nor ask her into mine,—to her disappointment, apparently. She wrote to her sister, and I can infer that she covered her tracks in the letter. We then had fires and drugs in unusual amount on reaching Boston, a specially large incendiary fire being on Alden St.

"A more recent case was that of a female identified with Winthrop. Just as soon as such a lady finds I am not giving her the attention for which she is waiting, and talks of it, there is a big and mysterious fire in Winthrop.

"Again, 'Post hoc, propter hoc' is not legal proof; but the issue in my case is so clear that I have been enabled to predict the occurrence of these big fires. This lends color to my theory about their origin, and the identity of the man responsible.

"Unfortunately for some purposes, the best way to stop the fires seems to be to ignore them, and to say nothing of the drugs, until the rascals in high places begin to forget about me, and let me alone. But I think that any possible attack on my father's health and business should justify calling all honest men to my aid.

"Still another of the feminine episodes may play its part here. In all these cases, it is not any conduct of mine that incites the girls, but dishonest gossip resulting from the needless use of anaphrodisiac drugs. In this case, it was our maid who showed desire. After many little possible signals, which I ignored, I once spoke of the view while in the kitchen. This view included the Fenway, Mrs. Jack's palace, etc. The maid then said, encouragingly, 'There's a good view in my room.' As a matter of fact, there is very little view from her room, as the next building cuts off some of it. I dodged by saying I didn't know men could go into her room. Thereupon she began to cry, and pretended she had been insulted. A moment later she said something about forgiving me. I haven't yet seen that I needed forgiveness for anything. She is talkative enough among her equals, I suppose. If the Lodge-Rockefeller machine, or whatever machine it is, got hold of the mistaken idea that a maid had something to forgive me, it would consider itself justified in almost any dishonest action against me. This occurred last spring. This fall, I have noticed that drinking water brought home by me, which has seemed pure at first, has later on shown the presence of drugs by the usual flavors, cooking reactions, etc. I now keep things locked away from the maid. If I really find that the dishonest drug machine has actually used the disappointed fear of a lewd-minded maid to drug things in my own home, I shall have to take action. Meanwhile, as the case is not yet definitely proven, I do nothing. I did ask my mother to let the maid go, and gave the reasons; but the maid, who had been thinking of returning to Ireland, switched around when I asked her to go, and stayed,—evidently afraid something might be said of her after

she went. The maid is kept now only for fear that a new maid would be hard to get.

"This possibility of trickery within the home, and the absolute surety of dishonesty from outside, makes me very keen to watch over my father's condition and food-supplies."

He shows now, and has shown in the past, no clouding of consciousness, thinking difficulty, psychomotor retardation, flight of ideas, incoherence or any other disorder of thinking; no lack of initiative, of spontaneity, of ambition or of interest, no indifference, no undue elation or depression, no increased emotional lability, or other abnormalities in the affective field; no diminution in power of attention or of concentration; no memory defect; no stereotypies, and no mannerisms except such as are the outgrowth of his individual peculiarities and of his delusional attitudes—there are none that are in themselves morbid. He is not a dreamer, but seeks normal objective contacts with reality; he is industrious, competent in his field, even under the long-continued restrictions and narrowing influence of the artificial hospital routine (which is ameliorated for him as much as is compatible with public safety). There have been no psychotic episodes. In all the other psychoses we find some of these interferences with psychic processes as such.

To understand how such extensive delusions, held with such absolute conviction, can arise and persist for so long a time in a seemingly otherwise normal mind, we need to review briefly certain of our normal mental processes.

Man has to adjust himself to all the varying situations that make up his environment. To do this he must think of the environment as it is and has been, and to reason as to what it will be. The more accurately and completely he does this, the more successful is he in his adjustments, other things being equal. There are three ways in which the normal man may fail, however.

First, he is *ignorant*. He can know the environment only incompletely at best. So far as his thinking conforms to the environment as it is, he has knowledge of it. So far as his thinking is incomplete, he is ignorant of it, he does not know it. We are all more or less ignorant. There are limits to our knowledge. All beyond is ignorance.

Secondly, he is *mistaken*. He thinks something is so that is not so. A patient presents a certain history and symptoms, and I make the diagnosis of typhoid fever. Further observation and examination show that it was paratyphoid. I drew the wrong inferences at first and was mistaken.

Ignorance is negative, it is the absence of knowledge. Error is positive, it is the presence of a belief in something that is not so.

Thirdly, he is *prejudiced*. He has associated unjustified feelings

or too intense feelings, or both, with a certain idea or group of ideas Then, when this idea comes into mind, the associated feelings determine to a large extent the content of the train of thought that follows. Trains of thought whose content is in harmony with the feelings are stimulated or facilitated, while those whose content is inconsistent with or contradictory to the feelings are inhibited. Even objective facts and evidence are seen or ignored in similar manner.

In the earlier days of the Republican party many a New Englander felt so strongly about the Democrats who opposed the Republican principles that to the end of their lives they could hardly believe that any man who was a Democrat was respectable. Not a few Southerners felt equally strongly and unjustly about those same Republicans. The unjustified feelings of each about the other were too intense to let either see that there were honest and respectable men in the other party.

We all have prejudices which are more or less strong. They may concern Roosevelt, or Bryan, or Democrats, or free trade, or single tax, or woman's suffrage, or vivisection, or the Chinese, or the Germans, or the Negro, or Freudism, or Catholicism, or Bacon as the author of Shakespeare's plays, or preparedness, or snakes, or a host of other things about which recognized prejudices are held, or controversies arise, or differences of opinion,—often better called "differences of feeling"—exist.

Ignorance and error contribute to prejudice, but it is the intensity and quality of the *feelings* which are associated with the subject-matter that make the prejudice persist, and give it its character as *prejudice*.

It is comparatively easy to correct ignorance, up to the limit of the individual's learning capacity, unless his *amour-propre* causes him to resent the imputation of ignorance, in which case he does not learn because he thinks he knows it all.

It is also comparatively easy to correct error, though this is a little harder, for the affect of *amour-propre* is stronger. It is a little less humiliating to say "I did not know" than to say "I thought I knew, but I didn't—I made a mistake." Feelings of *conviction* and of *certainty* also have to be overcome, *i. e.,* changed to feelings of questioning or of doubt, or of certainty that the thing was *not* so,—as when I changed my diagnosis from typhoid to paratyphoid.

There are few other feelings that are involved in simple ignorance or error, and they are not very strong. But with prejudice not

only these but many other feelings are involved, *i. e.,* are associated in our minds with one or another phase of the subject-matter. Hence, to correct a prejudice, not only does the ignorance or error, the ideational part, have to be corrected, but a good many feelings have to be dissociated from the main idea, and as some may be rather deeply rooted, it is a more or less difficult matter and usually takes time. It may, of course, occur suddenly, when some new experience with a very strong feeling-tone of an opposite or widely different character causes this latter affect to supplant the former one. This happens in conversions at revival meetings, for example.

Besides special affects, peculiar to the particular person and prejudice, there is almost always a feeling of conviction about the subject-matter. This on its objective side is a feeling of certainty that the idea conforms to reality, and on the subjective side it is a feeling "I am right." Hence, when you oppose a person's prejudice with a fact or a reason, you often get the response "Do you take me for a fool?" or "Do you think I don't know?" This is closely associated with a deeper lying *amour-propre*—we have no good English word or phrase that expresses the feeling exactly and that has not some connotations that do not properly belong to it. For example, *self-esteem* implies a little vanity, *self-approval* implies a little patting of one's self on the back, etc.

These feelings have to be overcome or supplanted by others before the prejudice is finally and completely rooted out, or corrected. But many prejudices persist, and some even grow. For example, the anti-vivisectionist has such strong feelings associated with the ideas of pain to animals, their unprotectedness, their right to immunity from pain, and of himself as champion of the animals' rights, etc., that on the one hand he sees "torture" in every laboratory use of animals, pictures inquisitorial instruments therefor, and thinks all physicians who uphold vivisection are deceivers and delight in the "torture" of the animals, and that these physicians invent diseases in order to practice on animals and humans; while on the other hand he cannot see the real meaning of articles which he misquotes or garbles, nor the real contributions to preventive medicine and to treatment which animal experimentation has rendered possible. Thus embryonic delusional systems are formed.

To understand why any particular anti-vivisectionist, for example, is such, we should have to inquire pretty deeply into the origins of the various unjustified or too strong feelings and of the associations between them and the different ideational components of the complex. We would probably find that some were taught

by or learned from parents or neighbors, that others arose from earlier or later experiences, and that some were perhaps instinctive.

In the same way we would find a very multiplex mass of causes for any one of our prejudices, if we would and could take the time and the attitude to impartially analyze them.

We normally form and hold prejudices without any derangement of our psychic processes as such. It is not the *process* that is at fault, only the *content*. The associations between one ideational content and another, or between an ideational content and an affective content, go in one direction instead of another, but the *process* of associating is normal. When you pound your thumb instead of the nail, all the physical *processes* as such are normal, but only the *direction* or *content* of the movement was changed or diverted. So it is with the mechanism of prejudice.

I have gone at some length into this mechanism of prejudice, because I believe that it is the same mechanism that is operative in true paranoia, and that it fully accounts for the psychosis. If this is the mechanism, it accounts also for the absence of any other psychotic symptoms, and for the absence of dementia except in the line of development of the delusions.

In the case cited we have as the apparent beginning of the psychosis an episode which aroused several strongly-toned affects.

The patient was rather ashamed of the locality where he lived, and somewhat more so of his going with the young men. He especially resented the kind of trick they tried to play on him and their impudence in bringing the girl to his room, and also their subsequent teasing. He apparently took their threats to compromise him in earnest, and was on the lookout for underhanded as well as open attempts on their part to carry them out. Their relation to the owner of the mill gave them some advantage, and he had many doubts, suspicions and fears as to what they might do and how they might do it. He was decent-minded and clean-living, and this experience touched his intimate personal honor. This concentrated and intensified his feelings about it. He dreaded lest the young men in some way outwit him and thus actually succeed in compromising him.

These and other affects predisposed him to see efforts where there were none, to see causality where there was only coincidence, and to take possibility for probability or even actuality; and, on the other hand, to ignore inherent improbabilities and even impossibilities. But this is the mechanism of prejudice.

There seem to have been no other psychotic symptoms, and the

whole delusional system appears to have developed chiefly on this basis. Undoubtedly there were many other antecedent experiences that gave strength and content to many of the affects involved in the complex. It has not been possible to get at these, because, though willing to coöperate in efforts to stop the drugging, etc., he sees no connection between probing into his youthful thoughts, feelings and experiences and this effort, thinks it is all nonsense, resents the inquiries, and only gets angry and refuses to coöperate when attempts are made to analyze them.

Two questions arise in connection with this whole subject. First, why does this particular person, normal or otherwise, have this particular prejudice, and second, why does the same mechanism stop short in most persons, and develop to such an enormous extent in the few paranoiacs?

The first can only be answered by thorough intensive psychological analysis of the given individual. Studies of this kind are very much needed, but so far as I know have not yet been undertaken. As a general underlying condition we may perhaps say that man, in the course of his evolution, has not yet become as much of a thinking animal as he gives himself credit for, and that affects still open the doors of associations—and so determine the content of his recollections and thinking, the direction of his trains of thought,—more than he realizes. But this does not help us in the specific instance.

The second question,—why the mechanism of prejudice stops short in most cases but in rare cases allows development into delusions of paranoia—is even more difficult to answer.

In ordinary normal life prejudices seem to be self-limited, as it were, and only comparatively rarely are they either elaborated or extreme. Perhaps the reasons are to be sought, as many think, in the make-up of the individual. The ignorant who do not like to admit their ignorance hold prejudices, but do not elaborate them much. The more elaborated prejudices are held perhaps by persons whose make-up is characterized by a certain amount of intellectual imaginative activity, even brilliancy, and by keen lively emotions, with strong sympathies and equally strong hates or repugnances. Before we can say that this is so, however, a large amount of material relating to prejudices must be collected. At all events, the paranoiacs whose cases are best described have had these characteristics.

When sufficiently comprehensive studies have been made, it may

be found that there is an unbroken series of cases extending from the simple unelaborated prejudices such as we all have, through the cynic, the optimist or the pessimist; then the anti-vaccinationist and some other ardent reformers; then the religious exhorters like Pastor Russell, or the extreme anti-Catholics; then the founders of religious sects like Dowie or Sandford; then, perhaps, unrecognized paranoiacs in private life, who keep their ideas to themselves and menace no one; to finally the paranoiacs who come to notice because of anti-social acts that require, for the protection of members of the community, their segregation in hospitals.

Two further questions also arise—Why are prejudices, and paranoiac delusions, so strongly held, and why do they persist?

Again, in the absence of sufficient studies, we may only guess. But *a priori* it would seem reasonable to guess that both the strength and the persistence of the prejudice would depend not only on the strength of the affects involved, but on how deeply they were rooted in or affected the inner personality. The studies of Freud and his followers show that affects associated with certain experiences or thoughts in early childhood are often very strong and lasting,—often more so than later ones. We may accept these findings without accepting the Freudian interpretations. I am inclined to think that, other things being equal, the more importance the subject-matter, *i. e.*, the complex, has for the individual, and the more intimately personal it is, the stronger and more durable are the associated feelings, and hence the more difficult it is to uproot, suppress or supplant them. Again, in the case cited, and in the best reported cases in the literature, the initiating experiences seem to have had these qualities. In paranoia it may also be that an unusual combination of both internal and external factors is necessary for the initiation and the development of the delusions.

There is one further point that I would like to make. Persons who have prejudices do not on that account dement. Neither do paranoiacs,—that is, not in the way in which patients with other psychoses do. Kraepelin mentions a patient of 90, paranoiac for 43 years, who was not demented. Yet there is a deterioration of a certain type, in that the delusions gradually grow. As the years go by, the patient more and more frequently sees in mere coincidences some causal connection with his delusional ideas, more and more trivial and inconsequential incidents assume signficance in his eyes and confirm him in his beliefs, and less and less is he capable of correcting these ideas. His judgment and reason grow less and

less good in relation to his delusional system, while remaining good in relation to other matters. Thus the deterioration is wholly and only in the line of the evolution of his delusions. In this the deterioration differs from that in all the other dementing psychoses. It seems to me that this fact is wholly consistent with the mechanism that I have tried to outline.

DYNAMIC PSYCHOLOGY AND THE PRACTICE OF MEDICINE[1]

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In the development of our study of human physiology and pathology, it is but natural that attention should first be directed towards things which are most obvious and most easy of interpretation, leaving until later those facts which are less easy of comprehension. Psychology perhaps stands first among these latter topics and it has certainly been left to the last. Indeed, it can even now be truthfully said that to the average student of medicine, psychology is regarded as an unnecessary evil to which he may even add that the physician is merely engaged in treating men's bodies. The older view, still too prevalent, that the body is composed of a number of separate organs, each with its own physiology, pathology and therapeutics, has been especially difficult to combat in regard to the brain. To use a chemical phraseology, man is not merely a mixture of various organs, he is strictly a compound. We, as physicians, are called upon to treat the man and to be able to do this we must learn to regard him as a unit. In this unit, the nervous system is the connecting link between the environment and the means for adaptation, and no man has the right to consider himself a physician if he is not prepared to take into consideration the activities of the brain as well as those of the intestines and kidneys.

Psychology, in its broadest sense, is a study of the part played by the brain in the activities of the body. It has in the past been regarded very largely as a separate and distinct subject from that of the body. Psychologists have mainly limited their researches to the study of the state of consciousness as such and, valuable and useful as are their results, this has tended still further to draw a line of demarcation between body and mind. From the practical standpoint of the physician such observations are valueless unless considered in the light of their relationship to the purpose they serve.

It cannot be too strongly emphasized that mind is not a separate something with mysterious powers and a wonderful vocabulary. There can even be no question of psychophysical parallelism or the

[1] Read before the Pittsburgh Neurological Society, May 4, 1916.

influence of mind over matter. Mind is nothing else than the brain in action for the purpose of coördinating the activities of the effector organs of the body with the conditions of the environment. Let me, in passing, indicate the consequent ambiguity of such a common phrase as "mental disease." Mind is not an organ and hence cannot be diseased.

Man, the compound unit, differs only in efficiency of mechanism from the simplest living organism. Biologically, he has the same aim, the maintenance of life and more specifically of human life. All his complex machinery, his strivings and yearnings are directed towards this end and he is more efficient and more successful because he has a greater adaptability to conditions of life than any other form of living organism.

Our subject, then, concerns the part played by the brain in achieving these results. The qualification, dynamic, is used for the reason that it is being studied as a force determining the activities of the body and not merely as a state of consciousness.

The difficulty in grasping correctly the mechanisms involved is largely due to the tendency to regard mind as a separate entity simply because of the fact of consciousness. When one speaks of simpler nerve activities, such as reflexes, in which consciousness is an unnecessary and even a disturbing factor, the ordinary man has but little difficulty in grasping the sequence of events and does not feel any need to postulate any separate directing agent. A stimulus is applied to some portion of the body, say the cornea of the eye. Here there lie the end organs of certain nerve fibers which are thereby set into a state of activity, this state is transmitted along the nerve fiber to the central nervous system where it comes into functional relationship with the terminals of another set of fibers. These in turn are set into action and the excitation is carried along them outwards to their endings in relation with certain muscle and gland cells. This causes these cells to perform the special function peculiar to them. There results the contraction and relaxation of certain muscles so that the eyes are closed whilst tears are poured out from the lachrymal gland.

Such a sequence of events, even though a reflex, is obviously not a chance collection of cell activity, but is accurately designed to carry out a definite purpose. It occurs without direction by any hypothetical mind and note that the reflex includes glandular as well as muscular activity together with all the necessary vascular readjustments. In this example we have an illustration of the entire purpose of the nervous system, which is the activation of the effector

mechanisms of the body adequately to meet the conditions of the environment under which the maintenance of life has to be sought. The brain is merely a more complicated mechanism evolved for the more efficient accomplishment of this purpose and the fact that brain activities are conscious does not in any way alter the principle involved.

It may well next be asked what is the special value of consciousness in rendering the effector mechanisms more efficient in the struggle for existence. The answer to this question is not easy to give briefly, but it may be pointed out that consciousness is the brain in action and that the development of the brain in the course of evolution coincides with the appearance of organs of special sense, particularly with that of those organs which are adapted to respond to stimulations coming from a distance, such as the organs of smell, sight and hearing. The organism is through them informed of changes in the surroundings taking place at a distance from the body, so that there becomes possible some preparation for taking advantage of, or avoiding, the altered conditions in a way which might well be impossible if the need for adjustment were in immediate proximity. With this possibility of postponement and preparation for action, the selection of the best mode of response can be made to better advantage.

The brain is so constituted that functional connections between different cell groups tend to become more and more closely established the more often they are used together. There are thus formed through sense experiences, associations between brain cells in various combinations, each such combination corresponding with some object, situation or happening. The future activity of any such combination whether aroused by fresh sense experience or by association with other combinations, is a state of consciousness which corresponds with that of previous activity of this set of nerve cells and we say we recognize or remember the corresponding experience. This mechanism differs in nowise from the associations which have been established, as the result of experience by generations of ancestors, in the lower levels of the nervous system and which are handed down to us in the form of what we call reflexes.

Hence we may say, briefly, that consciousness or brain activity serves the especial purpose of permitting a better grasp of the conditions to be reacted to, by arousing memories of past experiences of similar kind together with memories of all of the possibilities in the way of reactions and their consequences with which we have in any way become acquainted. The selection of the particular reac-

tion to be made is based upon the identical laws which govern all body activity, the sum of which is that that reaction follows which promises, in the light of the experience of the individual, to offer the best chance of securing the satisfaction of the fundamental law of the maintenance of life.

At first glance one might be inclined to regard selection of reaction as peculiar to conscious adjustments or brain activity and indeed this is, perhaps, the most difficult point for the average man to grasp. We are so imbued with the feeling that we have the ability to choose what we shall do under any given conditions that we are liable to forget that the selection always follows a certain rule. "I do as I wish" and "I adopt this course because it brings what I want" are common phrases and really contain the germ of the truth. It is the wish or want that makes the selection and these represent what we have spoken of as the law of maintenance of life.

But the researches of Sherrington and others prove beyond question that selection of reaction takes place even in the lower nerve centers. Thus, for instance, if in a dog, the brain of which has been entirely severed from connection with the lower centers, the sole of the hind foot is stimulated there may follow one of two reflex reactions, the leg may be either flexed or powerfully extended. Sherrington has shown that the question as to which of these two reactions will follow depends more upon the quality of the stimulus than upon anything else. If the stimulus be at all severe, calculated, were the animal capable of consciousness, to give rise to pain, the flexion reflex always follows and it is evidently adequately designed to remove the foot from harm. On the other hand, a gentle stimulus may give rise to the reflex known as the extensor thrust which is apparently part of the movement of walking. Here, then, we have an excellent example of the selection by the nervous system of the proper response to be made to meet varying conditions of the environment even in the absence of all possibility of consciousness and, at the same time, the key to a correct view of the way in which the brain acts. Consciousness is merely the means of using individual, as opposed to inherited, experience in the selection of the best mode of response and does not alter the general principle of nerve activity.

While speaking of reflex responses in the brainless dog, let me refer to another phenomenon which is perhaps of even greater significance. Sherrington has demonstrated that if the stimulus to the dog's foot be sufficiently severe, not only does the limb flex and thus tend to be removed from danger, but there may also occur a whole series of complex movements among which the animal's head is

turned towards the foot, the teeth are bared and he may even emit a growl. In this we have a more decided effort to protect the threatened foot by the use of the dog's natural weapons of offense. If it were capable of feeling, we would have no hesitation in saying the animal is angry. In other words there is an adjustment of the effector mechanisms of the body of the kind that is usually spoken of as an expression of emotion. And yet remember the dog feels nothing.

I cannot too strongly emphasize the importance of this observation, for it teaches us firstly that such primitive emotional states do not require consciousness for their occurrence, and secondly that emotion is not merely a state of mind, but is a state of the body. It is true that there is a difference between the emotional reactions of the brainless and of the unmutilated animal in that the latter shows a more prolonged and more efficient adjustment. This, then, must be the element which is added by the brain mechanisms.

Dynamic psychology is largely a study of emotional reactions, and it is therefore important to make clear what one is to understand by emotion. It seems, for some reason, to be difficult to avoid thinking of emotion otherwise than as a state of consciousness pure and simple. Even at the risk of boring you by repetition let me again remind you that it is not merely a state of mind but, as in the example given, an especially vigorous adjustment of the whole effector mechanisms of the body, glandular as well as muscular, towards meeting some situation of especial importance. This statement in itself contains the whole story. Emotion means an adjustment to conditions which have importance in the maintenance of life, or, as we often put it, to those situations which affect us nearly. The more important biologically any given situation, the more prompt, vigorous and decisive must be the reaction. Thus, a feeling of emotion is an index of biologic importance. A similar significance belongs to such other terms as attention, interest, affect, instinct, desire, fear, etc.

These phenomena of emotional adjustment may be primitive and inherent in the situations themselves, in which case the modes of reaction are provided by inheritance. Of these the anger of the dog quoted above is an example. On the other hand, changes in the environment may acquire interest as the result of experience by the individual that they have a definite bearing upon his ability to maintain the life of his race and of himself.

This is one of the most important problems in psychology and lies at the root of the modern views of psychopathology as elabo-

rated by Freud, Jung, Janet and others. I have repeatedly spoken of the fundamental law of living matter, the maintenance of life, and it will be necessary to go into this somewhat more in detail. It is customary to speak of this as an instinct inherent in all living matter and we must simply accept it as an axiom. It is generally subdivided into two parts, viz., self and race preservation, although these are intimately related to one another. They are also usually given in that order, although I would prefer to reverse this for the reason that, biologically, the preservation of the race is by far the more important. Many animals and plants will sacrifice their own lives for the preservation of the species. There is, then, a (not necessarily conscious) inherent striving for the maintenance of life which becomes, in the animal provided with a human brain, a feeling of desire or craving. It is still the same force, unaltered by the fact of consciousness, and may be regarded as the driving power leading to all activity whatsoever. Pleasure and pain, satisfaction and dissatisfaction represent consciousness of success or failure of this craving and are the foundations of our whole emotional life.

If one is to gain any comprehension of dynamic psychology, it is essential to grasp this fact and to realize that this craving or desire, libido as it is now being called, is not some new mysterious mental weapon created by the psychopathologist, in spite of the elaborate vocabulary he has built, but is the common property of all living matter.

The preservation of race and self must be accomplished at the expense of the environment in which the individual is placed, and since much of this is hostile and inimical, there has to be maintained a constant struggle. It is this need for struggle which has led to gradual improvement in the means for fighting. In this process of evolution those conditions for ensuring the maintenance of life which are most fundamental have become so well determined that but little variation is to be detected even in widely differing species of animals. The effector mechanisms of man, including his circulation, respiration, digestion, excretion and reproduction, differ but little from those of other mammals and we may regard these as modes of adjustment selected unconsciously as the result of the experience of innumerable generations of ancestors.

But it must be remembered that such modes of adjustment, being the result of general experience, must frequently be inadequate in the experiences peculiar to the individual and it is for the purpose of a more labile adaptability that the mechanisms of the brain have been especially evolved. By means of the brain path-

ways the various effector mechanisms of the body are rendered capable of a greater variety of combined activity without the addition of new organs. The brain has evolved in such way that the whole experience of the individual becomes a factor in determining his reactions, even dominating the organization with which he is endowed through ancestral experience. These two types of reaction, the inherited and the acquired, are easy to differentiate at the extremes and are usually spoken of as reflex and voluntary respectively. The distinction, however, becomes less obvious where they coalesce.

Reactions to be successful must often be prompt, delay might mean failure or even death. There is, hence, a strong tendency for modes of reaction, even those established by individual experience, to become standardized, or as we generally say, habitual. The more often we react in a certain way, the more liable are we in the future to react in the same way under similar conditions. This is a matter of everyday observation and we readily recognize that every person has certain habits or modes of reaction which stamp him with a certain character and, if we know him sufficiently well, we feel that we can predict what he will do under given circumstances. We must then recognize that there is going on a constant organization of our experience of situations and the results of reactions to them with the tendency to establish more and more clearly certain habits of adjustment. Obviously, the possibility of forming such habits is greatest in the earliest years of life and variations become less likely as age progresses. All these adjustments, from what has been said above, represent nothing else than efforts to satisfy the cravings of race and self preservation.

With these, necessarily brief, introductory remarks concerning fundamentals, I propose to pass on to consider certain points of immediate practical interest. First may well come the meaning of what are termed convictions or beliefs. A belief represents a conclusion reached with regard to some particular situation or group of situations. In other words, it represents a mode of adjustment already selected. Conclusions may be more or less important in the struggle for the preservation of race and self, or, to express this in conformity with what has already been stated, they may have more or less emotional coloring. This implies not merely a state of mind, but an attitude of the whole body. This state of the body is part of the belief and quite inseparable from it. The greater the biologic interest belonging to the conviction, the greater the intensity of special bodily adjustment and, further, the greater the interference

with carrying out other adjustments of the body not in harmony with the attitude assumed.

This is a matter of the very greatest everyday importance to the medical practitioner. Most physicians are more or less familiar with the fact that the beliefs of a patient often have much to do, not only with his recovery or relief, but also with his becoming "sick." We hear much talk in these days about the influence of mind over matter, suggestive therapeutics, faith cures and healing cults of various kinds. But there is no need to appeal to mysticism and dogmatism. If one appreciates the mechanisms I have briefly outlined, one has a complete and reasonable basis for understanding the disorders arising on this basis and how to deal with them.

Furthermore, the importance of studying the patient as a complete personality by determining his views, fears, and desires, together with his knowledge or mis-information of physiological facts bearing upon them, are of as much importance as an investigation of the individual organs of which his body is composed, although this is too often the sole thought of the physician. Remember that a conviction of ill health or disease of any organ means an attitude of body in which the functional activity of all organs is involved to a greater or less extent. A firm conviction, for instance, that the bowels will not act without purgatives is quite sufficient to explain chronic constipation. This does not say that the belief causes the constipation, but the latter is part of the attitude of the body representing this particular belief. The manner in which such convictions come about is of course quite a different question. I propose to touch briefly upon some of the principles of the more complex ways in which these may arise later, but may merely mention here that the mechanism may be simple. For example, there may occur some intestinal upset resulting in constipation at a time when, under emotional stress, for instance, the maintenance of health is an all-important matter. There results a fear of the constipation and a doubt as to the functional capacity of the intestine which may lead to the formation of a settled habit of body. The treatment of such a case, then, becomes a matter of teaching physiology to the patient. This is not so easy as giving cathartics but will be found much more efficacious.

Similarly a belief by the patient that certain effects will follow the exhibition of certain remedies is liable to lead to erroneous interpretations by the physician and has frequently resulted in an unjustifiable exploitation of remedies. The convictions of the physician mean an attitude of his body which is discernible by those to whom

he tells them (a further illustration of the fact that a belief is not entirely mental), and this will often render him far more convincing to his patients with the consequences of belief on their part.

We may now pass on to a brief statement of a further principle which though more complex is of even greater importance. As evolution has progressed and the struggle for life has become more severe, there has appeared, very gradually, a system of coöperation among individuals for mutual assistance and protection. This system of social or community life brings, besides the advantages which led to its adoption, certain restrictions upon the activities of each individual. The instinctive desires and cravings, the libido or force of life, inherent in each individual lead of necessity to conflicts between the members of the society. This, necessarily, has caused the development of certain regulations and restrictions upon the activities of the individual in order to preserve the social union. This is not a very difficult matter to grasp and yet it is very largely the crux of the whole question of the modern views of psychopathology which seem to many so shrouded in mystery and so unintelligible. To put it simply, man, like other living organisms, is striving for the satisfaction of libido, but is required by the social conditions of his existence to control his appetites. He is required to gratify them only under certain restrictions which constitute what are called the laws of society. In other words, he must under certain conditions repress them. Notice that this is repression and not suppression which would inevitably result in failure, since it would destroy the fundamental aims of life itself. Man still has the desires inseparable from life, but must gratify them only under restriction.

Thus, social existence brings with it the necessity for modes of adjustment foreign to primitive instincts. The mechanism for these adjustments is provided in the brain pathways, the activity of which is consciousness. Necessarily, those desires which are most subject to regulation or repression are those which are strongest, for this means those which are reacted to most violently and therefore are most likely to lead to discord and conflict in society. Hence one need not be surprised that social regulations fall especially heavily upon the reproductive instincts and that repression is most marked in, though not by any means limited to, this sphere as ordinarily understood. Much of the criticism of modern psychopathology is directed towards the prominence which is given to sexuality by its exponents. But if one regards all activities as directed towards the maintenance of racial life, this objection simply becomes one of a definition of the term sexual. Under this view all emotion, includ-

ing anger and fear, is a reaction having as its purpose the preservation of life, perhaps primarily individual, but at the same time also racial and thus in a very broad sense all activities may be called sexual.

Denied by social regulation the frank expression of undiminished libido, how does man react? In this there are large individual variations and it is in these variations that we find explanations for many differences in types of personality and for many of the so-called functional neuroses and psychoses. It is quite impossible for me even to attempt any discussion of these varieties of reaction, but I propose to try and outline the general principle which lies at the root of our present conception of them. Before doing so, let me recapitulate certain points which are of importance. Libido or desire, the mainspring of all human activity, is not a product of consciousness, but is common to all living matter. Emotion is bodily activity and not merely a state of mind. Emotion is an index of the biologic importance of the situation giving rise to this reaction. The greater the importance of any situation for the satisfaction of libido, the more potent the reaction.

Throughout life there is a constant preparedness to fulfil the demands of libido, to create and take advantage of opportunities for its gratification. This must, of course, mean that there is a fluctuation from time to time in the intensity of appetite and emotional adjustment. This fluctuation depends in part upon conditions inherent to the structure of the body and in part upon accidental conditions of the environment. The possibility of creating opportunities for the gratification of libido is essentially the outcome of consciousness which, as we have seen, affords the mechanism for postponement of reaction or futurity. Man thus takes an interest in, or has an emotional attitude towards, the tilling of the soil in order that he may have the opportunity to eat in the future. In this illustration there has been a repression of the natural instinct merely to live and take advantage of the gifts of nature with the joys of the chase, etc., and the man has adopted a different mode of meeting conditions by performing certain acts which may be said to contain, in themselves, no inherent interest. They acquire interest only by the results which will follow later and which the individual has discovered by experience.

There is thus the substitution of one activity for another, which might be described as a more natural mode of adjustment. This principle of substitution, here but vaguely indicated, is one that comes to play a very large part in determining human conduct.

Let me give you a more clear cut illustration of what is implied with some of its consequences. In a farce I saw played a few years ago, one of the principal characters was a German shopkeeper of extremely irascible temperament. So violent did the man become, even on small occasion, that he endeavored, whenever he began to get angry, to count ten before replying. This he succeeded in carrying out and on frequent occasions during the play would suddenly break off and begin marching up and down, saying ein, zwei, drei, etc., in a vigorous and emphatic manner which was extremely ludicrous and to the uninstructed observer would have been entirely incomprehensible. Anger is a powerful emotion and hence implies vigorous activity on the part of the body. Repression of anger is one of the laws of society, but this does not mean its suppression, which is impossible, and hence it has to find some expression. In our shopkeeper it took the form of an activity which, while harmless in that it did not bring him into conflict with social law, really accomplished nothing of the purpose of the emotion. The substitute reaction had even no real relationship with the anger at all and consequently appeared strange and not appropriate to the occasion. Were you to observe such behavior without the key to its meaning, you would be liable to conclude that the man was insane. Many of the oddities and peculiarities of sane as well as of insane persons are to be explained on an exactly similar basis.

Differences in the particular character and methods of selection of substitute reactions are some of the main features in defining differences in types of personality. At present we know very little of the factors governing the tendency to select any given type of substitution but we are beginning to be able to analyze and group them. Roughly, one might classify them as helpful, harmless and harmful according as they succeed in promoting the purpose of the emotion, the frank expression of which they replace, and permit the individual to satisfy his instinctive desires in the environment in which he is placed. Illustrations of the two first have been given already and one might cite the tendency to substitute dreaming for reality as an example of the harmful type. In this case the individual tends to build castles in the air and to picture the accomplishment of the desired end instead of reacting by direct activity. Such, it seems to me, is at the bottom of what is known as the dementia præcox type of reaction. The patient, in face of situations full of libidinous importance, tends to retire more and more into his dream world and thus become more and more incapable of social existence. Obviously, this is not the entire explanation and it is used

merely as an illustration of the general principle of substitution and substitutive disorders.

The understanding of these mechanisms has, as I think, been unnecessarily obscured by too much emphasis upon the question as to the awareness of the individual of the meaning of the substitutions which he practices. It might be alleged that the substitution had taken place unconsciously, for instance, if the irascible German referred to above were himself unaware of the meaning of his absurd behavior. This question is one of great interest and has given rise to the use of such descriptions as unconscious, subconscious and co-conscious activity by different writers. Nevertheless, it may be pointed out that it is from the patient that the meaning of such obscure reactions is always learned, if it can be learned at all, and one can only conclude that being capable of being recalled to memory it must, at some time, have been within his conscious experience. It rather seems that, where the question of unconscious substitution could be raised the emotional expression is so repressed that the individual does not admit the real facts of his desires or longings even to himself.

The particular substitute expressions selected by different individuals may be more or less obviously associated with the emotional expression which is repressed. Sometimes there seems to be no connection whatsoever, with the result that, as in the German shopkeeper cited above, the conduct of the individual seems entirely inexplicable. Nevertheless, close study will often reveal an association dependent upon some personal experience of the past. Into this question, deeply important and interesting as it is, I cannot enter as I fear I may have already exceeded the limits of your patience. Let me merely state that the types of substitutions we have called helpful, practically include all activities which represent the conversion of individual libido into social interests, the substitution of the welfare of society for that of self. For that reason such substitutions have been described by Freud as "sublimations." The harmless group are important as explanations of many oddities of conduct and behavior and will include many hobbies and habits which may otherwise seem inexplicable.

The third group is by far the most important to the physician, for it includes the adoption of attitudes which render the individual more or less incapable of social existence. In them will be found the explanation of many conditions of functional disorder (often called functional disease), the manifestations of which represent substitutes for libidinous gratification. The diversity of type is

well indicated by the names given to the different groups which will include hysteric, psychasthenic, neurasthenic, paranoic and dementia præcox modes of reaction, besides other less well differentiated forms. Among them will also come some criminal activities.

In concluding this very summary sketch, I realize that I have attempted to cover a very large area of ground and do not pretend to have done more than scratch the surface. My object, however, has been to give, in simple language, a broad statement of fundamental principles which may serve to permit a more intelligent consideration of details which often seem so mysterious and obscure. The difficulties disappear as soon as one grasps the fact that mind and body are not separate and distinct entities, the one guiding the other, but constitute an inseparable, harmonious unit, this unit being activated by a single force or purpose, viz., the maintenance of life.

A CONTRIBUTION TO THE SYMPTOM COMPLEX ASSOCIATED WITH INTERPEDUNCULAR TUMORS*

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While the subject of pituitary tumors offers many problems of the greatest theoretical interest, it is true that it offers no fewer problems of immediate clinical and practical interest. The following case is presented with the idea that the correlation of certain of its symptoms with experimental observations may be of some value of the latter sort.

The patient, J. C. (2d), a white male of 30 years, was born November, 1885, of Irish parentage.

The family history showed that the patient had four brothers and three sisters, living and well, and twin brothers and twin sisters who died shortly after birth. The informant thought the mother and father were dead. There was no history of heredity.

Past history showed that the patient was the second youngest child. His early life was normal. Education was rudimentary. In Ireland he worked as a farm laborer, but came to the United States in 1902, where he has worked as a coachman and carriage washer, earning as high as $12 to $14 a week. He was steady, saving, well-liked; indulged in an occasional glass of beer. Married Nov. 25, 1913, he has twin boys, born Oct., 1914 (1 yr. 8 mos. old). The wife has had no miscarriages.

The present illness began gradually in Nov., 1914, when the patient complained of feeling tired and sleepy all the time. He lost his job because he could not keep awake and sleepiness became a cause of unsteady employment. In May, 1915, he would sleep most of the time and when awake would talk and act peculiarly. His speech was incoherent. He would get up at night, dress, and walk the streets looking for work. In June, 1915, he lost control of both sphincters for the first time. The patient was admitted to the Wards July 8, 1915, on a certificate which stated that the attack began two months previously though the patient had not worked steadily since the previous November and had been dementing since then. It was also stated that the patient was uncleanly, dull and apathetic, disoriented for time and showed poor memory for recent events.

* Presented in brief under the title "A Case of Brain Tumor with Some Symptoms" at a meeting of the Worcester District Medical Society held at the Worcester State Hospital, March 8, 1916.

The notes from the hospital record show that the patient was good-natured, quiet and tractable and his conduct did not vary from this. He knew his name, but thought that he came to the Hospital in May. He knew the Hospital and its character. He did not feel that he was insane but felt weak, nervous, run-down, and that he could not eat anything. He had not observed that his memory was failing. More recently he had been troubled with headaches and occasionally had had pains from the back going down either leg. He denied venereal infection, but admitted exposure. The

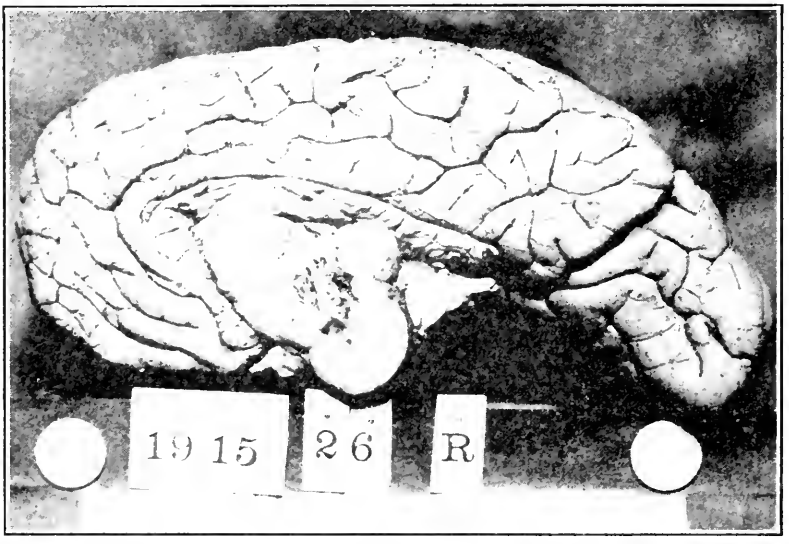

FIG. 1. Photograph of the mesial aspect of the right hemisphere, showing the relations of the tumor to the corpus callosum, chiasm, and pons. Several eroded areas appear in the tumor, some of them containing blood. The retrogressive changes here point to this location as the oldest part of the tumor and lend support to the idea that the origin of the tumor was in the floor of the third ventricle.

mental examination revealed no delusions or hallucinations. Asked if he were married, patient says, "Yes, sir, I have a wife and two children—twins at that—one year old." Asked how he accounts for his present sickness, he says, "By Godfrey, I don't know."

Physical Examination.—Height 5 ft. 5¾ in., weight 168 lbs., temperature 99°, pulse 82, respiration 22. Well nourished, extremities moist. Glands were slightly large in the groin. There was some edema of the prepuce though no scars were seen. Pulmonary and vascular systems were negative except that the arteries were thought to be slightly hardened and the blood pressure was 140 systolic. Abdomen was negative. Urine negative. Wassermann on the blood and spinal fluid negative.

The pupils were equal and regular but the reaction was sluggish and through a small arc. Visual fields showed bitemporal narrow-

ing, not amounting to an hemianopsia. Reflexes were exaggerated. There was a fine, rapid, irregular tremor of the extended hands and of the tongue margin. Patient was unsteady in Romberg's position and there was some tenderness on deep pressure over nerve-trunks.

A spinal puncture done on the morning of July 12 was followed in the evening by a severe vomiting spell and by a second on the

FIG. 2. Photomicrograph of a cellular part of the tumor. Shows the intercellular substance and many undifferentiated cells, many poorly stained. (Lens 7a, Ocular 2. Eosin methylene-blue stain on Zenkerized formalin tissue.)

following morning. The patient became stuporous and lost control of the sphincters. For the next week control of sphincters improved as did the mental condition. The patient talked coherently, but showed some difficulty called "ataxia." He denied pain. There were no hallucinations or delusions.

July 20 at 9.20 P.M., patient developed convulsions lasting 15 minutes and again at 10.40 P.M. lasting 20 minutes. He regained consciousness till 2 A.M. when a series of short convulsions occurred accompanied by unconsciousness which persisted till death. The movements were said to be general with frothing at the mouth.

When seen by the physician in charge (Dr. H. C. Arey) they appeared to be confined to the respiratory apparatus. There was no cyanosis. Attempts to open the mouth caused firmer closure of the jaws. A cleansing enema was not returned till 2 P.M. when pupils were dilated and the temperature began to mount.

An ophthalmoscopic examination at this time showed a small hemorrhage in the left fundus, a larger one in the right fundus with the surrounding vessels engorged (Dr. G. E. Mott). Temperature 106°, pulse 148, respiration 20. Exitus 2.35 P.M., July 21, 1916.

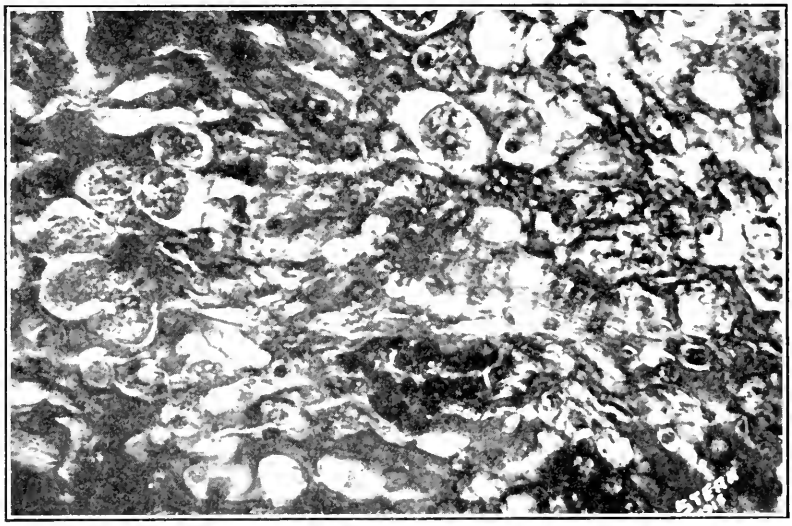

FIG. 3. Another area showing more structure in the cells and intercellular substance. The small, black, round bodies are red blood corpuscles which will serve as a standard for the size of the other structures. (Lens 7, Ocular 1, the bellows of the camera pulled far out. Mallory's connective tissue stain.)

The gradual onset of mental trouble in a previously normal man, accompanied by headache, "not being able to eat anything," together with bitemporal limitation of the fields of vision can point to very few things. The difficulty in this case seems to have been on the mental side. While loss of sphincter control, incoherence, and the night-walking incident are equivocal symptoms, being equally well produced by a disordered motor apparatus or by a disordered will to use an intact apparatus, disorientation and poor memory as they occurred in this case are signs of mental deterioration. But they are the only signs. Certainly the replies quoted above to several questions were those of a normal man. The speech at the Hospital was thought to be "ataxic" rather than incoherent. There were confirmatory neurological signs.

It was somewhat along these lines that the diagnosis of brain tumor in the region of the pituitary was made. In addition, it was thought that the patient's somnolence might be a clue to the origin of the tumor. This opens a question which may now be asked very properly in the light of recent work on the pituitary by Cushing and Goetsch (1). How far can somnolence as distinguished from coma or from stupor or from other semiconscious and unconscious states, serve as a sign of pituitary disorder? Whether rightfully or not the sign was considered to indicate pituitary disease by the diagnostician in this case and double certainty was felt because of the patient's subjective feeling of weakness and of being "run-down." He had the characteristic lethargy of hibernation. The patient may be said to have been hibernating. It is to be regretted that the other signs of hibernation were not tested in this case owing to the short duration after reaching the hospital. These signs are a low respiratory quotient, low body temperature, brachycardia, slowed respiration, lowered blood pressure, relative peristaltic inactivity, and marked insensitivity to painful or emotional stimuli.

On the mental side there was nothing characteristic of the disease. Disorientation and memory failure have frequently been observed with pituitary disorder, but they occur in so many other conditions that they have no pathognomonic value. Dullness and apathy noted in the case were doubtless a function of the patient's asthenia and drowsiness if they were not asthenia and drowsiness themselves, misinterpreted. The patient was apparently not demented. To say that a patient is demented is like saying he has a pain, except that the latter is subjective and the former is supposed to be objective. The night-walking incident was probably caused by the patient's disorientation for time, the loss having extended to the power of distinguishing night-time from day-time. Those who would assume that the patient had another sign of dementia called confusion, must account for the fact that the patient dressed before going out. Confused patients leave the house without the usual preliminaries of toilet. As there are centers in the cortex and thalamus whose stimulation causes reactions in the genital region, one must consider that disturbance of the paths connecting those distant regions, may cause disturbances in one or the other of them, and that untidiness is then no longer a sign of impairment of the prefrontal inhibitions.

Physically the patient was somewhat overweight, but not sufficiently to suspect pluriglandular disease. The temperature at entrance and the blood pressure are against the hibernation idea of the

man's drowsiness, but it is possible that they were terminal events. Respiration was always slow though not pathologically so, perhaps. Finally, it should be noted that the patient's drowsiness was not like that produced by intracranial pressure.

Pathological Report

Autopsy 4 hrs. postmortem. Body was hairy over chest, limbs and pubes. Right pupil measured 3 mm. vertical, 4 mm. horizontal diameter. Left pupil measured 3 mm. × 3 mm. External genitals undersized. Rigor mortis especially marked in the jaw. Panniculus 1.5 cm. over thorax, 3 cm. over abdomen. The omentum was laden with fat. The appendix measured 13 cm. in length. Pleural adhesions present over middle and lower lobes of right lung. The lungs weighed, right 424 gms; left 395 gms. The middle lobe of the right lung was very rudimentary. Infarct of the lung. The heart weighed 340 gms. Vascular system normal appearing. Kidneys weighed, right 155 gms.; left 162 gms. Accessory artery to upper pole of each kidney and the kidneys were lobulated. Left kidney showed one scar from an old infarct. Passive congestion was present in kidneys. Adrenals appeared normal. The spleen weighed 170 gms. It showed fetal lobulations and was very soft. The liver weighed 1,645 gms. and showed fetal lobulations. Pancreas appeared normal as did the gastro-intestinal tract. There was a small hydrocele on the right. Testicle did not thread well.

Central Nervous System.—Palpation through the dura revealed increased consistency over the first and second frontals on the right. Brain weighed 1,445 gms. The frontal area appeared to bulge forward. The Sylvian fissure took a more horizontal course than usual. The left hemisphere was fluctuant suggesting a dilated lateral ventricle. The convolutions were large and flat and lay closely approximated. At the base was a tumor mass measuring 4 cm. × 4 cm. extending from the optic chiasm anteriorly to the pons posteriorly, filling the entire anterior and posterior perforated space, overlying the mammillary bodies and separating the optic tracts widely. Section through the corpus callosum in the plane through the great longitudinal fissure showed that the tumor mass extended superiorly to the corpus callosum, filling the anterior genu, and extended posteriorly to the pars intermedia of the thalamus, filling the third ventricle. The tumor mass was soft and friable; showed eroded areas and small areas containing a reddish fluid.

Horizontal sections were made of the brain after it had been hardened in formalin. The tumor was very compact in its lower part and more expanded above. It was not so extensive on the left as on the right and yet the left ventricle extended higher on the left than on the right, and fluctuation was noted on the left at autopsy, before the brain was hardened. This apparent anomaly is explained by the fact that the tumor did not block the foramen of Monro on the right, in spite of its larger size, but did block the foramen of the left side. Corresponding with the larger size of

the tumor on the right was a feeling of increased resistance over the first and second frontals of that side, felt at autopsy.

The frontal limb of the internal capsule was distorted on the right. Perhaps to this was due the "ataxic" speech. The caudate nucleus was distorted or absent on the left. The thalamus was distorted on both sides.

The posterior surface of the sella was eroded offering communication into the sphenoidal sinus.

Spinal cord was normal.

Ophthalmoscopic examination repeated post mortem by another observer showed a large retinal hemorrhage in the right fundus and a smaller linear one in the left.

The cut surface of the tumor after hardening showed areas of an opalescent, refractile cartilage—or colloid—appearance.

Sections were stained for microscopic study by kresyl-violet, thionin, Weigert's neuroglia method, van Gieson's method, hematoxylin and eosin (Weigert's, Delafield's and Mayer's being tried), Mallory's phosphotungstic acid hematoxylin and the connective tissue stain and by eosin methylene-blue. The striking thing was the remarkable difficulty experienced in getting a stain to "take." Mallory's connective tissue stain was the only one that could be said to have succeeded easily and this was true mainly of its capacity to stain the intercellular substance for it did not stain the cells well. Sections stained by eosin methylene-blue had to be treated four times the usual length of time required and with double-strength stain. Eosinophilic cells were completely lacking as were basophilic cells. All cells appeared to be neutral. There was no tendency to cord formation with alveoli, but in parts there were masses of cells and in other parts few cells with a great preponderance of intercellular substance staining blue with the connective tissue stain and hence belonging to the group of connective tissues, amyloid, mucous, and hyaline substances. Near blood vessels were structureless masses staining red, probably fibrin. The cells seemed to belong to the undifferentiated anterior lobe cells.

Discussion

Considering first the local clinical signs in the light of the autopsy findings it may be thought from the gross findings that the exaggerated reflexes, unsteady Romberg, tremor, and "ataxia" of speech were caused by direct pressure upon the peduncles or perhaps more likely, by involvement of the motor pathways internally by the tumor. The question of untidiness can not be helped by this case as the tumor was so extensive as to involve the thalamus and paths from both the central and frontal regions.

The slight abnormality of shape of the pupils may have been missed clinically or may have been a terminal thing. Possibly it has no great significance.

The finding of rigor especially marked in the jaw is worthy of note in view of the firmer closure of the jaw on attempted opening shortly before death.

The peculiar fetal state of the shape of the organs and the predominance of the lymphoid structures is striking.

The undersized genitals with good growth of hair if due to pituitary disorder at all in this case, points to the adult type of Fröhlich's syndrome in which reversion to the infantile type occurs. The adiposity in this case was not marked, pointing to rather insignificant involvement of the posterior portion of the gland.

The microscopic findings if considered with the asthenic, drowsy state of our patient, assume a unique position.

At the time of the appearance of Cushing's monograph it was felt that asthenia and drowsiness when combined with adiposity, high sugar tolerance, sub-normal temperature and slowed pulse were due to secretory deficiency of the posterior lobe (2). However, in two cases (XVI and XXXVI) (3) in which these symptoms were improved by glandular feeding, whole gland was used and in one (XXXVI) thyroid was added. In another case (4) benefitted by injections of boiled gland and finally by implantation, whole gland was used. The aim at that time was not directed to alleviating individual symptoms, but the prophecy was made that at some future date we might be able to distinguish and treat disorders of separate parts of the gland (5). The feeding experiments, then, have shed no light thus far on the question as to which part of the gland caused the improvement of the asthenia and drowsiness noted in Cushing's cases, or whether the improvement was due to the combined actions of the total gland.

It now appears that somnolence in an individual with other of the cardinal signs of hibernation may point to a special sort of disorder of the anterior lobe of the pituitary, just as a peculiar distribution of fat in the body together with genital hypoplasia (dystrophia adiposo-genitalis typus Fröhlich) and high sugar tolerance unquestionably points to hypopituitarism. It will be seen that this assumption is based only on the association of asthenia and somnolence with a tumor whose cells resemble the undifferentiated cells of the hibernating animal. The idea of cause and effect between two associated conditions is recognized as one of the most naïve and it may be that more critical study later will reveal that the association is merely a chance one.

Another matter of importance in this case is the number of twin-pregnancies in this family group. This offers a coincidence of

unusual theoretical interest in view of the known connection between pituitary disorder and changes in structure and function in the internal genitals. Of course the current views concerning twin-pregnancies would deny to this high incidence any more than passing notice. But when one considers that our theories of twin-pregnancies are based mainly upon the evidence of comparative embryology and that even here the evidence is not entirely unequivocal, the matter at once assumes importance. Twin pregnancies are not the rule in pituitary disorders, doubtless, but further clinical observation may show that sexual variations of one sort or another are the rule. Merely by way of analogy, I would mention the phenomena in quite a different field, in order to cover the idea. I mean the phenomena of group reactions among the unorganized substances such as proteins and lipoids. While pituitary disorder may not necessarily produce twin-pregnancies, it may always produce sexual variations of some sort. Whether the converse would be true is perhaps less probable.

SUMMARY

A male of 30 years has active symptoms of eight months' duration characterized by drowsiness of such persistence that he lost various positions. He dies with signs of interpeduncular tumor.

The tumor is made up of undifferentiated anterior lobe cells such as are found in the hibernating animal and a correlation is suggested between tumors of this sort and the possibility of human hibernation.

There was a high incidence of twins in the immediate family of the patient. His organs showed fetal lobulations and other variations from the normal.

I wish to thank my technician, Miss Sherwood, whose patience made possible the study with stains and my assistant, Mr. Stean, who labored with the microphotographs. The clinical records are the work of my colleagues on the medical staff of the hospital.

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Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

JANUARY 2, 1917

The President, DR. WILLIAM M. LESZYNSKY, in the Chair

A CASE OF MYATONIA CONGENITA

By M. Neustadter, M.D.

The speaker said that in 1900 Oppenheim first described a condition characterized by a marked muscular atony and a paralysis in early childhood quite similar to poliomyelitis in some of its clinical aspects and reported several cases of that type under the name of myatonia congenita. In those cases he noticed an early weakness of the muscles of the lower extremities and at times also of those of the upper extremities. The atony was so marked that one could place the extremities in the most bizarre positions as if they were loosely pinned appendages. The deep reflexes were either weak or entirely absent, yet there was no visible wasting of the muscles and their electrical reaction to both currents was either very weak or entirely absent. After faradization, at times, movements of the muscles and even an absent reflex temporarily returned. There was also improvement in these cases and it was therefore deduced that there was a possible delayed development of the muscular apparatus as well as the anterior horn cells.

Spiller reported one case with necropsy findings in which there were no anterior horn cell changes, but marked muscle changes. In another case, however, he and Griffith reported a proliferation of the sarcolemma and connective tissue and their cells and fatty infiltration of the muscles. Some muscle fibers were atrophied, others were increased in size and still others presented a fatty degeneration. Accompanying these changes there were the following cord changes: the cells of the anterior horns were rather scarce and atrophied; the anterior roots were smaller than those of a normal cord and stained rather imperfectly and one peripheral nerve examined was much degenerated.

Scoog recently reported cases with degenerative changes in the muscles excited in vivo.

The clinical features were more or less uniform in all the reported cases.

The case under discussion this evening appeared to the speaker to be one of the type first reported by Oppenheim and named by him myatonia congenita.

The boy, A. P., seventeen months old, of Russian Hebrew parentage, was brought to the hospital for treatment suffering from a paretic condition. His parents were not of a high intellectual type and it was not certain that the history was completely given, but the family history as far as obtainable was negative as to lues or alcoholism. The mother related that the fetal movements of the patient while in utero were noticeable at four and a half months of gestation and they were quite strong throughout the period of gestation. Birth was at full term and normal without instruments. He was

breast fed, began teething at eleven months without difficulty and uttered his first words at ten months.

The patient moved all the extremities in a normal manner up to eight months, when his mother noticed that he was not standing on his legs as firmly as before and he did not sit normally. Within a few days a marked weakness manifested itself in the lower extremities so that the child was unable to stand at all. A month after the onset of the weakness the muscles of the lower extremities and of the trunk became completely paralyzed. The arms now began to grow weak and within a few days there was evident a paretic condition which was still present. The extensor groups of the arms and forearms seemed to be most affected.

At the age of seven months the child had fever for two days accompanied by brief vomiting, but he promptly recovered after the administration of a few doses of castor oil. The mother contended that this fever was the result of a dietary error. Besides this fever the child had suffered from no illness before or since.

The intellect of the patient was intact and he was clean in his habits. On physical examination he was found to be well nourished and of proportionate stature to his age and quite bright and intelligent. The reflexes, pupillary, scleral and pharyngeal were present as were the plantar; the biceps, triceps, radial, patellar and Achilles were absent, as were the abdominals and cremasteric. There was a complete flaccid paralysis of the muscles of the trunk and of the lower extremities and a paralysis of the upper extremities, especially marked in the extensor groups. On account of the extreme youth of the patient it was impossible to test the motor power of the various muscles. There was extreme atony of the muscles of the trunk and lower extremities, so that they could be placed in the most fantastic positions without any apparent discomfort to the patient.

The electrical examination showed no response to the faradic and galvanic currents in the lower extremities and only a weak response in the trunk muscles and those of the upper extremities, but there was no reaction of degeneration. There was no wasting in any of the muscles. The muscles innervated by the cranial nerves were intact. There was no disturbance of special sense organs. Pain and pressure sense were normal.

The mother refused permission for a lumbar puncture but the blood Wassermann reaction was negative.

For the last eight months the patient was carefully observed in Dr. Fisher's Clinic at the Bellevue Medical College, during which time he had improved to such an extent that he was able to sit up unsupported.

The question arose whether the temperature and vomiting a month preceding the onset of the weakness had anything to do with the case. Personally, the speaker believed the interpretation of the mother to be accurate. It could not be a case of poliomyelitis for the interval was too distant between the temperature and the onset of the paralysis, being nearly two months. The gradual onset, the absolute absence of any wasting in the muscles, the absence of reaction of degeneration in the muscles partially responding to faradization and the complete absence of any reaction to both currents in the lower extremities took the case out of the class of poliomyelitis. Marburg and others held that these were cases of uterine poliomyelitis. Against this theory stood, in the first place, the symmetrical development of the defects in all cases, the development of some cases a few months after birth and the fact that in some cases the muscles were involved and not the anterior horn cells, and that in those cases in which the cells were involved there was no evidence of any inflammatory changes.

Against Rothmann's contention that these cases were a type of the Werdnig-Hoffmann disease, it might be argued that there was no wasting and that they improved and the speaker was therefore inclined to regard this

case as belonging to the type first reported by Oppenheim and the diagnosis as myatonia congenita.

CASE OF DYSTONIA MUSCULORUM

By F. M. Hallock, M.D., and H. W. Frink, M.D.

Dr. F. M. Hallock read a history of this patient, a girl, fifteen years old, born in America of Russian Jewish parentage, who went to the Neurological Department of the Cornell Dispensary on November 8, 1916, complaining of difficulty in walking.

The family history was entirely negative. The patient was a full-term child, normal delivery and had a normal infancy and childhood up to the age of five, except for an attack of measles.

At the age of five she fell from a chair upon her back and for some time afterwards complained of pain in her back. Two or three months after this fall it was noticed that she did not walk as well as before, the legs seeming to be stiff and weak. The trouble began in the left leg and gradually involved all the other limbs, the left leg and arm being the most affected. For three or four years there was gradual exacerbation of the symptoms; her gait became progressively worse and she found increasing difficulty in using her arms for ordinary purposes, particularly the left, as when combing her hair, handling objects, etc. There also developed a certain difficulty in speech. There had never been a time when the patient could not walk at all.

Added to these symptoms the patient became very nervous; for instance, her sister stated she would become very much frightened and all her muscles became stiff on attempting to cross the street if there was a motor car anywhere in sight. Slight, unexpected noises, such as the slamming of a door, or sudden appearance of anyone, threw her into a panic.

All these symptoms grew progressively worse, including her difficulty in speaking, up to between the age of eight and ten, when there was a very marked change for the better. It was impossible to get from the relatives any information that would account for this improvement. It did not occur suddenly, but spread itself over this period of two years. Her gait improved, speech improved very much and she was less excitable. The improvement, however, did not pass a certain point and from the age of ten her symptoms had remained about stationary. She had never suffered any pain or other sensory disturbances. There had been no difficulty in swallowing and no sphincter disturbance.

On examination the patient was found to be well nourished and with a good color. She stood with the left hip higher than the right, the buttocks protruded and there was consequent hollowing of the back at the waist. She leaned a little to the right side, stood a little on the left leg with the right knee bent. Her gait was very stiff; she slid her feet along without lifting them and walked on the inner border of the left foot. She appeared to walk from the hips and a little on the ball of the foot, putting constant attention on her balance. She had a good deal of difficulty in using her hands in buttoning her clothes, writing, etc.

Throughout all the large muscle groups there seemed to be a disturbance of tonus; the muscles were spastic and movements were executed with difficulty. The spasticity was especially located in the thighs. The movements of the arms and hands were much disturbed. An effort to shake hands resulted in a movement something like that seen in writer's cramp. The movements were athetoid and grotesque. This was especially the case with the left arm and hand, which were considerably worse than the right. The hands were conspicuously affected and all the movements of the left arm

were performed with some show of the same difficulty. She could not raise the arm above the head or put it behind her back normally, nor use it as well as she could the other. Her handwriting was of course affected, but it was legible.

All these motor disturbances were evident only upon attempted motion. Passive movement was perfectly normal. There were none of the spontaneous and rhythmic movements when the patient was at rest, such as occurred in athetosis. No hypotonia was demonstrated.

All the tendon reflexes were exaggerated, but they were equal on both sides. The plantar reflex was of the Babinski type, the same on both sides, but there was no clonus, Oppenheim or Hoffmann. The abdominal reflexes were present but not very active and were readily exhaustible. There were no disturbances of tactile, pain, thermal or postural senses. The electrical response showed no definite abnormality. The muscles seemed slightly less responsive to faradism and slightly more to galvanism than was normal, but there were no polar changes and no evidence of the myotonic reaction.

She had no trouble in swallowing or in phonation, though there was a dysarthria which seemed to be due to a dystonic spasm involving the tongue, the muscles about the mouth and probably the larynx. Her speech was jerky and hesitant, somewhat like a partially controlled stammering. The patient herself referred the difficulty to her throat; she indicated that the larynx seemed to get stiffened. But the movements of the mouth and tongue showed the same dystonic character. There was considerable nervous excitability and the patient was a very light sleeper. There was no Romberg. The pupils were not quite regular in outline, but they reacted to light and accommodation. There was no nystagmus and the fundi and vision were normal. Wassermann and urine were negative.

MYOTONIA CONGENITA

By H. W. Frink, M.D.

A schoolboy, ten years of age, was born in America of Spanish parents. He went to the neurological department of Cornell Dispensary on March 8, 1916, complaining of some difficulty in walking. Family history was negative and he had always been well, except for a double mastoid operation at the age of four and his present trouble.

From the time he first began to walk his mother noticed some stiffness in his legs, which condition had remained ever since and was not progressive. It was especially noticeable when he tried to go upstairs. The patient stated, however, that he could run pretty well if he "first practiced a little to warm up." He had some difficulty in beginning a movement after a period of rest; it was hard for him to rise suddenly after sitting in a chair. When he closed his eyes tightly he had some difficulty in raising the lids. When he first began to talk he had some speech difficulty; this disappeared without treatment. He had never had any pain or other sensory disturbances.

Physical examination revealed a healthy-looking boy, with a rather bronzed skin and what appeared to be a good development of all the skeletal muscles. The difficulty in raising his legs when trying to go upstairs seemed to be due to a spasm in the thigh muscles; the spasm and stiffness tended to disappear as the movement was repeated. After hard contraction of a muscle immediate contraction was difficult. The muscles were abnormally sensitive to mechanical stimulation. Percussion of any of the larger muscles produced a well-marked muscle tumor which remained for nearly a minute. Electrical stimulation of the muscles had a similar effect. The patient had been given tablets of thymus gland for about a month and a quite definite improvement seemed to have taken place.

DISSEMINATED SCLEROSIS OCCURRING IN CHRONIC MALARIA

By C. B. Craig, M.D.

The patient was a Sicilian, forty-two years of age. Of great importance in his past history was the fact that fourteen years ago he began to suffer each year about the month of August with chills and fever, occurring intermittently and lasting ten days to two weeks. He treated this illness each year with purging and quinine. This lasted for six years. He was then quite well until about a year ago when the left leg began to grow weak and he had pain in the left side of the small of the back. After a month he began to experience pain and itching in the right thigh and a sense of retraction in the right leg. At the same time he became severely constipated and for a few weeks was occasionally incontinent of urine. There was no impairment of potency.

About nine months ago he noticed that cold things felt warm to the right lower extremity. During the past year the lower extremities gradually became stiff so that his toes scraped in walking.

Examination showed the following evidences of pyramidal tract disorder: A stiff-legged gait, increased knee and ankle jerks, left and right patellar and ankle clonus and a double Babinski. Absent epigastric, abdominal and cremasterics. Sensory changes consisted of diminished tactile and pain sensation of the right lower extremity and dissociation of temperature sense, invariably interpreting cold as warm. There was present in both hands the so-called Hoffmann sign. Pupils were slightly unequal, the right being larger, their borders were slightly irregular, but reaction to light and accommodation was immediate. There was a slight grayish cast to both optic discs. There was also slight nystagmus, it being more pronounced in looking to the right.

Spleen was enlarged and descended about six centimeters below the costal margin on inspiration; border was smooth, slightly rounded. The skin was of a curious pale yellowish cast. There was no genuine anemia. Wassermann, serum and spinal fluid negative. No excess globulin and no cells in spinal fluid.

On the tenth of December he was given ten grains quinine; on the morning of the eleventh five grains more. About noon he had a chill and temperature rose from 97° to 101° and was again 97° the following morning. Diligent search was made before and after the chill without discovery of plasmodia. On December 31 this experiment was repeated with the same result.

Dr. Craig said he believed that the enlarged spleen, the history of typical malarial attacks and the characteristic reaction of chronic malaria to quinine were sufficient evidence, without the presence of plasmodia, to attribute lesions in the patient's central nervous system to malarial infection.

Dr. Ramsay Hunt said that he would not regard the case shown by Dr. Hallock as one of dystonia musculorum deformans; nor, indeed, did it show the characteristics and peculiarities of true bilateral athetosis; the absence of spontaneous torsion movements would militate against the former diagnosis, and the absence of associated movements and spontaneous athetoid movements against the second interpretation. On the evidence presented, he would find it very difficult to classify the case with any degree of certainty, but would be inclined to regard it as belonging to the group of incomplete double hemiplegia.

Dr. Craig's case of disseminated sclerosis, associated with an enlargement of the spleen and a history of malaria, was of great interest. In the clinical course of the case, however, there were not the paroxysmal or inter-

mittent phases which were common in disorders of the central nervous system of malarial origin; furthermore, the absence of the parasite in the blood and the absence of anemia would perhaps militate against this etiology.

Dr. Neustaedter's case of myatonia was interesting as to the manner of its development, namely, following a febrile manifestation. The speaker had seen cases resembling myotonia following upon gastrointestinal disturbance in early life; they gradually recovered, and probably this clinical picture in infants might be produced by certain general affections, thus producing a symptomatic type of the disease.

Dr. Walter Timme said that Dr. Frink's case interested him particularly. The boy showed marked pigmentation and some congenital abnormalities, perhaps exaggerations of the normal type. The boy was ten years of age and on examination he showed disproportions between body growth and genitals, he had no pubic hair, had a pendulous abdomen significant of status thymicus and from that point it might be the case should be judged and treated. The fact that he did improve on thymus gland rather pointed to the diagnosis of this condition as a basis for his muscular difficulties.

Dr. C. C. Beling said that in regard to the case called dystonia musculorum, he agreed with Dr. Hunt that it was hard to diagnose it as such. There seemed to be an absence of spontaneous movements, the gait was a spastic shuffle and not one characteristic of dystonia. The speech was affected and there was an absence of hypotonia.

Dr. Foster Kennedy said that he hoped Dr. Neustaedter would bring his case of myatonia congenita before the Society some time, as the study of the photographs was not as enlightening as would be an examination of the patient. The account of the case did not seem to contain the usual characteristics of myatonia congenita. It was usual in those cases to find paralysis early and it might be possible that this case was really a poliomyelitis. The condition developed early in the life of the individual and tended to improve, in that way varying considerably from the group of muscular dystrophies. There was here a quite sudden onset ending in complete paralysis and afterwards some improvement. It seemed to the speaker that there was an acute condition imposed on that patient which was hardly characteristic of this disease.

The photographs were not incompatible with attacks of paralysis, not necessarily myatonia congenita, in which lack of tone was not only confined to the muscles but was shared by the ligaments and tendons.

Dr. S. P. Goodhart said he wished to say a word about the dystonia case. He had seen and studied two cases at the Montefiore Home and Hospital. The case presented here, while manifesting a gait and some of the other motor peculiarities of dystonia patients described in the literature on the subject, nevertheless appeared rather as a type of pyramidal disease with the usual spasticity. The pyramidal involvement, however, was obviously not characteristic, only the ill-defined Babinski being present to bear out the probable involvement of this tract.

More probably the case represented a type of lesion such as seen in lenticular nucleus disease; the characteristic torsion spasm, the peculiar corkscrew-like motor manifestation which characterized dystonia were not present in this case. The emotional features of dystonia were especially important; and in the variability of the emotional content the case presented bore strong likeness to dystonia. In one case the speaker had studied the motor unrest too had suddenly become intensified and the psychic unrest likewise. So great was the motor unrest that after three weeks of incessant choreiform generalized movements, during which the torsion spasm became most marked, to prevent complete exhaustion the patient was put under chloroform. During this period the hypotonia and hypertonia, at times alternating in the

same groups of muscles, became more marked. Even in sleep the abnormal movements continued. The erector spinæ and the trapezius muscles were at times so hypertonic and contracted as to cause most painful opisthotonos. The administration of chloroform alone caused relaxation and even in deep narcosis the hypertonus of the hamstrings was very marked. The patient was extremely emotional and the general movements, faintly suggesting chorea, though they were not truly choreic, were palpably influenced by the emotional content.

The pathology of this condition was really perplexing; it was a question if the disease was functional or organic, on the boundary, or just over the line and upon organic soil. The symptoms which had their organic basis in the large basal ganglia seemed to approach so closely to those regarded as purely functional as to strongly suggest that there was just here a close relationship that would yet bring enlightenment as to the seeming transition of the functional into the organic.

Dr. I. Strauss said that he wished to take exception to Dr. Timme's classification of Dr. Frink's case as status thymicus. Status lymphaticus was not a term altogether justified scientifically, but the term status hypoplasticus might satisfy the most critical. The objection, however, was not so much to the term as to the claim that this boy's pendulous abdomen was significant, as most children of that age had abdomens more or less pendulous. However, Dr. Timme was correct in saying that there might be something constitutionally wrong in this case, but it was difficult to see how he could attribute the boy's improvement to the thymus treatment he had received for one month.

Dr. H. W. Frink, in discussing the case presented as a dystonia, said that they had used that name for lack of a better one. It was a dystonia in so far as there was a general disturbance of muscular tonus, but it was not a case of Oppenheim's dystonia; on the one hand there were present pyramidal tract symptoms and speed disturbances, and on the other there were lacking the profound disturbances of gait and posture which characterized Oppenheim's disease. Naturally one thought of double athetosis in connection with the case; yet it was difficult to regard it with that condition, for there were lacking the spontaneous movements which characterized athetosis. One might best regard the case as being neither Oppenheim's disease nor athetosis, but midway between the two.

Dr. M. Neustaedter said that he understood Dr. Kennedy to say his case might be one of poliomyelitis. The history of the case could not be said to be accurate, as the father and mother of the child were not of a very high intellectual type, but the mother stated that the fever at seven months was due to faulty diet and was relieved by castor oil. The fact that she was rather observant was proven by her noticing a month later that the child could not sit or stand normally. Admitting that the child had fever, the speaker had never heard of a case of poliomyelitis developing slowly a month after the rise in temperature and resulting in complete paralysis of muscles of the body and lower extremities two months after fever, and nine months later improving under massage and electrical treatment of a few months. There was no wasting in this case.

Dr. C. B. Craig said that in reply to Dr. Hunt he might remind him that one could go through the literature and find cases of disseminated sclerosis due to malarial infection, without plasmodia being found during life. Marie claimed that malaria was one of the infections producing disseminated sclerosis and the preceding history of this case pointed to malaria being the etiological factor.

Dr. W. M. Kraus said that Dr. Craig's case reminded him of a woman who was admitted to Bellevue Hospital for gynecological treatment with a

diagnosis of carcinoma of the uterus which was made on account of the profound anemia and emaciation from which she was suffering. On further examination it was noticed that she had a double Babinski, increased knee jerks, ataxic tremor of both arms, absent abdominal reflexes and definite nystagmus. There was also enlargement of the spleen. The blood showed enormous quantities of tertian plasmodia, hemoglobin was below 40 per cent., and the red cells numbered less than 4,000,000. Under quinine therapy the plasmodia as well as all the neurological symptoms disappeared, the hemoglobin went above 80 per cent. and the red blood cells above 4,000,000. Apparently the neurological condition was cured by the quinine.

An interesting point was that on admission the Wassermann reaction was 2 plus (full positive = 16 units). From this no conclusion could be drawn at that time. About one year later she came back to the ward with a tertiary lesion of the nose at which time the Wassermann was returned as 15 units. This change was interesting in relation to the quinine therapy. The prompt disappearance of neurological symptoms under quinine showed these to be due to malarial infection.

"PUNCTURE" HEADACHE

By Charles L. Dana, M.D.

The speaker said that the methods of modern medicine had caused, not a new disease but an additional morbid state, viz., the headache and associated symptoms following puncture of the spinal cord and the removal of cerebrospinal fluid. This headache had become so common and its cause so well recognized that the term "puncture" headache had become a colloquialism in the hospitals.

It was not a serious condition, and it lasted but a short time, but it was a distinctly new thing in pathogenesis and neurology; hence, it was proper to study it, describe it, and, having learned its natural history, to place the systemized knowledge of it in the literature of neurology. Incidentally it might be learned how to prevent it and some inferences might be drawn from its phenomena as to other forms of headache, for the cause of other headaches was hardly so well known as that of this particular one.

The headache rarely began until the day following a puncture, when the patient was usually allowed to get up. It might start, however, directly after operation, or come on three days later, depending on the activity of the patient and the condition of the cerebrospinal fluid circulation. The patient felt a diffuse, bilateral and rather severe pain over the upper brow and perhaps somewhat less in the back of the neck and occasionally worse in the occipital region. The pain might be accompanied by nausea, or even violent vomiting, also with some giddiness and mental confusion and faintness. The symptoms were all increased by active exercise and were usually promptly relieved by lying down; the flatter he lay the better he felt. There might be some changes in the pupils and in the blood pressure. The condition lasted, with remissions, five or six days to two to three weeks.

The symptom was more common in patients whose cerebrospinal fluid was negative and in whom the fluid came out under low pressure; in other words, the healthy cord reacted badly to puncture. It was more common and severe in young adults, in women and in persons of high-strung nervous temperaments, also in the anemic or thin-blooded. In children, in acute conditions like poliomyelitis and meningitis, when there was high pressure, puncture often relieved.

In diagnostic puncture the amount of fluid usually removed was 4 to 10 c.c.; it did not make much difference whether a small or large amount was removed within these limits. The headache resulted from the acute disturbance of the mechanism of the cerebrospinal fluid circulation. Removal of fluid from the cerebrospinal ventricles did not cause the headache probably because in these cases the patient was kept very quiet in a horizontal position.

In about one half the cases of lumbar puncture in a hospital there was no headache reaction even if the patient was allowed to get up very early.

It seemed to the speaker that these "puncture" headaches might have a genuine value in calling attention to the circulation of the cerebrospinal fluid and the various way in which it might be disturbed.

CEREBRAL HEMORRHAGE AND STATUS LYMPHATICUS

By William Thalhimer, M.D., and I. Strauss, M.D.

Dr. William Thalhimer read this paper. He said that cerebral hemorrhage occurring in young people without a discovered lesion at autopsy was a rare occurrence. Syphilis and the constitutional anomaly called status lymphaticus had been thought to be responsible for the apoplexy in most of the cases. In the two cases referred to in this paper there was no evidence of syphilis, and there was a negative Wassermann reaction in the blood and spinal fluid in one. One showed at autopsy a definite status lymphaticus and the other presented a few anatomical changes indicating a mild degree of the same condition.

Case 1, aged seventeen years, was admitted to Mt. Sinai Hospital February 5, 1916, and died the same day. Diagnosis was status thymicolymphaticus; cerebral hemorrhage; colloid goiter; right hydro-thorax. Patient had had frequent attacks of tonsillitis for which tonsillectomy was performed three months before onset of present illness. For the previous year patient had trouble with one ear which discharged at intervals up to the time of the tonsillectomy. No history of headache or vertigo.

Onset was sudden; in the morning the patient felt ill and shortly afterwards collapsed; paralysis of entire right side developed. Taken to the hospital that day.

On admission to the hospital patient was in a moribund condition; there was aphasia, discharge from both ears and tympanic perforation; presystolic thrill and rumbling presystolic murmur at apex. Sudden death occurred eight hours after onset. There was a faint trace of albumen in the urine but no casts. Temperature 99.8°, pulse 72, respiration 24 on admission.

Autopsy showed a slight depression in the cortex of the left hemisphere at the region of the parietal lobe. The pia over this was slightly thickened. Section through this depressed area revealed the presence of a large gelatinous-like blood clot involving a considerable area of the centrum semiovale and extending into the left lateral ventricle, which was moderately dilated with blood. The thymus measured $7.5 \times 5 \times 1.5$ cm. There was a central cavity which contained dirty gray material. On the left side of the thymus were three hard masses resembling calcified lymph nodes.

Heart showed slight thickening of the mitral valve but no vegetations, and the elasticity of the aorta was increased. Lungs: Right thoracic cavity contained about 100 c.c. of clear fluid; lung was edematous and congested; left lung showed same. Spleen showed the Malpighian bodies much enlarged. Intestines showed marked hyperplasia of the solitary follicles and Peyer's patches of the ileum. Mesenteric lymph nodes varied in size from a pea to a marble.

The microscopical examination confirmed the diagnosis.

Case 2, aged nine years, admitted to Mt. Sinai Hospital June 19, 1912, died two hours later. Anatomical diagnosis, intraventricular cerebral hemorrhage (source and cause unknown). Status lymphaticus. On the morning of June 19 at 8:15 a.m. about one half hour after eating strawberries and cream, patient was taken ill with violent headache, vomiting and convulsions. Became comatose at 9:45 a.m., was removed to the hospital and died at 11:15 a.m.

Physical Examination on Admission.—Dullness and harsh breathing at right upper apex; pupils contracted; head turned toward left; abdominal reflexes absent; knee jerks not obtained; big toe in permanent extension; no clonus. Urinalysis: sugar present, no albumen, no acetone, no diacetic acid; microscopically negative. Temperature 99.2°, pulse 72, respiration 20.

Autopsy.—Convolutions of brain were somewhat flattened; third, fourth and lateral ventricles filled with a large, recent blood clot.

Mesenteric glands enlarged to size of small marbles. Thymus and regional lymph nodes slightly enlarged. There was congestion and beginning red hepatization of the upper lobe of the right lung.

These two cases were instances of cerebral hemorrhage occurring in apparently healthy individuals without either macroscopical or microscopical lesions to account for it. It was the custom to expect sudden death in cases of status lymphaticus. These cases showed that there was a group in which exitus occurred after some hours during which the patient presented symptoms of a cerebral type.

Status lymphaticus, status thymica-lymphaticus, or status hypoplasticus, as the condition was more properly called, was a constitutional anomaly. The individuals appeared to be predisposed to a variety of pathological processes which affected principally the glands concerned with internal secretion. The status was a condition which was the expression of a congenital tissue weakness. The sudden death in these cases had been explained as due to an accidental increase of vagus tonus. Very frequently death seemed to have been preceded by activities such as bathing, coitus or emotional excitement which resulted in increased demands on the sympathetic system and especially on the organs innervated by it. The theory of too rapid utilization of the adrenalin of the body had been advanced as a cause. There was nothing in the way of experimental data or fact to substantiate these hypotheses.

In these cases there was this state of status lymphaticus. This meant a congenital tissue weakness, and it was therefore probable that some alteration in either the vessel walls, or in the blood pressure, or in the heart action, caused the hemorrhage in the brain.

Dr. Charles A. Elsberg said that recent studies made by experimenters in Boston and Philadelphia and by Dixon and Halliburton in London were contributing a better idea of the secretion and the circulation of the cerebrospinal fluid. It was now known that under normal conditions only very small amounts of the fluid were secreted, that the fluid was a true secretion of the choroid glands and that there were various conditions which would cause an enormous increase in the secretory activity of the choroid glands. Thus it was known that asphyxia, certain drugs and the escape of fluid itself through a fistula would cause a marked increase in the secretion. Why, after the extraction of a small amount of fluid by lumbar puncture, there should be marked symptoms was still not explained. It was surprising that one could operate upon the brain, or upon the spinal canal and allow large amounts of fluid to escape and still never see any symptoms like those which appeared after lumbar puncture. Perhaps the fact that the air which entered the subarachnoid space kept up pressure conditions might be an explanation; but much work and much investigation would still be necessary before this problem was solved.

Dr. William Sharpe said that at the Polyclinic Hospital these puncture headaches were now infrequent. He believed that when the fluid was allowed to run out rapidly, as was formerly done, then headaches occurred very frequently, but if the needle was inserted and the fluid withdrawn slowly, as was now done, drop by drop, ten or fifteen minutes being consumed in the process, then headaches were very infrequent. The sudden withdrawal of the fluid from the cerebral spinal canal, rather than the large amount drawn, predisposed to the headache.

It was rare for these headaches to develop in children. It was true, as Dr. Dana said, that they were more frequent in women, but in the speaker's experience they had occurred in patients with increased pressure. The headaches depended on the mode of removal rather than on the quantity removed.

Dr. I. Strauss said that the subject of puncture headaches interested him very much. He had done many punctures, but had been unable to explain the subsequent headache. At Mt. Sinai they were now very infrequent, for it had been made a rule not to withdraw more than 3 c.c. of spinal fluid at a time. The rule was really 2 c.c., but it had been found impracticable to keep within this limit. This quantity was all that was necessary, for it took only 1 c.c. to get a Wassermann reaction, the cytological examination took a very small amount and the globulin test only 0.1, which sufficed for the ordinary examination. Unfortunately, headaches sometimes followed the removal of even that small quantity; it sometimes caused meningismus with marked rigidity and Kernig's symptom, which lasted for a week with the severe pain unrelieved by any posture in which the patient could be placed. When the puncture was followed by compelling the patient to lie flat for twenty-four hours there was less likelihood of headache, and if it occurred it could be relieved. In cases of internal hydrocephalus in children they rarely suffered from headache following puncture, probably because the pressure in the cranium was adjusted gradually. Caution should undoubtedly be taken in regard to the speed of the removal. Sachs and Schwab, of St. Louis, recently read a paper on cerebral conditions in which they spoke of sudden death in cerebellar neoplasm, but there need be no death if the puncture were properly performed. The fluid should be under absolute control and be taken out drop by drop. Occasionally, where death did not occur, there would be increase of symptoms, but that was temporary and due to disturbance of intercranial conditions.

The speaker had been impressed, as Dr. Elsberg had, with the impunity with which the spinal fluid was drained away in surgical cases, and had often wondered why these cases had not the headache seen following lumbar puncture. But it must be borne in mind that those surgical cases were in a condition of more or less shock following the operation and the sensorium was not in the state of those undergoing lumbar puncture, and in addition for twenty-four hours or even forty-eight hours subsequently they were under the influence of morphine, so there was really no analogy.

Dr. M. J. Karpas said that in his experience chronic alcoholics were not able to stand lumbar puncture as well as others and dementia præcox cases also did not stand it very well. At the Neurological Institute they always insisted on the patient remaining in bed for twenty-four to thirty-six hours, but in spite of that they had headache and sometimes, as Dr. Strauss had observed, of the meningismus type.

Dr. Foster Kennedy said that it could not be the loss of the cerebrospinal fluid that caused the headache, nor even the amount of it, because there had been many cases where there was constant leakage of cerebrospinal fluid and the patients did not complain of headache. At one time there were many postoperative cases where the skin wound was not properly closed and the fluid leaked for two weeks, so that the dressings had to be changed twice a

day; there was leakage to such an extent in some that they became marasmic, but they did not have headache. Nor could the fact of the absence of headache after operation be due to the fact that the patient was in a recumbent position. The cases referred to were frequently allowed to sit up and some to get up.

Dr. C. B. Craig said that his experience had been along the same lines as Dr. Kennedy's. He had the opportunity of seeing shell wounds of the spine in France where there was contusion of the cord and the open wound continued to drain spinal fluid for weeks, until death supervened, and none of the cases complained of headache.

Another phase might be mentioned. In 1914 the speaker undertook to make observations on lumbar puncture headache in connection with meteorological conditions. The pain in rheumatism related to the barometer and was not purely imaginary, and in lumbar puncture there was a definite and controllable cause for pain. Daily reports were obtained from the weather bureau as to humidity, temperature and atmosphere pressure. Only thirty observations were made when unavoidable interruption occurred and no definite conclusions could be drawn with such variable factors from so few observations.

Dr. S. P. Goodhart said that it was well known that when there was a continuous escape of cerebrospinal fluid, its replacement was so constant and rapid as to continuously cause an enormous increase in the amount within the bony canal and yet no headache was observed. Of value to this discussion also was the fact that where a certain amount of fluid was withdrawn by spinal puncture and a replacement made, and hence balance established by introducing a corresponding amount of fluid therapeutically prepared, headaches rarely occurred. Thus the loss of fluid within the canal and the attending mechanical changes within the cranial cavity would seem to be the factor in the production of the headache after spinal puncture.

Dr. B. Onuf said that these cases reminded him of some of the investigations of Klose and Vogt in regard to the relation of the absence of the thymus to disturbances on the part of the nervous system and bones, and came to the conclusion that permanent absence of the thymus during its period of physiological activity invariably led to a state of idiocy and terminated in death. They emphasized this for the guidance of surgeons who were often led to remove the thymus in view of grave symptoms of respiratory obstruction. The authors also exhaustively referred to the status thymica-lymphaticus and its surgical bearings.

Dr. Ramsey Hunt said that he had seen a number of cases of cerebral hemorrhage in young adults. He had not noted, however, any association in these cases with the status lymphaticus. The cases which had come under his observation could be traced to renal or cardiac affections, some vascular anomaly, lues, or latent tumor. He had, however, seen cases in which none of these factors could be demonstrated, and in which there had been a previous history of slight trauma, either direct or indirect, as by a fall on the base of the spine. Such an injury might well produce a weakening of the walls of an already defective blood vessel. The interest of status lymphaticus to this whole question would be the possibility of a defect in the development of the vascular system.

Dr. Timme said that it was difficult to diagnose status lymphaticus except by taking into account the small variations from normal shown by disproportionate body growth, especially skeletal, which to inexperienced eyes might seem normal. Wiesel, on status lymphaticus, stated the fact, heretofore mentioned by others, that the blood vessels in this condition were anomalous, the aorta small and thickened, the caliber diminished, as were all the vessels. That might tend to show the reason for the hemorrhage when no other could

be found; with this there was the compensatory relationship of the suprarenals, especially the cortex, the gonads and the thyroid. Through splanchnic stimulation on sudden exertion, the supply of adrenalin, if small, was used up. As it was needed by the smooth muscles of the body, the arteries and the heart in their physiological activity, its sudden absence allowed its antagonist—cholin, produced by the suprarenal cortex—to overact. But this overaction was exerted on the vagus nerve, as cholin was vagotonic, and there was sudden stoppage of the heart and death. Klose and Vogt proved the adrenalin content of the suprarenal medulla in cases of death and in status lymphaticus to contain quantities of adrenalin which should have been distributed to these organs and was not, showing there was some block in its distribution. Deficiency of adrenalin was to a large extent a factor in the production of death.

The speaker was surprised that Drs. Thalhimer and Strauss did not give some idea of the condition of the thyroid, the gonads and especially the adrenals in these cases for they, rather than the thymus, had an important bearing in status thymico-lymphaticus. He wished to say here that the thymus gland administered to a case of status thymico-lymphaticus for a month might be advantageous if the thymus was enlarged in compensation, and improvement might result. The best results, however, should follow the use of small doses of thyroid with adrenalin.

Dr. I. Strauss said that he was familiar with Wiesel's monograph in which he said that these cases must be regarded as suffering from constitutional anomalies or congenital tissue weakness, as Weichselbaum expressed it. Various organs of the body besides the thymus and lymphatic glands showed pathological changes or had pathological functions. Wiesel spoke of the exhaustion of the adrenalin as probably an active factor in these cases. Emotional conditions, according to Crile and others, influenced the adrenals, causing increased secretion, and this fact had been shown recently by Cannon to be true, not only of the adrenals, but likewise of the thyroid. Dr. Timme's suggestion, as well as Wiesel's theory, could not be correct in the light of present-day knowledge.

The question of the relationship between the internal secretory glands and the sympathetic nervous system was still a subject of investigation and controversy. Lewandowsky had written an excellent article criticizing the stand taken by the Vienna school upon sympatheticotonus and vagotonus, and showed very clearly that there was no anatomical nor physiological basis for their theory, and that the pharmacological basis was not a sufficient one upon which to base it. The cases described unquestionably had constitutional anomalies and hence were subject to pathological changes which would be brought about by stimuli which would not affect a normal individual. There was no history of trauma in either of the cases.

Dr. C. C. Beling said that he had had a similar case of cerebral hemorrhage. He was called to see the son of a physician, eight years old, who after playing in the yard apparently in perfect health came to the house with a severe headache, rapidly became comatose and died in three hours. The father said that except for suffering from adenoids and enlarged tonsils, the boy had been in good health. Dr. Martland, of the Newark City Hospital, performed the autopsy. He found a large hemorrhage in the temporal lobe. There were three or four miliary aneurysms in one of the vessels supplying the lobe. One of these had ruptured and caused the hemorrhage. His diagnosis was hypoplasia of the cerebral arteries associated with an enlarged thymus and a general lymphoid hyperplasia.

Dr. John T. MacCurdy said that in the first case it seemed to him careful search might have revealed a glioma into which a hemorrhage had occurred. He had seen such a case where it took a long search to discover the tumor tissue post-mortem.

In reply to the discussion Dr. Thalhimer said in answer to Dr. Hunt that the heart showed slight fibrous thickening of the mitral valve, the kidneys were normal and there was no reason to suppose embolism arose to cause the hemorrhage. As far as a hypoplastic condition of the aorta was concerned, the condition of the aorta seemed to correspond to a hypoplastic aorta in the seventeen-year-old girl. A hypoplastic condition of the blood vessels was looked for, but nothing definite was found microscopically. The walls were thin in most places, but not much more so than normally in a girl of this age.

So far as a glioma was concerned, every effort was made to discover one if it were there, neuroglia stain, etc., but unsuccessfully.

As far as degenerative changes were concerned, there was edema and also fragmentation of cells lying next to the hemorrhagic area.

The adrenals were normal both in gross appearance and microscopically.

NEW YORK NEUROLOGICAL SOCIETY

FEBRUARY 6, 1917

The President, DR. WILLIAM M. LESZYNSKY, in the Chair

TWO CASES OF MYOTONIA ATROPHICA

By I. Abrahamson, M.D.

The first patient, a woman, aged 38 and single, gave the following family history. One brother died at the Montefiore Home of a so-called progressive muscular dystrophy of the peroneal type; he had congenital cataracts. This was before the disease picture of myotonia atrophica was first described, but examination of the history seemed to show that he had the typical form of the disease.

The previous history of the case shown was negative. The present illness began fifteen years ago with the development of a peculiarity of gait. The lower limbs became weaker, the right more than the left, and she had great difficulty in climbing stairs, the gait becoming careful and the foot having to be raised high from the ground. Soon afterward a similar weakness in the forearms and hands developed. There had been a slow and steady progression of the symptoms, especially in the legs, most marked in the peripheral portions, but also in the arms, so that sewing became more difficult. There were no sensory disturbances, objective or subjective, at any time. Sphincters, vision and speech were normal. The exact date of onset of the weakness of the neck muscles was not noted, but attention had been drawn to it about fifteen years ago.

Physical examination revealed the following: a peculiar facial expression, a sleepy expression, sinking of the cheeks, wasting of the temporals and masseters, some weakness of the external recti muscles, weakness of the facial muscles which was distinct in forehead, eyes and lips and the patient was unable to completely close the eyes and lips. There was indication of myotonia in the direct muscular response of tongue and lips. There was wasting of both sternocleido muscles; when lying down she could not raise her head. The grips were very weak on both sides. Other movements of the upper extremities showed decided weakness, yet no distinct paralysis. At times there was evidence of myotonic response in the hands. Direct muscular irritation showed a distinct myotonic response in the thenar and hypothenar eminences, especially the left. There was no scoliosis. Electrically a myo-

tonic response could be obtained. Patient could not get out of bed, nor rise from a chair without help. The tendon reflex tests showed jaw jerk lost, triceps and wrist jerks not elicitable, absent Achilles and markedly diminished knee jerks. In summing up, one might conclude that the family history, the distribution of weakness and wasting, the myotonic response all confirmed the diagnosis of myotonia atrophica.

The second patient, also a woman and married, was clinically much more typical, yet the family history was absolutely negative. The illness began one year ago with cough, expectoration and progressive weakness, also night sweats, etc. Owing to the patient's low order of intelligence it was impossible to obtain from her any reliable information as to the cause of the disease, and it was also impossible to obtain thorough coöperation in making the various tests.

The facial expression was peculiar; there was an unusual protrusion of the lower jaw, a sleepy look, inability to close the eyes tightly and lack of normal lines of smiling. The speech was peculiar and shrill, doubtless largely due to the fact that the false teeth were loosely held by the weak facial muscles. Temporals and masseter showed weakness and wasting. Pupils were normal; swallowing also. Patient could not whistle. There was bronchiectasis. Tongue protruded inadequately; no fibrillations; tapping the muscles of the tongue, lips and chin with a hammer showed an unusually characteristic myotonic response. There was almost total absence of power of both sternomastoid muscles, patient being unable to raise the head when lying down. There was weakness of the extensors of the forearms, feeble grips being typically myotonic. All movements were very slow and deliberate. All tendon reflexes diminished but the Achilles which were lost. Dropped feet; both peroneal groups being very weak. Gait steppage. No scoliosis. Electrically, myotonic reactions were obtained in various groups. This was indubitably a case of myotonia atrophica of the classical type. This condition was so uncommon that these cases were always worthy of presentation.

A CASE OF TUMOR OF THE CORPUS CALLOSUM AND FRONTAL LOBES. WITH SPECIMEN AND LANTERN SLIDES

By C. C. Beling, M.D.

Dr. Beling read an account of this case and Dr. H. S. Martland, who performed the autopsy, threw pictures of macroscopical and microscopical sections on the screen.

The patient was a man of 54 years of age. The history showed that though at the age of 17 he suffered from a mild form of lead poisoning, he had always been otherwise healthy and robust. He had syphilis at about the age of 24 for which he was treated without any return of the symptoms. At the age of 30 he suffered for a few days from vertigo, during which time, though fully conscious, he could not walk in a straight line, but had to circle around to reach an objective point in front of him. On January 23, 1914, on his return from Texas where he had been employed, he complained of a tired feeling, of burning sensations in his feet and of his eyes being hypersensitive to light, failing sight causing him to have his glasses frequently changed. He complained of a feeling of heavy pressure on the top and front of his head. For many years he had experienced difficulty, if interrupted, in resuming the thread of a conversation and during the last few months of his life this difficulty was extremely pronounced. In April, 1916, it was noticed that he was forgetful and failed to understand what was said to him. In May he had a convulsive attack which began with twitching of the right arm, hand and leg, the face not being involved. The eyes were deviated toward the

right. Consciousness was not lost. He could not speak, nor could he show his tongue on request. Three hours later he apparently recovered, but acted abnormally while eating, exhibiting marked automatism in his movements. Five days later he was sufficiently recovered to resume work. A week or two later he began to talk and act in a silly manner and all through June he grew steadily worse. His conduct was peculiar; he was dilatory and not prompt in his actions. He often stood up for a long time and did not seem to be able to sit down, and at times asked to be pushed down. For some time previous to the convulsive attack in May he could not control his emunctories and later he urinated and defecated involuntarily, due to cerebral involvement. He gradually grew more and more somnolent. He had been a great reader and had had a retentive memory, but in June, 1916, it was observed that he did not concentrate his mind on what he was doing. He changed gradually from an active and energetic state to one of general indifference. At times he seemed to be worried and at others he joked in a silly manner. He frequently did the opposite of what he was told to do, made mistakes in dressing and failed to correct them after his attention was directed to them, and had many other apraxic disturbances. On July 2, 1916, the day before his death, he suffered from a persistent spasm of the jaws, which were tightly set, and both hands were in constant motion. The sense of smell could not be tested on account of his mental state. Optic neuritis was more marked in the right eye than in the left. Sight was reduced to 20/70. The other cranial nerves were apparently normal. On request, the tongue was at times protruded clumsily without tremor or deviation, while at others the teeth were shown or no action followed. The right epigastric reflex was somewhat diminished and easily exhaustible. The knee and plantar reflexes were fairly active. No Oppenheim, Babinski, clonus or Gordon. The gait was unsteady and somewhat ataxic and there was an occasional tendency to fall forward. The handwriting showed markedly the condition known as clonic perseveration. The spinal motor and sensory functions were normal. Blood and urine were normal. Blood Wassermann was negative. Objects grasped in the right hand were tightly held and could not be released readily. There was diminution of spontaneity of movements and will-lessness. His mental condition was characterized by irritability, inattention, impairment of volition, automatism, inability to concentrate and loss of memory for recent events and partially for remote events; incoherence and irrelevance in conversation and irresponsibility of speech and action, exhibition of clownism, silly jesting and the making of witticisms (Witzelsucht) with loss of ethical sense, alteration in character, temperament and tastes and a steadily progressive dementia which terminated in increasing stupor, coma and death, which occurred on July 3, 1916.

A clinical diagnosis of tumor of the corpus callosum and frontal lobes was made on the grounds that the disturbances of association resulting in apraxia, chiefly of the agnostic ideomotor, aphasic and agraphic character, was referable to a lesion of the corpus callosum; the automatisms to the right prefrontal and the defects of volition to a left prefrontal.

Eight hours after death a post mortem examination of the head was made. Cross section through the anterior portion of the brain revealed a large, apparently round tumor occupying the inner halves of both frontal lobes, and genu and the anterior third of the body of the corpus callosum. The tumor was found to be separated in its anterior half by the longitudinal fissure, and to form a somewhat horse-shoe shaped mass. It was infiltrative in character, fairly well circumscribed but not encapsulated. The other parts of the brain showed only the effects of a continuous and slowly progressing intracranial pressure.

The tumor presented the gross characteristics of a telangiectatic, infil-

trative, non-circumscribed glioblastoma which had invaded and destroyed the white matter of the anterior half of both superior frontal gyri, more extensively on the right than on the left, the anterior fifth of the cingulate gyri and the association fibers in the genu and anterior third of the body of the corpus callosum. It also encroached upon and destroyed to a small extent the inner portions of the fiber tracts of both midfrontal gyri.

Microscopic sections of the tumor showed that it belonged to a class of tumors of epiblastic origin in which the type cell was a neuroglia cell, namely, a glioblastoma. The greater part of the tumor presented extensive retrograde changes, especially necrosis and hemorrhage.

Dr. B. Sachs said that he wondered why so much emphasis was put upon the involvement of the corpus callosum, as in his opinion this was much more a tumor of the frontal lobe. Did the frontal symptoms play a less important rôle than was generally the case? Did anyone ever make a diagnosis of corpus callosum tumor that did not impinge upon the frontal lobe? If so, he would like to hear of it.

Dr. J. Ramsay Hunt said that some years ago Dr. Putnam of Boston had reported a series of cases of tumors of the corpus callosum in which lack of initiative, both psychic and motor, was a conspicuous feature, and he asked if this peculiarity had been observed in the case just reported.

Dr. C. P. Oberndorf, replying to Dr. Sachs's inquiry, said that while he was at the Manhattan State Hospital they had a case which was diagnosed as paresis, but which at autopsy was shown to be one of tumor of the corpus callosum. Judging from the history of the case of Drs. Beling and Martland, and from the mental picture, one might readily have been misled here also to make a diagnosis of paresis. In the Manhattan State Hospital case the tumor originated in the corpus callosum and extended downward into the right capsule, causing a mild hemiplegia on the left. A curious thing was the absence of the knee jerks, notwithstanding the hemiplegia. The patient had suffered from convulsions, recovered and was apparently normal until a few days before his commitment to the state hospital.

A CASE OF DYSPITUITARISM WITH HEART BLOCK

By M. Packard, M.D.

Dr. M. Rothchild described a few lantern slides, thrown on the screen, of electrocardiograms and radiograms of this case which Dr. M. Packard presented with a description of the history and physical findings.

The patient was a native of Smyrna, 23 years of age. His early history was rather suggestive; although the third child in the family, at an early age he was taller than his two older brothers; also, although the climate was tropical, he always felt chilly. Eyesight had always been good. There was no venereal history nor had he ever had any desire for sexual coitus. His symptoms were as follows: persistent headache for several years; for two years considerable precordial pain; for about a year periodical nasal hemorrhages, probably vicarious menstruation; dizziness and attacks of restlessness; occasional unaccountable sensations of thirst which were associated with polydypsia and polyuria; marked constipation, evacuation taking place only once weekly; an apparent polyuria, getting up in the night to void frequently. He never perspired, even on exertion in hot weather and did not ever have to cut his fingernails. He was mentally alert, but complained of being so physically weak that he was unable to work. His temperature was as a rule subnormal, averaging 96.8°, pulse 46 and respiration 16. He had a pleasing low tenor voice.

Physical examination showed the skin to be remarkably delicate and white There was no beard on the face, no hair on the chest or axillæ and the small amount of pubic hair was arranged in an effeminate configuration. Fingers long and tapering. Height 5 feet 11 inches and patient was still growing. The papillæ at the base of the tongue were hypertrophied, a condition seen in internal secretory disorders. Fat was distributed in special places. The penis was infantile; the testes descended but small; the scrotum was divided in two halves like a vulva. Superficial and deep reflexes were normal. Both visual fields and fundi were normal. There was a systolic murmur at the apex; the heart was hypertrophied. Systolic blood pressure was 100, but .001 gm. of adrenalin raised the pressure to 115. Wassermann reaction was negative. Blood sugar was 0.07; 300 gm. of lactose was given with no resulting glycosuria. 150 gm. of dextrose with a hypodermic injection of .001 of adrenalin produced no glycosuria, and 0.1 gr. pilocarpine caused a slight diaphoresis. His urine was clear and he passed 800 c.c. within twenty-four hours, the specific gravity being 1010. The alveolar tension was tested because of the low blood sugar and was found to be 45 plus by the Merriot apparatus. Blood urea and uric acid were low. Phthalein test showed 70 per cent. excretion within two hours.

The X-ray examination showed that while a peculiar bony configuration of the sella turcica was seen, there was no indication of absorption, erosion or pressure defect. The size of the sella turcica was small.

Electrocardiographic studies showed complete dissociation between the auricles and ventricles. There was also present a sinus arrhythmia. One record, taken before the administration of atropin, 1/50 gr., showed a condition of complete heart block; the ventricular and auricular rates increased after the administration of atropin; there was evidence that the block was not wholly functional; there were evidences of the influence of the vagus.

Dr. I. Strauss said that he had had a little experience with the electrocardiographic work at Mt. Sinai Hospital and it did not surprise him to hear that Dr. Rothchild was puzzled by the combination of conditions in his case. There was a case in the service of Dr. Sachs which might be mentioned in connection with the one presented here. This patient had a tumor of the pituitary and he was tested out with various glandular extracts, such as adrenalin, pituitrin and other like substances in an effort to learn what effect their administration would have upon a glycosuria from which he suffered. He had a glycosuria of 23 grams a day. One day he was given three doses of thyroid extract, about five grains at a time. This was immediately followed by a changed picture; instead of passing 23 grams of sugar, he immediately passed over 200 and continued to pass that large amount, so that a condition of glycosuria was converted into a true diabetes. The further interest of the case was this: the patient went to Boston to be operated on by Dr. Cushing for the tumor. He had acromegaly and also suffered from severe headaches. For some reason he refused operation and returned to New York. On arriving in the city he experienced a sensation as if an explosion had occurred (probably the breaking of a cyst) and the headaches disappeared and had not returned. In addition there had since been a disappearance of sugar from his urine. The speaker mentioned this case in connection with the testing out of Dr. Packard's case, to show how easily such cases were thrown out of balance by the administration of glandular extracts.

Dr. Walter Timme said that he was not prepared to say the case was clear, but there were some features that stood out in the dramatic presentation of Dr. Packard that led one to believe the condition was not altogether a result of dyspituitarism. The cause was much deeper to seek than that shown by the small sella turcica. The changes in the sexual sphere, the pre-

cordial pain and the distribution of hair were significant. Whenever one found inversion of sex, it was a good plan to search for the cause in the adrenal gland and in that portion of it known as the cortex. Tumors of the cortex of the suprarenal gland usually gave a type of inversion of sexual characteristics. Aplasia of the suprarenal cortex gave a more or less degree of amentia, so that idiots were found to be without it, and the lower the type of animal the smaller the proportion of suprarenal cortex to medulla. It was man that was characterized by great preponderance of suprarenal cortex. If by tumors of this cortex one got such results, it was only a step to the condition which was assumed here of irritable suprarenal cortex. This tissue produced an over amount of secretion and then there was a disproportionately small amount of medullary adrenalin. This medullary adrenalin produced a sympathetic stimulation; it increased the blood pressure and the rapidity of the heart action if it was not prevented from performing this activity by an overacting cortex which was antagonistic to it.

This case showed a diminution of adrenalin content. In so far as the vagus symptoms showed, this overactivity of the cortex would account for the slowness of pulse, the feeling of chilliness, the precordial distress, the low respiration ratio, the low blood pressure and the low temperature for the secretion of the suprarenal cortex was vagotonic. The relative diminution of the adrenalin medulla would account also for lack of stimulation of the cardiac accelerator nerve proceeding from the cervical sympathetic. Diminish the result of adrenal activity and one would have all the symptoms this boy showed, perhaps even the heart block. The speaker regarded the case, not as dyspituitary alone, but as polyglandular, the pituitary being secondary to disturbance in the suprarenal cortex, and he believed that therapy directed to this suprarenal unbalance would assist in overcoming the bradycardia and perhaps the heart block.

Dr. I. Abrahamson said that he would like to call attention to several points in connection with this case.

First, it was a common mistake in dystrophia genitalis to imagine a change to the opposite sex type; such was not the case. It was rather a return to an infantile, or to a neutral type. The epistaxis could scarcely be regarded as vicarious menstruation.

The second point was in regard to the experiments of Levy of London in studying death under chloroform. An animal given adrenalin before chloroform anesthesia developed ventricular fibrillation. This showed conclusively the close relationship between the heart action and the ductless glands.

How often had heart block been observed in adrenal insufficiency? The speaker had never seen a case, and if Dr. Timme's ready explanation were the true one, the condition ought to be commonplace instead of being so rare. Study of the hearts of animals during hibernation might give a clue to this condition, showing the relationship of the pituitary gland to heart action.

Dr. J. Ramsay Hunt asked if the question of congenital heart affection had been considered, and its possible effect on growth. Infantilism, associated with congenital heart disease, had been described, and he thought that such a possibility should be considered in the present case.

In closing the discussion, Dr. M. Packard said, in reply to Dr. Abrahamson, that in hibernating animals the pulse was slow, but there had been no heart block described in any of the experiments so far undertaken.

The cause of the condition in this case could not be definitely decided, so it was called dyspituitarism, although it was known that various glands were involved. The case had been shown in the hope that the problem might be definitely solved.

As to this being a case of congenital heart, no cases of heart block had ever been proven to be congenital.

In reply to Dr. Strauss, the speaker wished to say that the boy had never had glycosuria. He had been given 300 grams of lactose and 150 grams of dextrose and did not subsequently show sugar. Laboratory tests showed his blood sugar to be low; in fact there was rather a condition of hypoglycemia. The fact that this case had no glycosuria was one of the reasons for putting it in the category of dyspituitarism.

Dr. Marcus A. Rothschild, who demonstrated the electrocardiograms from the case presented, said that it was exceedingly fascinating to attempt to group the entire symptom complex—that is, the polyglandular disturbance and the complete heart block—under the same etiological basis. However, he believed it impossible to exclude a coincidental heart block. The fact that the ventricular complexes were normal in type and that the heart responded in a normal way to the effect of atropin, he believed to be evidences of no serious structural defect. The heart block might well be neurogenic in origin, brought about by some disproportion between the inhibitory and accelerator nerves. Buchanan had described bradycardia and even complete dissociation of auricle and ventricle in hibernating animals. This case presented many of the symptoms seen in hibernation. One could definitely exclude a congenital defect of the conduction system as the cause of the heart block.

ADDRESS OF THE RETIRING PRESIDENT

By William M. Leszynsky, M.D.

Dr. William M. Leszynsky said that one of the valedictory functions of the retiring president was to present a report of the general condition of the society and a résumé of the work accomplished during his term of office. It was gratifying and encouraging to note that the New York Neurological Society, now in its forty-fifth year, was still vigorous in the field of its chosen work, despite the development within recent times of other local neurological societies. It had a membership of 115 and there had been an average attendance of fifty-two at each of the sixteen meetings in two years. Thirty-seven patients had been shown and thirty scientific papers read. Among the clinical demonstrations there were fifteen patients with organic brain disease, nine with spinal cord affections, three with disease of the peripheral nerves and ten cases illustrating myasthenia gravis, Basedow's disease, chorea, tic, myatonia congenita, dystonia musculorum and myotonia congenita.

In thus recounting the creditable character of the transactions of the New York Neurological Society, it was quite evident that the topics discussed had been of unusual interest, and had covered a large field of neurological endeavor and progress.

The "Poliomyelitis Meeting" of November, 1916, was a memorable one, inasmuch as it attracted a very large attendance, interested the general profession and the public and called attention to the remarkable and inexplicable absence of official recognition of the value of neurological coöperation. Papers were read on the diagnosis, prognosis and treatment of poliomyelitis. Resolutions were unanimously adopted and a copy forwarded to the Public Health Committee of the Academy of Medicine, which had already taken the matter of poliomyelitis under consideration; their further deliberations on this subject had resulted in the appointment of a subcommittee to investigate what was being done at the various clinics, and also for the purpose of standardizing equipment. Certification would be required of the Associated Out-Patient Clinics, whose officers, after inspection, would report on the degree of conformity with established standards before any money would be furnished for equipment by the New York Committee on After-Care of Infantile Paralysis Cases.

As the meetings of the New York Neurological Society were held in the building of the New York Academy of Medicine, and as the regular November meeting was held on the second Tuesday of the month instead of the first Tuesday, on the same evening that the meeting of the Academy Section on Neurology and Psychiatry was held, it had been deemed suitable to hold a joint meeting annually on that evening. This has been done during the past two years.

It was to be hoped that the abundance of clinical material controlled by the members of this society would be sufficient incentive for the cultivation of a persistent initiative in offering cases for demonstration. Essays and other scientific material should also in a large measure be volunteered.

Before relinquishing the chair, the speaker took pleasure in expressing his grateful appreciation of the privilege and honor of having served as president of this society for the last two years. In thanking the members for their support and coöperation during that time, he wished to bespeak their continued enthusiasm and activity in behalf of his successor.

ADDRESS OF THE INCOMING PRESIDENT

By Frederick Tilney, M.D.

Dr. Frederick Tilney said that in taking the chair of this distinguished society, he wished to express his appreciation of the honor bestowed upon him; this office was a privilege, but it was also a responsibility. It was customary for a newly elected presiding officer of a scientific society to forecast the general trend of the proceedings for the ensuing year; in doing so, the speaker wished also to call attention to various opportunities in the neurological field.

The indispensable task of classifying, recording and cataloguing the diseases of the human nervous system was now nearly completed, due to the genius and industry of the past century. Attention could now, therefore, be devoted to the underlying causes and more thought could be given to the mechanism rather than to the syndrome. The nervous system had come to be recognized not only as a reflector of the many currents of life, but as a regulator of these currents. Called into being by the need of coördination, the nervous system held an intimate relation to the processes of metabolism. The necessity of understanding the mechanism of this relation was now becoming clearer and its problems more well defined. These were the problems of organic differentiation and the maintenance of such differentiation, of growth and the maintenance of limitations of growth, of the management of the chemical sources of energy—in a word, the regulation of metabolism; all of which problems lay within the province of neurology.

The underlying mechanism was in part mechanical, but more certainly chemical. There was a rich field for investigation for neurologists in the important bearing of the discrete endocrinous organs on the control of differentiation and growth. Present day interest in internal secretion demanded that every possible source of such secretory activity be explored and its mode of action investigated.

It was known that the thyroid was capable of accelerating somatic differentiation but had no power to stimulate growth. On the other hand, there was no evidence that the thyroid possessed the power to inhibit growth; when such suppression did occur, due to disturbance in this organ, it was incident to such rapid differentiation that proper growth was prevented. Experimental evidence also showed that the thymus had the power to stimulate somatic growth, but lacked the power of producing differentiation.

That the gonads, especially in the male, had much influence upon somatic growth and sex-differentiation, had long been recognized. A number of other structures must now be added to this class, chief among them being the cortex of the adrenal. This organ was genetically related to the gonad and, in the lower forms, remained distinct from that portion described as the medulla of the mammalian adrenal During the breeding season, in pregnancy and after castration the cortex of the adrenal body enlarged. Disease of it in females led to the diminution of certain female sex characteristics and the development of male characteristics.

The relation of the pituitary gland to somatic growth and sex differentiation had, perhaps, received more extensive attention than any other endocrinic organ. But even here there was room for further investigation, particularly in the relation of this gland to the epiphysis cerebri.

Differences of opinion still existed concerning the essential nature of the pineal body. It was regarded by some as an active gland, by others as a vestigium. The question was raised as to whether the nervous system was capable of giving rise to glandular tissue and this at first glance seemed like a serious obstacle. Certainly the nervous system was the most highly differentiated of tissues and the least likely to be pluripotent in its derivatives. Notwithstanding this, however, it might be demonstrated that it was quite possible for glandular structures to develop from the encephalic roof plate. There was evidence also that the epiphysis was primarily concerned in glandular development, but this required further investigation. Upon a decision in this matter would depend the acceptance of the pineal relation to growth and sex differentiation as well as its reciprocal relations with the pituitary gland.

There was an opportunity for the study of mechanisms in the fact that while the sympathetic nervous system in one capacity held sway autonomically over the biochemical and physical aspects of the vegetative life, in its equally important phase it served as the intermediary between this life and the psychic activities. In these respects there was indeed an opportunity for the study of mechanisms. There could be little doubt but that in the light of this study manifold complexes—sexual, gastro-enteric, cardio-vascular and respiratory—would disclose the secret of their difficulties and much less frequent use would be made of the convenient carry-all diagnosis, neurasthenia.

The striatal was a part of the nervous system which was a particularly promising subject for subsequent consideration. In addition, recent advances in knowledge of the cerebellar mechanism required attention, particularly in the matter of cerebellar localization. The newer work on muscle tonus, especially in its relation to the sympathetic system, introduced another point of view which should be investigated. In a word, there was no more fascinating or ultimately profitable field of investigation in neurology to-day than the study of those mechanisms which contributed to the organization of somatic motion.

No prospectus of neurological thought or endeavor was complete without a word concerning psychoanalysis. The psychoanalysts had developed a valuable method with which to search out and release the hidden difficulties of many who otherwise would not have received relief. But there was danger in the indiscriminate application of this method. Many believed that other parts of the body preëmpted cerebral activity while the gonad was yet little more than a struggling anlage, and that desires and repressions arose from impulses other than those directly or indirectly connected with sexual life. The restriction of psychoanalysis to the sexual sphere would seem to deprive a good method of its fullest application. It might be that there were opportunities for the psychoanalysts in the study of the phylogeny of behavior. In any event, the researches of the animal behaviorists could not fail to be constructive in the conception of psychic activity.

While intent upon the investigation of the mechanisms of the nervous system, clinical obligations should not be overlooked. Something of practical value should be demonstrated. The most promising opportunities along this line seemed to be in the relation of neurology to social problems which included those pertaining to mental hygiene, mental defectiveness and delinquency, prison reform, industrial regulation guarding against the development of occupation neuroses, the epidemiology of acute infectious diseases involving the nervous system and other allied subjects having sociological aspects.

Many of the topics here referred to as offering opportunities in neurology were at the present time engaging the interest and efforts of members of this society. It would seem advantageous, therefore, in order to encourage and develop the original work already in the process of preparation, to conduct the meetings as symposia upon assigned subjects and by thus concentrating deliberations, render them most valuable. In accordance with this idea the director of the Psychiatric Clinic, recently established at Sing Sing, at the March meeting would deliver an address on prison reform, and the succeeding programs would be planned so that the end of the year would see the neurological field widely represented in the annals of this society.

Translations

VEGETATIVE NERVOUS SYSTEM

By H. Higier, M.D.

Authorized Translation by Dr. Walter Max Kraus, A.M., M.D., New York

(*Continued from page 248*)

According to the same author the principle which claims a defecation center in the lower part of the spinal cord is false and is so on the basis of the above mentioned data. He claims that there are only ganglion cells for the control of the external voluntary sphincter in this locality.

Finally a few other conditions deserve mention, (1) congenital motor insufficiency of the rectum, (2) hyperirritability of the rectum (peristaltic waves in tenesmus) and (3) reflex constipation.

Severe constipation and acute cessation of intestinal activity occur in conditions of intense, lasting pain. The splanchnic leads to lasting inhibition of intestinal activity in gall stone colic, renal colic, circumscribed peritonitis, contusions of the abdomen, obstructed hemorrhoidal nodules, etc.

Eppinger and Hess state that many vagotonic conditions of the digestive tract have been described. In all of these pilocarpin and physostygmin are supposed to aggravate, adrenalin and atropin in large doses to alleviate.

In the vagotonic the following conditions may be seen: salivation and increased nasal and lacrimal secretion, permanent and periodic increase in the tone of the esophageal musculature taking the clinical form of esophago- or cardiospasm. Radiographically a retarded passage through the alimentary canal may be found, due in part to increased tone of the muscles, in part to diminished peristalsis. Not only the influence of the vagus upon the salivary glands and the esophageal musculature but also its influence upon the tone, peristalsis and secretions of the gastro-intestinal tract and its large accessory glands, the pancreas and liver, is noticeable in the vagotonic. The vagotonic stomach shows by its form the increase of muscular tone. The meal is slowly forced from the

fundus thorugh a narrow slowly unfolding canal. This is known radiographically as Holzknecht's cow-horn type or the spastic hour-glass type. Accompanying this are powerful peristaltic waves which are indicative of the presence of all of the hyperkinetic forms of motor gastric neuroses.

Further symptoms of vagus stimulation are hypersecretion and hyperactivity. These present themselves in various ways, intermittent gastrosuccorrhea, hypersecretion with or without hyperacidity. These are sometimes associated with sphincter spasm, pylorospasm and subsequent antiperistalsis. The beneficial effect of atropin and the detrimental effect of pilocarpin are said to differentiate between pylorospasm and pyloric stenosis in the absence of any signs of motor insufficiency. The accompanying pains are radiating in type, their paths being to the vegetative centers and thence to the segmentally corresponding sensory nerves (Head's hyperalgesic areas).

The diarrhea in vagotonia (diarrhœa nervosa) in Graves' and Addison's diseases have been claimed to be due to a state of hyperirritability of the vagus supply to the intestine, *i. e.,* to an increase of peristalsis and an increased serous transudation into its lumen. The beneficial effect of atropin subcutaneously and adrenalin enemata seems to confirm this.

The secretory neuroses have recently been included in the same group, enteritis membranacea (Nothnagel) or mucous colitis and eosinophilic rectal catarrh (Neubauer). In this latter there are a great many eosinophiles in both the blood and the intestinal secretions.

Closely related to cardiospasm and pylorospasm are spastic constipation and spasm of the rectal sphincters, both little understood conditions as far as pathogenesis is concerned.

In severe vagotonia there occasionally occur conditions of intense spasm in the smooth muscle of the gall bladder, gall duct, ureter and bladder. Spasm of the gall bladder is said to cause spasm of the gall duct and thus by a transitory shutting off of the gall passages causes (nervous spasmodic jaundice) acholic stools, jaundice and bradycardia. The same kind of mechanism is present in reflex anuria, which may be due to spasm of the renal blood vessels.

Of the general disorders which occur in vagotonics, a few deserve passing mention. In the sphere of blood chemistry, eosinophilia; in the sphere of metabolism, high sugar tolerance and absence of adrenalin glycosuria.

10. Bladder

The same conditions which hold in emptying the rectum of feces exist in the process of emptying the bladder. This organ is supplied by the nerves from the lumbar sympathetic, and the sacral autonomic. Very long rami communicantes go from the fourth lower lumbar nerves to the sympathetic cord, and from this to the inferior mesenteric ganglion. Here they are intercepted by a ganglion cell and proceed as post-ganglionic gray fibers in the hypogastric nerves to the musculature of the bladder, particularly to the internal sphincter (Tables VIII and XI).

From the sacral roots springs the sacral vesical nerve, the so-called N. erigens of Eckhardt, which, as a white ramus communicans, is interrupted in the ganglia of the hypogastric plexus, to proceed thence as the gray post-cellular branches to the detrusor muscle of the bladder.

The same conditions are therefore found here, as are found in all of the vegetative organs. For example, the pupil, which has been previously considered, also has a sympathetic dilator muscle, and an autonomic sphincter muscle.

In the conus medullaris the small pear-shaped sympathetic ganglion cells occupy almost the entire anterior and lateral parts of the gray matter—a blending of the inferior lateral and the medial inferior sympathetic nuclei. The bladder also has a group of ganglion cells in its musculature at the point where the ureters enter.

The mechanism of urination is like that of defecation and is arrested by the assistance of voluntary muscles. If there is a dull feeling of a full bladder behind the symphysis, the assistance of the pressure of the abdominal wall, and of an increase in abdominal pressure serves to accelerate the emptying. The spinal reflex is released; the tonus of the detrusor increases, that of the internal sphincter decreases, and thus there results, without further voluntary impulse, an emptying of the bladder with a good stream. Finally the repeated contractions of the voluntary perineal muscles about the posterior part of the urethra force out any residual urine and the sphincters are thus able to regain the usual tone which they possess when closed.

It is noteworthy that after removal of the lower part of the cord up to the middle of the lumbar region, emptying of the bladder and rectum, after an initial disturbance of the functions of these organs, becomes quite automatic and uncontrollable by the will.

According to Müller, it is questionable whether disturbances in bladder functions may lead to diagnostic conclusions as to the locality

of the trouble. Frankl-Hochwart and Zuckerkandl are less pessimistic in this regard, and believe in a spinal etiology whenever the voluntary increase of pressure on the bladder is lost, and there exists at the same time automatic emptying, paralytic dribbling, expressibility, and bladder hypertrophy. They say: "Early appearance of dribbling and of expressibility may with certainty be ascribed to a disease of the cauda and conus, while a spastic condition in the sphincter, or hypertrophy of the detrusor points to a lesion higher up."

The nature of cortical bladder disturbances consists in an inability to repress the tone of the sphincter, and appears clinically in cystospasm, pollakiuria, oliguria, more rarely in incontinence and retention [Frankl-Hochwart, Zuckerkandl, Czyhlarz, Marburg, Minkowski, Hamburger]. The diagnosis of cortical bladder disturbance becomes uncertain as soon as the patient ceases to be conscious, intelligent or ceases to have the normal autoptic control of the spinal cord. Bladder disturbances have always been obtained in experimental lesions of the mid-brain, involving the gray matter near the floor of the third ventricle (Lichtenstern).

In regard to the antagonistic relations which the bladder centers have to each other, the majority of physiologists, and recently also Lewandowsky, on the basis of his own experiments, conclude that the normal impulses to the bladder, both for closure and opening, are always initiated from the cerebrospinal axis, spontaneously or reflexly, while the integrity of the ganglia has no influence upon function. On the other hand Müller, who formerly placed the center for the control of the functions of the bladder in the sympathetic ganglion groups lying in the pelvis, is of the opinion that there is no single vesical center in the spinal cord, which influences the sympathetic. Since, in man, higher transectional disease of the cord as well as lesions of the conus cause bladder disturbances, and, furthermore, since in animal experiments both transection of the cord, and removal of the lower part of the cord result in the same type of bladder emptying, it may be concluded that localization of vesical centers in the conus medullaris is not justifiable.

II. Sexual Organs

In considering the special nervous relations of the sexual apparatus, it is to be noted that the nerve plexi in the internal genitalia are derived on the one hand from nerves coming from the lumbar cord, through the lumbar rami communicantes which proceed by way of the hypogastric nerves, and on the other hand from the sacral

cord and sacral roots by way of the N. erigens. Stimulation of the sympathetic lumbar rami communicantes causes vasoconstriction and contraction of the small muscle of the vas deferens and the seminal vesicles, while stimulation of the autonomic sacral rami causes vasodilatation and erection.

Erection and ejaculation have obviously separate spinal centers, the center for erection lying in the lower sacral cord, that for ejaculation in the upper lumbar cord. There are no special cortical centers for these acts.

In the sexual act the following phases are with justice sharply differentiated: the desire, erection, ejaculation and orgasm (Frübringer, Müller).

1. The concrete sexual desire appears at the age of puberty, possibly dependent upon the appearance of certain internal secretions (hormones) derived from the sex glands. It disappears immediately upon the emptying of the semen. It remains intact after section of the cord. In women it is increased after menstruation. In diseases of the cord it disappears gradually after impotence sets in, particularly when the disease has begun early, before the local sexual impulses have been normally impressed.

What substances may be libidogenous has not been finally settled upon. Most probably they are derived from the sex glands, which at puberty produce an external secretion (sperm) from their parenchyma as well as an internal secretion from the interstitial cells of Leydig. Both secretions are in a certain sense independent of each other. Contrary to the conditions in other endocrinous organs, the internal secretion of libidogenous substances seems to be shared by the prostate and seminal vesicles as well as by the sex glands themselves.

In cases in which the libidogenous, aphrodisiac substances are lacking, as in children and eunuchs, even the most hilarious and passionate feelings, founded upon associations, are unable to bring about the sexual passion. "Our cortex, and thus our thoughts, are made more sensitive to sensuous impressions and erotic conceptions by these substances. The cortex, on the basis of association, is only able to react with a sexually active feeling when these internal secretions are present" (Müller-Dobl).

2. Erection may be considered as being brought about in three ways.

(*a*) A cerebral or psychic stimulus is the most frequent manner of arousing this vasodilator phenomenon, *i. e.*, by means of sensuous impressions, memories and conceptions. The cerebrospinal fibers

leave the cord in its upper lumbar part and go thence via the N. erigens to the erectile organs. This origin is the reason for the intactness of psychic erection in lower-lying diseases of the cord.

(*b*) In the periphero-spinal reflex. The N. erigens also is the centrifugal path, the centripetal being from a reflexogenic area of the skin or mucous membrane of the periphery, through the N. dorsalis penis and the N. pudendus communis, via the corresponding sympathetic ganglia to the second sacral segment.

(*c*) The last way in which erection occurs, one which is automatic, is neither from the cortex nor the cord, but is due to fulness of the seminal vesicles or bladder. The nervous organ which transmits this reflex is possibly contained in some of the ganglion cells in the hypogastric plexus. If the spinal cord connections be severed this automatic reflex erection remains, but the peripheral skin sensibility is lacking and thus the individual can only be aware of the erection by inspection.

Permanent erection (priapism) in acute transverse lesions of the cervical and thoracic cord is probably due to disturbed vasomotor centers in the cord. Whether there be a form of erection not due to stimuli coming through the nervi erigentes, but due to a decrease in the tone of the vasoconstrictor fibers in the N. dorsalis penis must remain an open question (Eckhardt, Lovén, Müller).

3. In the act of ejaculation, as in all motor activities, both the sympathetic and spinal systems are to be considered.

The reflex functions of the former come into play in that the summation of adequate stimuli (rubbing movement) acting upon the erected organ causes peristaltic contraction of the smooth muscles of the three secretion-bearing organs, the vas deferens, seminal vesicles and prostate. This causes the orgasm and empties the mixed secretions into the prostatic urethra. A secondary reflex of a somatic nature now occurs, namely a contraction of a spinal cord origin of the cross striated bulbo cavernosi and ischiocavernosi muscles which act forces the semen out of the prostatic urethra.

The sympathetic arc of this reflex mechanism is seldom disturbed, while on the other hand the somatic arc frequently is injured by spinal cord lesions, particularly deep-seated diseases of the conus. When this injury occurs there is also disturbance of the mobility and sensation of parts supplied by near-by muscles. The semen under these latter circumstances is not forcibly ejaculated, but flows off drop by drop.

The relaxation following ejaculation is partly due to a passive process, decrease in tone in the N. erigentes, partly to an active

process, contraction of the smooth muscle of the skin of the penis and of the erectile bodies. Nocturnal flow of semen during sleep or pollution may occur without sensory stimuli acting upon the individual and may yet be accompanied by the marked and well-known feelings of passion. This may be called orgasm and is regularly accompanied by the manifestations of stimulation in the rest of the vegetative system (mydriasis, hyperidrosis, and tachycardia).

The antagonistic innervation of the genitalia is seen in the fact that when the tonus in the lumbar sympathetic part of the cord decreases, that in the sacral autonomic part increases (Langley).

Among the vagotonic symptoms in the pelvic region are the following: Tenesmus, dribbling, erection, spermatorrhea, and prostatorrhea. The sympathetic disturbances in the female genitalia are atony of the uterine muscles with atonic or so-called genuine hemorrhages, more rarely inversion of the uterus.

It must be said of the uterus that its contractions are automatic. Thus there are cases of painless though normal births, with subsequent uterine contractions, even when disturbances exist in the lower part of the cord.

That psychic stimuli and sudden pain have great influence upon all the ano-vesico-genital reflexes is well known. Incontinence of feces during fear, involuntary micturition during terror, cessation of labor pains during grief, decrease of libido and the power of erection during strong emotional strains, nausea, and when feeling of satiation exists, show this to be so.

12. Respiratory Tract

Little of a positive nature is known about the respiratory tract. It is claimed that fibers pass from the sympathetic cord to the bronchi which relax the bronchial musculature and which also dilate the bronchioles and increase the lung capacity in the deepest branches of the bronchi. Groups of multipolar ganglion cells are to be found. These are of a viscero-motor nature and in structure like those in the sympathetic cord. Ganglion cells of the spinal ganglion type with one or more dendrites are also to be found in the bronchi where the bronchial plexus is formed by the vagus. These are in all probability viscero-sensory in nature (Müller).

The superior laryngeal nerves, the brachial and the bronchial nerves—all autonomic vagus fibers—carry sensations from the mucous membranes, which they supply, to the domain of consciousness, and upon stimulation cause inhibition in the respiratory center in the form of a cough reflex, as in inflammations, accumulations of

mucus, pressure of foreign bodies, poisonous gas, and dusty air. It appears that these fibers are solely sensory in nature and not sympathetic.

The smooth muscle of the bronchi is supplied by the motor visceral vagus. Stimulation of this nerve does not give relaxation but always contraction. In bilateral section of the vagus, the bronchi are dilated, and breathing is slow and deep, while stimulation of the vagus causes inhibition of inspiration followed by expiratory cessation of respiration.

Clinically, acute bronchio-spasm or asthma must be considered. This is characterized by lack of breath, marked difficulty of expiration, slowing of the aspiratory phases, blanching of the lungs and viscous sputum filled with eosinophils. In paroxysmal increase of the tone of the vagus, spasm and hypersecretion is not only seen in the bronchial muscles, but also in the laryngeal muscles (laryngospasm) and is associated with nervous symptoms in other branches of the vagus. The reflexogenic zones lie in the bronchi, nose and many other parts of the body. Emotional excitement as anger, or sexual emotion may, as observed above, favor and cause these attacks.

In the realm of pathology further mention must be made of the laryngeal crises of tabetics, the respiratory arrhythmias of vagotonics (cessation of breathing, arrhythmia or pulsus irregularis respiratorius infanto-juvenalis), narrowing of the glottis or the laryngospasm of tetany, and stoppage of respiratory movements after pressure upon the eyeball, all of which manifestations, on the one hand, are increased by pilocarpin, and on the other are somewhat diminished by atropin.

Of these manifestations, those lending themselves readily to mechano-physical investigation, as respiratory arrhythmias and Aschner's respiratory standstill, are particularly to be noted.

(*To be continued*)

Periscope

Jung's Psychologische Abhandlungen

ABSTRACTED BY THOMAS J. LIBBIN, OF ZÜRICH, SWITZERLAND

(Vol. I)

1. On the Determination of Resistance in Psychoanalysis. JOSEF B. LANG.
2. A Hypothesis of the Psychological Interpretation of the Delusion of Persecution. JOSEF B. LANG.
3. A Story by Napoleon: The Masked Prophet. J. VODOZ.
4. On the Psychology of the Incendiary. HANS SCHMID.
5. Archaic Elements in the Delusions of a Case of Dementia Paranoides. C. SCHEITER.

1. *Determination of Resistance.*—The writer made association tests according to Jung's formula with twenty-five of his sanatorium patients; tests of the viscosity of the blood were also made at the same times in nineteen of the cases; these tests were repeated at different stages of the treatment. The data and other corroborative material are presented in case histories with tables and seventeen statistical graphs (curves).

The quotient obtained by dividing the arithmetical by the probable average of the reaction times is named the quotient of resistance (Widerstandsquotient) and is proposed as the measure of resistance of the subject to the experimenter. In all cases the quotient of resistance is found to be in correlation with the other data of the patient for the same period; the quotient of resistance decreases with the disappearance of the symptoms, the improvement in the rapport and general health of the patient and with the approach of the viscosity of the blood to the norm to be expected under the régime and diet at the sanatorium; on the other hand the quotient of resistance increases in the cases and at the periods where the patient is making no improvement or is growing worse; in these situations the viscosity of the blood remains the same or departs more and more from the norm. The correspondence between the resistance and the changes in the viscosity of the blood, the other bodily conditions (weight, oxidation of the sugar taken, etc.) may point to a toxic condition of the blood due to the resistance.

In ten of the cases the percentage of the reactions of the predicate type expressing personal judgment (Wertprädicattypus) was calculated. It was found to decrease and increase with the coefficient of resistance. This form of predicate type of reaction is to be traced to an unsuccessful attempt at transference and the subsequent damming of the libido. It is a compensation against the too intensive introversion of the libido.

2. *Psychological Interpretation of the Delusion of Persecution.*—A study by means of the association method of the reaction type of thirteen families. "The dementia præcox patient represents the family reaction type most clearly. In case he gets delusions of persecution, he selects as persecutors those members of his family who next to him best represent the family reaction type. It seems that the sex of the person chosen as persecutor plays no particular rôle. The persecutors are merely the objectivation of the reaction type (characteristic affective type) of the family. Fundamentally, the ideas of persecution are directed against that part of the patient's own personality

which is bound up too much with the reaction type of the family. According to this hypothesis the delusion of persecution functions biologically as an attempt on the part of the sick person to free himself from the all too close ties of the specific affective life of his family. The attempt fails because the struggle for freedom is made on the objective (projection) instead of the subjective plane."

3. *The Masked Prophet.*—A study based mostly on original sources. A phantasy which Napoleon wrote at the age of nineteen is a formulation of his own life problem. This phantasy, in all its details, reveals not only the introverted and fighting attitude which characterized Napoleon at this time, but also the fateful consequences which would follow if this attitude were not compensated. The story is a clear instance of the teleological and prospective function of the products of the unconscious. Napoleon was introvert by temperament; the attitude portrayed in the story was considerably determined by his reaction to his parents and characterized his whole life. His career was the working out of this attitude to its ultimate consequences.

4. *Psychology of the Incendiary.*—A study of 139 cases based on court and institutional records, and on correspondence; of these cases 52 were personally examined by the author. A number of case histories, an extensive tabulation of the data from 130 cases and a statistical graph afford the basis for a critical discussion of the psychological and criminological literature.

Stekel's explanation, that incendiarism is another instance of a repressed sexual wish which finds expression by means of a symbolic act, is rejected as merely causal: it does not make use of the specific data supplied by many of the cases. A psychological study of the cases, to the extent that it has been carried out, regularly reveals that the subjects were passing through a crisis of readjustment in an unfortunate way at the period of the setting of the fire. To cite the situations most frequent in the records: young people going into service for the first time and suffering badly from homesickness; a sudden breaking off of love relations; death of the favorite parent or relative; falling heir to unexpected responsibilities and debts, etc. In such cases the libido, not finding adaptive expression, takes a regressive course and tends to reanimate disused archaic paths of adjustment. One of these paths is the production of fire, a symbolic form of libido diversion which was truly adaptive and consequently of positive sublimation value in the prehistoric period of the human race. To the subjects investigated the idea of getting up a big blaze presents itself in the manner of a true compulsion and is carried out without the slightest reference to imagined or real adjustment. The motive of revenge or other motives given by some of the subjects, while possibly contributory in a very small percentage of the cases, are really attempts at rationalization analogous to the explanations made by a subject after carrying out a posthypnotic suggestion. The motive and motive power lie deeper, in the subconscious of the human race. Incendiarism, in brief, is a regressive symbolic action which allows an outlet to the dammed libido through an archaic and therefore useless attempt at sublimation. This formulation Dr. Schmid puts forward as a hypothesis which may be raised to the standing of a theory should it be confirmed by more thoroughgoing psychoanalysis of incendiaries as soon as possible after the commission of the act.

5. *Archaic Elements in Dementia Paranoides.*—An analysis of a case: each part of the system of delusions is presented, stated in the language of the Freudian School, restated in the language of the Zürich School and then compared analogically with mythological motives after the method developed by Jung in his Psychology of the Unconscious. The aim of this concise and thorough piece of work is to present additional evidence that the delusions of the dementia paranoides group present psychic products which belong to an archaic or infantile level of human thinking.

Psychiatric Bulletin

(Vol. IX, No. 3)

ABSTRACTED BY DR. SANGER BROWN, II, NEW YORK

1. The Scope of Psychopathology. ADOLF MEYER.
2. The Dementia of the Cerebral Arteriosclerosis. AUGUST HOCH.
3. The Nature of the Dementia in Dementia Paralytica. C. MACFIE CAMPBELL.
4. Some Factors in Schizophrenic Dementia. CLARENCE B. FARRAR.
5. Epileptic Dementia. JOHN T. MACCURDY.
6. Alcoholic Hallucinosis with Special Reference to Prognosis and Relation to Other Psychoses. GEORGE H. KIRBY.
7. Chemical Studies on the Central Nervous System. BURT E. NELSON.

1. *The Scope of Psychopathology.*—In this stimulating address, the president gives an account of the origin, place, and mission of the Psychopathological Association. The address opens with a brief discussion of the reasons which led to the formation of this society. There has never been in America a society which frankly combined neurology and psychiatry. Those societies already in existence have emphasized either the psychiatric or neurological side to the neglect or exclusion of the other. In Germany and Austria the principal organs of neurology began as combinations of psychiatric and neurological interests, but the psychiatric journals of France, England and America have for the most part taken little interest in neurology. Neurology in this country has had a development independent of psychiatry. With psychiatric and neurological societies already in the field, psychopathology enters as a tertium quid. It finds its origin in the teachings and schools of such persons as Janet, Charcot, Bernheim and Freud in Europe. In this country it has had its beginnings in the schools of Morton Prince and Boris Sidis, and (the reviewer may add) in the study of constitutional and mental disease from the psychopathological and psychodynamic viewpoints, by Adolf Meyer; in the psychotherapeutic and psychoanalytic groups; in the work of Healy and Goddard; and the psychological work done in schools and penal institutions. The American Psychopathological Association was founded in 1910 under the auspices of Morton Prince, as an offshoot of the American Neurological Association, and in response to the need for the study of psychobiological problems. Modern psychology has turned from philosophical discussions on the one hand, and the study of the physiology of the nervous system on the other, to an objective study of the mind, and, as pure psychology would deal with the normal performances of the mind, so psychopathology studies those mental reactions which deviate from the normal, and investigates their causes and origins. Oppenheim has pointed out that many conditions are misinterpreted by the general practitioner from lack of neurological training, but he failed to make room for a psychopathology and for psychobiological training. Attention is being directed by the writer and others to the principles of a medically useful psychobiology and the need of a systematic body of facts and methods. The psychopathological method is as follows:

"1. To determine the assets and adaptive tendencies or difficulties;

"2. Their reduction to non-mental or to mental factors;

"3. Their orderly use for education and reëducation;

"4. The readjustment of conflicts, inhibitions, or one-sided fixation of reactions, by reëducation, and by the use of capacities unnecessarily checked, by immunization to morbidly sensitive complexes through a better understanding or through suggestion." Psychobiology and psychopathology aim to discover especially "those features closest to the core of the mechanism of balance which spells health or disease, construction or decline." Classification

is to be avoided, and no single scheme of therapy will be effective to the exclusion of others. "Most of the modern efforts will ultimately tend to be comparable with the use of auto-vaccines, a process of self-immunization, of learning to see and accept oneself in one's past and present tendencies." As a remedy to one-sided methods the writer urges a freer contact among teachers and workers in the various schools, and greater clearness in the common body of facts and methods; recognition of work already accomplished and a conscientious use of cross reference. From this method there will gradually arise an aggregate of survivals, of psychobiological and psychopathological facts which may be used as safe and fundamental.—HELEN W. BROWN.

2. *The Dementia of the Cerebral Arteriosclerosis.*—Dr. Hoch has paid considerable attention recently to the matter of mental deterioration in arteriosclerosis, and this short paper summarizes his principal findings. The memory defect in this form of mental disorder consists, not so much in the fact that the memory is wiped out, as in that memory is less readily at the command of the patient. The normal process of thinking is disordered, the mentality not being up to its normal tension. Dr. Hoch speaks of this condition as a "defect of mental tension" and it is here that the disorder in the process of thinking exists. Mild degrees of this disorder are observed in mental fatigue where elaborate problems are not readily comprehended. Arteriosclerotics do not fail in memory so much as that they make mistakes, and perseveration as the path of least effort is a very important symptom. Aphasic, agnosic, ideatory-apraxic elements enter into the picture in the more severe cases, but in the setting of diffuse defect. These conditions have a relationship with mental tension and are met with in fatigue, in the organic deliria, as well as in cases of demonstrable focal lesions. The retention defect in arteriosclerosis differs particularly from that of the Korsakoff syndrome; in the latter condition it stands out above everything else; in the former it is in a diffuse setting. As regards the personality, the arteriosclerotic shows a remarkable retention of personality, in contrast to the general paralytic; moreover, psychotic symptoms are relatively rare; depression occurs occasionally, but elation and delusional formation are quite infrequent. In the arteriosclerotic it seems that constitutional psychotic tendencies, such as delusional formation, etc., are wiped out, rather than evoked.

3. *The Nature of the Dementia in Dementia Paralytica.*—Dr. Campbell's long experience in cases of dementia paralytica enables him to define the leading demential features quite clearly, and at the same time to correct a number of misconceptions, quite widely held in regard to this dementia. He points out that grandiose ideas do not necessarily mean dementia, and quotes an interesting case in which there was no residual of mental defect despite the fact that the patient was very grandiose during a prolonged episode of about two years' duration. The term "dementia" indicates or should indicate a permanent loss or reduction of function. Even the personality, apparently much impaired during an episode, may be restored to a surprising degree at times. Campbell observed such a restoration, in a tabo-paretic, after two years of most dilapidated conduct. In most cases, however, the personality change is the most marked and the most fundamental. With this the defective memory goes hand in hand. In dementia paralytica "the earliest mental involvement is apt to be that of the highest integrative levels, but the other levels and more special functions do not remain immune, and in the later stages it is not easy to attribute to each level its due weight in the production of a special symptom." Dr. Campbell sums up: In the center of the dementia paralytica is the degradation of those most complex reactions which are the essence of the personality, the deterioration in the directing forces of the personal activity, the loss of that synthetic grasp of personal memories which gives them complete unity, the progressive disappearance of the con-

stituent memories, of the store of acquired information and skill, of simple and complicated associative processes. The non-dementia symptoms, such as the delusions, in their unsystematized and poorly elaborated structure, are liable to show the influence of the dementia background; they show a disintegration of the self and not merely, as in some other conditions, a perverted attempt at the extreme realization of the self. The dementia is characterized not merely by the deterioration of the individual as a social unit, but by the general deterioration of all those reactions, simple and complex, personal and impersonal, through which the individual responds as a unit to the environment.

4. *Some Factors in Schizophrenic Dementia.*—In discussing the form of dementia characteristic of dementia præcox, Farrar interprets the process in terms of personality. He utilizes Kraepelin's classification of these deteriorating states, consisting of eight groups, namely: Simple Mental Enfeeblement, Hallucinatory Dementia, Delusional Dementia, Schizophasic Dementia, Apathetic Inert Dementia, Silly Euphoric Dementia, Stereotyped Manneristic Dementia, and Negativistic Dementia; and while he considers these designations valuable for formal purposes of orientation, he indicates that they contribute only indirectly to the problem of schizophrenic dementia. Dementia præcox represents a failure of development in the personality sphere, and so can scarcely be said to have a definite onset in the usual sense. There is always an anlage in the personality in early life. Farrar has mentioned certain personality types which are of significance. They are as follows: Backward types, in which an intellectual inferiority is the outstanding feature; precocious types, which show a morbid precocity; neurotic types,—the delicate, nervous, emotional child; asocial types, where shut-in characteristics are conspicuously dominant,—the autistic anlage; juvenile types, cases suggesting evolutionary arrests, with mental "sets" at the juvenile or infantile period. Farrar does not consider this classification exhaustive, and the designations are chiefly observational. As to the personality disorder, in health, the evolution of personality is a continuous constructive process. In dementia præcox the personality sense develops abnormally with inharmonious factors, which cause its disintegration. The sense of personality is a form of self-consciousness which is an outgrowth of consciousness, seeming to have originated from states of feeling reducible possibly to somatic and kinesthetic sensations. This sense of personality, then, "is the end-product of an extended series of integrations of ever increasing complexity, constituting a veritable hierarchy of mental data, at the head of which sits self, subjectively autocratic." A normal development gives to the personality sense at the head of the hierarchy feelings of self-sufficiency, potency and self-urge, which make for a sound independent mental existence. In the schizophrenic where these integrations have failed of establishment the personality sense is deficient and the symptoms of depersonalization appear. In closing, the author refers to the work of Professor Warren on "Purposive Consciousness," which, given as briefly as possible, is as follows: Sense of personality is shown only in purposive behavior or volition. In the consciousness accompanying purposive activity Warren finds an anticipatory idea, or forethought, and four other elements, namely, assent, potency-feeling, the self-factor, and the sense of fitness and unfitness. In dementia præcox with a lesion of personality-sense, purposive consciousness and the mental factors necessary to purpose are disordered. Dementia præcox cases do not perceive irrelevances in forethought and consummation, and have no consciousness of unfitness. The self-factor is weakened and the assent and potency factors probably lack their normal clearness. In conclusion, if the viewpoint of the author is correct, dementia præcox is the result and a part of a specific, imperfect type of psychobiological evolution. The essential element of this type is a lesion

in the personality-sense, with associated feelings of inadequacy. With this imperfect anlage there is, after a varying period of compensation, a failure in the possibility of adjustment with a progressive loss of the sense of personality.—HELEN W. BROWN.

5. *Epileptic Dementia.*—A digest of a longer article appearing in the Psychiatric Bulletin, Vol. IX, No. 2, previously reviewed.

6. *Alcoholic Hallucinosis with Special Reference to Prognosis and Relation to Other Psychoses.*—Kirby, in discussing the alcoholic hallucinoses, favors the views recently expressed by some writers on this subject, namely, that the alcoholic hallucinoses are to a great extent of psychogenic origin. He emphasizes the absence of organic symptoms in this disorder as contrasted with delirium tremens and Korsakoff's disease. Bonhoeffer considers the hallucinosis as a modified form of delirium tremens. Kraepelin holds somewhat similar views but Kirby thinks that emotional factors are important in the psychogenesis, and considers these disorders as essentially constitutional reactions. He has been particularly interested in the outcome of a number of these cases and summarizes his findings as follows: "Of the 102 cases, 15 per cent. are now in the hospital as cases of dementia præcox. The number of cases which have shown clearly manic-depressive symptoms is 7 per cent. The lesson to be learned from the dementia præcox cases is that in practically all of them a poor anamnesis or failure to pay attention to the make-up or to symptoms manifested before or during the early part of the hallucinosis led to a wrong sizing up of the case. In two patients there appears to have been a real transition from a pure hallucinosis to a dementia præcox. The combination of a hallucinosis with manic-depressive insanity is frequently met with, the two types of reaction being curiously intermingled in the psychosis; the hallucinosis, however, usually appears in the first part of the attack and subsides as manic symptoms develop. In considering the pathogenesis of the alcoholic hallucinosis, a number of facts speak for the view that we are not dealing with a specific toxic disorder of alcoholic origin, but that the hallucinosis belongs rather in the category of reaction types dependent upon constitution and emotional situations in the presence of alcoholic excesses. The interrelation between the alcoholism and the other precipitating causes has not yet been worked out."

7. *Chemical Studies on the Central Nervous System.*—Methods of procedure in the chemical study of the central nervous system are described. The writer finds that water is increased in paresis, in acute infectious conditions, and in youth. Lipoids are decreased in paresis and senility, extractives show little change. Total proteins are increased in paresis with a relative increase in protein sulphur. Two cases of dementia præcox showed alterations in the protein content. Studies in brain protagon confirmed the findings of other writers, namely, that protagon is a mixture of several different phosphatides, and not one of the definite organic constituents of the brain, as it has long been regarded.

Book Reviews

WIT AND ITS RELATION TO THE UNCONSCIOUS. By Professor Dr. Sigmund Freud, LL.D. Authorized English Translation, with Introduction by A. A. Brill, Ph.B., M.D. Moffat, Yard and Company, New York.

The translation of this work of Freud presents to English readers a volume of peculiar interest and importance. The subject of wit has received but scanty attention in its profounder psychology, but in Freud's hands it is subjected to that painstaking elucidation by which this author carries his reader with him into the deep recesses penetrated by his insight and thought. One is particularly impressed here with this method of research in the development of the meaning and service of wit. An appreciation is also due the translator for preserving and reproducing this same lucidity in spite of the difficulties of translation of a subject so peculiarly elusive of transference into another language.

The ultimate value of the study itself is discovered through this probing of the profound psychology of wit which thus finds its place through connection with the unconscious in the psychic economy of life.

The author devotes the first part of his study to an analysis of wit through a variety of chosen examples. These manifest the details of the technique upon which wit depends and by which it accomplishes its ends. The outer form of the wit discovers to us condensation, application of the same material, double meaning in the play upon words, arrangement and use of the material of expression, which might cause confusion in the study of wit if there were not also discoverable a unification in condensation as the chief tendency which comprises the others and which loses itself in the broader conception of "economy." The significance of the latter is left to be explained through the careful deliberation which characterizes the entire study.

Therefore the author turns first to a consideration of the technique as it concerns the inner content as well as the outward form of the wit. Here displacement is the essential element and it is active in the stream of thought itself of the witticism. Absurdity or sense in nonsense also belongs here as an important element. These are really examples of faulty thinking, which likewise expresses itself in sophistic thinking and in automatic errors of thought. It is scarcely profitable in a brief review to enumerate the variety of techniques of wit which attain their real significance only by a careful and detailed following out of the author's individual discussion of these. They lead to the recognition of the striking resemblance to the technique which Freud's investigations have revealed in the dream.

Another source of pleasure lies in the tendencies of wit. Harmless wit may be rich in content and wit activity, both of which combine to give pleasure, which is really an end which redeems even this wit from aimlessness or purposelessness. There is, however, a sense in which wit may be especially designated as tendency wit when it is used as a means to a definite end aside from this original pleasure and therefore opens up new sources of pleasure. Such wit is either hostile wit or obscene. An analysis of this form of wit prepares the way further to understanding the sources of the peculiar pleasure arising from wit.

The synthetic part of the book is concerned with the discussion of the attaining of this pleasure through psychic economy. This has to do with the external or internal hindrances or inhibitions which stand in the way of an easy attainment of pleasure. They may best be studied in the case of the tendency wit but have their place also in the pleasure in nonsense of all kinds. The retention as well as the formation of an inhibition requires a psychic expenditure. The inhibition or suppression may be that which tendency wit evades or it may be the control which reason exercises in rejecting and condemning play as senseless and absurd, and which is removed accidentally through the techniques of wit. The inhibiting or suppressing stream works against an impulse to liberate pleasure from a certain source and though it is stronger than this impulse it can not destroy it. The suppressed tendency can, however, become strengthened by the aid of wit pleasure to such an extent that it can overcome the inhibition. This liberating "fore-pleasure" thus overcomes reason and critical judgment and suppression.

There must be so complete a psychic harmony between the originator of the wit and the person to whom he imparts it that the same inhibitions are ready to be evoked in the latter on hearing the joke. The amount of psychic expenditure involved arrives, however, too late and finding itself superfluous is discharged through laughter. Meanwhile the auxiliary wit techniques divert the hearer's attention and so preserve this discharge for the wit itself in laughter. For wit seeks the shortest path of discharge expression, avoiding distracting mental effort but rather fascinating attention by its façades until the automatic discharge can take place. The wit-maker enhances his pleasure through the laughter of the hearer of the witticism. His pleasure in removing inhibitions and diminishing expenditure is not complete until it finds this discharge in the auditor.

The theoretical division of the study reveals more fully the essential relationship of wit to the dream. Freud reviews very concisely the principles of his interpretation of dreams and compares the dream mechanisms with those employed by wit. He thus locates definitely the sphere of the wit work in the unconscious. He expresses it thus comprehensively: "A foreconscious thought is left for a moment to unconscious elaboration and the results are forthwith grasped by the conscious perception." The inspirational character of wit confirms this conception.

By thus submerging the thought into the unconscious wit has recourse to the infantile sources of pleasure, which are manifest also in the forms of technique at its disposal. Its manner of obtaining pleasure here is through the economy of expenditure in inhibition. The comic and humor, to whose discussion large space is devoted, likewise derive their pleasure through the same element of economy, the latter in economy of expenditure in feeling, the former in thought. They all seek to attain again that childish state when psychic work involved but slight expenditure and thus made possible a pleasure which has been lost in the course of development.

The dream guards itself from intelligibility, for it has no social aim or purpose. Wit, on the other hand, is preëminently social and its process must be completed through at least two and often three persons. The dream, however, never loses its relation with life. It "serves preponderately to guard from pain."

JELLIFFE.

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Original Articles

A COMPARATIVE STUDY OF CASES SHOWING THALAMIC LESIONS AT AUTOPSY

By Arrah B. Evarts, M.D.

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In 1909 Ernest Sachs published the results of his careful and painstaking experiments upon the optic thalamus, in which he used the brains of monkeys and of cats. Before he did his work the thalamic nuclei had been variously named and arranged, their number also varying with the observer from nine to nineteen. He simplified these existing classifications and adopted a list of seven nuclei as being sufficient for all experimental as well as clinical purposes for the present, thus: Nucleus anterior, Nucleus medius, Nucleus lateralis (dorsal, middle and ventral portions), Nucleus ventralis, Centre media, Nucleus arcuatus, Pulvinar. These he studied as to their relations with each other and the fiber tracts leading from the cortex to them as well as those leaving the thalamus. He concluded, among other things which do not particularly bear upon the subject of this paper, that the thalamus must be regarded as consisting of an inner and an outer division, which are in the main relatively independent organizations, the inner division including the nucleus anterior and the nucleus medius.

Again in 1911 Sachs published the results of an investigation undertaken to determine the relation, if any existed, of the thalamus to circulation, respiration, temperature and the spleen. He carefully studied the reactions to stimulation of each nucleus and concluded that the thalamus as such has no influence over these functions, although sometimes changes were observed which he decided were pressor effects or due to altered blood pressure.

We thus see that the thalamus is a complicated organ and we can understand that lesions of its various nuclei will be liable to produce clinical signs and symptoms which are more or less unlike. However, as a matter of fact, a lesion in the thalamus is usually large enough to involve the majority of the nuclei and to catch the fibers from those not directly impaired, so that the clinical manifestations present a fairly constant picture. Just which nucleus is responsible for which symptom we are not as yet in position to say.

It has been with no thought of adding anything to the existing knowledge of the thalamus and the thalamic syndrome that this study was undertaken, but merely that those cases in the files of the Government Hospital for the Insane showing any lesion of the thalamus at autopsy might be correlated.

The records of the last thousand autopsies, extending from number 2600 to number 3600, were gone over and all those cases showing any gross lesion of any character in any portion of the thalamus were selected, and there were added to these the few showing lesions only in the caudate or lenticular nuclei, even though the thalamus escaped. In this way thirty-one cases were selected. The first thing that strikes our attention is that the percentage, 3.1 per cent., is small. Southard, who studied similar material from the Danvers State Hospital, found forty cases of thalamic lesions in one thousand autopsies, or 4 per cent. Yet our thirty-one cases contain not only the thalamic lesions but the lesions of the cerebral ganglia, the caudate and lenticular nuclei. As the work of selection progressed we next noticed that the cases wanted were growing more frequent as the numbers became higher. This immediately suggested the conclusion that the observations of the autopsy room are steadily growing more thorough and painstaking and more accurate. This was well borne out by the progressively better descriptions of the lesions which occurred in the higher numbers. Later in studying the clinical records of these cases the same steady improvement in bedside observations and notes made in the histories was found. However, not all of the thirty-one cases were retained. Number 3 was discarded because this patient was mute upon admission, remaining so during residence here, and never coöperated in either physical or mental examinations. His brain was found to contain an old softening in the left thalamus, also one in the left lenticular nucleus. Number 6 was greatly excited upon admission and died so soon thereafter that no examinations had been made. This brain showed softenings in the left caudate and right lenticular nuclei. Number 30, although coming to autopsy comparatively recently, had

never had examinations other than casual observation because of a persistent refusal to coöperate. The only lesion in this brain was in the left lenticular nucleus. This leaves us a total of twenty-eight cases showing lesions in the thalamus, the lenticulate or caudate nuclei, upon which to make our comparative study. The only reason allowed to influence the discarding of any case has been the lack of proper examinations, and when we notice that only three cases out of thirty-one thus fall under the ban, in each one of which the failure is fully explained by the nature of the case, we can appreciate the conscientious work done by the clinicians, for we know that the insane are by no means easy to examine. In Southard's series of cases he excluded everything except chronic diffuse lesions of the thalamus, unaccompanied by any other condition, in this way confining himself to but twenty-five cases from his original forty in one thousand autopsies.

We decided to tabulate all cases showing any lesion of the thalamus, regardless of what else might be present, in order to see if involvement of this area might be expected to betray itself in the presence of better known and more common conditions.

The "Syndrome Thalamique" was first described by Roussy in 1907, although in searching the literature on this subject in 1912 Head found that similar cases had been reported before. The signs and symptoms upon which Roussy laid stress were hemianesthesia, involving the deep sensibility more than the superficial; paroxysmal pains on the affected side; little or no hemiplegia; hemiataxia and athetoid or even choreic movements on the affected side. Since he defined and delineated this clinical entity, a few cases have been added to the literature, their scarcity proving the infrequency of the occurrence of this type of case. Some variations or even discrepancies in these recorded cases have been discussed by Head, but such variations do not argue against the original points made by Roussy, for we all know how very seldom does any clinical case conform absolutely to the accepted descriptions, but some signs will be pronounced, others modified or absent altogether and many minor manifestations found. Guilfoyle says that lesions of the thalamus causing clean cut symptoms are rare. Gordon Holmes, writing on the Optic Thalamus in the Modern Treatment of Nervous and Mental Diseases (White and Jelliffe), says that the thalamic syndrome is characteristic if the thalamus alone be involved. He ascribes the two great fundamental causes to apoplexy and syphilis, those prolific reasons for brain trouble, and has tabulated the thalamic syndrome as follows, this being very similar to Roussy's findings:

GROUP I

	Age at Onset	Mental Diagnosis	History	Autopsy Findings: Shrinkage	Thalami	Caudate and Lenticular Nuclei	Paralysis	Physical Examination: Reflexes	Sensation	Movements	Speech	Miscellaneous	Mental: Hyperkinesis	Emotions	Mental Manifestations
1.	20	G.P.	Syphilis chronic alcoholism	+	R.	R.C.	Ptosis of left eyelid.	−		Incoördination	Indistinct	Convulsions.	+	+	Hysteria at 15.
2.	69	Unclassified psychosis.	Civil War veteran.	+	L.	L.L.	Right arm later of left arm.	+		Incoördition. Tremors.	Aphasic	Convulsions.		+	
4.	66	Psychosis with arteriosclerosis.	Chronic alcoholism. Civil War vet.	+	L.	L.L. R.L.	Right arm and hand.	N.	No sensory disturbances.	Intention tremor. "Constant gymnastics."			+		Grandiose.
5.	60	G.P.	Chronic alcoholic. Hard worker.	+	R. L.	L.L.	None.	R + L −	Subjective "pins and needles" in feet.	Incoördination.	Slurring.			±	
8.	88	Dementia with arteriosclerosis.	Chronic alcoholic. Civil War veteran.	+	L.	R.L.		+	Anæsthesia in left hand.	Tremor in left half of body.		Left otitis media.	+	+	Auditory hallucinations.
9.	70	Dementia with arteriosclerosis.	Unknown.	+	R. L.	R.C. R.L. L.L.	Right hemiplegia.						+		Deteriorated.

GROUP I.—*Continued*

11.	47	Psychosis with arterio-sclerosis.	Mother, brother and uncle insane.	+	L.	L.L. L.C.	Paresis of left side.	Both K.K. ++			Incoher-ent.	Dyspnea		±	Amnesic.
18.	68	Dementia with art.-scl.	Civil War veteran.	+	R. L.	R.L. L.L.		K.K. −		Tremor.		Hearing impaired.		+	Amnesic. Fearful.
23.	69	Dementia with arterio-sclerosis.	Father alcoholic. Mother insane. Civil War vet.	+	R.	L.P.		K.K. +		Tremor.		Hearing impaired.	+	+	Sometimes depressed and crying; sometimes laughing.
24.	59	Dementia with arterio-sclerosis.	Criminal.	+	R. L.	R.L. L.L. L.C.	Partially recovered rt. hemiplegia Later left hemiplegic atrophy.	Right K.K. + Left K.K. −	Muscular pains. Left side analgesic.		Aphasic.			+	Grandiose. Deteriorated.
28.	73	Dementia with arterio-sclerosis.	In the Navy 22 years.	+	R. L.	R.L. L.L. Clot of blood in R.L.	Had several series of convulsions.			No permanent impairment.					Irritable and quarrelsome before convulsions, quiet and cheerful afterwards.
29.	63	Undifferentiated psychosis.	Civil War veteran.	+	L.	R.L.	Recovered from rt. paresis in 1907. Left hemiplegia contractures and spastic.		Impaired below left knee. Pains in left arm.			Hearing impaired.			Amnesic. Cheerful.

GROUP I—*Continued*

	Age at Onset	Mental Diagnosis	History	Autopsy Findings: Shrinkage	Autopsy Findings: Thalami	Autopsy Findings: Caudate and Lenticular Nuclei	Physical Examination: Paralysis	Physical Examination: Reflexes	Physical Examination: Sensation	Physical Examination: Movements	Physical Examination: Speech	Physical Examination: Miscellaneous	Mental: Hyperkinesis	Mental: Emotions	Mental: Mental Manifestations
12.	60	Paranoid state.	Spinal curvature since 2 years old. Clerk.	Dura adherent.	R.	L.L.	Crossed paralysis rt. face and left side of body.		General soreness. Headache.		Hemiplegic				Ill-natured, was semi-stuporous from stroke till death—3 mos.

GROUP II

7.	61	Dementia præcox. Art. sel.	Civil War veteran. Carpenter.	+	R.			Right KK++ Left KK N.		Left foot, much tremor.	Incoherent.			±	Auditory hallucinations. Persecutory delusions.
13.	69	Epilepsy	Civil War veteran.	+	R.		None.	++		Tremor of tongue and fingers.		Convulsions	+		Delusions of inventing perpetual motion.
15.	56	Dementia with arteriosclerosis.	Unknown.	+	T.		Bedridden, cause not stated.	KK++ TA−. Radials− Triceps ++ Cremasteric −.	Astereognosis.	Incoördination of upper extremities. No tremor.	Slow.	Vision impaired.		±	Deteriorated.

GROUP II.—*Continued*

20.	57	Dementia with art. scl.	Sister died of cerebral hemorrhage.	+	L.		Slight right hemiplegia.	Rt. ++ Left −		Incoördination.	Aphasic.	Convulsions.	−	−	Depressed, apprehensive; hallucinations of hearing.
21.	85	Dementia with arteriosclerosis.	Slave. Civil War veteran.	+	L.			KK ++ Plantar ++	Pains in muscles. Hyperesthesia of rt. side. Hypoesthesia of left side. Burning sensation on left side.	Coarse tremor of fingers. Muscular twitchings on left side.	Normal.		+	±	Homicidal. Delusions of persecution. Deteriorated.
25.	73	Epilepsy with art. scler.	Civil War veteran. Epileptic.	+	L.		None.	++	No tactile disturbances.	Tremors of fingers.		Hearing imparied. Convulsions.	+	+	Grandiose.
27.	51	Psychosis with organic brain disease.	Moderate alcoholic. Waiter.	N.	R.		Left face. Left lid ptosis.	Right greater than left.	Everywhere hyperesthetic.			Double optic strophy.			Amnesia.
31.	24	Dementia præcox.	Unknown.	Whole brain soft.	L.		Evidences of chronic nephritis only.						−	−	Deteriorated.

GROUP III

10.	50	Manic depressive.	Civil War veteran.	+		L.C. L.L.	Right leg paralyzed.								Cyclic mental manifestations.

GROUP III.—*Continued*

	Age at Onset	Mental Diagnosis	History	Autopsy Findings			Physical Examination						Mental	
				Shrinkage	Thalami	Caudate and Lenticular Nuclei	Paralysis	Reflexes	Sensation	Movements	Speech	Miscellaneous	Hyperkinesis	Emotions	Mental Manifestations
14.	72	Dementia praecox, later art. scl.	Civil War veteran.	+		R.C.	Mild left hemiparesis.	KK++ Others N.		No incoördination.		Hearing impaired.	−	−	Depressed and retarded.
16.	76	Dementia with organic brain disease.	Mother paralyzed.	+		R.C. R.L.	Left hemiplegia.			Incoördination marked.		Ptosis of left eyelid. Deaf in left ear.	+		Deteriorated.
17.	75	Dementia with art. scl.	Civil War veteran.	+		R.C. R.L.	Slight paralysis of right arm.	++		Incoördination, tremor.	Aphasia. Apraxia.			±	Transient persecutory delusions.
19.	59	Post hemiplegic dementia.	Civil War veteran.	+		L.L.	Left hemiplegia.	KK++ Others N.	Left hyperesthesia and hypoalgesia.	No incoördination. Tremor of fingers of left hand.	Aphasia.			+	Deteriorated.
22.	68	Manic depressive, later cerebral hemorrhage.	Unknown.	+		L.L.	Right hemiplegia.				Aphasia. Apraxia.				Deteriorated.
26.	48	G.P.	Syphilis.	Basal vessels atheromatous.		L.L.		KK++		Incoördination tremor. Romberg. Argyll-Robertson pupil.	G.P.		+		Euphoric. Grandiose.

1. Persistent loss of superficial sensation over one half of the body subject to partial recovery—loss of deep sensibility persists.
2. Slight hemiataxia, more or less astereognosis.
3. Severe subjective pains on the affected side.
4. More or less hemiplegia—contractures rarely develop.
5. Choreic or athetoid movements.

Rather than make separate tables for each group of facts entering into consideration, it was thought best to make one complete table, although this would of necessity be more or less complicated. In this way each case remains an entity, besides affording a more comprehensive view of the whole situation.

The age at onset was taken, not necessarily as the beginning of the primary psychosis, but as the beginning of this particular organic condition. Some patients were admitted to the hospital because of the psychosis following this brain lesion, while others had been with us for many years, this being their terminal state. In comparing the ages at onset we find that the senile and arteriosclerotic period contains the most cases, there being twenty such who were 60 or beyond. One, at 59, just misses of being included; while two others, at 56 and 57, are not far away. However, in these last three the presence of arteriosclerosis was diagnosed, thus including the individuals in the arteriosclerotic period, although rather young. Hence we have a total of twenty-three cases or 82.1 per cent. from our entire twenty-eight who belong in this group. Two cases occurred quite early, at 20 and 24 respectively, and the other three in the middle of life, at 47, 50 and 51. Hence the later years of life, when the arteries have become more or less hardened, is the period when such a lesion can be more confidently expected.

In comparing the mental diagnoses we may consider as being identical for all practical purposes, dementia associated with arteriosclerosis; psychosis associated with arteriosclerosis; post-hemiplegic dementia; and number 16, dementia associated with organic brain disease, the organic brain disease in this particular case evidently being arteriosclerosis. Of cases with this diagnosis we find fourteen. In cases number 7 and 14, diagnosed dementia præcox, the presence of arteriosclerosis was also noted. Number 25 was diagnosed epilepsy plus arteriosclerosis; number 22, manic depressive psychosis, was known to have suffered from cerebral hemorrhage. Numbers 2, 29, 12 and 13, as will be seen by looking at the table, fall definitely within the arteriosclerotic period. We thus find a total of twenty-two cases, or 78.5 per cent., in which arteriosclerosis was undoubtedly the cause of the trouble. We find but three

cases, numbers 1, 5 and 26, in which the presence of syphilis was definitely known, all three of these cases being diagnosed general paresis. Hence twenty-five of our cases fall without question under one or the other of the two great causative factors mentioned in White and Jelliffe. Of the three remaining, numbers 27, 31 and 10, no definite cause was determined.

In comparing the histories of these cases very little hereditary taint was found. Number 11 had a mother, brother and uncle who were insane; number 23 had an insane mother and an alcoholic father; number 20 lost a sister from cerebral hemorrhage; number 16's mother became paralyzed. In looking at the personal history of the individuals concerned we can find more reasons for the trouble which came to them later. Syphilis and alcoholism are several times repeated, and over and over again do we read "Civil War Veteran." This at first was considered merely a curious coincidence, but as the table lengthened and this fact continued to occur until fourteen cases, ten of which belonged in the first two groups (see table) in which lesions of the thalamus were seen, were found to have this history in common, it was decided that it must have some bearing upon the problem. The Civil War veterans are but one element in the population of a hospital which draws its patients from many sources, and all other classes combined have contributed no more lesions of the thalamus and lenticular and caudate nuclei to this study than have the "Old Soldiers." We know the period of terrible emotional strain through which these men passed, when brother was fighting against brother and the nation was rent to its foundations. Pictures taken then show the grim agony of the participants, an agony which left their faces stamped forever with their sufferings. It has been abundantly proven, as Guilfoyle says, that the thalamus has some relation to the emotions, although the whole subject is more or less vague. Therefore, it does not seem at all unlikely that this awful emotion should have left the thalamus a vulnerable point at which a definite lesion might be expected when arteriosclerosis appeared in due course of time. Reasoning from these conclusions then, we learn that we may expect to find in the history of a patient suffering from the thalamic syndrome, some unusually severe and long-continued emotional strain.

In comparing the autopsy findings our cases fell naturally into three groups; first those cases in which there were lesions of the thalamus and one or the other, and sometimes both, of the other two nuclei; second, those in which the lesion existed in the thalamus only; and third, those in which the lesion existed only in the lentic-

ular and caudate nuclei, one or both. We have thirteen in the first group, eight in the second and seven in the third. This gives us but twenty-one cases of thalamic lesions from our one thousand autopsies, or 2.1 per cent., a much smaller percentage than that found by Southard. In only one instance, number 27, was the brain as a whole considered normal. Of the others, shrinkage was present in all but numbers 31 and 12. The entire brain of number 31 was soft while the dura was everywhere adherent in number 12. The shrinkage varied in distribution, the frontal lobes being usually the ones attacked. It also varied in degree from that grade described as atrophy, to merely a slight general shrinkage. This we know to be the usual finding in arteriosclerosis, and it probably has a large influence in determining the mental manifestations of the patients affected. It must therefore be taken into account in evaluating these various reactions.

The findings of the physical examination of these cases were grouped along the general lines indicated by Gordon Holmes' tabulation of the thalamic syndrome; paralyses (and reflexes), sensation and movement. Because so frequently were disorders of speech noted, this was given a place and a space for unrelated observations of interest in individual cases was also arranged. Since it is the general practice to record only positive findings in making examinations, the cases were treated as if all points were absent except those definitely stated to be present. In three cases the absence of paralysis was noted. The paralyses present varied from a complete hemiplegia in numbers 9, 24, 29, 12, 20, 16, 19 and 22, to a mere ptosis of the lid in number 1. Sometimes the paralysis was described as slight, and often a partial recovery was noted. In numbers 24 and 29 a partially recovered hemiplegia was described which was followed in a few years by a lasting hemiplegia of the opposite side, and number 29 showed that rarity in paralyses due to thalamic lesions, contractures and spasticity. In both of these cases the lenticular nucleus was involved. In Group I we find paralysis present in eight out of thirteen cases, or $61\frac{7}{13}$ per cent. In Group II paralysis is present in only two out of eight cases, or 25 per cent. In Group III it is present in six out of seven, or 85.6 per cent. The number of cases upon which these percentages, as well as all others in this study, are based is necessarily so small that the percentage cannot be read as applicable to the entire problem, for the difference of even one case would have made a very material difference in the results. However, it is startlingly clear that those lesions in the thalamus alone were much less frequently accompanied by paralysis

than those in which there was involvement of the lenticulate or caudate nuclei, one or both. Of the two cases in Group II showing paralysis, one, number 20, was described as a slight right hemiplegia, and the other, number 27, as being a paralysis of the left side of the face with ptosis of the left eyelid. This puts our cases very definitely on the side of Roussy's original observation, "little or no hemiplegia."

The reflexes in these cases can only be described as variable. In number 4 they were considered normal. In number 1 they were absent. Often the knee kick was exaggerated and the others normal. In number 5 they were somewhat exaggerated on the right side and absent on the left, yet this is one of the cases in which the absence of paralysis was noted (probably because of this unaccounted for peculiarity of the reflexes). In number 20 they were increased on the right side and absent on the left, this coinciding with the presence of a slight right hemiplegia. In number 27, which shows a paralysis of the left half of the face, the deep reflexes on the right side were greater than those on the left. There is probably no other single type of observation made in which the personal equation of the examiner plays so large a part.

Disorders of sensation were noticed in only nine of the entire twenty-eight cases. Of these, five, or $38\frac{6}{13}$ per cent., were present in Group I; three, or $37\frac{1}{2}$ per cent., in Group II, and one, or $14\frac{2}{7}$ per cent., in Group III. Here we see that the percentages of impairment of sensation in Groups I and II, the thalamic lesion being present, are practically the same, and are markedly decreased in Group III, where there is no involvement of the thalamus. Of these cases muscular pains were present in three, numbers 24, 29 and 21; general soreness in one, number 12; anesthesia in only one, number 8; astereognosis in number 15; number 24 also showed a left-sided analgesia, which accompanied the left hemiplegia in this case. Number 19, also showing a left hemiplegia, had a left hyperesthesia and left hypoalgesia, this being the only case manifesting sensory disturbances with no lesion of the thalamus. Number 27 was said to be everywhere hyperesthetic, and number 5 had the subjective sensation of "pins and needles" in the feet. These disorders of sensation are what Bing calls *direct thalamic symptoms,* they being dependent upon the function of the thalamus, which he calls "the great connecting station . . . through which practically the whole of the sensory tracts must pass before diverging to the cortex."

Hemichorea and hemiathetosis we find in these cases but rarely. Number 8 had a tremor in the left half of the body, number 7 a

marked tremor of the left foot, number 21 muscular twitchings of the left side and also tremor of the fingers of the left hand. Thus we have but four cases showing anything like the characteristic movements of the thalamic cases, and they are not sufficiently close to the accepted symptoms to warrant any conclusions. Besides these, some involvement of movement is present in seventeen cases, usually incoördination or tremor, or both, but it is highly possible that the shrinkage of the brains could account for this.

Some disturbance of speech was present in thirteen of these cases, grading from mere incoherence and slurring to the hemiplegic speech. Of these six cases were definitely aphasic, and two showed both aphasia and apraxia. In none of the aphasic cases was there any involvement of Broca's convolution or Wernicke's center noted at autopsy, but Broca's convolution was described as shrunken in number 5 where the only speech defect was one of slurring. Bing says that the anarthric form of aphasia, which depends upon a disturbance of the nervous mechanism of the speech muscles themselves, is met with in both bulbar and pseudo-bulbar paralysis as the result of a nuclear lesion on the one hand, or a supra-nuclear lesion on the other.

In the last division of the table under physical examination were placed findings which might be of interest. Thus we have five cases who suffered from convulsions. One of these was a paretic and two were epileptics, and two suffered from arteriosclerosis. One, number 8, had an otitis media on the same side of the body showing sensory and motor disturbances. One suffered from an unexplained dyspnea; vision was impaired in four; double optic atrophy present in one, this being number 27, a case of brain tumor involving the thalamus; hearing was impaired in six cases, one, number 16, being deaf on the side opposite to the lesion. All of these last cases, except number 27, occurred in patients who were definitely in the arteriosclerotic period, this being the probable cause for such impairment.

In Southard's series of cases, which it must be remembered were purely thalamic, hyperkinesis was found to be the most prominent mental manifestation, being present in 66 per cent. As hyperkinesis he included all grades of increased activity from rather severe excitement to mania. Because of his findings this was made the first line of our mental observations. In looking at the table it will be seen to be present in six cases in Group I, or $46\frac{1}{13}$ per cent.; in three cases of Group II, or $37\frac{1}{2}$ per cent.; and in two cases of Group III, or $28\frac{4}{7}$ per cent. Although, as has already been stated,

our numbers are too small to admit of very definite conclusions, we did not find this symptom present in so large a percentage as we had expected, nor indeed as could confidently be looked for if this is to be considered the result of simplification of the thalamus, for the primary conditions of arteriosclerosis and general paresis, one of which is present in each of these cases, would only tend to make this result more noticeable. On the other hand we find two of our cases, or 25 per cent., in which the thalamus is the site of the only lesion, to be definitely akinetic while only one case in Group III is akinetic. Also it will be noticed that number 28 was irritable and quarrelsome; *i. e.*, hyperkinetic, before what was probably the beginning of this trouble and quiet and cheerful afterwards.

The thalamic over-response in the emotional field was found in five cases, or $38\frac{6}{13}$ per cent., of Group I, and in only one, or $12\frac{1}{2}$ per cent., of Group II, and one, or $14\frac{2}{7}$ per cent., of group III. Besides there were six cases from the entire twenty-eight which were considered emotionally indifferent. There was no case of depression in Group I, but there were two, or 25 per cent., in Group II, and one, or $14\frac{2}{7}$ per cent., in Group III. The depression of number 20 was accompanied by apprehensiveness, and number 14 by retardation, while number 13 was deteriorated.

If we look over the mental manifestations exclusive of hyperkinesis and the emotions, we find nothing especially characteristic. Number 1 is seen to have suffered from hysteria at the age of 15. This probably brings this individual in line with those who have suffered a severe and long continued emotional strain, rendering the thalamus a fit subject for attack five years later when general paresis developed. Numbers 4, 24, 25 and 26 were grandiose. Delusions and hallucinations of various kinds were found in numbers 8, 7, 13, 20, 21 and 17, while number 21 was the only one which showed any homicidal tendencies.

Now in comparing these cases as units with each other, we find not one to present the perfect picture of hemiparesis, hemiathetosis, loss of superficial sensation and deep muscular pains, together with the mental phenomena of hyperkinesis and emotional over-response. Numbers 24, 29 and 21 are the most complete.

Number 24 was admitted at the age of 59, coming to us from jail, with a diagnosis of post hemiplegic dementia, date and onset unknown. Nothing more concerning his history could be learned. He bore the residuals of a right hemiplegia and was already quite amnesic. He was irritable, excitable and grandiose. Two months after admission he passed through a period of several days when he

was stupid and semi-stuporous, although he showed no other evidences of cerebral hemorrhage at the time. Not long afterwards he began complaining of muscle pains, his left side was analgesic and left-sided paralysis accompanied by rigidity and atrophy appeared; his speech became muffled and finally a distinct motor aphasia, which was probably in reality anarthric, was noted. He became almost completely amnesic and hyperkinetic. He died two years later of respiratory trouble.

Number 29 was admitted in 1871 at the age of 25, and was a model patient, working for years in the tailor shop. At the age of 63 he had a slight cerebral hemorrhage, following which there was some clouding of consciousness and some diplopia, and a transient right hemiplegia. He made a complete recovery in one month's time and returned to his former employment. Three years later he had a more severe cerebral hemorrhage followed by a left hemiplegia from which he later made a partial recovery, although his left arm became contractured and spastic. He also had some difficulty in swallowing. Sensation became impaired below the left knee and he complained of muscle pains in his left arm. He finally became amnesic but never showed any hyperkinesis or lack of emotional control.

Number 21 was a slave and a Civil War veteran. He had been suffering for a long time with gradually progressive blindness and deafness, which began during the war. His first mental symptoms were noticed about a year before admission when he became excitable, suspicious, talked to himself, began harboring delusions of persecution and became homicidal. There was no history of his having had a stroke and there were no evidences of one upon his admission. He did, however, have pains in his muscles; there was a hyperesthesia of the right side and a hypoesthesia of the left side; subjective numbness of the left arm and leg; and muscular twitchings of the left side. He showed hyperkinesis, but remained emotionally indifferent. He died five years after admission.

If we compare Group III, in which there are no thalamic lesions, with Groups I and II, we find some points of difference and some of similarity. Age, diagnosis and history are very much the same throughout the entire table. There is hemiplegia, either mild or partially recovered, as a result of lesions of the caudate and lenticular nuclei, just as commonly as in those cases in which the thalamus is involved. There is marked difference in the presence of sensory and motor disturbances. Only one case in Group III, number 19, showed hyperesthesia and hypoalgesia of the affected side. No case

showed muscular pains. There is no single instance of hemichorea and hemiathetosis, although number 19 does show tremor of the affected hand. This group also contained half of the cases of aphasia, and all of the cases of apraxia. Although hyperkinesis was present in two cases of this group the emotional over-response was present in only one.

Conclusions

1. Lesions of the thalamus are more liable to occur in the later years of life.

2. An early, severe and long continued emotional strain leaves the thalamus susceptible to future trouble.

3. Lesions of the thalamus seldom exist alone.

4. The presence of a partially recovered hemiplegia is not especially diagnostic of thalamic involvement.

5. Sensory and motor disturbances over half the body point more certainly toward a lesion of the opposite thalamus.

6. While the thalamic syndrome is characteristic if present, its absence does not indicate that the thalamus is intact.

7. Hyperkinesis is not so constant as expected, and often it can be accounted for by the arteriosclerosis present, as well as by the simplification of the thalamus.

8. However, no other mental phenomena are so constant as hyperkinesis and the emotional over-response.

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THE SPINAL TYPE AND FAMILY FORM OF PROGRESSIVE MUSCULAR ATROPHY AS APPEARING IN ADULTS

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NEUROLOGIST TO THE GERMAN AND K. C. GENERAL HOSPITALS

The following case report is that of a patient who represents the third generation and the fourth member of his family having this very unusual type of muscular atrophy.

Basing our nomenclature upon the location of the primary lesion we recognize three general types of progressive muscular atrophy, *i. e.*, the nuclear, the neuritic and the myogenic. The nuclear types are those in which the primary degeneration is in the ventral horn cells, with secondary nerve and muscle fiber changes. The forms are the Hoffmann-Werdnig of infancy, the Aran-Duchenne of adults, and mixed forms. The neuritic types are those in which the primary degeneration appears in the motor nerve fibers with secondary changes in the ganglia, cord and muscles. The forms are the (Charcot-Marie-Tooth) peroneal-arm type, the (Dejerine-Sottas) tabetic type, and the peroneal and arm type (Sainton and Haenel). The myogenic types are those in which the primary degeneration appears in the muscles. The forms are hereditary (Leyden-Möbius), juvenile pseudo hypertrophy (Landouzy-Dejerine), and mixed forms (Erb-Zimmerlin). Heredity is recognized as the most important etiological factor in the infantile nuclear, the neuritic and myogenic types of atrophy.

The adult types of progressive nuclear atrophy usually appear as isolated phenomena, endogenous factors seem to be less, and exogenous factors more preponderant in the etiology. The exogenous factors that have been suggested as being most important are trauma, cold, toxins and infections. There has been described by Bernhardt and others a family form of progressive nuclear atrophy which appears in adults, almost exclusively in males, usually between the third and sixth decades of life. Exogenous factors seem to have little if any part in its etiology.

It is not to be confused with anterior poliomyelitis, amyotrophic lateral sclerosis or occupation atrophies, although overuse of the muscles may precede its development.

The primary symptom is usually a weakness of the thumb of the right hand, although the thumb of the left hand may be first affected in left-handed persons. The weakness is soon followed by a flattening of the ball of the thumb. The weakness and wasting quickly extend to the flexor and abductor muscles of the thumb, and when these become weakened and atrophied the preponderant action of the extensor brevis pollicis pulls the first metacarpal bone backwards so that the thumb lies on a plane with the other fingers, giving the so-called ape hand.

The intrinsic muscles of the hand are next involved, after the interossei muscles atrophy, the hand is transformed into a claw hand, and when the deep and superficial flexor and the hypothenar muscles are atrophied it becomes a skeleton hand. The muscles of the segment of the shoulder girdle corresponding to the affected hand are usually involved secondary to the hand, the muscles of the arm and forearm later. The atrophy is not complete in any one group of muscles before other groups are attacked. It may jump from group to group, attacking one or more muscles of the group, rarely does it involve all the muscles of a group equally, nor are all the fibers of the individual muscles affected to the same degree simultaneously.

The weakness and wasting may be limited to one side for several months before the opposite hand, shoulder and arm are affected. The weakness and wasting are usually limited to the hands, shoulder girdle and arms, the pelvic girdle and legs rarely being affected, or if affected at all, very late in the course of the disease. The neck muscles may atrophy late in some cases, and the cells of the bulbar nuclei degenerate. The paralysis is a flaccid paralysis, the tendon reflexes are diminished and may be lost, although they may be exaggerated in the earlier stages. Fibrillary twitchings are always present in the wasting muscles. There action of degeneration is present but is rarely complete.

There are no objective sensory disturbances, but paresthesias may be present. There is frequently some pain due to the pendent position of the humerus, which may result in pressure upon the brachial plexus.

The rapidity of progress varies greatly. If some intercurrent disease does not cause death, the patient lives from one to several years. Remissions sometimes occur lasting over several months. Death not infrequently results from a diaphragmatic or bulbar palsy. Treatment is of little avail. Gowers recommends strychnia, a daily hypodermic dose, varying from $\frac{1}{120}$th to $\frac{1}{40}$th of a

grain in the earlier stages, and one dose two or three times per week in the later. Arsenic and extract of the thyroid gland have also been suggested. Oppenheim advised the use of electricity, the galvanic current to the spine and the faradic or galvanic to the muscles, but has little confidence in such treatment giving beneficial results.

The wasting muscles fatigue readily, and excessive use should be carefully avoided. As a prophylactic measure, avoidance of excessive use of the muscles of those predisposed is of value. I submit the following case report.

The patient, H. J. P., male, aged 37, married, occupation carpenter, consulted me November, 1915. Complaint, a weakness and wasting of the muscles of the right hand, arm, forearm and right segment of the shoulder girdle.

Past History.—Previous health had been generally good, no serious illness. Syphilitic infection denied. No trauma. Smoked moderately but has not used alcohol. Has been following the trade of a carpenter for many years. While of medium size with a maximum weight of 150 pounds has always been proud of his strength. Had a good salary and lived well.

Family History.—The only part of his family history of special importance is that relating to his paternal grandmother, his father and uncle. At the age of 57 his paternal grandmother developed a weakness and wasting of the right hand, segment of the shoulder girdle, arm and forearm, which later extended to the left hand and left segment of the shoulder girdle, arm and forearm.

Death occurred about one year after the first symptoms made their appearance. He gave a history of his father's half brother by a common mother developing at the age of 51 a condition which he described as being identical in onset and course with that of the grandmother. He, too, died about one year after the first symptoms developed.

At the age of 46 his father began complaining of weakness of the thumb of the right hand followed by a wasting of the muscles of the ball of the thumb. The weakness and wasting then extended to the other muscles of the hand, right segment of the shoulder girdle, arm and forearm. Later the thumb of the left hand was affected in a similar manner. Weakness and wasting progressed to the other muscles of the thumb, muscles of the hand, left segment of the shoulder girdle, arm and forearm, and then to the muscles of the neck, but according to the statement of the patient there was no involvement of the muscles of the pelvic girdle or legs. He states that his father died quite suddenly. Thirty minutes before his death he had walked across the floor. From the history given I believe the father died of a respiratory paralysis, and had some involvement of the bulbar nuclei. His death occurred eighteen months after the onset of the first symptoms.

History of Present Illness.—According to the statement of the patient his symptoms appeared about the middle of August, 1915. The first symptom was a dull pain in the right hand; this was soon

FIG. 1. January 27, 1916. Showing evidence of weak contraction of right biceps and atrophy over scapula.

followed by a weakness of the adductor muscles of the thumb. He discovered that he could not grasp and hold articles with which he was working as strongly as had been his custom. Whereas formerly his right hand had been the stronger it now appeared to be the

FIG. 2. January 27, 1916. Left arm flexed. Compare with right arm in Fig. 1.

weaker of the two. On examination he found that the muscles of the ball of the thumb were wasting. This wasting rapidly extended to the other muscles of the thumb and to the muscles of the hand, to the right segment of the shoulder girdle and to the arm and forearm. At the time he consulted me he was able to work, but according to his opinion the strength of his right hand and arm had decreased about 50 per cent. He could observe a considerable wasting and the pain had continued of sufficient severity to be quite annoying.

Upon examination I was much impressed by the very excellent

general muscular development. There were no signs of any wasting, loss of power or decrease of muscle tone about the left segment of the shoulder girdle, left arm and hand, or about the pelvic girdle or the lower extremities. There was a very perceptible wasting involving the muscles of the right segment of the shoulder girdle, right arm and all of the hand. Also evidence of loss of power of the affected muscles. The grip of the right hand, tested by the dynamometer, was 70, that of the left hand being 140.

Fibrillary twitchings were present all over the involved area. The deep reflexes of the right arm and shoulder were present, but

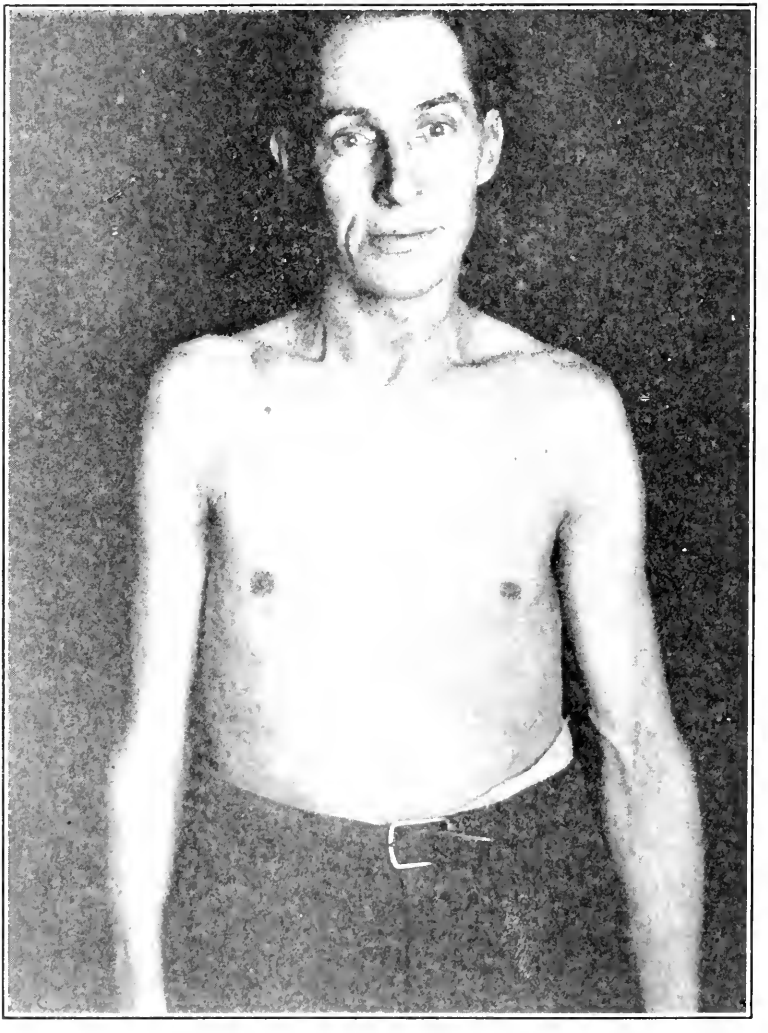

FIG. 3. January 27, 1916. Note difference in size of arms and pectoral atrophy.

much depressed, while those of the left arm and shoulder and lower extremities were normal in quantity and quality. Station and gait were not impaired. There were no symptoms present of involvement of the pyramidal, sensory or cerebellar tracts of the cord.

FIG. 4. March 3, 1916. Contrast with Fig. 3, and note progress of atrophy from January 27th to March 3d.

There were no objective evidences of disturbance of any of the components of sensation. All the organs of special sense appeared normal, with no signs of impairment of function. There were no

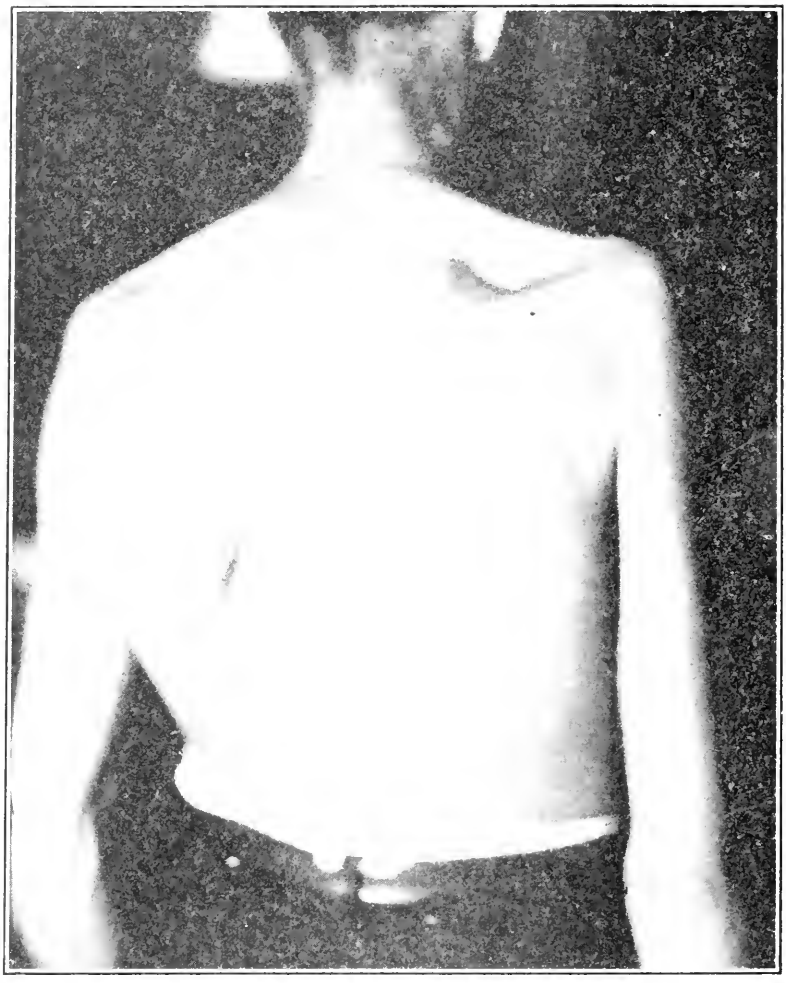

FIG. 5. March 3, 1916. Atrophy of supraspinatus, deltoid and trapezius muscles well illustrated.

anatomical or physiological abnormalities found in the circulatory, respiratory, gastro-intestinal or genito-urinary systems. There were no symptoms present indicating a syphilitic infection, or any other form of intoxication. The blood responded normally to all tests. The cerebrospinal fluid was normal in quality and quantity, being negative to the Wassermann, gold chloride and globulin tests.

The financial affairs of the patient were such that it was imperative that he continue his occupation, therefore the affected muscles could not be given the rest which they should have had. The patient was under my observation from November, 1915, to March 3, 1916, when he left Kansas City. During this time he was given

strychnia in accordance with Gowers' suggestion, arsenic in the form of Fowler's solution a part of the time, and some galvanic electricity to the spine, interrupted galvanic and faradic to the muscles. The progress of the weakness and wasting was steady, by the middle of February, 1916, the power of the right hand had so decreased that the dynamometer did not register above zero.

On March 3, 1916, there was no appreciable wasting of the muscles of the left shoulder, arm or hand, but the power in the left hand had also decreased so that the maximum registration of this hand was not more than a hundred. Since he left Kansas City I have heard from him twice. These reports indicate that the progress of the weakness and wasting has continued steadily, and fibrillary twitchings have appeared in the left side. When I last saw him the wasting was greater in the right segment of the shoulder girdle and the right hand than in the arm and forearm, and reaction of degeneration was complete in some of the muscles about the shoulder and hand, but not in all. The progress has thus far been rapid, and I believe will continue relatively rapid until death.

Note. It is reported to me that Mr. Parker died of respiratory paralysis, December 3, 1916. I have been unable to get further details of his last illness.

VARIATIONS IN THE SENSORY THRESHOLD FOR FARADIC STIMULATION IN PSYCHOPATHIC SUBJECTS

By G. P. Grabfield, M.D.

IV. The Alcoholic Group*

The first indication that information of clinical value could be obtained by the determination of the sensory threshold for faradic stimulation in psychopathic individuals was in the alcoholic group, and the present study shows that this value lies chiefly in its prognostic importance. In the first study (1) the following conclusions were drawn in regard to this group: "The average threshold for alcoholic cases was 252, and among alcoholic cases the polyneuritic or Korsakoff cases ran highest. Upon withdrawal of alcohol and in convalescence the threshold falls, and the method may even have practical value in gauging the degree of progress toward recovery in the delirium tremens group." These conclusions appear to find ample substantiation in the present series. Before presenting the results the experimental procedure and findings in normal cases will be briefly set forth.

Experimental Procedure.—The method used is that described by Martin (2) for the measurement of induction shocks. It depends upon the fact that with a given current running through the primary coil of an inductorium the shock delivered by the secondary (on making or breaking the primary current) is dependent upon the proximity of the secondary to the primary in any given plane. The fact that the amount of shock does not vary proportionately to the distance between the two coils makes it necessary to calibrate the inductorium used according to the method described by Martin. The current running through the primary used in this work was 0.3 ampere. The shocks were delivered by means of the Martin "Make and Break Key" (3), the advantage of which lies in the fact that it gives a uniform break or make as the case may be. Throughout this work only break shocks were used. The electrodes consist of two tubes about 5 inches long and of a diameter to admit the fingers

* I wish to express my sincerest thanks to Dr. E. E. Southard for his kind assistance and interest and for placing the clinical material at my disposal.

comfortably. The wires from the secondary coil are led to the bottom of these tubes (one into each tube) over the top of the tube. The insulation of the wires is stripped for a distance of about 1–2 cm. from the ends of the wires which rest on the bottom of the tubes. Around the ends of these wires is a layer of mercury, over which lies a layer of calomel paste to a depth of 2 cm. The rest of the tube is filled with 15 per cent. salt solution.

The patient, who sits in a different room from the operator, dips the index and middle fingers of his left hand into the electrodes and is instructed to press a telegraph key whenever he feels a shock. The operator starts with the secondary coil in a position where it will deliver a subliminal shock and gradually approaches it to the primary, breaking the current at short, irregular intervals. Finally the patient signals, indicating that he has felt the shock. This point and its environs are tried and retried until the point furthest from the primary is found where the patient feels nearly every shock. This can be found within 2 mm. as measured on a scale which has as its zero the point where the secondary is over the primary. This procedure is repeated three times with 10,000, 20,000, 30,000 ohms respectively added to the secondary circuit. Thus it is evident that deception on the part of the patient is impossible. The entire procedure consumes about 6 minutes, on the average, although perseverance will frequently procure a reading from a subject who at first seems to offer no coöperation whatever. The resistance of the coil used in this work is 2,900 ohms. In work of the highest accuracy it is well to determine the resistance of the patient's skin in each case by the Kohlrausch method. These resistances have been found to be very constant, however, and in our work we felt that it was better not to determine the resistance in each case on account of the time necessary for the procedure and the restiveness of certain patients. We have taken the resistance of the skin to be 2,100 ohms. About 75 per cent. of all resistances lie within 300 ohms of this figure and the remainder vary from 1,000 to 4,000 ohms. This introduces such a small percentage error (especially inasmuch as we are dealing for the most part with pathologically high thresholds) that the plan of not taking resistances appears to be justified. We have, then, in the secondary circuit the resistance of the secondary coil (2,900 ohms) plus the resistance of the patient (2,100 ohms) or 5,000 ohms. Our four readings of the position of the secondary of the coil are made with the resistances of 5,000, 15,000, 25,000 and 35,000 ohms respectively in the secondary circuit. From these resistances, the value of the primary current, and the position of the secondary of

the coil we arrive at the value of the shock necessary to cause sensation by certain formulæ developed by Martin (2). The final result is expressed in beta units. Throughout this work the threshold has been expressed in these units, and, of course, the higher the figure the less sensitive is the subject. One beta unit is the average amount of shock necessary to cause a minimal contraction of a frog's gastrocnemius stimulated through the sciatic nerve in the well-known nerve-muscle preparation. Thus it will be seen that these units have a physiological basis.

The average human threshold for the fingers in these electrodes was found by Martin, Porter, & Nice (4) to be about 100 Beta Units at 2:00 P. M. It was later found that this threshold had diurnal and nocturnal variation (5, 6) which correspond closely with the diurnal and nocturnal variations of the nervous system as observed by other methods. It was also found that general fatigue raised the normal threshold (7) to a marked degree but not to abnormal figures. All the present observations were made at a time when the threshold is at a high point in the daily rhythm, *i. e.,* between the hours of four and eight P. M. It has been found by Dodge and Benedict (8) that the normal threshold is raised by alcohol and by Martin, Grace, and McGuire (9) that a similar effect is demonstrable after the ingestion of acetphenetidin. From these last two observations it will be seen that the following evidence has a solid experimental basis.

The Present Material.—The present series falls naturally into the following groups and will be considered under these heads:

I. Delirium Tremens.
II. Acute Alcoholic Hallucinosis.
III. Korsakoff's Psychosis.
IV. Unclassified and Miscellaneous Conditions due to Alcohol.
V. Other Psychoses complicated by the use of excessive Alcohol.

Again in this group as in all others much depends on the accuracy of the diagnosis. The diagnostic error of the Psychopathic Hospital diagnoses as judged by further observation of cases sent from here to other state institutions is about 20 per cent. (10). Although not specifically mentioned in the paper quoted the diagnostic error of this group must be much smaller. Many of the cases here considered were never sent to other institutions, but were observed at this hospital during the entire period of their psychosis, and inasmuch as the diagnoses here used are the final discharge diagnoses they are probably as correct as it is possible to establish. Furthermore the diagnostic lines can be more sharply drawn in this group than

in the dementia præcox group, for instance, and thus the opportunity for diagnostic error is considerably less.

There were in all 94 cases tested[1] of which number there were two from whom it was impossible to get a valid reading at any time.

TABLE I

Types	Total Cases	Males	Females	Limits of Variation	No. of Observations	Av. Threshold
Group I.....	22	18	4	85– 493	33 – 1 = 32	241 β units
Group II.....	17 – 1 = 16	15 – 1 = 14	2	46– 545	26 – 1 = 25	209 "
Group III....	7 – 1 = 6	3	4 – 1 = 3	150–1,560	20 – 2 = 18	443 "
Group IV.....	14	14	0	86– 606	20 – 0 = 20	249 "
Group V.....	34	29	5	23–1,661	74 – 0 = 74	246 "
Total.....	94 – 2 = 92	80 – 1 = 79	15 – 1 = 14	23–1,661	173 – 4 = 169	270 "

As one looks over the alcoholic cases (cf. Table I) the one fact that is impressive is that the ingestion of alcohol undoubtedly raises this threshold. This is more apparent when one finds that almost every low value is in a recovered case, or at any rate in a case that has not had alcohol for some time. We have divided the observations into three fields (1); normal (under 150 beta units, doubtful (150–175), and pathological (over 175 beta units). According to this scheme it is found (cf. Table II) that the highest threshold values

TABLE II

Groups	No. of Observations[2]			Average Time of Observations Before Discharge		
	Normal	Doubtful	Pathological	Normal	Doubtful	Pathological
I. 22 cases.....	7	2	23	4	6	9
II. 16 cases.....	3	1	21	3	12	11
III. 6 cases.....	0	1	17	–	5	90
IV. 14 cases.....	4	3	15	3	3	21
Total. 48 cases.....	14	7	76	3	6	24

are obtained nearest the point where the alcohol is withdrawn and that lower values are obtained the longer after the withdrawal of the drug the observations are made. Group V was omitted from

[1] The case numbers are: 2820, 3573, 2845, 1750, 2318, 1857, 1713, 1877, 380, 2220, 2812, 1879, 2054, 1999, 1926, 2323, 3804, 2824, 2200, 999, 2042, 2280, 1420 ( ), 4382, 4255, 3720, 3926, 3042, 3816, 3776, 1997, 1354, 2500, 1900, 3697, 1635, 2299, 1831, 2853 1483, 3898, 1952, 1910, 4268, 4252, 3104, 4332, 2303, 2365, 2334, 2020, 1941, 2840, 227, 2850, 3755, 3681, 2089, 4302, 3578, 3757, 1886, 2030, 2210, 3571, 2336, 2154, 2078, 2058, 4001, 2851, 2354, 2347, 1837, 1926 (3958), 4277, 3583, 202, 1109, 2367, 164, 2227, 3664, 3830 (3627, 3037), 3591, 1848, 2180, 3699, 3880, 3862, 2105, 1849, 2297, O. P. D. No. 2070.

[2] Invalid observations are excluded from consideration.

this table as the variation of the threshold is complicated by the variations of the values in the psychoses to which the cases in this group belonged and about which not enough is known to enable them to be taken into consideration. It is from this fact that the hope that this test might prove to be of prognostic value arose, and we feel that the evidence afforded by the present group of cases is quite conclusive on this point.

Group I.—The delirium tremens group offers the best material for prognostic study. There were five cases tested more than once,

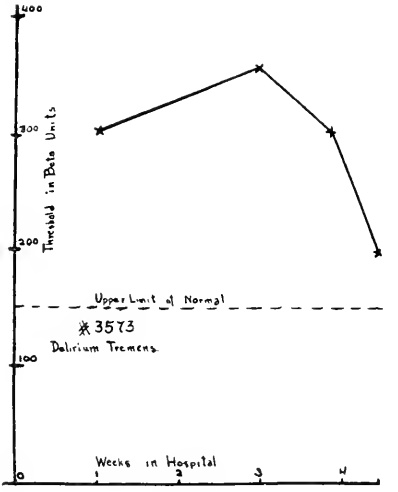

FIG. 1. Shows a curve of recovery in the delirium tremens group. The ordinate represents the threshold expressed in the number of beta units required to produce sensation, the abcissa the duration of the patient's stay in the hospital in weeks.

and each one showed a downward trend, until at the time of discharge a normal value was obtained. Only one case failed to show a pathologically high threshold when tested soon after admission. This man (No. 380) was a morphinist and at the time he was tested was possibly suffering more from this drug than from alcohol. Fig. 1 shows the type of progress of these cases. This case (No. 3753) showed an increase in threshold before the final fall to normal, acting in this respect like certain of the acute hallucinosis cases. In other cases this rise was not obtained.

Group II.—The group of the acute hallucinoses shows no great divergence from Group I, though clinically characterized by a longer course. Fig. 2 shows the course of a case frequently observed.

Group III.—Characteristic of the polyneuritic or Korsakoff group is the wide variation without any particular trend either up

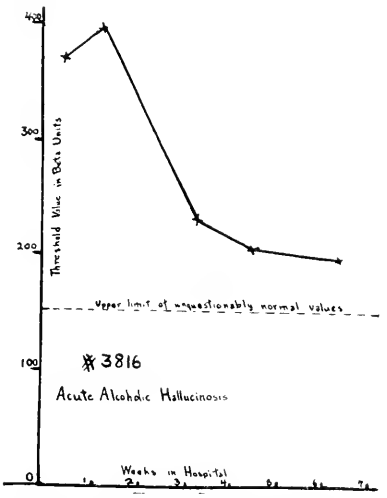

FIG. 2. Shows a curve of recovery in the group of acute alcoholic hallucinosis. Ordinate represents threshold value in beta units, the abcissa weeks in the hospital.

or down (cf. Fig. 3). Two of these cases recovered. One recovered case (No. 1919) seemed to be getting worse (according to this test) when last tested; the other recovery had a very short course (No. 2853) and fell like the delirium tremens cases. The most

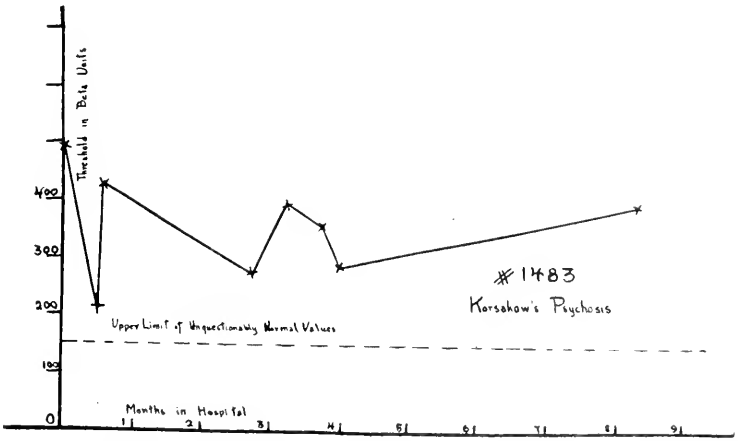

FIG. 3. Shows a curve from one of the cases of Korsakoff's psychosis. Ordinate represents the threshold value in beta units, the abcissa months in the hospital.

severe case (No. 1952) gave only one valid observation. Clinically the patient showed very marked mental deterioration and extreme contractures.

She also showed the highest threshold of the group. Here again may be a point in the prognosis. It is worth while noting that the check on the replies of the patient is especially valuable in this group with its confabulatory abilities.

Group IV.—This group shows a series of high thresholds in a number of cases of mental disease caused by alcohol. There are only three cases in the group that show normal values. One of these is really a high normal (149), the other two are cases of acute alcoholism (cf. Table II). Apparently from these observations in

TABLE III

Chronic alcoholism	4	243
Unclassified alcoholic psychosis	3	279
Acute alcoholism	2	115
Alcoholic paranoid condition	1	149
Pathological intoxication	1	257
Alcoholic delusional insanity	1	216
Periodic drinker	1	230
Alcoholic epilepsy	1	397
Total (20 observations)	14	249

the light of Dodge and Benedict's study (8) alcohol in any form raises the sensory threshold for faradism but does not raise it to a pathological degree unless the imbibition of the drug continues over a certain length of time. In regard to the withdrawal of the drug we find in this group the same type of result that is found in the others. The longer after the withdrawal of the alcohol the lower becomes the threshold (cf. Fig. 4). The case figured is a case of "alcoholic epilepsy."

Group V.—This group of cases consists in those patients who, in addition to having another condition, have used alcohol to excess. In many of these cases alcohol was considered to be a factor in producing the existing mental condition and in as many others it was not so considered. The average of this group as compared with an earlier average of random psychopathic cases (including the alcoholic cases) shows again the tendency of chronic alcoholism to raise the sensory threshold; the first series averaged 223 β units as against 246 β units for this group. It seems fair to regard this as a definite increase in average as the number of cases compared is such that wide variations are obscured in the averages and inasmuch as the composition of this group is very similar to that of the former series. The average threshold of the cases in the first group of

cases studied whose diagnosis was not connected with alcohol was 211 β units. This contains the cases of these psychoses in which alcohol was used to excess, but is more comparable to this group than the average of the entire group. From these figures the effect of

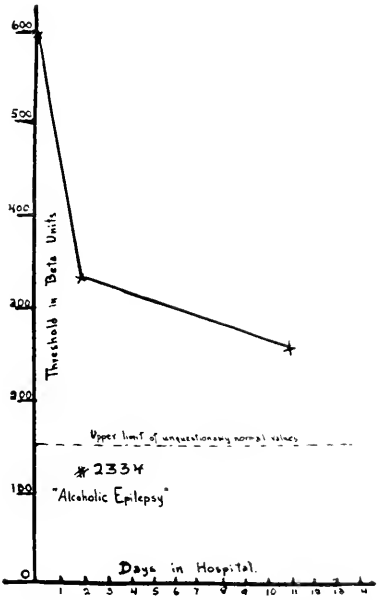

FIG. 4. Shows the variation of the threshold values in a case of alcoholic epilepsy. The ordinate represents the threshold value in beta units, the abcissa the duration of patient's stay in the hospital in days.

chronic alcoholism is even more apparent than from the former comparison. The only class of cases that contain enough instances (cf. Table III) to compare with the remainder of their particular group that have not used alcohol to excess is the dementia præcox

TABLE IV

	No. Cases	No. Observations	Av. Threshold
Dementia præcox	14	23	190 β units
General paresis	5	13	258 "
Unclassified	4	7	228 "
Psychoneurosis	3	13	251 "
Defective	3	5	182 "
Syphilis of the central nervous system	2	5	203 "
Manic-depressive insanity	2	5	474 "
Hyperthyroidism	1	1	183 "
Senile dementia	1	2	459 "
Total	34	74	240 β units

cases. 37 cases of this psychosis in which alcohol was not used to excess averaged 168 β units and the dementia præcox group as a whole (11) averaged 186 β units as compared with 190 β units for the alcoholic group of this psychosis. One case deserves special mention as an exception to the rule that alcohol raises the threshold value. This was one of the manic-depressive cases (No. 2165) and had the lowest threshold in that group (23 beta units). It was a manic case and this value was obtained on the day of admission and it was suggested that this might account for the exceedingly low value (12), in spite of the excessive use of alcohol by this patient. It is not profitable at present to discuss the effect of the withdrawal of alcohol on the threshold value in this group as this is complicated by the variations seen in the various psychoses here represented and of which not enough is known to estimate their influence. However, in certain cases it is observed that the alcoholics had discordantly high thresholds which came down to the level of the other cases of the group to which they belonged after the withdrawal of the alcohol.

In conclusion, it is again to be emphasized that the chronic alcoholic has a pathologically high threshold even if his psychosis is not due to alcohol, that the threshold falls after the withdrawal of the alcohol, that the impressions gleaned from the first series have been substantiated by this study, and that this test may be used in gauging the course of recovery in the alcoholic group, the Korsakoff cases showing an irregular type of falling curve, whereas the other types of cases show a more regular curve of falling threshold.

Conclusions

1. The alcoholic psychoses show a pathologically high sensory threshold for faradism for varying periods after the withdrawal of the alcohol. Acute alcoholic excesses do not appear to raise the threshold to a pathological value. The thresholds of cases having other psychoses complicated by chronic alcoholism often show that alcohol raises the threshold above the general level of the group to which such a case belongs.

2. In convalescence from the alcoholic psychoses the threshold falls, reaching a normal value if recovery takes place. This fall appears to follow a smooth curve in the delirium tremens and acute hallucinosis cases and shows irregular variations in the protracted Korsakoff cases. In cases of other psychoses complicated by chronic alcoholism the threshold falls to the level of the other cases in the group to which the particular case belongs, after the withdrawal of the alcohol.

3. This test apears to have practical value in gauging the rapidity and time of recovery in the alcoholic psychoses.

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A CASE OF ANOMALOUS TORSION SPASM

By Francis X. Dercum, M.D.

The following case, to which the term "torsion neurosis" might be applied, is of unusual interest. It differs, however, markedly from the cases described by Ziehen, Oppenheim, Flatau and others. In fact in my experience the case is not only anomalous but unique. Briefly the history is as follows:

C. B., male, aged 33, native of Pennsylvania, white, gentile, married, and a farmer by occupation, was admitted to the Jefferson Hospital, September 15, 1916. He complained of a "twisted neck, fits and a deformed right foot."

The family history was unimportant and without significance. Father is living and in good health as are also two sisters. Mother died of appendicitis.

Personal History.—Had measles, mumps and whooping cough in childhood; never had scarlet fever, diphtheria, pneumonia, pleurisy or typhoid fever; no history of rheumatic fever; one attack of tonsillitis when thirteen years old. Venereal infection denied. Up to six years ago used alcohol moderately.

When nineteen years of age his head began turning to the left. At first he could prevent the turning but gradually this became more frequent and more pronounced until finally the head, neck and shoulders became firmly fixed in a twist to the left; the trunk also shared in this rotation but to a lesser degree, as did also the hips. The right leg and foot also finally became involved, the thigh, the leg and especially the foot being markedly rotated to the left. The patient states that when sixteen years old he hurt his foot when he jumped off a moving car, two years later again injured the foot and also a third time when he was twenty-three years of age. It is of course probable that the injuries were due to a beginning and finally a more pronounced disability to use the foot properly.

Seven years ago he married. His wife is in good health; no miscarriages. Has three children living and well. His general health has always been good.

Three years ago, one evening while at supper, he suddenly noticed a queer taste in his mouth which he cannot describe. This was associated with a sensation as though he were being "overcome by gas." This sensation persisted for about fifteen minutes; no loss of consciousness. A month later a similar attack occurred, and this was now followed by others for about one year following, on an average of about once a month. He then began to lose consciousness in the attacks. In the last two years has had ten or eleven attacks, in all of which he lost consciousness. Eight of

these occurred at night. The unconsciousness lasts about fifteen minutes. Does not bite his tongue or soil his clothing. Is able to get around again in about half an hour. Has been told that during the attack he "snores and froths at the mouth." Sometimes he fails to experience the peculiar taste but has a numb feeling at such times about the upper jaw and teeth, with sensations as though the right arm were asleep. He thinks that during the last mentioned attacks, he retains consciousness, but says that he cannot speak.

About one year ago attempts were made to relieve the torsion of his neck and the malposition of the right foot by section and resection of various tendons but without avail. For a year past has suffered from pain in the back. Has also been very nervous.

FIG. 1.

Thinks that his memory has failed him, though this is not apparent during the examination. Says also that he has the feeling as though his "joints were constantly moving" and that he gets very tired.

Present Condition.—The patient stands with the head and neck

markedly rotated to the left, the chin pointing to the left shoulder. The trunk also is much distorted; it is flexed somewhat forward and rotated to the right so that the left shoulder is brought slightly forward and the right thrown slightly backward. The arms are allowed to hang at the side, though the right is often used as a support against the right thigh. The right lower extremity is held in the position of extension, the foot is rotated inward and

FIG. 2.

inverted so that it rests upon its outer edge while the toes, especially the great toe, are in a position of marked extension. The left lower extremity presents no special abnormality. The musculature of the right lower leg is poorly developed. The patient walks awkwardly and with difficulty and avails himself of crutches. There are no abnormalities of the deep or superficial reflexes. There are no anomalies of sensation. Stigmata of hysteria cannot be elicited. Education is that of the common schools; intelligence is good.

A Wassermann examination of the blood is negative. A microscopical examination of the blood reveals no peculiarities. The urine is normal.

An examination of the eyes reveals equal and well-rounded pupils, normal to light reaction and perhaps a little sluggish to convergence. Ocular rotations and muscle balance normal. Media clear and eye grounds normal.

Roentgen-ray examination of the head revealed no abnormality save that the skull seems rather thick. An X-Ray of the spine and shoulders revealed no disease of the vertebræ in the cervical or dorsal regions. In the cervical region the transverse processes of the left side all impinge upon each other. There are no evidences of lesions in the region of the shoulders.

On October 5, 1916, he complained of an attack of numbness of the right side of the face, right arm and leg and a dazed feeling.

October 7 had a typical epileptic attack while eating dinner. Cried out and had a general convulsion. The attack was observed by the nurse, who stated that the patient at first became stiff and then became convulsed. One part of the body was not affected more than another. The patient bit his lip slightly but did not soil himself. Subsequently he had two similar attacks.

It is evident at once that the present case is not identical with the affection described by Ziehen as torsion neurosis, by Oppenheim as dysbasia lordotica progressiva and as dystonia musculorum deformans, and by Flatau and Sterling as progressive torsion spasm. The latter affection occurs especially in childhood and early youth and its principal symptom consists in the fact that when the patient attempts to stand or walk a marked lordosis or lordoskoliosis makes its appearance in the lower dorsal and lumbar regions with marked flexion at the pelvis and prominence of the nates. Finally the affection has thus far been observed only in Jewish children.

In the present instance the patient began to present symptoms first at nineteen years of age and the latter did not reach their full development until some years later. Secondly, the torsion is most Finally, the case is complicated by epileptic seizures. Leaving the pronounced in the cervical region. Again, the patient is not Jewish. latter fact out of consideration, the thought arises that possibly this case is an unusual and bizarre outcome of a rotatory tic. In any event the case is not only anomalous but unique.

THE MAKE-UP OF ATYPICAL CASES OF MANIC-DEPRESSIVE INSANITY[1]

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For some time it has been known that manic-depressive insanity occurs in patients who, even between the definite attacks, show a tendency to unusual buoyancy or to spells in which depression is more apparent than is ordinarily the case. Dr. H. D. Singer[2] goes much further and says that "The so-called mixed states and atypical forms are not mixtures simply of certain traits but represent affective oscillations colored by peculiarities in the individual patient," or in other words that the patient, during the so-called attack, presents in an exaggerated degree only his usual characteristics; not merely those which are affective in character but also all others which are part of the make-up as a whole. This being true, it is obvious that the manic-depressive attack will present opportunities for the investigation of personality not to be had at other times since, during it, all ordinary manifestations are magnified and held up as it were for all to see. Here, then, is an avenue which promises much in the study of disposition and individuality. The need for such study can hardly be gainsaid, but perhaps a few words in this regard are justified. If, as seems probable, it takes several generations to produce an insane person, except where due to gross structural defect, from healthy stock, there must be changes between the two extremes which show the degenerative tendency. This view is commonly held even by the laity but as yet is too vague and general in scope to be of very great practical use. What is needed is the careful study of individual cases with the idea of establishing certain types of reaction which are harmful to the individual. Armed with definite knowledge of these types the physician will be in position to spread what are now hardly more than personal beliefs and to attempt to treat the first deviations from the "normal" rather than end states.

Among the cases studied on the wards of the Psychopathic Institute there have been several atypical cases of manic-depressive in-

[1] Read before the Illinois State Hospitals Medical Society at Anna, May 25, 1916.

[2] H. Douglas Singer, American Journal of Insanity, Vol. LXXI, No. 4, April, 1915.

sanity which resembled each other superficially in that all presented considerable difficulty in the determination of when they might be termed recovered and at the same time were loud in their protestations that it was unjust to keep them in the institution. In some instances the relatives were loath to assume responsibility for the patient because she was one who always had had difficulty in getting along. Each had always been decidedly self-assertive in spite of the fact that adherence to her own ideas had led her more or less constantly into difficulties.

Three of these cases will be reviewed.

Case I

S. A.—A woman of neuropathic heredity and of unstable emotivity whose aims have been ill-advised and poorly accomplished. At 36 years, following a loss of position and a venture into a promising new field, she became excited, expansive and developed a press of speech and of activity with vague ideas of influence and auditory hallucinations without clouding. This condition obtained for about five or six weeks and was followed by gradual improvement and a return to her usual state in two and one half months.

It is said that the mother of the patient is nervous and that she was unhappy before the patient was born, and did not want the child.

The patient was born in Illinois in 1878. She attended several different public and private schools and learned readily. "The patient was always somewhat unruly, easily excited, had fits of temper, and was emotional."

According to the mother, her teachers could not manage her because she was stubborn and determined to have her own way, and for this reason she remained but a year or two in most of the schools she attended. She would become angry and have "tantrums" in which she would do such things as destroy photographs of those for whom she cared most. At one time while angry, she tore the photograph of her father in two, although she had always been very much attached to him. At about nineteen years of age she drank wood alcohol with suicidal intent. She did this on the impulse because she had lost her position. She was immediately sorry for her act and went to a hospital for aid. She would not live at home because she would not suffer any restraint. Her departure compelled her parents to leave a four-room apartment and live in one of two rooms only. They had to aid the patient by doing her laundry.

After the father suffered a reverse of fortune in 1893, the patient was told that she need not take a position if she would be contented with what her parents could do for her. She wanted to work, however, and therefore was sent to the State Normal. The mother said she knew this was "throwing money away but wanted to give her a chance. Her father went down there and brought her home for some reason." "Then she wanted bookkeeping, so we

spent $50 on that." Then she insisted upon a course in stenography and an uncle paid for this. The parents did not feel they could afford this added expense because of their financial condition and because the patient up to that time had shown little indication of profiting by education.

She worked as a stenographer for the most part. She did not remain longer than two years in any one place, but she said her work was satisfactory to her employers and she was considered a good stenographer. She received some financial aid from her father, but in explanation she said she had to support herself and daughter on $15 per week and that as a girl she had been used to having everything she wanted, as her father was wealthy at that time. The mother stated that during one period she loaned money to the man she afterwards married instead of paying her board.

She was married in 1904 and a daughter was born in 1906. Her husband drank to excess and never supported her. She knew he was addicted to alcohol before she married him and did not tell her parents of the wedding until three weeks after the ceremony. On returning home one day in an intoxicated state the husband tried to choke her and without any conscious plan of what she would accomplish by so doing, she jumped from the second-story window. She did not sustain any injury. She separated from her husband in 1909.

The history is undoubtedly that of one who is in certain respects below the average, but the difficulty seems to lie in an emotional instability and ill-formed ideas with poorly planned efforts to achieve her ends and not to definitely perverted instincts. She was not anti-social as this term is ordinarily understood, but yet was not in accord with the social organization.

In the latter part of November, 1914, the father told the patient he could no longer help her financially. Soon afterwards she lost her position on account of business being slack in the office where she was working. She decided to sell post cards and did well for a time. Then she took up other lines and sold painted china, art work, etc. She procured concessions in several waiting rooms and intended to do business on a large scale; rode about in automobiles and engaged assistants. When an acquaintance told her she was working too hard she became angry, noisy and profane. This was about December 10. She was taken to St. Luke's Hospital where she was restless and talked "day and night." It is said she talked irrationally part of the time but as far as can be determined she was not clouded.

She was admitted to Kankakee, December 24, 1914. She was of a slight build, apparently about thirty-five years of age. There were no evidences of somatic disease.

She was clearly oriented and her memory was good for both recent and remote events. She was restless, talkative, distractible and for the most part slightly elated.

Her expression was animated. When told she laughed quite frequently she said: "Some things strike me funny—the humorous

side of it, I mean." There were periods which lasted but a few minutes or perhaps a few hours in which she was tearful, complained of the injustice in keeping her, that her requests were not granted, etc.

She wrote voluminous letters. One of them, telling of her recent experiences, was twenty-one pages in length. She talked most of the time and rapidly. While in the examining-room on one occasion she talked steadily during the hour she was there. Both letters and speech were coherent but showed evidence of distractibility. She talked of her past experiences and of her plans to work her way to Florida by serving in railroad stations, wanted her daughter brought to friends in an adjacent town, asked the loan of works on psychology, said she would like to become a nurse, etc. She would pass from one topic to another without giving due consideration to any one, but yet held to her desires from one day to another, argued about them and was irritable and cross when they were denied her.

She held vague ideas that she had been hypnotized by a doctor at the Detention Hospital, by the physician who had attended her during the onset of the mental disturbance and by the one who examined her in the insane hospital. She said it was that which made her talk. It also made her feel "as though she were dying." The room was filled with electricity. She had a psychic power by means of which she could interpret the meanings and gestures of others. All these ideas probably represented abortive attempts to explain her experiences at that time.

She said she heard voices talking to her but would not explain further. Apparently these played a very minor part in the psychosis.

Toward the latter part of January, 1915, the patient became less talkative and would read to a class of demented patients. By February 1 the improvement was still more marked. She did not intrude herself upon the physician and did not talk or write so much as formerly. She corrected her ideas in regard to hypnotic influence, etc., and explained them by saying she had been "excited and did not weigh impressions" at the time she held the ideas. The brief periods of fretfulness occurred once or twice a week until the end of February. From then on she was quiet and contained, a fairly good worker and very anxious to return home. She associated freely with the other patients and had no difficulty in remaining on good terms with them. She was paroled on May 29, 1915, and at that time possessed comparatively full insight.

This case adheres more closely to the classical manic state than the others which will be cited later, but yet was not of the "textbook" variety. She appeared happy, restless and distractible only when studied closely. She would have seemed fairly quiet in manner and relevant in speech to one who observed her only casually and at intervals.

Her tendency to be fretful or angry recalls the fits of temper shown as a girl and the many ill-advised plans were the counterparts

of decisions made throughout her life. It is quite true that manic cases usually show poor judgment during the attack, owing to the distractibility, but this individual did not seem sufficiently distractible and elated to account for the profusions of poorly planned ideas. These were fixed and expressed so emphatically and frequently as to lead to conflict with the authorities since granting her wishes was obviously impossible. Here was the groundwork on which a paranoic state might develop were she unable to adapt herself to the confines forced upon her by the situation. Her lack of adaptability is shown in the delusions of hypnotic and electrical influence and of "psychic power" as well as by the persistence of her desire to go to Florida, etc., although there was enough of compromise in her attitude to prevent strife.

Altogether the history is that of one who was quite frank in the type of her reactions. The unruliness and fits of temper, the determination to live away from home, her marriage and even the attempt at suicide were apparently straightforward and simple in character. Even where she deceived her parents in not telling them that she loaned money to her future husband and in postponing the announcement of her marriage, she later freely admitted both. During the psychosis there was no pretense. The idea that she was influenced so she could not speak is probably the best and most straightforward explanation of which she was then capable for the restrictions incident to ward routine. Other cases of manic-depressive insanity show more definitely paranoic characteristics and in some a permanent paranoic state is left after the manic attack has subsided. Lack of space forbids more than a passing reference to such cases.

Case II

E. B.—A woman of somewhat unstable affectivity and inclined to subterfuge who at 38 years of age following a period of stress and strain had a so-called attack of "acute mania" of three weeks' duration. At 44 years, shortly after the death of her husband, she passed through a mental disorder which lasted about three or four months, characterized by an elevated mood, pressure of speech and activity, and distractibility with fairly clear grasp of the situation. This condition was followed by an apparently complete restoration to her usual condition without insight.

No family history was obtained except regarding the parents. The father died at 54 years of "heart trouble." He was 25 years old and the mother 17 years at the birth of the patient.

The patient was born in 1869. She progressed with average rapidity in school and attended until she was forced by sickness to leave in her last year at high school. She remained at home where

she helped with the housework, etc., until her marriage, with the exception of one year during which she went to live with an aunt with the purpose of learning from her how to make dresses, etc.

She was married in 1893 and had two children; one born in 1895 and the other in 1899. Her married life was congenial. In regard to her own disposition, the patient stated that she was rather dependent upon the opinion of others. She could not declaim at school if her father was in the audience because he would "grin" at her which would make her cry.

She said she was of a very happy disposition, always looked out for a good time, but she cried easily and grieved on account of even comparatively small matters, such as the death of a bird. She "could not get over her father's death," but mourned for two years afterward.

From the sister it was learned that the patient was always of a "very nervous disposition," has had periods during which she was "restless and nervous," and was inclined to "severe outbreaks of anger." From the informant's account it is evident that these outbreaks were not entirely straightforward in character. Once while still a child the patient became very angry, held her breath and pretended to become unconscious. The father picked her up and started to run to a doctor, but while running the patient's head happened to strike against a fence and she promptly "came to." This episode is described as an example of the patient's characteristic mode of reaction. If thwarted, she would not only become angry, but would resort to any subterfuge regardless of the trouble to which others might be put. The husband would try to sympathize with her and quiet her, but this would seem to make her worse. She was always antagonistic toward anything that was planned for her. She never would confess that she had been at fault with the exception that after her husband's death she admitted she had often been "sort of a worry" to him.

Poor judgment is shown by the fact that although the patient wanted her daughter to do well in school she would take up the daughter's time, so that she did not have time to study.

In August, 1907, her husband went down to Panama to fill a position as civil engineer. During the following winter, after she had nursed her child through an acute illness and lost much sleep thereby, she passed through a mental disorder which lasted about three weeks. The interrogatory spoke of this as "acute mania," and the patient herself said she was held in bed by the physician and nurse after she had tried to jump through a window. A lack of insight into her condition at that time is shown by her statement that she tried to jump through the window because a friend was being operated upon. This knowledge came to her through some "supernatural means."

According to the patient's account she was very "hysterical" part of the time and had to be held in bed. During another portion of that illness she lay as if "dead." A tendency to exaggerate her ills and virtues so as to gain attention was shown in the two state-

ments, first that her illness was a "nervous breakdown in the worst form," and second that although a relative wanted to take the patient to her home, the latter had chosen to go to the hospital rather than "impose on anyone."

After that attack the patient returned to her home and continued to keep house for her children until the present trouble occurred.

That a repression of libido made necessary by the absence of her husband was difficult, is inferred by a statement of the stepmother: "she always had a great liking for talking to the men, especially to the doctors; if she was sick she wanted every doctor in the town to attend her." During the attack above mentioned, "the nurses told us if she had a husband, he surely should be with her by all means."

In February, 1913, the patient received a letter from her husband which stated that his lungs were slightly affected and that he was going to leave Panama for New Mexico. From that point encouraging letters were received and the patient was led to believe her husband was getting well. They even planned a trip together. On July 18, 1913, the husband died, the death coming as a great surprise and shock to the patient. No information was received in regard to her condition from that time until the onset of the present attack.

About the middle of September, 1913, the patient became "very nervous." A few days later, according to her stepmother's statement, "she went insane" while in a tailor shop and it took "two policemen to lock her up." It is thought that the patient was insulted at the shop, since the tailor's assistant disappeared directly afterwards. The patient said she was attacked by him. When seen by her relatives she pretended not to know them. Later, it was found that she had known them and remembered what was said.

She was admitted to Kankakee on September 22, 1913, at 44 years of age, according to her own statement. She was well nourished, apparently 45 years old. The palate was high and narrow. There were no evidences of somatic disease. When first examined it was thought that the tactile and pain sensibilities were not acute, pupils were sluggish to light and knee jerks exaggerated. Subsequent examination did not verify these findings although the pupils reacted a little less briskly to light than is usual. Knee jerks were brisk and equal. Other findings were negative.

She called this place Lockport, but was evidently not clouded to any extent, since she appreciated the questions asked her, gave the month and year correctly (she said September whereas it was October 2) and knew the business of the stenographer.

The principal features were a happy mood and irritability with pressure of speech and activity and distractibility.

The statement is made that she appeared to be happy and playful. This is not amplified in the history but is shown by her stream—

Q. "What place is this?"

A. "Hell."

Q. "What are you doing in hell?"

A. "Well, I guess if you were there you wouldn't have to ask me. This is hell, hell, hell, personified and all the angels and all the cherubs and Gabrielle and the whole shooting match is nonsense. I give it to you in shorthand. Say, tell her to cut the comedy (referring to stenographer) and beat it, kids, out to the woods somewhere. I don't like to swear but they do that in hell you know—I never say such things but they say them here. When you are in hell you have to do as hell does, and when you are in Rome you have to do as the Romans do. When you are in 'Hingland' you have to do as they do. You want this in dictation? What more do you want?"

The patient talked rapidly. She moved about almost continuously, doing and undoing her hair, throwing the bedclothes about her, etc. She could be kept quiet only while in a pack.

She remained in the condition just described until sometime in November, 1913, when she began to improve and the packs which she had been receiving were discontinued. About the middle of December she was still somewhat talkative and happy, with a tendency to become irritable. She helped with the work about the ward, braided the hair of some of the other patients, talked to a considerable extent with the others and read to herself.

At about the first of the year (1914) she had returned to what may be considered her usual state. From that time until she was paroled she showed no elevation or depression of mood except that which probably was normal for her. She was keenly interested in her surroundings, cared adequately for her own needs, etc. She wrote many letters to her relatives, asking them to take her out on parole and made plans for her future. She was industrious, helped with the ward work and made a number of baskets for a bazaar held on the ward. She had a walking-party parole.

The patient did not have full insight into her recent disorder. She believed she was entirely well until attacked by the tailor's assistant, whereas it was stated that she was "nervous" for several days preceding the occurrence. She thought medicine administered by the doctor at her home was responsible for her condition when she entered the hospital and that her behavior during her first few weeks here was an adequate reaction to the alleged abuse received at the hands of the nurses.

Even after the patient had ceased to be restless or unusually talkative, it was difficult to say whether she was in condition to be released. She asked certain patients about intimate matters and then told others what she had learned, things much better left unsaid. In May she wrote a letter complaining of the indecent remarks of others and even quoting them to her own thirteen-year-old daughter. When the ward physician reproached her she attempted to excuse herself by saying that she had never before heard such language as she had in the institution. In the conversation which followed she made the statements: "It is awful to be among crazy people when you are not crazy yourself." "If I can't go home, I don't care if I am dead." "It hurts my nerves when the patients

yell." The absurdity of her complaints are more apparent when attention is called to the facts that at that time she was on a quiet ward and that formerly she herself was decidedly noisy and profane. She was asked if she preferred to be transferred to another ward and replied, "Oh, yes, if you want to kill me, send me to another ward," implying that the physician was threatening to remove her to a disturbed ward. These remarks were quite characteristic. Many like examples could be given. Throughout she was inclined to be irritable and at different times was vituperative toward the hospital authorities, her own relatives and the other patients on the ward. At times she told falsehoods to protect herself when she seemed not to appreciate the fact that she was lying.

She was paroled on June 6, 1914, to her sister. At that time the latter was dubious about the patient's ability to keep out of trouble because she always had had more or less difficulty. The sister realized that the patient had quite recovered from the attack on account of which she was sent to the hospital and had returned to her usual condition.

In this case the similarity of the ordinary characteristics to those features which played such a prominent part during the manic excitement is plain. In regard to type of reaction it is evident that she met problems with fits of temper as did Case I, but in Case II the vituperative quality of the anger contrasted with the petulance of the other.

Case II, in contradistinction to Case I, evidently would stoop to any deceit to gain her end, and in fact the pseudo-delirium which occurred during each recognizable attack strongly suggests a hysterical mechanism. Each reaction was impromptu in character as were the reactions of Case I. In neither was there evidence of a well-thought out line of action.

Case III

L. R.—A woman of neuropathic heredity, in whom were combined an unstable affectivity with a paranoic type of make-up, who at 29 years of age passed through a mental disorder characterized at its onset by unusual oscillations of mood which were followed by a dream-like state of abrupt onset lasting ten days during which distressing sense-falsifications of self-condemnatory content played a prominent part. This was followed by a peculiar depression without retardation or press of activity in which were expressed hopelessness and self-condemnation in combination with odd deviations in the stream of words and a feeling of external influence. After eight or nine months this gave place gradually to a state of mild excitement characterized chiefly by irritability and profanity, ending in recovery in three months, or about one year from the time of onset.

A grandmother of the patient was insane for a short time before her death at 65 years. The father used alcohol to excess and died

at 34 years of nephritis. A brother at 18 years was depressed and "confused" for two days after a sister (not the patient) attempted suicide.

The patient was born in 1885 in Illinois. She attended a country school and was as bright as the average. Her education amounted to a common-school course. Before her marriage she worked as a domestic with what success is not known. Menstruation was established at 15. As far as was learned, this function was not attended by any difficulties. She was married at 22 years in 1907 and a child was born in 1911.

In regard to her disposition, the husband stated that the patient was subject to spells of depression which would last from half a day to three or four days at a time. During them she would lie on the bed and "cry and grieve." The patient admitted that she had such spells; she did not know why she had them. At other times she would be unusually buoyant; would whistle and seem quite happy.

Certain unsocial traits were shown in that she took no real enjoyment in contact with others except her child and those with whom she had but recently become acquainted. She never remained on good terms with neighbors for long. She always was inclined to think people were trying to take advantage of her. She would not own up to her own errors; "last thing she would do," but would criticize others. She was difficult to satisfy and the husband stated that for this reason she would spend four times as long a time when she shopped as most would have done. "She was of a stubborn, self-willed disposition and a great part of the time melancholy and brooding trouble." The husband had known the patient since a few months before marriage, but there is evidence that the unsocial traits were always present in the sister's statement that "she was always hard to get along with even as a child."

The husband stated at one time that the onset of the present trouble was "about one year ago" (September, 1913). She began to interest herself at that time in the Bible and later in Christian Science and to neglect her housework. She did not show a lack of interest in the things she was studying.

Probably the patient's own account gave more closely the time of onset. She said that about the first of August, 1914, "a power came on me like I discovered something; just came on me while I was thinking." For two weeks she "felt quite good, better than usual." In the latter part of August she became depressed; she thought the mother-in-law was trying to take her child from her and that her own relatives had turned against her. She said that if anyone was to be sacrificed, she wished to be the one and begged to be given opium so that she might die. She wrote a letter to a former lover with whom she had been unduly intimate before her marriage in which she blamed herself for his lack of success. The reply to this letter was not seen by the patient as it was intercepted by the husband. This correspondence figured largely in the ideas which the patient later developed.

About the fourth of September she became resistive and refused to do the work she had been doing up to this time. Two days later "she cried and laughed and sang"; "talked incoherently" about Christian Science.

She was admitted to Kankakee, September 8, 1914, at 29 years of age. She was well nourished and presented no evidences of somatic disease. She was "somewhat exalted," showed a "little excitement and some emotional disturbance," and was talkative. No depression was noted that time. Within a few days after her admission she developed dream-like fantasies and sense-falsifications, was fearful and depressed and was probably partly clouded. She believed the nurse was going to chloroform everybody in the ward and picked up a shoe with the intention of defending herself. "I thought they were going to put my head in hot oil and boil me in hot ammonia water." Chloroform and other odors came out of her body, "it seemed as though I went through the Valley of Death —it was just like smells of dead human flesh pouring out of me." She heard voices which frightened her. It seemed that they came from a long way off. She believed the people around her were relatives of her own. At times people seemed to be turning into animals. She felt an "awful burning" and a sensation as though there were a thousand wires on her body. "I had the burning for six weeks and there is nothing so miserable. It's the most awful torture I ever experienced. There was a fear as though you'd seen a ghost."

She expressed a sense of change within herself. She was hypnotized and her "body changed." Later, the patient stated that during the period just described there were times when she did not know the date nor where she was. She was "confused," but believed she would have been able at any time to recognize her husband.

After three or four weeks she became clearer, but had terrifying "nightmares." In one of these her child lay by her side, but was changed to a doll and taken away. In another the head and shoulders of her child appeared. The patient had the impression that it had been "born insane" and would remain so always. There "would be no hope for it in this world or the next, would have no resistance to sin." "Best way I can express the whole thing is death this side of the grave and no hope beyond."

On September 29 she was correctly oriented and her memory was quite good. A formal examination had not been made before.

On October 3 notations were made that she "was quite contented and happy and laughed at times," and on October 30 she was "pleasant and interested." For the most part she was depressed, however, said she was the "blackest of women" and "wanted to die." She begged her husband to buy some morphine and admitted afterward that she wanted to use it to commit suicide. She said she was tortured by her ideas; had no hope. Her expression and tone were in keeping with the ideas expressed. She was not agitated and showed no retardation. At times she worked quite well, even when apparently depressed.

The patient blamed herself because she married her husband whom she says she had never loved, and thereby disappointed her lover. "I have suffered for seven years and a half for what I did." She said it was a sin to write the letter to her lover and as a result she had developed leprosy which would cause not only her own death but also the deaths of relatives and many others. Referring to this in one of her letters, she wrote: "The awful thing I've done." I count over the members (*i. e.*, over those who would die as a result of her sins). "My God, I didn't think of sinking to this." There is no doubt that there was a strong sexual coloring to her ideas. While in the dream-state, she believed she had sexual relationship with two men, one of whom was her lover. She referred to a sensation as though there was a sort of "gum" in her system and said she had expectorated semen. Her blood contained some poison. "This poison came out of my tonsil like a snake spitting exactly."

She felt that her body was changed, said she was hypnotized. Her speech contained many other odd expressions, such as "third power." These were not stereotyped but on the other hand were expressed in different ways and she frequently voiced new ideas which apparently were but loosely associated with the main topic. This would suggest distractibility rather than scattering.

A sample of her speech is the following (the patient had referred to a scare):

Q. "What was the scare?"

A. "Well, it was the scare that I caused in the man (presumably her lover). He brought back the spiritualism that added it to the body there. Right there is where the origination of the magician starts. There is where he gets his power. He gets his power from the Devil even to the day of the year. Instead of joy it turned from what should have been joy, it turned into a scare. I could go on further and show you even where these people on the stage get their power, even light matches or candles without matches off the body. That burns the body. I have seen them on the stage. It takes it back down to the play in the child to the medicine. It brings back down to the germ in the groceries." (Her child had thrown out certain medicine.) (The husband had a grocery store and the patient believed small-pox would break out in it.)

The state described above persisted until in April, 1915, she suddenly dropped her ideas of having leprosy. In May she was heard to speak of that disease again, but denied that she was afflicted with it. After that she made no further reference to leprosy, etc. Instead of the depression which had been present heretofore, she became pert, irritable and emphatic. She was profane toward those who in any way crossed her and made obscene references to her husband and herself. She wanted to know why her room-mate was held. She would lie on the bed and laugh to herself but worked quite well.

In July she said she was going to institute proceedings in order to obtain her release from the institution and wrote a letter to a

lawyer with that purpose in view. She continued irritable, referred to the "damn doctors" who knew nothing about her case and wrote letters of a flighty, witty character to her relatives. She refused to work during most of July and August, but talked a good deal with the others, played the piano and sang.

During the last week in August she became more quiet and was less irritable and profane. She commenced to work about the ward. When she was visited by her brother on August 22, the latter said his sister seeemed as well then as she ever had been. No further change was noted while she remained in the hospital. She was paroled to her husband on September 19, 1915. She was not on good terms with him as was shown by her letters, but from certain references in them it was evident that Mr. R—— made remarks calculated to disturb one of his wife's disposition.

Irritability was well marked during the excited phase in this case but it was part of a more outspoken paranoic type of reaction than was true in the two previously considered. In Case I the opposition to others was fleeting in character and without malignity. In Case II the antagonism was on the whole fleeting, but yet was maintained as long as she felt others stood in her way. Her enmity was of episodic and explosive nature and lacked the qualities of coolness, continuity and reasonableness which to some extent colored the reactions of Case III. Unlike the first two patients, Case III was not frank in her way of meeting existing conditions. Case II would resort to subterfuges but even these apparently were fairly frank, possibly not wholly so, to the patient herself. In Case III quite a different mechanism existed. She, too, resorted to subterfuges, but here the purpose was not to mislead others so much as it was to save herself from facing realities. This led to the retirement from facts and to the development of fancies and symbolisms which were so obvious during the disorder, suggesting a dementia præcox type of reaction.

To summarize: three cases have been considered. All were subject to unusual oscillations of mood which in each individual became so marked that it was necessary to send her to an insane hospital. In the first, the reaction was colored by a slight paranoic tendency; in the second by paranoic and certain hysterical manifestations, and in the third by a paranoic make-up with a dementia præcox-like mechanism. From the cases here presented, one might infer that in any type of personality affective oscillations to an extreme degree may occur.

During a marked oscillation of mood the way in which the individual ordinarily meets situations will stand out with especial clearness. This affords us the only reasonable basis for the understand-

ing of the great variety of odd features which are met with in connection with manic-depressive attacks. This has a practical significance. Each of the individuals, the history of whom has been given above, was for a time in a state to which even the lay observer applied the term "insane." Had he studied and expressed his opinion of any one of the patients before the affective oscillation he might have used such descriptive terms as "queer," "fits of temper," etc., but it is safe to say that he would not have considered the condition as one which was so closely akin to "insanity" as to need treatment. By a study of such cases one may gain a knowledge of the slighter indications of such types of reaction as paranoiac, dementia præcox, etc., which of themselves when exaggerated may lead to the need for institutional care. There is little hope that education in such cases may be attempted until there is a better understanding, both among the profession and the laity, of the prognosis in the different types of reaction. The writer believes that manic-depressive attacks present certain advantages in the study of these types.

Society Proceedings

PHILADELPHIA NEUROLOGICAL SOCIETY

JANUARY 26, 1917

The President, DR. F. X. DERCUM, in the Chair

A CASE OF FACIAL PARALYSIS OF THE FAMILIAL TYPE. A CASE OF ISOLATED SYMPATHETIC PARALYSIS

By George B. Wilson, M.D.

The curious condition, which has been variously called heterochromia and chronic heteropia, in which the pigmentation of the two irides is different, has of late years acquired new importance as to its etiology and pathology.

Decoloration of the iris is not infrequently the result of a chronic inflammatory process in the eye, and in a number of cases of fake heterochromia there certainly has been a preceding cyclitis with the later formation of cataract. Scalinci is of the opinion that the term heterochromia should be reserved for those cases in which there has not been a pathological condition within the eye, such as a rise of tension or iridocyclitis. The change in color Scalinci believes is always of a pathological character, although the underlying cause may be difficult of detection.

Mayon, Bistis and others have suggested that, in some cases, the cause of heterochromia is a paralysis of the cervical sympathetic.

Bistis describes a case in which the heterochromia associated with other signs of sympathetic paralysis came on at the age of thirty-six. Mayon and Galezowski report somewhat similar cases.

Twenty years ago Angelucci recorded his observation that in certain animals section of the cervical sympathetic resulted in trophic disturbances of the eye. In the course of certain experiments involving division of the sympathetic trunk, Angelucci found disappearance of the pigmentary tissue of the iris with some atrophy of the choroid, in one instance, depigmentation of the choroid and shrinking of the arterial supply of the iris in others.

Brown-Séquard had previously determined that excitation of the divided sympathetic produced atrophy of the corresponding side of the face.

Dr. Wilson reports the following case of heterochromia iridis occurring in a patient with other signs of paralysis of the sympathetic.

F. G., female, 14 years of age, came to the nervous dispensary of the University Hospital with her younger brother who was receiving massage. She was not ill, but it was noticed that her features were abnormal. The right eyeball showed an exophthalmos of twelve, the left of sixteen. Thus the right eye was distinctly exophthalmic, with a much narrower palpebral fissure. The right pupil measured 2 mm., the left 4 mm. The reaction to light and accommodations were brisk and equal on the two sides. The tension of the eyeballs was not determined, neither was the effect of a mydriatic. The right iris was a bluish gray, the left a dark brown. The right side of her face was distinctly smaller than the left; there was no alteration in the texture of the skin or in the amount of perspiration. The teeth in the right upper jaw were irregular, probably due to crowding, the result of a smaller mandible. The

girl's mother said that the decoloration of the right iris came on at the age of five following an acute illness in which there was a swelling on the right side of the neck.

A CASE OF FACIAL DIPLEGIA

By S. Leopold, M.D.

L. D., age 45, colored, single, laborer, moderate drinker, was admitted January 27, 1916. One year ago he had a chancre. Two and one half months ago eruption on arms. Five days ago patient states that right side of face became stiff, two days later the left side of face became affected. On the day of onset he had been working out in the cold, but the stiffness came on after he went home.

Examination shows a mask-like face. He cannot raise the left eyebrow, and only slightly the right. He closes the eyes slightly. He cannot show his teeth. He opens the mouth about half the normal amount. He draws the jaw slightly to the right, very little to the left. Facio-labial folds are absent. Extra-ocular movements are normal.

Sensation to touch and pin-point is normal on either side of the face. An old injury has occurred in the left eye with anterior adhesion of the iris, the right pupil reacts both to light and in accommodation.

On the anterior aspect of tongue he quickly recognizes sugar, salt, and vinegar. Taste seems to be lost on the hard palate and back of the tongue. Hearing is normal in both ears. There is no paralysis of the masseters, no disturbance in speech or swallowing.

Gait and station are good, patellar tendon reflexes are large, and there is no ankle clonus.

Eye grounds are normal.

Wassermann of the blood and spinal fluid is negative.

Dr. Tom A. Williams said that the fact that the eighth nerve was not involved led him to exclude intracranial peripheral lesion, because we know that in the meningeal process many bundles may be infiltrated while others escape. Indeed the eighth nerve frequently escapes and the seventh is implicated in the syphilitic process. Again, if we have to go to the basilar process in the medulla it would be hard to imagine how the sixth nerve would escape. Even though he had omitted to mention the sixth nerve, Dr. Leopold presumed that it was understood it should be included.

A CASE OF MONOPLEGIA OF UNUSUAL ORIGIN

By J. H. W. Rhein, M.D.

L. G., age 45, was a finisher, with negative family history and previous history negative, except that in April, 1915, he fell and struck his hip, but suffered no ill consequences. No history of alcoholism, metallic poisoning or toxic conditions. Wassermann reaction reported negative. On July 15, while working at his trade, sitting, suddenly had pain beginning in the right hip, extending down back part of leg to the foot, without fever or vomiting or other constitutional symptoms. He walked home, though the pain was so great in the hip that he had to walk with leg partially flexed. The paralysis of the leg below knee came on immediately after the onset of pain, he states. Three days later he went to the Jefferson Hospital, where he stayed for five weeks and was treated for "neuralgia of the right sciatic nerve." He stated that the loss of power which he presented when applying for treatment at the Polyclinic came on immediately and has remained stationary ever since.

Upon examination on October 27, 1916, at the clinic at the Philadelphia Polyclinic and College for Graduates in Medicine, loss of power in the right anterior tibial group of muscles was present, causing marked foot drop. There was some weakness in the adduction of the right leg and in the peroneus group of muscles. He complained of pain down the side and back of calf. The anterior tibial group of muscles and peroneus group of muscles showed reactions of degeneration. There was total anesthesia to heat and cold, touch and pain over the dorsum of the foot and this area of anesthesia extended to outside of calf and thigh. Knee jerks slightly increased and there was a tendency to clonus of right side. Babinski phenomenon was absent on both sides. A month later he complained of pain in left leg, extending down the back part of the thigh: Two months later the sensation had returned in the right thigh and in part of the leg, leaving an area of anesthesia which extended to the antero-lateral part of the leg, involving the lower third of the leg and dorsum of the foot. Upon examination January 13, 1917, it was found that besides the conditions just described which have not changed since he has been under observation, outside of improvement in sensation, that there was some loss of sensation in left leg along the anterior surface of the calf, extending down the dorsum of the foot over an area about an inch wide and extending as far as the big toe. All forms of sensation were implicated. Knee jerks increased and equally so. The sensory changes take this case out of the anterior poliomyelitis group, which was first suggested by the presence of the epidemic and the suddenness of the onset. The case is one of neuritis or root lesion and presents sufficient unusual and interesting symptoms to justify presenting it.

TUMOR OF THE GASSERIAN GANGLION

By Charles H. Frazier, M.D.

The tumor was removed from a patient fifty-three years of age, with the following history: An initial burning pain of three months' duration, which soon became "jumpy" in character and later more intense. This was followed by numbness in the upper lip and was associated with or followed by neuralgia above the left eye. Two successive alcoholic injections only partially relieved the pain, and the patient preferred a radical operation to repeated injections. The operation revealed a tumor the size of an almond, encapsulated and occupying a position immediately over and in contact with the superior surface of the ganglion. Its removal was unattended with any peculiar difficulty and the patient was discharged from the hospital eight days after the operation. The tumor proved to be an endothelioma.

Dr. Frazier then referred to the incidence of tumors involving the Gasserian ganglion, which from his personal experience included three cases out of 218 patients with trigeminal neuralgia, a proportion of 1 to 72. He entered a protest against the terminology and suggested that these cases should not be called "tumors of the Gasserian ganglion," but "tumors of the middle fossa involving the ganglion," inasmuch as practically none of the tumors takes its origin from the ganglion itself and the involvement of the latter is a mere coincidence.

Dr. Frazier found, in a brief survey of the literature, the records of some twenty-nine cases, most of which, however, were discovered at autopsy. From 1895 to the present time there are on record but twelve cases, not including his own, which have been exposed at operation. Of this number the majority were large, inoperable growths and the death rate was high. So far as he could tell from the description given at operation, the case which Frazier pre-

sented was the only one of the operable series in which the tumor might be said to have been amenable to radical treatment. While the great majority of cases have been inoperable from the curative point of view, there is a field for surgery in the performance of palliative operations, such as avulsion of the sensory root for the relief of pain. This is an operation which Frazier believes is thoroughly justified under these circumstances and too infrequently resorted to. The diagnosis of tumors involving the ganglion is not unattended with difficulty. The symptom complex is not sharp and distinct. Emphasis might be laid, however, upon the following points: There is often the combination of pain and hyperesthesia; the pain differs somewhat from that of the major form of trigeminal neuralgia; the corneal reflex is frequently absent, and there may be disturbance of the muscles of mastication. These symptoms, not otherwise explained and taken in connection with other neighborhood symptoms, will at least arouse one's suspicion as to the existence of a tumor encroaching upon the Gasserian ganglion.

Dr. Cadwalader said that in two cases Dr. Spiller referred to endothelial tumors had been removed by Dr. Frazier that had apparently been growing from the petrous portion of the temporal bone. Dr. Cadwalader further said that he believed that tumors arising in the neighborhood of the Gasserian ganglion are not as Dr. Frazier has already said, strictly speaking, tumors of the ganglion itself. They appear to have their origin in the endothelial cells lining the dura. In such cases the function of the fifth nerve is disturbed early, whereas in cases of tumor growing from the cerebello-pontile angle, nerve deafness is the earliest and most important localizing sign.

A CASE WITH A NEURASTHENOID AND VISCERAL SYMPTOM GROUP, OF MANY YEARS' DURATION, FINALLY PRESENTING THE FRANK SYMPTOM OF PARESIS

By George F. Phelps, M.D.

M. S. K., white, male, 50 years of age. Dates condition back twenty-four years as follows: Complained of heartburn, constipation, accumulation of gas in stomach, stoppage of bowels, and catarrhal condition of stomach and head. Four years ago (1912) he began losing flesh rapidly, from 200 pounds to 137 pounds. He consulted a specialist who diagnosed condition gastric catarrh. He was put on diet with no success for two months. An X-ray made by same specialist, who decided a rapidly growing cancer of intestines was present, and patient could not live over six months, but later reversed his diagnosis to gastric catarrh.

From this time on patient began to take on flesh, reaching 160 pounds, and resumed his work for two years. Twice following this he lost and gained flesh and several X-rays were taken with negative results. In June, 1915, he consulted a surgeon and was operated upon for a diseased appendix, which afforded him relief for a short time, and in the summer of 1916 he entered the surgical ward of the Jefferson Hospital for observation. From here he was transferred to the medical, eye, and finally neurological department, with following history and physical signs:

Gonorrhea and chancroid at 18 years of age. *Gait*—Slightly spastic. *Station*—Romberg. *Pupils*—React to light and accommodation sluggishly, irregular and unequal. *Reflexes*—K. J., right, delayed; left, delayed. *Babinski*—Minus. *Ankle Clonus*—Minus. *Speech*—Slightly slurring. *Memory*—Much impaired. *Eye Examination*—Low-grade primary, optic atrophy. Tremors of hands, tongue and lips. *Serological Examination*—First examination, 12/29/16: Blood Wassermann—negative; S. P. F. L. D. lymphocytes

44, globulin positive, Wassermann negative. Second examination: 1/16/17: Blood Wassermann—negative; S. P./F. L. D. lymphocytes 20 globulin positive, Wassermann negative.

Dr. George E. Price said that one of the things that helped to keep up the interest in this class of cases is its infinite variety. That was nowhere better shown than in its initial symptoms. We have the more familiar types with gradual lighting up, then we have the form of the neurasthenoid and the form in which the first symptom is some vascular crisis and then this with the hypochondriacal or somatic symptoms. It was his experience that this type of case runs much the longer course.

Dr. G. F. Phelps said that his object in bringing the case before the Society was the neurasthenic symptoms he presented with the other condition and the patient was in the clinic that day and one of his chief complaints was visceral derangement.

REMARKS ON ACROESTHESIA AS DIAGNOSTIC IN TABES DORSALIS

By Tom A. Williams, M.D.

In a discussion of the pathology of tabes dorsalis (Amer. Jour. Med. Sci., 1908) an attempt was made to ascertain the reasons for the early implication of the attitude sense on physicopathological grounds. One of the factors of the more usual early implication of the lower extremities was regarded as the greater length of the fibers carrying these impulses; and here reference is made not to distal length from extremity to root ganglion but to proximal length from root ganglion to nucleus gracilis in the medulla. The physiopathological explanation ventured was borrowed from plant pathology, where the law held that when interruption of trophicity occurred the degree of blighting was proportional to distance from the lesion; for instance: those leaves farthest from a constricting band on a branch would first perish.

Observations of cases of early tabes were confirmatory of this hypothesis, due regard being paid to those cases where the disease began and was most conspicuous, not in the sacral roots as is most frequent, but in the upper lumbar or the thoracic, or perhaps in that rare type in the brachial region; for, of course, in these cases where mainly fibers of relatively shorter course are diseased, one would not expect to find clinical signs from the fibers of long course which are not diseased.

It is perhaps from the observation of cases of this type that a recent observer has been led to the hypothesis that the disease process of tabes attacks first the controlling mechanism of the great proximal articulations rather than of the more distal regions (Hoover, Amer. Jour. Med. Sci., 1915). Of course, the impression of many observers that the disease is characterized by early implication of the control of the larger articulations may be due to lack of adequate examination of acroesthesia.

The further generalization of this observer that it is to the cord changes of pernicious anemia or similar condition that we should look for the occurrence of early distal acroanesthesia will be reserved for a later communication.

This communication is merely for the presentation of clear instances illustrating the fact that in sacral tabes there is a loss of acroesthesia without any ascertainable implication of the more proximal functions. Cases conformable, therefore, with the explanation made in 1908 in consonance with the conception of the pathogenesis of the disease as a radiculitis.

As to deep sensibilities as a whole, there are clinicians who maintain that the loss of acroesthesia is less apt to occur in tabes dorsalis than in

mixed sclerosis of the cord, or in peripheral neuritis; and that locomotor ataxia is more apt to be characterized by impairment of sensation in the more proximal parts of the limbs. But that it is the sense of attitudes that is most often affected in tabes dorsalis is a supposition which has been accepted without due comparative control; for there are many instances of tabes dorsalis where examination shows that the superficial sensibility is much more impaired than that carried by the deep fibers.

Leaving aside this question, however, and returning to the acroesthesia, Dr. Williams presented for consideration a case of tabes dorsalis where the very earliest manifestation includes a loss of acroesthesia in the deep sense without any loss in the limbs in general.

CASE I. Very early tabes. A driver, aged 32, was referred from the Freedmen's Hospital, genito-urinary clinic, because after renal hematuria cystoscopic examination showed a much trabeculated bladder, which Dr. H. Fowler believed to indicate incipient tabes. There was a 4 plus Wassermann reaction.

Further examination was negative, except that the plantar reflexes were very feeble; that the attitude sense was completely lost in the lesser toes though less so in the other toes, where the middle toe was the most defective. There was also some impairment in both great toes. All the other sensibilities were present, even those to vibration and deep pain, and there was no impairment in the deep reflexes, even the bulbocavernosus being present. The lumbar puncture recommended was not performed.

Here then is a case of tabes in its very earliest stages, as shown by a typical bladder, quadruple Wassermann, a history of syphilis; but neurologically only a deep acroanesthesia.

CASE II. A man, aged 29, was sent by Dr. Rawls, of Virginia, because of impaired gait for six months, cramp for thirteen months, and bearing down feeling in lower waist.

Examination showed deep reflexes absent, plantar feeble flexion, bulbocavernosus present, abdominal and cremaster active.

Sensibility: Vibration diminished, bettering upwards, deep pain not diminished, attitudes intact in hip, knee and ankle, much impaired in toes, temperature, pin, localization intact, slight increase of Weber spacing in fingers, two points 2.5 mm. apart being felt as one on the forefinger. There was marked ataxia in heel-and-knee test, improving with practice. Latterly slight tingling in fingers.

Pupils react to light, but are poorly maintained. Spinal fluid gave triple plus Wassermann, increased globulin, 290 cells per cubic millimeter.

Here then is an active case of tabes in which is a marked impairment of deep acroesthesia without any detectable implication of the great proximal joints save ataxia in heel-to-knee test, perhaps due to the loss of attitude sense distally.

A CASE OF HYPOPITUITARISM

By Joseph McIver, M.D.

The patient was a white male, aged 20, admitted to the Philadelphia General Hospital December 26, 1916. Family history was negative.

So far as could be ascertained he was a normal child at birth. He went to school from the age of 7 to 13, and got along fairly well, but was never as bright as his classmates. At the age of 13 he lost interest and had to be sent to Elwyn, where he remained until his admission to the hospital.

Past Medical History.—Epilepsy when a child from two to seven years. Compound myopic astigmatism at fourteen years of age.

Physical Examination.—Height 6 feet 1 inch. The head is peculiarly shaped, with a marked increase in mento-occipital diameter. A heavy growth of hair over the scalp. The face shows the protruding lower jaw but no beard. The eyes show an apparent subocular edema and a very narrow palpebral fissure. No color or form fields were obtained. The mouth shows an extremely high-arched palate.

The limbs were of excessive length, with somewhat tapering fingers and a number of pigmented scars over both lower limbs. The chest is flat and the mammary glands resemble in every respect those of a young virgin. Axillary and pubic hair very scant. The penis is well developed, but the testicles are very small, about the size of a small peanut. Thyroid gland is not palpable and there is no substernal dullness.

Sexual desire is slight.

Sugar-tolerance increased—350 gm. glucose. No reduction of Fehling's.

X-ray shows sella turcica a little deeper than normal. Considerable hypertrophy of posterior clinoid processes.

He showed a polyuria, 2,500 to 3,000 cc. per twenty-four hours. Blood count, negative. Wassermann spinal fluid, negative. B. P., syst. 118, diast. 70.

CASE OF TRAUMATIC PACHYMENINGITIS

By S. F. Gilpin, M.D.

S. D., a young Italian, aged 18 years. Has good family and personal history. Dates onset of present trouble from a fall in November, 1912. Fell down stairs, striking head and back of neck. States he had no motion or feeling in arms and legs for about twenty minutes after fall. Was not unconscious. Was able to go to work the next day. In about six months he noticed weakness of arms and legs. In January, 1914, entered the University Hospital, where he remained for nine weeks. Was treated by extension and went home feeling well. Now worked for about one year, when on account of weakness and stiffness of arms and legs he reëntered the University Hospital, service of Dr. Deaver. Entered hospital on March 8, 1916, and left on April 5, 1916. States he was unimproved and his extremities were becoming more weak and stiff.

Admitted to Jefferson Hospital April 26, 1916, service of Dr. Dercum. Examination showed normal healthy young man with the exception of marked weakness and spasticity of muscles of neck, trunk and limbs. Reflexes were all markedly exaggerated with pronounced ankle clonus and Babinski, the exaggeration being most marked on the left side. Patient was unable to walk, dress, or feed himself. X-ray showed double cervical (seventh) rib, but no other lesion. Serological tests were all negative. Patient continued to grow worse. Became so spastic he could move left arm and leg very little, could breathe with great difficulty and only with the diaphragm. Neck muscles became very rigid. Had difficulty in swallowing. Patient was slightly cyanotic and felt need of air.

June 13, 1916, operated on by Dr. DaCosta. Incision made over lower cervical vertebræ. Spines and laminæ of fifth, sixth and seventh cervical vertebræ removed. Dura thickened like leather. Arachnoid bulged through opening in dura. Cord could be seen compressed and thinner than normal. Vessels not observed to be pulsating. On opening arachnoid a large quantity of clear fluid came out under considerable pressure. Vessels of cord were observed to pulsate and patient immediately breathed better. No adhesions were found. Membranes were closed with sutures.

Examination of patient June 23, 1916: Can bring tips of forefingers to-

gether. Can move both arms above his head. Reflexes are increased, those on the left side more than on right. Babinski sign has greatly diminished on the right side. All signs of irritation of the motor columns of the cord have rapidly lessened since the operation.

Examination January 5, 1917: Patient able to walk about. Gait spastic. Reflexes still exaggerated. Ankle clonus present on each side. Babinski sign has disappeared on the right side. Motion is much better in right arm and leg than in left. Patient states he is still improving.

The Presidential Address by F. X. Dercum, M.D., was on the interpretation of the neuroses, biological, pathological and clinical considerations, together with an evaluation of the psychogenic factors.

THE CHICAGO NEUROLOGICAL SOCIETY

DECEMBER 21, 1916

The President, DR. HAROLD N. MOYER, in the Chair

At the beginning of the meeting the Society unanimously adopted the following resolution in regard to the departure of Dr. William Healy from Chicago:

WHEREFORE, Dr. William Healy, the director of the Juvenile Psychopathic Institute of Chicago, has resigned from his position and is leaving for Boston to take up similar duties there.

Be it Resolved, That the Chicago Neurological Society wishes to express its regret at Dr. Healy's departure, desires to signify its appreciation of Dr. Healy and his work, and wishes him every success in his new field of labor.

A CASE OF BROWN-SÉQUARD PARALYSIS

By Lewis J. Pollock, M.D.

Dr. Pollock presented a case of a boy aged twenty-seven, whose previous history has no bearing upon the present condition. The Wassermann reaction was negative upon the blood serum.

On October 1, 1916, he was stabbed in the left groin, the left buttock, and in the back of the neck. The wound in the neck extended from the fifth to seventh cervical vertebræ. His right leg was immediately paralyzed. For three days he complained of severe shooting pains in both arms. He was unable to move the right leg for four days, then movements of the thigh and leg returned and on the sixth day he was able to be out of bed, and more or less rapidly regained all function except dorsal flexion of the foot and extension of the toes. He remained in the hospital until the eighteenth and was examined five days later.

He showed a weakness of the muscles of the right side of the body below the level of the fifth and sixth cervical segments; the groups represented by these levels were more markedly affected than those of the fifth alone, inasmuch as the deltoid especially, and the pectoralis major, supinator longus and biceps were feeble, and the supraspinatus, teres minor, subscapularis and serratus magnus were probably not affected. The muscles representing the lower levels were still weaker, the greatest disability being in the extensor of the index finger, the oppenens pollicis and the first dorsal interosseous. In the lower extremity, where the dorsal flexors of the foot and extensors of the toes showed the greatest weakness, the motor disability was most marked.

The right side of the abdominal wall was paretic. Ankle and knee clonus were present on the right side; the rectus jerk was greater on the right side. The deep reflexes in the upper extremities were equal and about normal with the exception of the right scapulo-humeral, which was increased. A Babinski phenomenon was present on the right side. The right cremasteric and abdominal reflexes were absent. The sympathetic and organic reflexes and vasomotor functions apparently were normal upon both sides. The pupils were normal. Sensation to touch was disturbed only over the area supplied by the anterior femoral cutaneous nerves of the left side. They had probably been severed by the stab wound in the groin. There was an analgesia of the left side below the level of the third dorsal segment. For a short distance above this pain sense was diminished and below the fourth cervical segment, although very slight pain stimuli were felt upon the left side, the sensation which they awakened was more acute upon the right side. Temperature sense was lost to a level slightly higher than the third dorsal, and for a small band above this was diminished. As with temperature sense, so here it was found that as high as the level of the fourth cervical segment temperature stimuli were more acutely felt upon the right than upon the left side. However, the slightest stimulation was correctly interpreted upon the left side in this area. Over the arm only that portion represented by the second and third dorsal segment showed a similar condition as to pain and temperature. Joint and muscle sense were apparently normal but slight paresthesia was present upon the right side. No difference in tactile space sense existed.

Since the time of examination an improvement has been noted in the motor functions; the same muscle groups, however, are affected and in similar proportions. The thermal anesthesia has retreated caudally so that the upper border is at the sixth dorsal level. Above this to the fifth dorsal either heat sense alone is lost, or heat and cold slightly diminished. Analgesia likewise has retreated caudally to a level lower than the thermal anesthesia, namely, the eighth dorsal segment. Up to the level of the sixth dorsal pain sense is diminished. The same acuteness of sensation to heat and pain is present in the same area of the right side as was noted at the first examination.

The case is of particular interest because of several features. First, the low level of the crossed sensory disturbance as compared to the direct motor injury illustrates the obliquity of the crossing of the sensory fibers, as pointed out by Gordon Holmes. Second, the caudal retreat of analgesia and more slowly of thermal anesthesia, indicates a lamellar arrangement in which the fibers that convey impressions from the lower spinal roots are placed lateral to those that have later reached the contralateral side. Finally, inasmuch as the upper margin of anesthesia to heat is slightly higher than that to cold, it is probable that the afferent impulses which subserve the latter decussate more slowly.

PRESENTATION OF A CASE OF TRAUMATIC BROWN-SÉQUARD PARALYSIS

By Peter Bassoe, M.D.

The patient is a boy aged sixteen years who was in perfect health until November 27, 1914, when he was stabbed with a penknife in the median line of the back between the eighth and ninth thoracic spines. He at once became totally paralyzed in both legs, lost all sensation from the hips down and had complete urinary retention for four days. By the end of the first week he passed urine normally. There was no pain at any time. After two months sensation began to return and soon afterwards he began to move the toes. Muscular power gradually returned and six months after the injury he could

stand up when holding on to the bed. In another month he could take a few steps when using crutches. He has gradually improved and now walks quite well with crutches and when sitting can cross one knee over the other. The right leg is much weaker than the left. There is almost complete right foot drop, so the right foot drags and also is everted. Flexion, abduction and adduction of the right hip are also weak, while the knee movements and dorsal flexion at the ankle are fairly good. The sensory disturbance is typical; pain and temperature sensations being greatly impaired in the entire left lower extremity, tactile sensation less so in the same portion, while muscular sense is greatly impaired in the right foot. The knee jerks are increased, the right more so, and ankle clonus and Babinski sign are present on the right side only.

Dr. Hugh T. Patrick asked how Dr. Bassoe accounted for the distribution of the paralysis. Why should the boy have a foot-drop and fairly good calf muscles, and why should the hip muscles be weaker than the thigh muscles? He thought the lesion must be above the level of the extensors of the thigh because of the increased knee jerk. Perhaps the motor fibers for the muscles more affected lay nearer the periphery of the cord.

Dr. Bassoe said he supposed the initial paralysis was largely due to hemorrhage and inflammation above. As long as improvement was still going on he thought it was difficult to say how much of the paralysis was due to severing of the fibers and how much to actual changes.

BONE AND JOINT CHANGES IN NERVOUS DISEASES

By D. B. Phemister, M.D.

The topic for discussion has a two-fold interest. It is of interest to the surgeon from the point of view of the bone and joint changes and to the neurologist from the point of view of nervous lesions back of the changes. In order that the surgeon or neurologist may fully understand his own field he should have the detailed information possessed by the other. The surgeon knowing the precise nature of the nervous lesions could better undertake the surgical or orthopedic management of the bone and joint changes, while the neurologist from a better understanding of the bone and joint changes can figure out the precise nature of the nervous lesions which must of necessity exist in order that these changes can develop. By such a combined study information may also be obtained on general points in physiology and pathology, as for instance on the way in which trophic disturbances are produced. Are there special trophic centers and nerve fibers running from them to the tissues, disease of which leads to trophic change, or are they the result of lesions of the sensory nerves removing restraining forces, permitting overactivity of the muscular apparatus and of outside mechanical influences? In the joints we see changes the result of the nervous lesion and of traumatism which otherwise require an infectious or chemical basis for their explanation. For example the villous changes in the synovia of Charcot's joint are similar to those of arthritis deformans and gout. One cause for heteroplastic bone formation is also elicited. As a result of the nervous lesion the periarticular structures are so traumatized and stimulated that their connective tissue element undergoes metaplasia into bone entirely independent of the skeletal system.

Bone and joint changes may occur in lesions of almost any part of the nervous system. Straight motor lesions as in infantile paralysis result in a simple bone atrophy, usually of the concentric type in children, which differs in no way from that produced by disuse as from immobilization by a plaster-

of-Paris cast. Sensory lesions in diseases of the cord, of posterior nerve roots or of straight sensory nerves lead to much more complicated changes that are rather difficult to explain. Sensory cord lesions are impossible for most of the osteo-arthropathies met with. Statistics vary much as to their frequency in the various diseases. According to Borchard they are found in 10 per cent. of tabetics and in 25 per cent. of patients with syringomyelia. The frequency of occurrence in general paresis is much lower and is dependent upon changes in the spinal cord rather than those occurring in the brain.

The lesions may be divided into the arthropathies and osteopathies. The arthropathies are the most interesting and complicated. They may be divided into Charcot's joint and the joint changes in perforating ulcer. There is a difference of opinion as to the causation of Charcot's joint. It is most commonly considered to be due to mechanical violence secondary to loss of deep sensation. Some claim that it is a trophic disturbance secondary to diseases of trophic nerves, while others claim that it is a syphilitic infection of the joint with secondary changes resulting from the nervous lesions. The changes and their mode of development are as follows:

As a result of the loss of deep pain sense and the accompanying disturbance in muscle sense the joint is undoubtedly traumatized unaware to the patient. This leads to relaxation of supports and the changes in the synovial membrane of a traumatic arthritis with exudate and villous change. Marginal fractures develop which may become reattached or escape into the joint cavity as loose bodies where they may later become attached in some recesses and lead to new bone formation. Osteophites develop about the margin of the articular cartilages. Periarticular ossification occurs in the joint capsule by direct extension from the bone at the seats of capsular attachment. Paraarticular ossification also occurs in the remote portions of the capsule independent of the bone and in the surrounding muscles. This is almost pathognomonic of Charcot's joint. It forms as a result of the abnormal traumatism and over-stimulation. Some of this new bone serves no purpose but in some instances it may reach such dimensions that hypermotility in the joint is restricted, acting as a sort of internal orthopedic appliance. There is a variable amount of wearing away of the ends of the bone. It is usually more marked in the distal bone of a joint, as for instance the tibia in the knee joint. In some cases it is slight, while in others it is extreme and may result in destruction of the entire ends of the bone. Changes in the interior of the bone bordering on the joint surfaces are marked. Irregular sclerosis occurs and in some instances there is a tendency to the formation of cavities filled with fibrous marrow. When the changes are more marked subluxation frequently occurs. Thickening along the surface of the shaft is common. This results partly from traumatism, partly in response to the traumatism, and partly from the subluxation in which the new bone forms in order to meet the new lines of force. Larger interarticular fractures are not common.

In perforating ulcers there is practically always a lesion of the underlying joint somewhat similar in character to that of Charcot's joint. From the absence of sensation the overlying parts are undoubtedly traumatized and lead to a breaking down of the skin and soft parts and the discharge of the fluid joint contents. Healing is slow because the underlying causes are not removed.

Since the discovery by Noguchi of spirochetæ in the brain in general paresis attempts have been made to explain Charcot's joint on the basis of a direct syphilitic arthritis. Stargart found round celled infiltration in the thickened synovia similar to the Heller-Doehle syphilitic aortitis. Franckel and Oehloecker examined the tissues from three joints and were unable to verify these findings. No case has been reported where spirochetæ have been found in the tissues and as the microscopic changes in the synovia are ordi-

narily identical with those of a chronic arthritis and in no way resemble a gummatous process, it is very improbable that we are dealing with a direct syphilitic infection of the joint. With the existing nervous lesion permitting of an extreme traumatism of the joint it seems hardly necessary to assume the existence of diseased trophic nerves in order that the process may come about.

Eloesser of San Francisco has been able to produce joint changes very similar to Charcot's joint by division of the posterior nerve roots. Also he has found no grounds for assuming the existence of special trophic nerves in order to explain the changes.

The osteopathies consist in pathological fractures, curvatures and bone atrophy. Curvatures are seen largely as a result of muscle atrophy or are static in origin. Curvature of the spine is very common in syringomyelia where no doubt the loss of deep pain sense is of considerable etiological importance, permitting of more unequal pull by the stronger muscles of one side than would be tolerated in the presence of normal sensation. Pathological fractures may occur in connection with the joint surfaces in Charcot's joint or in the shaft or ends of the bone in the absence of any joint changes. Intra-articular fracture is commonly seen in the shape of chips off of the articular margins or in a more extensive form as a fracture of the neck of the femur. Interarticular fracture is particularly common about the ankle, as a fracture of either condyle or of the astragulus. Fracture of the bone may occur independent of any joint change. It is most commonly seen in the metatarsals and will frequently appear as an incidental finding if routine X-rays of the feet of tabetics are taken. Fracture frequently occurs and heals without the patients being conscious of the extent of the injury. In all of these fractures X-ray examination shows the absence of any considerable atrophy of the bone. There may be sclerosis or disarrangement of trabeculæ in the fractured ends about Charcot's joint, but any such changes are absent in the shaft when fracture occurs. The cause of the fracture cannot be explained by the assumption of a trophic lesion because approximately a normal amount of lime salts is present and that is the all-important factor in determining the strength of a bone. This is shown by the fact that a dead bone is practically as strong as a living one. The most plausible explanation for the occurrence of these fractures is that undue violence is done to the bones either by external forces or by the body weight as in the case of the metatarsal bones and the patient is unaware of it because of the loss of deep sensation. Disturbances of muscle and joint sense also makes it impossible for the patient to estimate the amount of violence which is done to the bones and joints by routine muscle contractions. Osteogenesis is not interfered with and healing will occur if satisfactory immobilization can be obtained. This is frequently difficult because of the absence of the protecting sense of deep pain and exuberant callus forms combined with myositis ossificans in the neighboring muscles as illustrated by the specimen of humerus demonstrated.

X-RAY FINDINGS IN NEUROPATHIC JOINTS

By Hollis E. Potter, M.D.

The X-ray findings in neuropathic joints are both pronounced and distinctive. By the time they are noticeable clinically the pathology is usually advanced to such a stage as to give marked abnormal findings in and around the joint. These findings consist of destructive changes in bone adjacent to the joint, growth of osteophytes about the joint (and on the outside of near-by bone), and changes both absorptive and productive within the original bone.

In the early cases the only finding may be that of destruction of the bone adjacent to the joint, usually at one edge.

To be diagnostic of any disease X-ray findings must be compatible with that and only that condition. In Charcot's joints the findings are so very characteristic that if it were necessary the X-ray would be of good service in the differential diagnosis of this from other joint diseases involving bone destruction and bone absorption. These joints being rather characteristic clinically it has been his experience that the X-ray serves its greatest use in demonstrating the existence of a real bone involvement, and in showing in a graphic manner the extent of the same. In the hip joint, the shoulder joint and the spine it has special utility, since these regions are not so accessible for physical examination. Among the bone and joint diseases from which Charcot's joints must be differentiated are tuberculosis, syphilis, arthritis deformans, miscellaneous infections and sometimes tumors.

The points which should be mentioned as characteristic in radiographs of neuropathic joints are:

First, the character of the bone destruction. This occurs at a joint margin and as the disease develops extends to a considerable distance. The resultant bone margin is irregular, spongy and fringed. Irregular islands of detached bone are usually found in the interspace.

Second, the character of the osteophytes. These lie as irregular islands of bone in the tissues around the joint and spring from the cortex of contiguous bone structures often for some distance from the joint. The osteophytes are partly formed from pieces fractured from joint surfaces although are not recognizable as such. They do not spring as spurs or lips from the edge of the joint so frequently as in hypertrophic arthritis deformans; they do not tend to form bands of bone as is seen in healing infections, but are apparently purposeless in their origin and lie in clotted clumps hit-or-miss about the joint.

Third, the character of the bone near the destructive process. Contrary to what would be expected in the pathologic literature there appears in most Charcot joints an increase in the lime content of bone near the joint. This is true even after discounting the added osseous material superimposed by the osteophytes. Although porous areas frequently appear, this added bone density appears so frequently as to be listed as important and in the presence of clumped osteophytes, characteristic.

Dr. George W. Hall said he had been interested in joint changes in tabes for a good many years as well as in cases with gastric crises, and had reported seven or eight cases of the latter a few years ago which had been operated on by mistake. One patient still has a normal knee jerk but since he has been under observation has developed a Charcot joint of the ankle. Dr. Hall thought the X-ray should be used to help make the diagnosis even the Charcot had not been brought out clinically.

Another thing was that many cases of Charcot spine had been overlooked and in the few cases he had seen there had always been other joints involved as well, whereas one often saw involvement of the elbow and knee and ankle joint without involvement of the spine. In looking over the literature concerning the question of gastric crises he observed that Spiller in 1902 had described a case of Charcot's spine, and at about the same time another man had described it. This was the first time Charcot of the spine had been described in this country. Dr. Hall thought that diagnosis of Charcot's spine had been greatly neglected, perhaps because it was not looked for often enough. Although the rule is to have no pain in a Charcot joint, once in a while it is very painful. Within the last month or so he had seen a case with severe pain in the knee joint, a Charcot's joint which subsided within a few days after putting the patient to bed.

Another thing was the density of the tissue of the joint. In an article he had read it had been shown by some French authorities that the amount of inorganic substance in a Charcot's joint decreased from a normal of about 65 to 25 per cent. and the organic increased from 45 to 75 per cent. He commented upon this statement that if that be the case it would seem that the joints would show decreased rather than increased density.

Dr. Hugh T. Patrick said he was sure that the members of the Neurological Society were very much obliged to the surgeons and radiologists for illuminating many obscure points about these things. He would still like to see two or three features explained. In the old days one used to speak of the hypertrophic and atrophic forms of the Charcot joint. Dr. Phemister and Dr. Potter had shown very good examples of what would have been called hypertrophy of the end of the bone, but Dr. Phemister had failed to explain why some of these joints seemed to be atrophic and why others showed the increased deposit of bone or bone salts. All of the joints shown, with the possible exception of an elbow joint shown by Dr. Phemister, exhibited an increased deposit of bone or of some substance which caused a shadow about the joint, making bony contour greater. Why did the one elbow joint show bones smaller than normal?

Dr. Patrick recalled having seen a woman at the Salpêtrière a good many years ago in whom the head of the humerus had entirely disappeared, and as the arm hung at the side there was a hiatus where the end of the bone should have been of two or three inches, so that the arm could be turned quite around on its axis without any difficulty. One could perhaps easily understand why repeated traumatism of an injured painless joint should cause increased bone deposit, and one might imagine how eventually constant attrition might lead to wearing away of the end of a bone in a joint like the knee, but how could this come to pass in the shoulder of a woman who had been practically bedfast for years? How could one account for the disappearance of practically the whole end of the bone in the absence of traumatism and attrition?

Dr. Patrick wished to say that in his experience 10 per cent. of joint changes in tabes and 25 per cent. in syringomyelia were very much too high for the ordinary run of cases. Perhaps in some hospital or infirmary a critical search might show a relatively high proportion, and of course the X-ray would show changes not otherwise obvious but he was sure that 10 per cent. in tabes was too high, and unless in the cases of syringomyelia one includes the more or less pronounced spinal curvature, he was very certain that 25 per cent. of neuropathic joints was altogether too high for the syringomyelia cases as we commonly see them.

Dr. Peter Bassoe said that the emphasis made by Dr. Phemister on the relative unimportance of local syphilis or local arthritis in Charcot joints as compared to the rôle of the underlying nervous affection brought to his mind another disease which had not been touched upon, namely, leprosy. In this disease bone changes were very frequent. A number of years ago Harbitz reported a case of leprosy in which the phalanges were very largely destroyed. In leprosy we also have local changes as well as nervous affections which might produce neuropathic bone disease. He thought a comparison with the changes in leprosy might throw some light on these factors.

Another condition which had not been touched upon was the joint changes in caisson disease, where we also had to deal with two factors: first, the changes brought about by liberation of air in the joint with subsequent lesions of the synovial membrane. Secondly, changes produced by liberation of air in the cord. Dr. Bassoe had had occasion to investigate this disease a number of years ago. Dr. Potter had made most of the X-ray pictures and considered the joints very similar to those of arthritis deformans. Probably

most of them were due to the primary liberation of air in the joints themselves.

In regard to the Charcot spine, it had been his good fortune in 1912 to see two cases of Charcot spine in one week but he had seen none since then until he saw Dr. Phemister's case. In one of these cases the patient had an old tabes and his back had become deformed. It was interesting that at one time while having a course of mercury the man suddenly developed a right foot-drop which was permanent. Then after some salvarsan treatment he suddenly developed a left foot-drop from which he later on partially recovered. The spinal lesion was located chiefly at the fourth and fifth vertebræ, and he thought the position of the spine with possible traction on or destruction of the nerve roots had something to do with the production of the foot-drop.

Dr. Meyer Solomon stated that most of the discussion had been confined to a consideration of the Charcot joint. He thought one of the things that should be considered by neurologists more than anything else was the etiology of the chronic peripheral pains patients so often complained of. The neurologists often tried to convince them that they were due to their mental state. Dr. Solomon did not believe ideas could bring about any pains and he did not believe pains were due to so-called hysteria. He thought the work on chronic focal infection was of great importance in this connection. At the last meeting of the Society Dr. Patrick had brought out the fact that many cases of so-called sciatica were frequently due to something else than sciatic nerve involvement. Dr. Dana had published a paper which brought out very interesting points. He showed that not all of the pains, especially in the lower extremities, of individuals who complained of these chronic peripheral pains, were due to the involvement of the tendons, joints and muscles, but that some of them were due to ostitis and periostitis. Dr. Solomon thought it would be interesting to learn from other members whether they had had cases of that nature. He thought the neurologist was really being swept more and more into the association with the internal medical man and that examination of the blood, etc., was becoming more necessary to him in every way.

Dr. Phemister, in closing, said that the so-called atrophic forms of neuropathic arthritis of which Dr. Patrick spoke seem to come from excessive erosion of the ends of the bones which is not preceded by atrophy. X-rays of an elbow with extensive erosion were shown again to illustrate this point. There was sclerosis in the ends of the bones.

In closing the discussion Dr. Hollis E. Potter said that the existence of lipping at the margins of the joints brought out by Dr. Phemister has not been seen commonly in Charcot's joints in the early stages. Seen in the later stages the bone growth is of coarser texture than that seen in arthritis deformans. It has been seen oftenest in the spine, where it may grow like a real purposeful reaction tissue tending to produce a pseudo-ankylosis as in spondylitis deformans. This is the most noticeable exception to the general purposelessness of the new bone formed.

Dr. Patrick's inquiry as to the atrophic forms of Charcot's joints is very important. It is true that the discussion has been limited to the hypertrophic forms which are so much more common and interesting radiographically. Four times he had seen Charcot's joints which were of the atrophic form, two in the hip and two in the shoulder. In each case two or three inches of the humerus and of the femur were completely absorbed and no osteophytes or other hypertrophic growths present. The peculiar point about these cases was the abruptness in transition from apparently normal bone to a region of total dissolution, and the free end of the absorbed bone was straight, as if cut off by an operation. These atrophic conditions are very properly listed as neuropathic joints and should have been considered. The general atrophy

and scoliosis seen in the spine so frequently in syringomyelia was purposely omitted.

JANUARY 18, 1917

The President, DR. HAROLD N. MOYER, in the Chair

A CASE OF MULTIPLE SCLEROSIS: CURED

By James C. Gill, M.D.

The patient was referred to Dr. Gill the latter part of May, 1916. He was sent to a hospital and the following history obtained.

Mr. W. McG., age 31, single, born in this country, worked for the past several years as wall paper printer, but handled no dyes or metals. Complained of general muscular weakness, difficulty in walking, numbness and paresthesia in hands, headaches, blurring of vision, disturbance of bladder. Family history negative. Previous illness, measles in childhood. Habits: Never used alcohol or tobacco; tea and coffee moderately; denied venereal infection.

Examination.—Reflexes, eyes normal; faucial exaggerated. Upper extremities, right exaggerated, left normal. Abdominal, right side absent, left present but diminished. Knee jerk, right exaggerated, left probably normal. No patellar or ankle clonus. Achilles reflex present. Plantar showed double Babinski more pronounced on right side.

Motion.—General muscular weakness, more pronounced on right side. No atrophy. Slight tremor and incoördination. Rotary nystagmus, no speech defect.

Sensation.—Areas of analgesia and hyperalgesia, irregularly distributed over both upper and lower extremities. Over left dorsal and lumbar region, epicritic and protopathic sensation markedly increased. Sensory disturbances were interesting but cannot be detailed here. Frequent desire to urinate with occasional inability to control sphincter of bladder. Blood Wassermann negative; lumbar puncture showed a normal cerebrospinal fluid. Urine negative, eye ground slight paling temporal side of disk. Thoracic and abdominal organs negative. Dr. Bassoe, who saw the case, concurred in the diagnosis of multiple sclerosis.

In looking for a source of possible infection, X-ray of teeth revealed several root abscesses. An examination of tonsils showed the presence of pus in both. Extraction of teeth and tonsillectomy advised and done at once. The patient given weekly intramuscular injections of salicylate of mercury in oil without any definite reason for so doing. Within a period of about ten days from the time of operation on tonsils and teeth, patient began to improve; remained in hospital for about ten weeks. Improvement continued until the end of October, when he felt able to resume his work. And now the only evidence of his previous disorder is a slight spasticity with exaggerated knee jerk on the right side.

Dr. Peter Bassoe said that in his record of the case he had notes of the ankle clonus and double Babinski and he thought he had never in multiple sclerosis seen such pronounced hypersensitiveness as was present in this case. There was very little tremor.

This case reminded Dr. Bassoe of one reported as cured by removing a focus of infection. It was a case of a man who had a rather rapid onset of a spastic paralysis of one leg. He came to the Presbyterian Hospital about a month after the onset and some infected tonsils were found and removed and the patient very promptly got symptomatically well. This man was discovered to have had a similar but milder attack two years previously with spontaneous recovery.

Dr. Geo. W. Hassin said he had seen a case that was similar in many respects. The patient apparently "recovered" and was well for about a year and then had a relapse. He was in the County Hospital for seven months and then was "well" for two and a half years before a second relapse. Dr. Hassin thought it was questionable whether Dr. Gill's patient did not show a temporary remission.

Dr. J. Elliott Royer was reminded of a case of multiple sclerosis which had been under observation, giving the impression of a cure, but after a period of twelve years had a relapse and on admission to the hospital showed a typical form of multiple sclerosis. Dr. Royer thought, that in view of the pathology, the nerve impulse is wasted because of the changes in the myelin, leaving an imperfectly insulated axis-cylinder, and not strong enough to carry the load. He said the leakage of a nerve impulse could explain the sudden palsy and after rest-improvement.

Dr. Harold N. Moyer asked why a diagnosis of central myelitis had not been considered instead of multiple sclerosis.

Dr. Meyer Solomon said that this case made one think of the fundamental etiology behind multiple sclerosis.

In multiple sclerosis we had been in the habit of considering the disease incurable and although there might be a remission for a number of months or years, it could not be looked upon as a cure. An individual of normal stability did not develop this disease even if he had a focus of infection, but in individuals of peculiar nervous constitution susceptible to breakdown, it may occur. This man had been apparently clinically cured by removal of the chronic foci which had been responsible for his condition. Dr. Solomon thought that so far as the disease which he had was concerned he was clinically cured, and if he could be kept free from foci of infection he might have no relapse.

Dr. Krumholz said he had asked Dr. Gill before the meeting what he meant by the word "cured" in the title of his case, to which he had replied that it stood there for the purpose of arousing discussion. Dr. Gill had been very guarded in mentioning much about the cure in his presentation of the case. The fact that the patient still had the spasticity and exaggerated reflexes made Dr. Krumholz very doubtful about the cure. He thought that the improvement represented a remission of the symptoms. Remission and intermission of symptoms is the rule and is one of the important diagnostic signs in the early stage of this disease. One rarely finds Charcot's syndrome in the beginning of multiple sclerosis.

Dr. Krumholz thought that Dr. Gill's case was most interesting from the standpoint of pathogenesis. The so-called "cure" of the patient corresponded better to a recession of an inflammatory process of the central nervous system than to the old theory of a primary sclerosis. Marburg and other investigators have demonstrated the presence of inflammatory changes in this disease in the brain and cord. Flesch believes the disease is due to a toxemia from a distant tuberculous focus. Of course, this is an extreme view, but it is probable, and as Dr. Gill's case shows, that multiple sclerosis is caused by a focus of some kind of infection present in some organ in the body. Dr. Krumholz was, therefore, of the opinion that in the treatment of this disease the aim should be to search out and remove all foci of infection.

Dr. A. B. Yudelson asked if there had been any history of vomiting or abdominal pain or palsies. The patient had worked at printing wall paper and Dr. Yudelson thought that he might have been affected by the dyes.

Dr. Sanger Brown said he did not recall a case of insular sclerosis in which the quality and distribution of the sensory symptoms corresponded very closely to those presented by this patient, but the history together with the present findings strongly supported the diagnosis offered. Perhaps a re-

mote concession should be made in favor of brain tumor. The rapid development and the equally prompt disappearance of pronounced motor and sensory symptoms, sometimes led those physicians who practiced neurology a quarter of a century ago to commit themselves to a diagnosis of "functional" disorder in cases which further observation showed were examples of one of the diseases just mentioned. Notwithstanding the present fashion of attacking the teeth and the tonsils as measures of treatment the well established natural history of insular sclerosis, in his opinion, seemed rather to contradict Dr. Gill's claims either as to cure or etiology.

Dr. Hugh T. Patrick said there were three affections which might be called the acrobats of disease: syphilis, hysteria and multiple sclerosis, and Dr. Gill's case was a very good example of multiple sclerosis. He had no desire to quarrel with the diagnosis. The interesting feature of the case was the sensory disturbance. Dr. Patrick had never seen a case which presented such marked sensory disturbances but the amount of improvement in the motor symptoms he did not consider at all exceptional. He ventured to suggest that Dr. Gill call the case cured in the Pickwickian sense.

Dr. Harold N. Moyer said he thought that Dr. Gill had used the word "cured" in quite the proper sense, in that cured really meant treated. Dr. Gill had not said the patient recovered. The older writers had used the word correctly when they said they "cured a case until death."

Dr. Gill, in closing, stated that undoubtedly many patients with multiple sclerosis were not seen until permanent secondary changes had taken place in the central nervous system. He believed that this patient showed the importance of seeing these cases early, trying to find the source of infection and removing the same. He believed in this particular case that the cause was a focal infection in the tonsils and teeth and the early removal of such infection before permanent secondary changes occurred resulting in permanent improvement and not merely in a remission of symptoms such as have been noted in disorders of this kind in the past.

Dr. Gill, in replying to Dr. Yudelson, said the throat was very sensitive and the reflex pronounced, but the patient had not vomited during the time he had observed him.

A CASE OF BLINDNESS WITHOUT DEMONSTRABLE ORGANIC CHANGE

By Sigmund Krumholz, M.D.

The patient was a man, aged thirty-four years, married, who was first seen by Dr. Krumholz on November 1, 1916. He was a laborer in a machine shop. Family history negative. He denied drinking any intoxicants and smoking.

The patient complained of being totally blind in both eyes. In February, 1916, a piece of emory the size of a pinhead entered his left eye; he felt a burning in the eye and soon thereafter lost the sight of that eye. Two days later the piece of emory was removed by the company physician, but the vision did not return. He continued at work until May 24, 1916. A few days previous to that he noticed a burning pain in his right eye and on May 25 lost the sight of the right eye and claims to have been totally blind since then.

Examination.—November 1, 1916: The patient's eyelids drooped and when led into the room he occasionally avoided obstacles. He displayed an unusual amount of care on sitting down. He firmly asserted that he could not remove his shoes but removed his socks without difficulty. At first he declined to untie his tie but afterwards did so. He dropped his clothes on

the floor automatically without any attempt to find a chair, although he was leaning against one. He claimed to be unable to lift the eyelids or to turn the eyes to either side. However, voluntary eye movements could be seen upon conversation with him when standing at either his right or left side. On attempting to raise his upper eyelids one could feel at first some resistance in them, followed by relaxation. No nystagmus. No pupillary abnormality of any kind. The corneal and conjunctival reflexes were present. On aiming an unexpected blow at his eyes he blinked and quickly withdrew his head. The eye department found that the eye grounds were normal. Sensation to touch was at first present but soon patient claimed bilateral analgesia on the forehead and above a line extending down from the nostrils to the angle of the jaw; sensation on the upper lip was normal. Other cranial nerves entirely normal. Reflexes, sensation over the rest of the body and coördination normal. Blood Wassermann negative.

November 8, 1916: Analgesia over the entire face except the chin. November 25, 1916: Analgesia also of the chin and on December 13 sensation to pin prick was also absent all around the head down to the collar line.

Dr. Krumholz said that he had called this a "case of blindness without demonstrable organic change."

Complete blindness without optic nerve atrophy and with an intact pupillary light reflex is not compatible with blindness caused by a lesion of the optic nerve.

The patient was never hemianopic but became suddenly completely blind in one eye and three months later in the other eye. Complete blindness in one eye, if not due to atrophy of the peripheral optic nerve, is usually of a functional nature. The character of the sensory disturbance of the face and head correspond to that usually seen in cases of neurosis. The behavior of the patient, without entering into any analysis, spoke very much in favor of a traumatic neurosis.

Dr. Hugh T. Patrick asked if there was any question of compensation from the employer or the State Board.

Dr. Krumholz, in closing, said the case was pending and while the patient had won the case on one occasion there was a chance of an appeal. He thought it was unquestionably a case of traumatic neurosis.

EXPERIENCES IN SPINAL CORD SURGERY

By Allen B. Kanavel, M.D. (by invitation)

The speaker presented the clinical histories of twenty-two patients upon whom he had performed laminectomy for various surgical conditions.

As to the results obtained in spinal root resections, one patient with intractable pain in the distribution of the fifth dorsal, who gave a history of having suffered for fifteen years with attacks coming on at least every two weeks, had been perfectly well after operation without any serious post-operative consequences.

The results obtained in tabes might be described as an amelioration of the symptoms rather than complete relief. The vomiting had in most instances been relieved. The patients frequently complained of some pain over nerves not cut in spite of the fact that a very wide exsection had been done.

In certain cases of meningitis Dr. Kanavel recommended doing a lumbar spinal canal drainage but reported in this connection one patient who had been subjected to repeated lumbar punctures which had ended in the obliteration of the subarachnoidian space over six vertebræ, in which the course of the disease had been uninfluenced.

The cord tumor cases had shown an unexpected amount of improvement. One patient with complete paralysis of the lower extremities, loss of bladder and rectal control and concomitant sensory changes, following the removal of a fifth dorsal extradural tumor had made such recovery that he was able to walk with a cane, was completely relieved of pain and had restoration of his bladder and rectal control. A second case with a tumor in the region of the eleventh and twelfth dorsal was presented in which practically the same results had been obtained.

Attention was drawn to the fact that it was extremely difficult to differentiate certain cases of syringomyelia and intramedullary cord tumors, and that in view of the comparative safety of exploratory laminectomy it should be resorted to more frequently than in the past.

In cases of fracture of the spine where there had not been complete severance of the cord considerable improvement had taken place even after some weeks of moderate pressure.

Attention was drawn to the deaths occurring two or three days after cervical fracture in which no operation had been performed because the patient seemed to be in such good condition, without evidences of serious pressure.

Of the twenty-two cases reported none of the operations on patients in a comparative state of health had proved fatal. The meningitis patient above mentioned was practically moribund at the time of operation, and one tumor patient with destruction of the cord and involvement of the vertebræ had died some weeks after the operation. Otherwise there had been no deaths.

Dr. Geo. W. Hall, in referring to the one case which Dr. Kanavel operated on at the County Hospital, said it is difficult to say just what the results have been. The man returned with considerable pain some months after the operation, but at the same time he was crying for morphine and it was difficult to say whether he was really suffering pain or longing for morphine. He had no attacks of vomiting but attempted to vomit several times following the operation.

Dr. Geo. B. Hassin said that in the case of his patient who had the bullet in his spine for six years an unsuccessful attempt had been made to remove the bullet soon after the man was shot. He finally insisted upon having the bullet removed and Dr. Kanavel had consented to do it. Dr. Hassin was pessimistic as to the final results of the operation on account of possible scar formation around the bullet. During the operation two solid scars were found surrounding the bullet, yet the results of the operation were excellent, as the pain totally disappeared about three months after the operation, and the man was able to resume his work. The speaker said such cases were rare, only seven or eight similar cases having been reported in the French, German and American literature, and those cases had been early ones, about three months old; one case, that of Englemann, of Berlin, was only of five days' duration. Dr. Hassin had been unable to locate his patient recently but was sure he was perfectly well.

Translations

VEGETATIVE NERVOUS SYSTEM

By H. Higier, M.D.

Authorized Translation by Dr. Walter Max Kraus, A.M., M.D., New York

(*Continued from page 376*)

Pulsus irregularis respiratorius, as is well known, consists in an acceleration of the heart beat and a decrease in the pulse volume during inspiration, while expiration makes the pulse fuller and slower. According to Hering, this phenomenon is particularly frequent in young persons, and is to be identified with Mackenzie's "infantile type" of respiratory arrhythmia. This arrhythmia presupposes the presence of an increased tone in the inhibitory vagus fibers to the heart. It can only be considered pathological when it occurs during gentle breathing.

Aschner's phenomenon of pressure upon the eyeball has been less studied. It may be elicited in vagotonic persons by pressure upon the eyeball, or after stimulation of any of the branches of the trigeminus. The results are expiratory standstill, or at least bradycardia—the decrease being as much as to 10 beats per minute.

According to Miloslavich, this reflex is always present in epilepsy, never in hysteria.

13. The Heart

The heart receives many different kinds of nerves from the sympathetic and vagus, in spite of the fact that it is an automatically acting organ.

These nerves, receiving impulses from the cerebrospinal axis, have antagonistic actions upon the heart beat, some accelerating, some inhibiting it.

Histologically there are:

1. Vagus nerve fibers to the heart, of which the majority are unsheathed.

2. The extracardiac ganglion of Wrisberg, lying between the

pulmonary artery and the arch of the aorta. This may be designated as a vertebral ganglion of the sympathetic cord. It is about the size of the head of a pin, and has large round or oval cells which give branches in all directions.

3. Many intracardiac groups of ganglia which, with encapsulated ganglion cells, resemble the head ganglia.

The accelerating sympathetic fibers are supposed to be connected with the extracardiac ganglia, the inhibiting vagus fibers with the intracardiac ganglia (Hering, Aschoff).

The sympathetic tracts to the heart arise from the first to the fifth dorsal segments, are interrupted in Wrisberg's ganglion, and proceed as post-articular fibers without further interpolation of ganglion cells to the musculature of the ventricles of the heart. They have no influence upon the complicated conduction system of the heart. It is not thus with the vagus supply, which is triple. One branch springs from the superior laryngeal nerve, one from the recurrent laryngeal nerve, and the third from the thoracic part of the vagus. The branches which proceed from the heart to the aorta are mainly depressors. The right vagus supplies the deeper layers of the heart, the left goes to the superficial cardiac plexus, whereby its branches lie mainly between the arch of the aorta and the pulmonary artery near the ganglion of Wrisberg. Small ganglion cells are found at all the end branches of the vagus.

When it was first discovered, that besides the ordinary auricular and ventricular musculature there exists a special conductive system, uninfluenced by the former, namely the bundle of His, and the bundle of Hill and Mackenzie, and further, when it was discovered that there exist muscular nodes or ramifications from these bundles, as the node of Aschoff and Tawara at the entrance of the coronary veins, and Keith's node, at the sinus of the venæ cavæ, it was thought that these discoveries would bring the myogenic theory to a final victory, particularly since the fact of resuscitation of the excised heart for days could readily be correlated with the above mentioned discoveries.

The balance of opinion, however, is again swinging to the old neurogenic theory, which is favored by the presence of large numbers of ganglion cells in the heart musculature. The intracardiac ganglion cells, whose function according to many physiologists and clinicians is viscero-motor, are most thickly distributed just where the muscular conduction system begins:

1. At the place of origin of the auriculo-ventricular bundle of His and at Tawara's node.

2. At the orifices of the superior vena cava in the right auricle, where the embryonic muscle node, called the sinus node, or node of Keith and Flack forms the beginning of the cavo-auricular bundle.

In order to make certain the question of the autonomy of the heart, Lyon tried the following experiment on dogs: When the carotid and vertebral arteries are tied off, the heart after a brief time comes to a standstill. If the brain be perfused with blood the heart will beat again. Thus merely restoring the function of the brain suffices to recommence the vanished automatism of the heart. Thus, the cerebral nerve organ may itself call forth heart beats. This observation is as difficult to reconcile with a myogenic origin of the cardiac autonomy as are the groups of ganglion cells piled up in those muscle nodes which are the site of the origin of the nervous impulse which regulates heart action.

In favor of the viscero-motor nature of these ganglia, Müller cites much physiological data, as Stannius' experiment, as well as pathological conditions, such as Adams-Stokes Disease, and anatomical peculiarities, such as the piling up of ganglion cells on the end branches of the motor vagus fibers.

The vagus tracts seem to act upon the muscle through the intervention of ganglion cells, in that the activity of the ganglion cells is inhibited, but not arrested, by these tracts.

Whether the sympathetic spinal center of the heart may be reflexly influenced, as is the cardio-respiratory center in the medulla, cannot be as definitely stated. The classical "klopfversuch" of Goltz causes in frogs stimulation of the medulla, with cessation of the heart beat in diastole.

The types of irregular pulse of vago-sympathetic origin, as well as the positive and negative influences of the cardiac nerves, have already been discussed in the section on physiology.

It is quite difficult to explain the manifestations of sensory stimulation in heart disease if one regards all the sympathetic ganglion cells as viscero-motor. It has been supposed on the one hand that there are viscero-sensory fibers in the depressor nerve of the vagus, and that on the other hand the cardiac manifestations due to fear are caused by vaso-motor disturbances of the caliber of the coronary vessels. The uncomfortable feelings of those with heart disease are probably transmitted through the sympathetic rami communicantes, via the spinal ganglia, or directly to the spinal cord, and thus are carried to consciousness, the hyperalgesia and brachial pains of Head being explained as a radiation up and down the spinal cord. The vagus has no anatomical relation to these

latter phenomena since vagus fibers are nowhere in near relation to fibers going to the arm.

If one denies the existence of vegetative centers in the cortex as well as the existence of a brain center for the actions of the heart and lungs, one must regard the gray matter of the midbrain in the vicinity of the floor of the third ventricle, or, in other words, the bulbar-autonomic dorsal vagus nucleus, as the real end station. The tonus of this station is affected by affects, bodily pains and local stimuli, with resulting palpation, cessation of cardiac action and arrhythmia.

Among local stimuli must be mentioned that passing through the depressor nerve of the vagus, when the pressure in the aorta rises. This stimulation results in a slowing of the heart.

The antagonistic action of many drugs upon the heart has already been noted. Adrenalin, by stimulating the sympathetic accelerator nerve, causes an increase in the force and weight of the heart beat, while atropin, by paralyzing the depressor nerve of the vagus, also causes an increase in the rate of the heart beat.

As signs of local vagotonia in the domain of the heart, we have enormously stimulated or depressed heart activity in young people, which after atropin either disappears or is transformed into a tachycardia.

Not infrequently phrenodynia is noted, with the uncomfortable feelings of momentary cardiac standstill, and of sudden flow of blood to the head. Great lability of the heart action with variations in the pulse frequency up to an arrythmia is also found.

Bradycardia is noted in convalescence from quite a few infections as well as in conditions having a rise in intracranial pressure, in digitalis therapy, and in certain kinds of goiter hearts.

If in vagotonic bradycardias the vagus stimulus between auricle and ventricle is disturbed, a discontinuance of conduction is obtained, the auricle beats more frequently than the ventricle, and a "nervous heart block" results. This may be relieved by atropine with the result that the loss of ventricular systoles is eliminated and the rhythm is restored to normal. Should the disturbance be organic, this will not be the case.

Many forms of angina pectoris seem to depend upon stimulation in the autonomic nervous system. Stimulation of the vagus can undoubtedly cause a spasm in the muscles of the coronary arteries, and so a narrowing of the cardiac vessels. Drugs which paralyze the vagus and dilate blood vessels exert a beneficial influence upon vasomotor angina cordis. Langendorff concludes, from his experi-

ments with suprarenin, that the sympathetic supplies vasoconstrictors to the lungs and vasodilators to the blood vessels of the heart.

Stimulation of the mucous membrane of the nose, pressure upon the eyeball (Aschner's phenomenon) and faradic stimulation of the peripheral endings of the trigeminus will influence the vagus via the trigeminus, causing a bradycardia (Eppinger and Hess). Intravenous injections of adrenalin cause cardiac irregularity only in vagotonic individuals.

In addition to vasomotor angina pectoris, disturbances in the vago-sympathetic system are found. These manifest themselves as paroxysmal tachycardia, or bradycardia, allorhythmia or cardiac irregularity, fluttering and irregularity of the individual contractions, or irregularity of the pulse; all of these may be noted, particularly, in hystero-neurastenic individuals.

It is worth mentioning the following conditions of irregular pulse, observed by means of the sphygmograph: pulsus irregularis perpetuus, irregularis alternans, irregularis respiratorius, irregularis extra systolicus and disturbances in the conduction of the stimulus. In the two latter, the trouble may start in the auricles, ventricles and bundles of His. The recently described asphygmatic pulsis alternans, or asphymigia alternans of Halbey must be considered as a peripheral angioneurosis, and is discussed in the section on blood vessels.

In general it may be said that those questions which have been of great interest in the last decade, questions of the relation of the vago-sympathetic system to pulse irregularities, to the Stokes-Adams syndrome, the functional adynamias, and the organic disturbances in the atro-ventricular structures are still far from a satisfactory solution. If, as Ciechanowski says in his monograph upon the heart, one regards the discovery of the atro-ventricular system as a new chapter and a new page in the many-sided book of cardiac pathology, one must admit that the researches up till now are scarcely more than outlined, the ABC of the new chapter.

14. Blood Vessels

The nervous regulation of blood vessels, arteries (Stilling), veins (Goltz) and capillaries (Steinach) has been recognized for many years. Only the nature and site of the vasomotor organic disturbances in the central and peripheral nervous systems are as yet possible of diagnosis. More often the opposite path of reasoning is taken in that the anatomy and physiology of blood vessels yields information about clinical and pathological conditions.

The following facts contribute to the difficulties in clarifying the activities of the vasomotors.

1. First of all, the relations of the vasoconstrictors to the vasodilators and the relations of both to the heart and its ganglia have not as yet been cleared up. According to many physiologists vasoconstriction follows active stimulation, vasodilation, active inhibition of the circular muscle of the blood vessels.

2. Secondly, it is not definitely known whether or not the vasodilators and vasoconstrictors follow the same paths, and further whether vasodilator changes plethysmographically recorded are due to a diminution of the tone of the vasodilators or to stimulation of the vasodilator fibers.

3. Thirdly, the situation is complicated by the fact that the innervation of all blood vessels is not always simultaneous and of equal intensity. It is not proper either teleologically or physiologically to suppose that all blood vessels should contract or dilate simultaneously and should thus suddenly throw an excess of blood into or remove an excess of blood from the heart. In this regard it may be said that the visceral blood vessels act individually and in most instances both the external and internal blood vessels of the heart react oppositely to those of the extremities (Wiechowski, Hürthle, Weber).

4. Finally, another difficulty is the fact that the influence of the sympathetic nerves upon the blood vessels is not only exerted upon the smooth muscle of the arteries but also affects the muscle cells of analogous nature in the capillaries (Rouget, Mayer, Steinach, Kahn).

The question is, what may be learned as to the localization of vasomotor centers and tracts in the periphery, cerebrospinal axis and cerebral cortex by a study of anatomy, physiology and experimental pharmacology.

The skin vessels of the face are supplied by fibers from the upper cervical ganglion. They pass via the internal carotid plexus to the gasserian ganglion, the spinal ganglion of the trigeminus. From here they pass with the fibers to the sweat glands via the sensory nerves to the face. The fibers to the vascular supply of the extremities pass via the plexi to these parts (Duval, Benders, Claude Bernard). The vasomotors to the arm go via the brachial plexus and arise in the thoracic part of the sympathetic chain. The vasomotors to the leg which go via the sciatic nerve arise in the lumbar cord. The former group arises much lower, the latter much higher than the corresponding spinal motor nerves and must therefore be fairly

near to one another in the spinal cord. Helweg places the segmental origin of the vasomotor fibers to the arm at C5–D7, the majority arising from D3–D7. Langley found that the vasoconstrictor fibers of the upper extremities arose in segments D4–D10. Those for the lower extremities in D12–L3. The former ascend in the sympathetic chain, the latter descend. According to the contention of Onuf and Collins, the fibers for the upper extremities have their origin in segments which are lower than those at which the fibers leave the spinal cord. Thus they ascend not only in the sympathetic chain but also in the spinal cord. The same is claimed for the lower extremity, only here the fibers descend in the spinal cord and then leave at segments below their origin to descend further in the sympathetic chain before going to the peripheral nerves.

The principal control lies normally in the cerebrospinal axis. However, when this is vitiated by destruction of the cord or section of the peripheral nerves, peripheral tone comes to the rescue. After a short period of vascular depression the reserve tone, arising most probably in the peripheral ganglia, reëstablishes the normal level of pressure. In general the spinal cord serves local segmental functions. The bulbar or main center of blood pressure behaves differently. This lies in the nucleus dorsalis vagi and is the autonomic vascular center of nearly all the viscera. It may be stimulated reflexly from many points. If the bulbar center is stimulated by one means or another, autonomic stimulation of the vessels in the splanchnic area results with dilatation of the vessels and subsequent narrowing of the peripheral vessels. The depressor nerve in the aorta guards against too great a rise of blood pressure, for it is reflexly stimulated by any increase in aortic pressure (Tschermak).

According to some authors (Benders) the bulbar center owes its control of the large vasoconstrictor areas to the presence of paths which run to the lower spinal cord centers and which are secondarily stimulated when the bulbar centers are stimulated.

That the cerebral vessels are controlled by a center lying above the bulbar center is natural from their position. If the superior cervical ganglion be nicotinized, thus cutting the path of the vasoconstrictor nerves, constriction of the verebral vessels cannot be obtained. Vasodilatation in the brain may still be produced and also after destruction of the medulla oblongata. Weber states that there are both vasodilator and vasoconstrictor fibers for the cerebral vessels in the cervical sympathetic.

Some authors deny, others affirm the presence of a cortical center. Experiments in which the frontal brain area in cats is stimulated

with resultant stimulation of the splanchnic area and increase of blood pressure (Lewandowsky, Weber) have been cited as evidence of a center.

The following course of the vasomotor tracts in man has been suggested. The evidence is clinical and experimental. Frontal lobes (Rossolimo), internal capsule, nucleus caudatus, thalamus (Bechterew), pons, gray matter of the fourth ventricle, in the region of the calamus scriptorius (Reinhold) of the medulla oblongata, weisse Dreikantenbahan (Helweg) or anterior lateral tracts (Cassirer) and the gray lateral horn of the spinal cord. Helweg states that almost all the vasomotor paths cross in the posterior commissure. The further course of the vasoconstrictor fibers is the customary one; anterior root, communicating branch, sympathetic ganglion. The autonomic vasodilators pass through.

(*To be continued*)

Periscope

American Journal of Insanity

(Vol. 72, No. 3, 1916)

ABSTRACTED BY DR. C. L. ALLEN, LOS ANGELES, CAL.

1. Defective Delinquents in Massachusetts. A. W. STEARNS.
2. Sensory Phenomena in Epilepsy. E. M. AUER.
3. Paresis and Cerebrospinal Syphilis. I. A. DARLING and P. R. NEWCOMB.
4. Functions of a Psychologist in a Hospital for the Insane. S. I. FRANZ.
5. Recollections of a Psychiatrist. J. M. KENISTON.
6. Dangers of the Continuous Bath. WM. A. WHITE.
7. Treatment of Paresis. H. A. COTTON.
8. Focal Lesions in Catatonia. E. E. SOUTHARD and M. M. CANAVAN.

1. *A Survey of Defective Delinquents under the Care of the Massachusetts State Board of Insanity.*—Dr. Guy G. Fernald has stated the qualifications for entrance into the class of defective delinquents as follows: "We may regard as within the group of defective delinquents, one whose mentality is so imperfectly developed that he is unable to support himself honestly, and whose acts repeatedly conflict with established social and legal requirements." . . . "The defective delinquent is one who is smart enough to get into trouble, but is not smart enough to keep out of it." A survey of the state institutions of Massachusetts showed that there were in the state hospitals 82 individuals of this class, while the two schools for the feebleminded furnished 76 more, a total of 158. In general these cases come about the border between the normal and the feebleminded, being mainly morons of the higher grade. Their offenses vary from murder to disorderly conduct of various sorts, the highest figure on the author's list being for sex offenders (84). Naturally these people are a menace to the community and require more or less permanent institution care. They do not, however, fit into existing institutions, being a disturbing factor in prisons, insane hospitals, and schools for the feebleminded, hence a segregation of this type of cases in special institutions which should combine the discipline, security and industry of a penal institution with the educational methods of a school for the feebleminded, would seem to be indicated. Their moral and criminal depredations, the cost of repeated arrests, trials and commitments and the reproduction of their kind would be so avoided. Provision for safeguarding the rights of the individual through observation and periodic examination, with the possibility of ultimate release under parole, should be made. A law providing for the care of this class was passed by the Massachusetts Legislature in 1911, but unfortunately has not been utilized as the practical measures necessary to permit of its operation have not yet been put into effect. A copy of this law is added as an appendix to this article.

2. *Sensory Phenomena in Epilepsy.*—Sensory manifestations may occur either as pre-paroxysmal, paroxysmal, or post-paroxysmal phenomena. From an examination of patients at the New Jersey State Village for Epileptics, the author found the following occurring as auras: Visual "flashes of light," "dark fleeting spots," "red and green colors," "balls of fire," "lines moving

up and down"—these latter being seen in the perpendicular and with eyes either opened or closed. "Objects decreasing in size," "shadows of things jumping up and down," "blurring of vision," "dark cloud descending," and "things like diamonds."

Auditory auras: "Humming," "buzzing," "hissing," "roaring," "unusual quietness," "a crash within the head or a clang as if a piece of metal was struck within the head," "voices repeating in the head."

Olfactory aura: "A disagreeable acid odor which gradually becomes more offensive until consciousness is lost."

Gustatory auras: "A salty bitter taste," "a tasting of sour on the tongue and lips."

Visceral auras: Epigastric pain is the most common and may be sharp and shooting or dull and heavy, "gnawing," "burning," "an indescribable feeling," "as though something heavy had crawled over the stomach," "something moving in the stomach," "pain in the chest," "palpitation of the heart," "pressure or pain over the heart," "turning about of the heart," "choking or tickling sensations of the throat," "sensations," "suffocation," "strangling," "desire to urinate and stool."

Auras in the form of paresthesia may be unilateral or bilateral, of any location or distribution, "a slow freezing sensation of cold beginning in the soles of the feet and ascending to the head," a chill, "tickling over the entire body," "needle-like pains in the left fingers and arm," "tickling over the entire body," "numbness of the left arm," "stinging feelings in the fingers of the left hand."

The author reviews the literature of the subject and narrates the following observations: (1) A boy of thirteen years of age was struck in the head by an automobile and was unconscious for six days. Eight months later he had his first convulsion, which was preceded by vertigo. He has an aura of seeing vertical bands of light, first red, then green, then purple, in the axis of central vision. At times he has the aura without a convulsion. (2) A woman of forty years of age had a convulsion at two years old, and at six an injury to the head said to have resulted in paralysis—side not given—and since then has had convulsions constantly "A black round object appears about to fall from above and to the left upon her head; she can close her eyes and still see it." She raises her left arm for protection and her eyes move to the right and upward. After being transitorily unconscious she is anesthetic on the left side, which feels cold to the touch. Anesthesia persists on the left for about six hours. In other attacks there is a sensory aura, the colors of the rainbow begin to dance up and down before her eyes, green predominating and next to this red. These are seen with eyes both open and closed, but more clearly with them closed. These are seen throughout the whole visual field, though more faintly on the right. Sometimes she has a feeling as if someone was thumping her in the pit of the stomach, this preceding a severe attack ten or fifteen minutes. The first warning of a convulsion is a dull frontal pain more marked on the right; things before her then become all colors and "the shadow before me will be dancing up and down." Then comes the numbness on the left side, arm and leg and she begins to shriek "I'm numb, I'm numb," cries for someone to come and "rub her back to life." In five or ten minutes she will fall on the floor and have a convulsion. She has also petit mal attacks, in which she suddenly has difficulty in seeing, more marked in the right eye and has a "thumping pain in the stomach" and as if she had "bumped her funny bone" on the right side. She has a sensation of being blind and cries: "I am dying, I am dying." In these she does not appear unconscious and there is no convulsion. (3) A man of twenty-seven years had at the age of twenty-four years an attack in which the right side suddenly became numb. The numbness spreads over the

right side in waves. He has gone three months without any attack and again has had six or seven attacks a day. Sometimes he cannot speak for a moment and there is slight twitching of the orbicularis, at other times there will be instead of numbness a sensation of burning or stinging, again flashes of heat or cold. In a later attack his right arm flexed in spite of his resistance and he later had a severe convulsion with an unconsciousness of fifteen minutes. (4) A man of twenty years of age has as a preparoxysmal phenomenon a slight pain in his eyes, then things about him appear rigid and statue-like. After about five minutes a bright spot the size of a dollar appears at arm's length and he must follow this, moving to the right and turning his head and eyes in the same direction. He never sees this with the left eye. (5) Another patient before a grand mal attack either sees things dancing up and down before him or a dark cloud before his eyes, then has a severe headache for three or four minutes, followed by the convulsion. Occasionally previous to the onset of the convulsion he has an aura "numbness of the tongue."

3. *The Correlation of the Findings in Paresis and Cerebrospinal Syphilis.*—Out of 697 admission to the Warren State Hospital, 87 were diagnosed as syphilitic diseases, 69 general paresis, 5 cerebrospinal syphilis, while the remaining 13 cases were considered more or less doubtful. Of the 69 paretics 8 had negative Wassermann reactions on the blood, as did also 3 of the 5 cases of cerebrospinal syphilis. In all the cases the Wassermann on the spinal fluid was positive. Of the 8 paretics, however, 2 cases showed positive Wassermann on the blood, sometimes in repeated examinations. In 3 of these cases the cell count was normal as it was in all the cerebrospinal syphilitics except one. The method used was that described by Paul G. Weston (Journal of Medical Research, Vol. 30, No. 3).

The authors summarize as follows:

1. A positive W. R. in the blood is the rule, but even repeated negative findings do not exclude paresis.

2. The Blood W. R. may or may not be positive in cerebrospinal syphilis.

3. Positive W. R. was found in the spinal fluid in all paretics and cerebrospinal syphilitics.

4. The globulin reaction was very inconstant in both and no aid in differential diagnosis.

5. The cell count varied greatly in both conditions but was as great in one as in the other.

6. The five cases of cerebrospinal syphilis with uniformly positive W. R. in the spinal fluid and two positive, three negative W. R. on blood, show clearly the difficulty of diagnosis by laboratory methods alone.

7. Two of the cases show the necessity of making a series of tests when possible.

8. The authors believe that all the bloods reported negative would have given a positive if tests enough had been made.

9. Satisfactory diagnoses are only possible when clinical and laboratory findings are considered together.

4. *The Functions of a Psychologist in a Hospital for the Insane.*—A general discussion of this subject containing few new suggestions.

5. *Recollections of a Psychiatrist.*—An interesting account of the author's experiences during his early activity as assistant physician at the Butler Hospital, where the lot of the insane seems to have been no less happy in the early seventies than to-day.

6. *Dangers of the Continuous Bath.*—A strong protest against the method of restraining patients in the continuous bath, a practice which the author regards as altogether pernicious and capable of leading to tragedy.

7. *The Treatment of Paresis and Tabes Dorsalis by Salvarsanized Serum.*—(Concluded from Vol. LXXII, Nos. 1 and 2.) After considering the methods

of bringing salvarsan into contact with the diseased tissues, the author concludes that its introduction either into the cerebrospinal fluid through lumbar puncture or its subdural injection on to the surface of the brain by the method of Wardner offer practically the only sure means of bringing this about. As methods he has used the Swift-Ellis, the Ogilvie, the mercurialized serum after Byrnes and combined methods.

As diagnostic methods he places in the order of their importance: (1) Lange's colloidal gold reaction. (2) Globulin test by Noguchi's butyric acid method. (3) Increase in the number of lymphocytes in the spinal fluid and the presence of plasma cells. (4) The Wassermann reaction upon the spinal fluid. (5) The Wassermann reaction upon the blood. He admits that a certain number of cases of paresis undergo spontaneous remissions but from a careful study of the material at the New Jersey State Hospital at Trenton, for a period of seven years, he puts these spontaneous remissions at 4 per cent. as against 35 per cent. as a result of his treatment carried on for two years. He had treated altogether 66 cases, some for only a short time, however, so he selects a series of 31 cases all of which had had at least six months treatment. Of these group 1 of 11 cases (or 35.5 per cent.) are classed as arrested, group 2 of 7 cases (22.5 per cent.) as much improved, group 3 of 7 cases (22.5 per cent.) as not improved and group 4 of 6 cases (19.5 per cent.) died.

He next takes up his cases in detail, considering the fluctuation of symptoms and the variation in the chemical and microscopical picture, wherein the showing made by the favorable cases seems quite remarkable; then discusses the biological reactions of each group as a whole. He also treated four cases of tabes and several cases of cerebral syphilis, but with less favorable results. He has not definitely decided as to the best method, but on the whole thinks that the Swift-Ellis is to be preferred at any rate in early cases, although since he regards the intravenous introduction of the salvarsan as too dangerous to be repeated oftener than once in two weeks he sometimes alternates with the Ogilvie method. He has found neosalvarsan quite as favorable in its action as salvarsan and of late has used it exclusively. Mercury and iodides he has not used. This article is illustrated by charts, specimens of handwriting, etc., and is a very complete presentation of the subject. The author sums up his conclusions as follows:

1. In salvarsanized serum we have an agent which causes definite arrest in general paresis with improvement in the clinical symptoms and corresponding change in the biological reactions.

2. To be effective the case must be treated in the early stages, since in the advanced cases there is no favorable reaction.

3. Length of time is not always an indication of the severity of the symptoms, but the majority of cases can not be helped after two or three years have elapsed.

4. Treatment must be persistent and uninterrupted, the dose and its frequency depending upon the condition of the patient.

5. Tabo-paralysis should be treated with caution, the dosage being small and not oftener than every three weeks.

6. Remissions after treatment can not be compared to that occurring spontaneously, since they occur in the proportion of 35.5 per cent. for the former against 4 per cent. for the latter.

7. The changes in the cell count, globulin content and Wassermann reactions on spinal fluid and blood are the direct result of treatment and not comparable to those occurring in untreated cases.

8. The efficacy of the treatment depends not so much upon the method used as upon the stage of the disease

9. Hence the necessity for early diagnosis and prompt treatment.

8. *Focal Lesions of the Cortex of the Left Angular Gyrus in Two Cases of Late Catatonia.*—In line with their previous communications on this subject the authors report two cases in which the diagnosis of dementia præcox coming on late was made, and which died respectively at the ages of fifty and forty-one years, in the first case a cyst and in the second a focal sclerotic area having been found in the left angular gyrus. In the first case a female, the trouble began with a "fainting spell" at the age of forty-three years, while in the second, a male, the first symptom noticed was business inefficiency at thirty-six years. Both died of tuberculosis, this being generalized in the second case. In neither case were there ever any focal symptoms except the "fainting spell" in the first case and this was never repeated, so the autopsy findings were in a way a surprise.

Both patients showed at one time or another, hallucinations of hearing, disorder of consciousness, confusion, incoherence, mutism, refusal of food, impulsivity, delusions of persecution, apprehensiveness, fixed attitudes, mannerisms, somatic delusions, destructiveness, violence, stuporous states. Neither case could be tested for alexia. In the second case the eyes were sometimes fixed for long periods upon a succession of points in space. As to automatism and catalepsy, *A* was at times passive to any form of attack, *B* showed automatism, possibly waxy rigidity. *A* had some delusions of negation, while in *B* there was shifting of ideas with some maniacal play on words. In the first case it seems probable that the "fainting spell" at the start is to be correlated with the softened area found. The writers are especially interested in the fact that the isolated lesion found in each case was in the parietal region, a region which they have long held to be correlated with catatonic symptoms.

Deutsche Zeitschrift für Nervenheilkunde

(54 Band, 1 Heft)

Abstracted by Dr. N. S. Yawger, of Philadelphia

1. Ludwig Edinger, 1855–1915. Kappers.
2. The Exhaustion Theory and Its Application to Types of Paralysis. Auerbach.
3. Polyneuritis of Mixed Nerves in Neurasthenic Soldiers. Nonne.
4. A New Family with Spastic Spinal Paralysis. Reitter.
5. Observations upon the Study of Langner, in Zeitschr. f. Nervenheil., Band 53, Heft 1–2, upon the Pathological Anatomy of Acute Ascending Spinal Paralysis. Nonne.

This issue presents what appears to be an excellent picture of the renowned neurologist of Frankfurt, Edinger. The occasion was his sixtieth birthday and around him were gathered his colleagues and pupils who contributed numerous articles appropriate to the event.

A list of his contributions to neurology and other scientific branches is appended, but this is so stupendous as to prohibit insertion. The list covers more than five pages.

2. *Exhaustion Theory.*—The author states that he had occasion to write previously upon this subject. Edinger's classification of nervous diseases is that due to focal affections, toxic disturbances and exhaustion states. The list is divided into: (1) Such diseases as occupation neuroses, where there is neuritis and atrophy and due to exhaustion of the nerve paths. (2) Diseases where degeneration is brought on by toxic substances such as lead, syphilis,

etc., leading to a multiple neuritis or tabes dorsalis. (3) Diseases of an hereditary degenerative nature, due to a congenital weakness of the nerve paths such as amyotrophic lateral sclerosis, progressive bulbar palsy, spastic paraplegia and Friedreich's disease.

The author is not entirely in accord with Edinger and refers to his former article where he contended that the factors involved were mechanical, physiological and anatomical: That muscles which have to perform their functions most unfavorably in regard to these factors, are the muscles that become most readily and most completely paralyzed and recover most incompletely and most slowly.

3. *Polyneuritis in Neurasthenic Soldiers.*—Nonne speaks of cases illustrative of Edinger's exhaustion theory. Individuals were observed free from alcoholism, syphilis, intoxications or infections. Multiple neuritis was observed in the ulnar, median, radial, anterior crural and posterior tibial nerves.

The existence of the polyneuritis neurasthenica of Mann is confirmed. The patients were free from alcoholism and infections nor had they had previously marked neurasthenic manifestations. The neuritis did not develop until some time after the muscular exertion.

4. *Family Paralysis.*—Hereditary spastic spinal paralysis is here shown through three generations. In all, there were affected the grandmother, two daughters, one of whom had a son likewise affected.

Revue Neurologique

Abstracted by Dr. C. D. Camp, Ann Arbor, Mich.

(An. XXII, No. 10, May 30, 1914)

1. Radial Paralysis and Syphilis. A. Baudouin and E. Marcorelles.
2. The Reflex of Prehension in Organic Affections of the Brain. A. Janichewsky.

1. *Radial Paralysis.*—The radial paralyses are not to be confounded with cases of syphilitic amyatrophy in which the weakness is slight and proportional to the atrophy. In the three cases reported there was complete localized paralysis with slight atrophy. In one it was bilateral; in the other two it was unilateral. There was no pain and no disturbance in sensation. The supinator longus escaped. In the first case there was a history of syphilis contracted ten years before, which was treated for five years with mercury and iodid. There was a positive Wassermann reaction on both the blood and spinal fluid. In the second case the history was positive but the Wassermann reaction on the blood and spinal fluid was negative. In the third case the Wassermann reaction was not done. Lead palsy was excluded by a negative history and the absence of any signs of plumbism. Antiluetic treatment had no effect on the paralysis.

2. *Reflex of Prehension.*—The author first described (Revue Neurologique, 1909, No. 53) this reflex as occurring in a case of paralysis agitans. The patient could voluntarily open and close the hand slowly and with effort, but if the examiner's finger was lightly drawn across the palm of the hand it was quickly grasped. The case here recorded was clinically diagnosed as one of brain tumor located in the frontal lobe and also invading the cortical motor area. The same reflex was present on the hemiplegic side. The author's conclusions are: that the reflex indicates an increase in reflex activity following a diminution of voluntary activity of the cerebral cortex; it is observed in paralysis agitans and also in cases with organic lesions in the brain; the center of the reflex is in the subcortical nuclei probably the optic thalamus; it indicates a frontal lobe lesion above the subcortical centers.

(An. XXII, No. 11, June 15, 1914)

1. Brown-Séquard Syndrome (Injury to the Cervical Cord by a Bullet). E. Dupré, Heuyer and Bergeret.
2. Myoclonus and Epilepsy (Syndrome of Unverricht). A. Austregesilo and O. Ayres.

1. *Brown-Séquard Syndrome.*—For three months after the injury there was paralysis of the left upper and both lower extremities with total anesthesia of the parts paralyzed and incontinence of urine and feces. An X-ray examination showed the bullet in the region of the first dorsal vertebra. The condition gradually improved and a month later examination showed paralysis of the left arm and leg only. There was a general hyperesthesia on the left side. On the right side there was disturbance of sensation up to the nipple line anteriorly and to the fifth dorsal spine posteriorly, but more marked below the sixth dorsal. There was no hyperesthesia on the right side. Bone sensibility was diminished in the left side, relatively, but the sense of pressure was diminished on the right. The lowest sacral distribution was affected in the same way as the others. There was no trouble with the sphincters. There was no "reflex of defense." The abdominal reflexes were abolished on the left but present on the right.

2. *Myoclonus Epilepsy.*—The condition was present in two patients, brother and sister aged fourteen and seventeen years, respectively. There was marked mental deterioration. The parents were well and the family history was negative.

(An. XXII, No. 12, June 30, 1914)

1. Crural Paraplegia Due to Extradural Neoplasm, Operation and Cure. J. Babinski, P. Lecêne and J. Jarkowski.
2. Certain Mental Troubles Observed in Aphasia. Serge Davidenkof.

1. *Extradural Tumor.*—The first symptoms consisted of rapid tiring of the legs noticed in 1901. This weakness gradually increased and in 1908 there was added dysuria and some sensory changes in the legs. Also occasional, spasmodic pains in the lumbar region. In February, 1910, the patient was no longer able to walk and a few weeks after this became completely paralyzed. From then until she was examined in December, 1911, her condition remained unchanged. She was completely paralyzed, had incontinence of urine and feces and sensory changes up to the level of the nipple. The tendon reflexes in the lower extremities were exaggerated, there was a positive Babinski reflex on both sides and a very active reflex of defense which could be elicited by irritation up to three fingers breadth above the umbilicus. The diagnosis was extradural neoplasm compressing the cord from the fourth dorsal segment to the ninth dorsal; the lower limit being fixed by the reflex of defense. At operation, January, 1912, a laminectomy was done from the third dorsal to the seventh dorsal vertebræ and an extradural tumor eleven centimeters long removed. The patient made a complete recovery. The remarkable features of the case are: the slow evolution of the symptoms, the complete recovery after such long compression and the diagnosis of the length of the tumor by means of the reflex of defense.

2. *Mental Condition of Aphasics.*—Aphasic patients of all kinds usually show a peculiar mental state which consists of a change in personality, a peculiar sentimentality which leads them to speak in diminutives. They show embarrassment and especial humility.

(An. XXII, No. 13, July 15, 1914)

1. Contribution to the Semeiology of Tumors in Different Portions of the Temporal Lobe. G. Mingazzini.

1. *Temporal Lobe Tumors.*—The temporal lobe is divided into four zones. The first is the anterior portion of the convex surface in which tumors cause disturbance in motility and, if on the left side, sensory aphasia. Zone two is the posterior portion of the convex surface. Tumors in this location frequently cause disturbance in the oculomotor control, conjugate deviation of the head and eyes, etc. The third zone is the posterior portion of the inferior surface of the lobe and the symptoms most frequently found are: unilateral paralysis of the abducens, contralateral ptosis, facial palsy, hemiparesis and hemianesthesia. The zone that includes the anterior portion of the inferior surface is indicated by hallucinations and illusions of odor or taste.

(An. XXII, No. 14, July 30, 1914)

1. Compression of the Spinal Cord by Arachnoiditis. Laminectomy Cure. Georges Bouché
2. Intermittent Chronic Chorea without Mental Disturbance, Postpuerperal Origin. J. Lhermitte and Cornil.

1. *Arachnoiditis.*—The patient had typhoid fever three years before he was admitted to the hospital. This typhoid was complicated by symptoms of meningitis. The onset of his trouble was four months before he was admitted to the hospital, when it was noticed that he had a weakness and trembling in the legs. This weakness progressed until he was only able to walk with a cane. He became anesthetic in an area corresponding to the distribution of the ninth thoracic to the second lumbar segment, inclusive. There was permanent contracture in the extremities, great spasticity. The cerebrospinal fluid showed a large number of cells and large amount of albumin. An operation was done in the region of the ninth dorsal vertebra and a thin-walled cyst uncovered. This was removed and the patient made a gradual, practically complete recovery.

2. *Intermittent Chronic Chorea.*—The patient was forty-six years old. There was no history of any similar trouble in the family. The choreic movements first began about six weeks after the birth of her first child, at the age of twenty-two. This affected all four extremities and the head. When twenty-four years old she had a second child. During this pregnancy the choreic movements diminished, but after the birth they became more intense. At the age of twenty-six a third child was born. As before, the choreic movements diminished during the nine months of pregnancy. When the patient was thirty-one years old the choreic movements suddenly disappeared. At the end of six years she was abandoned by her husband and the movements immediately returned. There were no sensory changes, the tendon reflexes were active, no paralysis. The mental state was normal. The notable points were: the apparent etiology, the influence of pregnancy, the long period of remission and the absence of mental involvement.

Book Reviews

THE DIAGNOSIS OF NERVOUS DISEASES. By Purves Stewart, M.A., M.D. Fourth edition. E. B. Treat & Co., New York, 1916.

This fourth edition of this excellent work on diagnosis contains a number of new features which are worthy of being accented. Written under the stress of the present world cataclysm, the author has had opportunity to see much war neurology. A most excellent chapter in this volume is one of the results.

The author utilizes the term vegetative nervous system and his chapter XX is an excellent discussion of a number of its disorders, arranged in a manner as found in but one recent text-book. The viewpoint expressed that the boundary between organic and so-called functional diseases of the nervous system is purely imaginary meets with the reviewer's approval. Arbitrary is the word we should prefer, since imagery after all is the essential feature of thinking, and productive imagination is responsible for all advance. Still the author's concept of disease is quite inadequate, since he does not grasp the energic concept which has come to express itself through symbols. When he says that disease is inconceivable without some physical basis, the author shows a lack of that imagination which fails to discriminate in the use of language. If he means that disease is inconceivable without a material or physical syndrome, that is comprehensible, but, if disorder is confined solely to somatic features, then the whole group of psychogenic disorders receives no adequate consideration. It seems strange that one who is surrounded by the appalling organic disasters, resulting from a purely psychogenic cause—the symbol of national supremacy—should still imagine that physico-chemical tropisms and sensori-motor reflexes make up life in its entirety. Have the desires of individuals and of nations no place in individual pathology?

The author reluctantly, half-heartedly and only partly informally touches on the psychoanalytic doctrines. When will it be understood what Freud has expressly and most detailedly described as "sexuality"? Stewart has not the slightest conception. Sexuality to him simply means genital contacts. A dream, to a psychoanalyst, we suspect, is understood to be only a glimpse in at the unconscious, just as a urinary examination is a look in on the kidney function. If the interpretation of the urinary findings depends upon certain hypotheses underlying kidney function, so does the interpretation of dream symbolism utilize the idea of its wish-fulfilling function—an hypothesis not Freudian in origin, but Heraclitian and probably before him. In the chapters on the Neuroses the author's attitude is the gradually developing one of half-hearted acquiescence to the obvious and active repudiation of scarecrow doctrines never taught but made up whole cloth out of the preconceived notions of the uninformed.

Aside from Dejerine's large volume on Semeiologie, this small volume of Stewart's is the best book on diagnosis with which we are acquainted.

JELLIFFE.

AN INTRODUCTION TO NEUROLOGY. By C. Judson Herrick, Professor of the University of Chicago. W. B. Saunders Company.

One is tempted to heave a great sigh of comfort on reading this book and to say "at last" an authoritative and excellent work has appeared in which a dynamic attitude towards nervous structure and functioning is set forth.

On the structural side the book contains an excellent description of the nervous receptors, and their various linking pathways. A type of description which has in mind the functions, as only such works as those of Cajal, Van Gehuchten and other great masters have shown. We are reminded that the "five senses" doctrine belongs to the kindergarten and yet comprehensive systems, even of philosophy, are founded on the minimal stimuli sources of these so-called five senses. Herrick describes a couple of dozen and has not even suggested the form of many chemical receptors.

When the author writes that "it is plain that man's sensory equipment is adapted to respond directly to only a limited part of the environing energy complex" and "we may conceive the body as immersed in a world full of energy manifestations of diverse sorts, but more or less completely insulated from the play of these cosmic forces by an impervious cuticle," there is hope for the student of medicine that he may get away from the still orthodox teachings that the 3,000 calories put into his stomach is a sufficient measure of the energy transformations performed by the human body. The stomach is only one surface of those energy receptors of which Herrick writes, and so well. Man as a transformer of those bits of cosmic energy which bombard him from all sides—and which in very small measure enter his few score of receptors, "windows" Herrick aptly terms them, to come out in appropriate, voluntary or involuntary muscle action or secretion.

How these energy transformations can take place so far as structure will permit them is well illustrated in this book, as the author very adequately builds up the neuronic architecture.

When Herrick writes "there is *no evidence* of subsequent improvement in the physiological mechanisms," his concept, so adequately expressed heretofore, falls down. We suspect that the structural discipline is too hard a taskmaster, and that notwithstanding the most admirable handling of the many phylogenetic aids, which tend to make this book stand out before all of its contemporaries, the lesson of steadily advancing grasp of the realities of life has to a certain extent been lost to the author. The energy content of symbols alone, and their power of condensing energy values for larger social purposes, is a concept that is not even suspected, though a necessary correlate to the author's own attitude. To say that no improvement has taken place is nonsense, and that no evolution is possible or has ever taken place.

We, for ourselves, doubt that adequate explanation of nervous disease will be arrived at before some knowledge of "organ inferiority" will be more clearly posited. This is the subtle background of what is summarized under "heredity."

When Protagoras, in commenting on color blindness, said that the differences (in men's perceptions due to differences in structure) exist, although they are not perceived until they are very great or inconvenient, he evidently knew that evolution in physiological capacity was going on all of the time; and so undoubtedly does the author, although the statement quoted would seem to imply too static a conception of nervous function.

We have commented at length on this small volume because we find it one of the few that are worth while. We believe every worker in nervous diseases should possess it.

JELLIFFE.

TRAUMA UND PSYCHOSE MIT BESONDERER BERÜCKSICHTIGUNG DER UNFALLBEGUTACHTUNG. Von Professor Dr. Hans Berger. Verlag von Julius Springer, Berlin, 1915.

Professor Berger is one of those writers who has presented a volume of more interest perhaps than he knew. He offers a large amount of valuable descriptive material covering generally the wide range of psychoses and

psychotic disturbances which result from traumas or which have even indirect relationship with them.

The careful selection and examination of his material makes this an illuminating treatise and it is here that its further significance becomes evident. While he has confined himself somewhat to the level of description, relating it always, however, to the interpretation which belongs to his particular theme, workmen's insurance, he has not followed the possibilities which he himself offers of a deeper understanding of the reality of the symptoms and forms of disease treated. He has, however, in so far as he has gone, opened the way to the extending of the knowledge of these various symptoms and the very suggestive relationship of the occasion of their precipitation and the form they take to their significance in the whole personality of the patient concerned.

This not only adds an element of understanding to the practical evaluation of the psychotic outbreak and the duty it involves upon the psychiatrist in relation to the workman's welfare, actual clinical care and, still further, guidance toward a readjustment of personality and mode of life, in occupations or otherwise, necessitated by the traumatic experience. It furnishes, besides, most valuable clinical material for the deeper investigation of mental disturbances which is more and more devolving upon psychiatrists.

Berger's attitude, in spite of an apparent inappreciation of the more profound psychological significance of his presented material, is a broad and comprehensive one, and a carefully detailed one as well. He recognizes the futility and meaninglessness of hard and fast classifications. He gives place to the complexity and interaction of various factors, of heredity, of organic injury, of functional disturbance, of the relation of insurance laws to the desire and demand for redress and support. In this last factor as in all his broad human grasp of conditions is evident. He intimates though he does not perhaps so plainly state that some of the human desire elements which certain psychiatrists find a cause of complaint and harsh judgment in the application of insurance measures are themselves a part of the psychical complex to be included in the clinical consideration.

Just here enters that further service which the interpretative psychology, reaching deep into human motives and hidden complexes, makes possible and of which there is here such ample suggestion.

There is likewise distinct diagnostic value in this treatment of the subject, liberal and comprehensive as it is. These same elements make it of particular value at a time when the question of workman's insurance with its many perplexing problems is extending itself to all parts of our own country.

JELLIFFE.

TEXTBOOK OF NERVOUS DISEASES. By Charles L. Dana, A.M., M.D., LL.D. Eighth edition. Wm. Wood & Co.

Dr. Dana's textbook has appeared now in an eighth edition. It has been of signal service for twenty-three years in the field of neurology and is a well-tried veteran.

The present edition differs in few important respects from earlier editions, the anatomy has been reduced, the major psychoses omitted entirely and a tentative rearrangement of the psychoneuroses put forth. The discussions of the disorders of the vegetative nervous system are fragmentary, as are also those in the endocrinopathies. Thus the thyroid disorders are dealt with in different chapters, widely separated. Exophthalmic goiter and the hyperthyroidism constituting chapter XXV, myxedema and cretinism are put in chapter XXVIII under the now meaningless term, trophic disorders.

The descriptions are for the most part adequate and reflect the author's viewpoints mainly.

JELLIFFE.

DISEASES OF THE NERVOUS SYSTEM. A TEXTBOOK OF NEUROLOGY AND PSYCHIATRY. By Drs. Smith Ely Jelliffe and William A. White. Lea & Febiger, New York and Philadelphia.

This is distinctly a new book. It differs in many respects from all of its contemporaries. It is highly systematized and the groupings follow an evolutionary scheme. Thus the entire scope of diseases of the nervous system is arranged as (1) disorders chiefly of the vegetative functions of the body—here called neurology of the physico-chemical level—with a full discussion of the vegetative nervous system, and the functions of the autonomic and sympathetic systems. This section of the book also deals with the endocrinopathies in an orderly but too fragmentary fashion. There is more of this material than the usual textbook of neurology has contained, but not enough to satisfy the demands of this most actively growing branch of neurology. The authors present the position that the metabolism of the body is maintained by neuro-chemical regulators, in which contention they are in line with the modern trend of medicine and these chapters have a continuity of point of view which is distinctly in line with presentday research.

The second part of the work deals with sensori-motor neurology—neurology in the old-fashioned sense. These chapters are extremely compact, filled with a carefully digested mass of facts, at times so tightly compressed and condensed as to make close reading necessary. The style and interest seem sacrificed to the ideal of completeness. An enormous mass of neurological information is to be found in these pages. This digest is for the most part proportionately arranged, and follows well-established lines of neurological thought. The present reviewer believes that the muscular dystrophies really should have been placed with the vegetative disorders. The authors suggest this grouping, but seem unable to break from the older classification here, whereas no such conservatism is manifested in other parts of the book.

Part three deals with the mental part of the human body in its adjustment of the individual to society. They use the rather striking, yet not incomprehensible, idea that the energy at the psychical level is to be traced through symbols, *i. e.*, through ideas, concepts, institutions, laws, etc.; these are the functional units at the psychological levels, whereas the reflexes and the chemical substances (hormones) are the functional units at the other levels of the nervous system.

The newer researches of the psychoanalytic and psychopathological schools are freely used in this section. The arrangements are chiefly Kraepelian, the discussions of the psychoneuroses frankly follow the leads indicated by Freud, Bleuler, Jung and others of the psychoanalytic schools. This is the first textbook with which we are acquainted which has used these concepts and put them in concise and succinct form. The neurotic is no longer a creature of dry descriptive terms, but a part of the human family, more adequately comprehended and more humanely dealt with. One does not find here the useless types of treatment of "character defects" by pills, by hydrotherapy, electricity and other useless procedures. The final chapter in the feeble-minded group is much too fragmentary in view of the immense interest taken in this class of individuals.

There are many points of view in this new and novel program which might be signalled out for discussion. There is a certain lack of smoothness in its execution, which in view of its newness is comprehensible, but its insistence upon the functional and biological viewpoint makes it a book quite distinct from all others in this field. Practically all fields of medicine are

swinging into place along biological lines. The authors are to be congratulated upon seeing the signs of the times and in their attempt to present a living neurology of the entire body.

L. B.

SULLA MALATTIA DI THOMSEN (MYOTONIA CONGENITA). Studii del Dottor Sergio Pansini. Casa Editrice Cav. Dott. V. Pasquale, Naples.

Pansini's monograph upon this rare disease is based upon the intensive study of four of the author's own cases compared with an extensive study of the literature upon this disease. These cases emphasize certain characteristics which distinguish this disease and peculiarly set it aside from other affections.

These are the voluntary myotonic disturbance and the myotonic reaction to stimuli both of which affect only the voluntary movements. The disturbance appears after a period of rest at the initiation of movement and gradually disappears as the movement continues. The disturbance may begin in the upper or lower limbs and after a time progress upward or downward as the case may be, being diffused from one group of muscles to another. It may progress first from the muscles of mastication and of speech to the upper and lower limbs in turn, or affect other muscular groups in the face or otherwise. There is also pronounced dystrophia in the muscular mass. At the same time there is absence of other symptoms on the part either of the central or peripheral nervous system.

These, with its hereditary nature, are the distinctive marks of this rare disease. Any external cause of the disease is unknown, as also how or why such a cause may affect the germ plasm and appear in certain cases in afflicted families. Precipitating causes have in some instances effected the sudden appearance of the disease or increased its severity. It takes the lead in hereditary diseases and is transmitted through both male and female, although women are less often affected by it than men. The psychic condition is usually sound, although in the family of Thomsen, from whom the disease was named, and perhaps in some others, psychopathic conditions exist.

The disease progresses in distribution and in intensity, but then usually reaches a degree of intensity where it remains stationary, a detriment to well-being, yet permitting of ordinary activity under suitable regulation. The fact that but one case has come to autopsy is indicative of such an outcome.

This extended review of this important yet comparatively rare disease presents many points of interest and value, especially as illustrated in the author's own typical cases. Pansini has not kept pace, however, with vegetative neurology, although when this monograph was originally written the possible vegetative neuromuscular hypothesis was hardly even foreshadowed.

JELLIFFE.

Notes and News

AMERICAN NEUROLOGICAL ASSOCIATION

PRELIMINARY PROGRAM, MAY 21, 22 AND 23, 1917

"Vascularization of the Central Nervous System in its Relation to the Connection Tissue Elements in the Brain and Spinal Cord," Dr. Louis Casamajor and Dr. Frederick Tilney, of New York City, N. Y. "Psychoses Associated with Diabetes Mellitus," Dr. H. Douglas Singer and Dr. S. N. Clark, of Hospital, Ill. "Commitment to Psychopathic Hospital as Related to Question of Personal Liberty—Advantages of a Proposed Law for Detention instead of Present Law for Commitment," Dr. Richard Dewey, of Wauwatosa, Wis. "The Symptomatology of Certain Infectious Processes Involving the Ciliary Ganglion or its Connections," Dr. LaSalle Archambault, of Albany, N. Y. "Studies in the Pathology of Human and Experimental Poliomyelitis," Dr. Louis Casamajor and Dr. Hubert S. Howe, of New York City, N. Y. "Further Evidence in Support of the Glandular Nature of the Pineal Body," Dr. Frederick Tilney, of New York City, N. Y. "An Analysis of Normal Skilled Movement and its Disturbances Due to Lesions Involving the Central Nervous System," Dr. Frederick Tilney and Dr. Adrian V. S. Lambert, of New York City, N. Y. "Rhizotomy for the Relief of Intractable Pain," Dr. Charles H. Frazier, of Philadelphia, Pa. "A Case of Wilson's Disease with Autopsy," Dr. Samuel T. Orton, of Philadelphia, Pa. "The Relation of Focal Infections to Nervous Conditions," Dr. Henry A. Cotton, of Trenton, N. J., Dr. E. P. Corson White, of Philadelphia, Pa., and Dr. George W. Stevenson, of Trenton, N. J. "The Rational Use of Lumbar Puncture and Interpretation of Findings," Dr. James B. Ayer, of Boston, Mass. "The Subacute Form of Multiple Sclerosis," Dr. William G. Spiller, of Philadelphia, Pa. "Proposals for a Sequence of Disease-Groups to be Successively Considered in the Practical Diagnosis of Mental Diseases," Dr. E. E. Southard, of Boston, Mass. "The Ataxic Type of Cerebral Birth Palsy," Dr. J. Ramsay Hunt, of New York City, N. Y. "An Experimental Study of the Factors in the Production of Ascending Nerve Processes," Dr. L. B. Alford and Dr. Sidney I. Schwab, of St. Louis, Mo. "A Preliminary Report on the Difference in the Degeneration of the Pyramidal Tract in Accordance with the Location of the Lesion," Dr. Willliams B. Cadwalader, of Philadelphia, Pa. "Lesions of the Frontal Lobe Simulating Cerebellar Involvement," Dr. Alfred Gordon, of Philadelphia, Pa. "Jacksonian Fits in Multiple Sclerosis," Dr. Hugh T. Patrick, of Chicago, Ill. "Congenital Cerebro-cerebellar Diplegics and their Training Treatment," Dr. L. Pierce Clark, of New York City, N. Y. "An Anatomical Search for Non-Tuberculous Dementia Præcox," Dr. E. E. Southard and Dr. M. M. Canavan, of Boston, Mass. "The Clinical Display of Syphilis of the Nervous System," Dr. Joseph Collins, of New York City, N. Y. "Report of Recent Studies on the Number of Neurons in the Central Nervous System of Mammals," Dr. Henry H. Donaldson, of Philadelphia, Pa. "The Thymus Gland and its Part in Psychiatry," Dr. S. D. W. Ludlum, of Philadelphia, Pa. "Atrophy of Cerebral Origin," Dr. John H. W. Rhein, of Philadelphia, Pa. "Synesthesia; its Relation to Epilepsy and Migrainous Auræ," Dr. Sidney I. Schwab

and Dr. L. B. Alford, of St. Louis, Mo. "Poliomyelitis; A Neurological Study of the 1916 Epidemic in Philadelphia," Dr. T. H. Weisenburg, of Philadelphia, Pa. "A Report of Three Cases of Progressive Lenticular Degeneration," Dr. John Jenks Thomas, of Boston, Mass. "The Results of Salvarsan Therapy in Syphilogenous Diseases of the Nervous System," Dr. Joseph Collins and Dr. Walter Haupt, of New York City, N. Y. "An Unusual Case of Hydromyelia," Dr. Edwin G. Zabriskie, of New York City, N. Y. "The Expert and the Issue: (1) The Insanity Plea in a Criminal Charge; (2) The Question of Testamentary Capacity," Dr. Sanger Brown, of Kenilworth, Ill. "A Psychiatric Contribution to the Study of the Sex Interest," Dr. Herman M. Adler, of Chicago, Ill. "The Efferent Pallidal System of the Corpus Striatum," Dr. Ramsay Hunt, of New York City, N. Y. "Epilepsy in the Adult," Dr. Edward D. Fisher, of New York City, N. Y. "Medical Treatment of Exophthalmic Goitre: Special Reference to Use of Corpus Luteum," Dr. Herman H. Hoppe, of Cincinnati, Ohio. "Treatment of Delirium Tremens by Stimulation and Spinal Puncture," Dr. Herman H. Hoppe, of Cincinnati, Ohio.

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Original Articles

METASTASIS OF CANCER IN THE CENTRAL NERVOUS SYSTEM*

An Experimental and Clinical Study

By Isaac Levin, M.D.

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Metastasis of carcinoma or sarcoma in the brain is a comparatively rare anatomic finding. Krasting (1) made an exhaustive statistical study on the subject, based on an analysis of 12,730 autopsies performed in the Basel Hospital between the years 1870 to 1905. 1,078 cases of carcinoma were found among these autopsies. The brain was examined in 817 cases, in 39 of which metastasis of carcinoma was found. There were 160 cases of sarcoma, and of 118 cases in which the brain was examined, metastasis was found in 14. Thus metastases of carcinoma were found in 4.7 per cent. of the cases examined, and in 11.6 per cent. of sarcoma. R. Williams (2) as a result of an analysis of 893 autopsies of carcinoma of the breast, found metastasis in the brain in only 6.6 per cent. of the cases. These figures present a very small percentage, when we consider that more than half of all cases of cancer show metastasis in various organs.

Krasting and Silvan (26) found that metastases are more fre-

* From the Department of Cancer Research of the Montefiore Home and Hospital, and the Geo. Crocker Special Research Fund, Columbia University, New York.

quently met with on the left side of the brain than on the right, but Offergeld (27) denies this.

Another characteristic feature of metastasis of the brain is the varying frequency of its occurrence depending upon the seat of the primary tumor. In Krasting's material metastasis in the central nervous system was found in 18.8 per cent. of cases of carcinoma of the breast, in 22.2 per cent. of cases of carcinoma of the prostate, and in only 3.4 per cent. of cases of carcinoma of the uterus. Not a single metastasis in the central nervous system was found in 227 cases of carcinoma of the stomach.

These striking peculiarities in the occurrence of metastasis of carcinoma in the central nervous system must be due to certain phenomena in the general mechanism of metastasis formation. A brief consideration of the theoretical conceptions in connection with this mechanism is therefore indispensable for a clearer understanding of the subject matter of this investigation.

The opinion prevails among pathologists that the differences in the frequency and the localization of metastatic tumors is due to the greater or lesser facility with which cancer cells reach a certain locality.

The only conceivable mode of formation of metastasis is the proliferation of a group of cancer cells, which have been transported through the blood and lymph channels to distant parts or organs of the body. These particles of cancer tissue act as emboli and, finding lodgment in some region of the organism, form secondary metastatic tumors.

Handley (3) attempted to prove recently that embolism has no significance in the formation of metastasis of carcinoma of the breast. According to his conception, metastasis is formed by a process of "lymphatic permeation." The tumor cells grow along the lymphatic vessels until they reach the nearest lymph glands, and from these glands the cells enter the next lymphatic vessel. This process is continuous, and the appearance of an apparently isolated tumor nodule is due to the fact that a perilymphatic fibrosis destroys the permeated lymphatic vessels which form the lines of communication. The formation of metastases in distant organs Handley ascribes to the proliferation of cancer cells which escape from the subserous lymphatic plexuses into the serous cavities, pleura, or peritoneum. The cells are then distributed through these cavities under the influence of gravity and of visceral movements, and implanted on the serous surface of the viscera.

Handley's theory is inadequate to explain all the phenomena of

formation of metastasis even in cancer of the breast. Only the conception of embolic transportation of tumor cells accords with the main factors of the process of formation of metastases.

Until recently it was generally accepted that carcinoma metastasises through the lymphatics exclusively and that only sarcoma metastasises through the blood-vessels. von Recklinghausen (4) was the first to indicate that carcinoma may also metastasise through the blood-vessels. The most thorough study, however, of the subject of the relation of blood-vessels to the formation of metastasis in carcinoma was made by Goldmann (5) and by Schmidt (6). Goldmann proved that there is an extensive invasion by tumor cells of the coats of blood-vessels in carcinoma as well as in sarcoma. The paths of entrance of the cancer cells into the vascular coats appear to be the vasa vasorum, since the blood-vessel walls do not contain any lymphatics. This supposition is in accord with the fact that in arteries, the tumor cells rarely proceed further than the outer coat, whereas in veins they are generally found beneath the intima. The same difference takes place in the distribution of the nutrient vessels in the arteries and veins. While in the former the vasa vasorum usually remain within the limit of the outer coat, they extend in the veins beyond the middle coat into the region of the intima. The same investigator has shown, further, that fluid injected into the jugular vein passes with the greatest ease from the vein into the adjacent lymph glands. The conclusion must be drawn from Goldmann's investigations that there is a very intimate relation between the lymph- and blood-vessels, and that carcinoma cells enter blood-vessels just as readily as do sarcoma cells. Indeed, a tumor cell may penetrate a vein with greater ease than a large lymphatic vessel, since in the latter the vasa vasorum do not penetrate as near the inner coat as they do in the vein.

Schmidt examined forty-one cases of carcinoma of the abdominal viscera, selected at random from his autopsy material, for possible metastases in the lungs. In fifteen cases he found, on microscopic examination, small nodules either surrounded by a stroma of connective tissue formed apparently by the endothelium of the blood-vessel, or else consisting of a free group of cancer cells which seemed to have been transported more recently. The coats of the small pulmonary arteries, in which the cancer nodules were usually found, showed no lesion. The tumor cells apparently did not break through the wall of the blood-vessel from a focus of local dissemination, but were transported from the primary tumor or from a distant metastasis. Schmidt inclines to the opinion that

the carcinoma cells found in the lungs were transported through the lymphatic vessels, thoracic duct, subclavian vein, and pulmonary circulation. He finds support for this supposition in the fact that in three cases where nodules were found in the lungs there were visible mestastases only in the regional lymph glands. Furthermore, he actually found small carcinoma nodules within the lumen of the thoracic duct. He does not exclude, however, the possibility that in certain cases, in accordance with Goldmann's findings, the cancer cells may have entered a minute blood-vessel either within the primary tumor or within the metastatic tumor of the regional lymph gland, and in this way have reached the pulmonary vessel. Schmidt arrived at the conclusion that in carcinoma of abdominal organs, cancerous embolism of the small arteries of the lungs occurs with great frequency. Only a small proportion of these emboli give rise to metastatic tumors, because most of them are encapsulated and rendered harmless. A certain number of these emboli may, however, pass the pulmonary circulation and form metastases in distant organs. All these investigations seem to have established firmly the fact that cells of all malignant tumors may be transported either through the lymphatics or the blood-vessels.

In view of this conclusion, nearly the same facility exists for the transportation of tumor emboli from any primary tumor into distant parts of the organism.

The difference in the channels of transportation alone is thus inadequate to explain the variations in the frequency and the localization of the metastatic tumors. Numerous additional theories are offered in explanation of the phenomena; von Recklinghausen, for instance, believes that the formation of bone metastases in carcinoma is due to the fact that the veins and capillaries of the bone marrow have thin walls and are not collapsible. These morphological peculiarities favor the accumulation of carcinoma cells within these blood-vessels. Lubarsch (7) is of the opinion that the relative sizes of the cancer cells and of the minute blood vessels of an organ are of importance for the formation of metastases.

On the other hand, Neusser (8), and Bamberger and Paltauf (9) believe that certain organs possess a peculiar affinity for the cells of certain types of malignant tumors. This selective affinity may be due to some peculiarity in the chemical constitution of the organ. More recently Albrecht (10) and Ehrlich (11) advanced the hypothesis that the development of a metastatic tumor is determined by the chemical metabolic condition of the entire organism. Their idea is that the growth of a secondary tumor depends upon

the character of the primary growth. If the latter is very malignant and reaches a large size, then it uses up all the specific food required by the multiplying cancer cells, and none remains for the cells of the secondary growth. On the other hand, when the primary tumor is growing slowly, a sufficient amount of the specific food is left for the development of the metastatic tumor.

There is the same difference of opinion concerning the mechanism of formation of metastases in the central nervous system. Siefert (12) lays stress mainly on the transport through the blood-vessels, Knierim (13) and Curschman (14) consider the lymphatics and the subarachnoid spaces the channels of transport. On the other hand Cruveilhier (15) claims that the central nervous system offers a greater resistance to the growth of cancer than do other organs. O. Fischer (16) states even that grey matter offers greater resistance to the formation of metastases than does white matter.

The Behavior of a Sarcoma of the Fowl when Inoculated in Organs

The correct estimation of all the complex phenomena involved in the mechanism of formation of metastases is extremely difficult.

Experimental cancer research on inoculable malignant tumors of lower animals offers the opportunity of studying the subject under less complicated conditions than is obtained in human pathology. Particles of the tumor may be introduced into various normal organs of normal animals and the subsequent changes of the tumor as well as of the organ, the soil so to speak of inoculation, may be observed.

The first spindle cell sarcoma of the fowl described by Peyton Rous (17), when inoculated into the breast muscle of a chicken, is extremely malignant in the new host. The tumor infiltrates and destroys the surrounding tissues and organs; undergoes extensive local dissemination and metastasizes in the internal organs. The inoculated animal soon emaciates and dies, usually within three weeks after the inoculation. This tumor is biologically analogous in many respects to human sarcoma and seems to be well adapted for an experimental study of the mechanism of metastasis formation.

The experiments consisted in the inoculation of the tumor in different organs, and in a comparative study of the biological characteristics of the tumors developed in the new host and of the behavior of the latter.

The biological phenomena considered in the present investigation were the clinical malignancy, as manifested by the length of

life of the inoculated animal, the size of the primary growth, and the frequency and location of metastases. The tumors were inoculated in the liver, in the gizzard, and the brain. For each operated animal a control animal was inoculated in the right pectoral muscle, with the same quantity of tumor obtained from the same source. All the animals were allowed to die; and after death autopsies were performed and all the internal organs examined for metastases visible on gross inspection. Every suspicious area and nodule observed on the surface of an organ or on the cut surface was examined microscopically. The extent of local invasion and destruction of the organ caused by the growth of the tumors was also determined by microscopical examination.

CHART I

Inoculation into Liver

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	13	*E*	*	*	–	–	–	–	–	–
2	11	"	–	–	–	–	–	–	–	–
3	14	*L*	–	–	–	–	–	–	–	–
4	23	*E*	*	–	–	*	–	–	–	–
5	19	"	–	–	–	–	–	–	–	–
6	12	"	*	–	*	–	–	–	–	–
7	16	"	–	–	–	–	–	–	–	–
8	14	"	*	–	–	–	–	–	–	–
9	17	"	*	–	–	*	–	–	–	–
10	20	"	–	–	–	–	–	–	–	–
11	31	"	–	–	–	–	–	–	–	–
12	17	"	–	–	–	–	–	–	–	–
13	18	"	–	–	–	–	–	–	–	–
14	14	*S*	*	–	–	–	–	–	–	–
15	13	*E*	*	–	–	–	–	–	–	–
16	13	"	–	–	–	*	–	–	–	–
17	13	*L*	*	–	–	–	–	–	–	–
18	18	*E*	*	–	–	–	–	–	–	–
19	17	"	–	–	–	*	–	–	–	–
20	16	"	–	–	–	–	–	–	–	–
21	23	"	*	–	–	–	–	–	–	–
22	19	*M*	*	–	*	–	–	–	–	–
23	15	*L*	*	*	–	*	–	–	–	–
24	22	*E*	–	–	–	–	–	–	–	–
25	12	*L*	*	–	–	–	–	–	–	–
26	16	"	*	–	–	–	–	–	–	–
27	17	"	–	–	–	–	–	–	–	–
28	17	"	*	–	–	–	–	–	–	–
29	16	*E*	*	–	–	*	–	–	–	–

Explanation of Charts

E on the charts indicates a tumor which infiltrates nearly the whole breast muscle or organ. *L* indicates a large tumor, the cut surface of which is not less than 10 cm. square. *M* indicates a medium-sized tumor, of which the cut surface is not less than 5 cm. nor more than 10 cm. square. *S* indicates a small-sized tumor, of which the cut surface is less than 5 cm. square. * indicates the presence of metastasis in an organ. – indicates the absence of metastasis in an organ. The other words and figures on the charts are self-explanatory.

Inoculations in the Liver

The tumor was inoculated through an abdominal incision into the liver of 31 chickens; two died of an intercurrent disease. In 29 animals death was caused by the growth of the tumor. Of the 31 control animals in which the tumor was inoculated into the right pectoral muscle, in 26 death was caused by the growth of the tumor. Charts I and II show the comparative size of the primary tumor,

CHART II

Controls to Inoculations into Liver

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	17	*E*	–	–	*	–	–	–	–	–
2	30	"	*	–	*	–	–	–	–	–
3	13	*L*	–	–	–	–	–	–	–	–
4	16	*S*	–	–	*	–	–	–	–	–
5	16	*L*	–	–	–	–	–	–	–	–
6	28	*E*	*	–	*	–	–	–	–	–
7	26	"	*	–	–	–	–	–	–	–
8	19	"	*	–	*	–	–	–	–	–
9	14	*M*	–	–	–	–	–	–	–	–
10	27	*E*	*	–	–	–	–	–	–	–
11	39	"	*	–	*	–	–	–	–	–
12	22	"	*	–	–	*	–	–	–	–
13	21	"	*	–	–	–	–	–	–	–
14	19	"	*	–	–	–	–	–	–	–
15	25	*L*	–	–	–	–	–	–	–	–
16	26	*E*	*	*	–	–	–	–	–	–
17	23	"	*	*	–	–	–	–	*	–
18	18	*M*	–	–	–	–	–	–	–	–
19	21	*E*	*	–	–	–	–	–	–	–
20	19	*M*	*	–	–	–	–	–	–	–
21	29	*L*	*	–	*	–	–	–	–	–
22	27	*E*	*	*	*	–	–	*	–	–
23	23	*L*	*	*	–	–	–	–	–	–
24	29	*E*	*	–	–	–	–	–	–	–
25	18	*M*	*	–	*	–	–	–	–	–
26	20	*E*	*	*	*	–	–	–	–	–

the duration of life, the absence or presence, and the location of metastases in the operated and control animals.

The sarcoma of the fowl when inoculated into the breast muscle or into an organ grows diffusely, and it is difficult to make an accurate measurement of the tumor. Only an approximate estimation of the size of the tumor is given in the present investigation. A tumor which infiltrates nearly the whole breast muscle or organ is indicated by a letter E (*i. e.*, the *entire* breast or organ). When a cut surface shows not less than 10 cm. and not more than 15 cm.

square it is indicated by a letter L (large). When the surface is not less than 5 cm. nor more than 10 cm. square it is indicated by a letter M (medium), and when the surface is less than 5 cm. square it is indicated by a letter S (small). The average duration of life was calculated by dividing the aggregate number of days of life by the number of animals.

CHART III

Inoculation into Gizzard

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	14	*E*	—	—	*	—	—	—	—	—
2	21	*L*	*	—	*	—	—	—	—	—
3	17	"	*	—	*	—	—	—	—	*
4	23	"	*	—	*	—	—	—	—	—
5	10	*S*	—	—	—	—	—	—	—	—
6	10	"	—	—	—	—	—	—	—	—
7	18	*L*	*	—	—	—	—	—	—	—
8	16	*M*	*	—	*	—	—	—	—	—
9	14	*E*	—	—	*	—	—	—	—	—
10	12	*M*	—	—	—	—	—	—	—	—
11	20	*L*	—	—	—	—	—	—	—	—
12	19	"	—	—	—	—	—	—	—	—
13	18	*E*	—	—	*	—	—	—	—	—
14	11	*S*	—	—	*	—	—	—	—	—
15	15	*L*	*	—	*	—	—	—	—	—
16	14	"	—	—	—	—	—	—	—	—
17	12	"	—	—	*	—	—	—	—	—
18	20	"	*	—	—	—	—	—	—	—
19	23	*E*	*	—	—	—	—	—	—	—
20	14	"	—	—	*	—	—	—	—	—
21	13	*L*	—	—	—	—	—	—	—	—
22	18	"	—	—	—	—	—	—	—	—
23	15	*E*	—	—	*	—	—	—	—	—
24	20	*L*	*	—	*	—	—	—	—	—
25	17	"	*	—	—	—	—	—	—	—
26	17	"	*	—	*	—	—	—	—	—
27	20	"	*	—	—	—	—	—	—	—
28	15	*E*	*	—	*	*	—	—	—	—

The animals inoculated in the liver presented an average duration of life of 17 days, and the controls of 22.5 days. There did not seem to be any great difference in the frequency or in the location of the metastases. The autopsies of the animals inoculated in the liver showed that the tumor had invaded (Fig. 1), and frequently completely replaced, the right lobe, in which the inoculation took place. The invasion also frequently reached the left lobe. Occasionally the tumor became disseminated throughout the peritoneal cavity and infiltrated other organs.

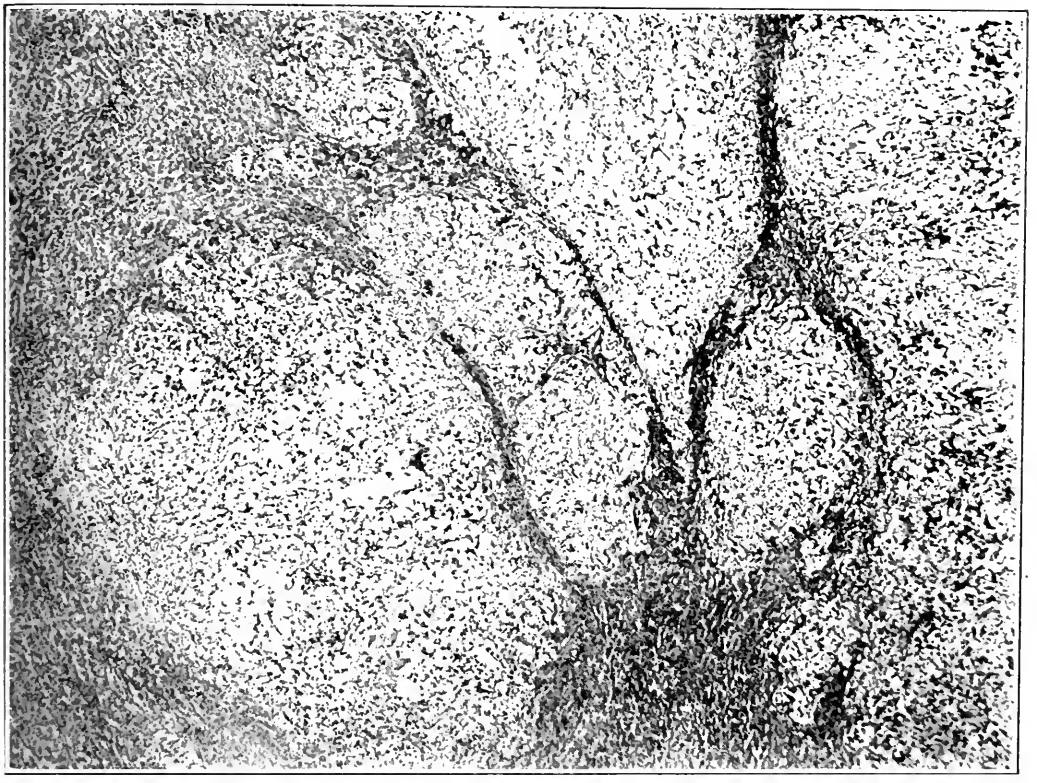

FIG. 1. Growth of sarcoma in liver. Microphotograph, low power.

INOCULATION IN THE GIZZARD

The tumor was inoculated through an abdominal incision in the gizzard of 31 chickens; three died of an intercurrent disease. In 28 animals death was caused by the growth of the tumor. Of the control animals in 26 death was caused by the growth of the tumor. Charts III and IV show the duration of life of the animals, the size of the primary growth and the location of the metastases, in the operated and in the control animals. The average length of life of the operated animals was 16.3 days, and of the controls 21.8 days. The animals of this group and their controls did not show any perceptible difference in either the frequency or the location of the metastases. Autopsies upon the operated animals showed that the tumor invaded and replaced the musculature of the gizzard. The dissemination of the tumor into the peritoneal cavity was even more frequent and more extensive than after inoculation into the liver.

CHART IV

CONTROLS TO INOCULATIONS INTO GIZZARD

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	21	*E*	—	—	—	—	—	—	—	—
2	22	"	—	—	—	—	—	—	—	—
3	36	"	*	*	—	*	—	—	—	—
4	29	"	*	—	—	—	—	—	—	—
5	18	"	—	—	—	—	—	—	—	—
6	27	"	—	—	—	—	—	—	—	—
7	16	"	—	—	—	—	—	—	—	—
8	46	"	*	—	—	—	—	*	—	—
9	22	"	*	—	—	—	—	—	—	—
10	19	*L*	*	—	—	—	—	—	—	—
11	23	*E*	*	—	*	—	—	—	—	—
12	22	"	*	—	*	—	—	—	—	—
13	13	*L*	—	—	—	—	—	—	—	—
14	25	*E*	*	—	*	—	—	—	—	—
15	21	"	*	—	—	—	—	—	—	—
16	12	*L*	—	—	—	—	—	—	—	—
17	16	"	*	*	—	—	—	—	—	—
18	24	*E*	*	*	*	—	—	—	—	—
19	19	"	*	—	—	—	—	—	—	—
20	17	"	*	—	—	—	—	—	—	—
21	19	"	*	*	—	—	—	—	—	—
22	22	"	*	*	*	—	—	*	—	—
23	15	*M*	—	—	—	—	—	—	—	—
24	16	"	—	—	—	—	—	—	—	—
25	20	*E*	*	—	—	—	—	—	—	—
26	27	"	*	*	—	—	—	—	—	—

It was interesting to note that with one exception, none of the tumors, even those that destroyed nearly the entire musculature of the organ, invaded the mucous membrane (Fig. 2).

INOCULATIONS IN THE BRAIN

The inoculations in the brain were done in the following way. An opening sufficient to admit a trocar needle was made in the skull over the area of the left hemisphere. The needle was then inserted into the hemisphere to the depth of about 0.5 cm. from the surface of the skull. The opening of the skull was sealed with wax and the skin closed with a silk suture. Generally the animals stood the operation well. A certain number of them developed motor paralysis but the majority died under conditions of general depression. 34 animals were operated upon, and of these 6 died of intercurrent conditions. In 28 animals death was due to the intracranial growth of the tumors. Of the control animals, in 29 death was caused by the growth of the tumor. Charts V and VI show the duration of life of the animals, the comparative size of the primary tumors, and

the frequency and location of the metastases. The average length of life of the animals inoculated in the brain was 11 days, and of the controls 25.5 days. The size of the primary tumors and the frequency and location of the mestatases of the control animals, were similar to these conditions in the other controls. On the other hand, not a single operated animal of this group showed metastases anywhere. Autopsies of the animals showed that the tumors invaded and replaced the brain tissue (Fig. 3). The size of the tumors was

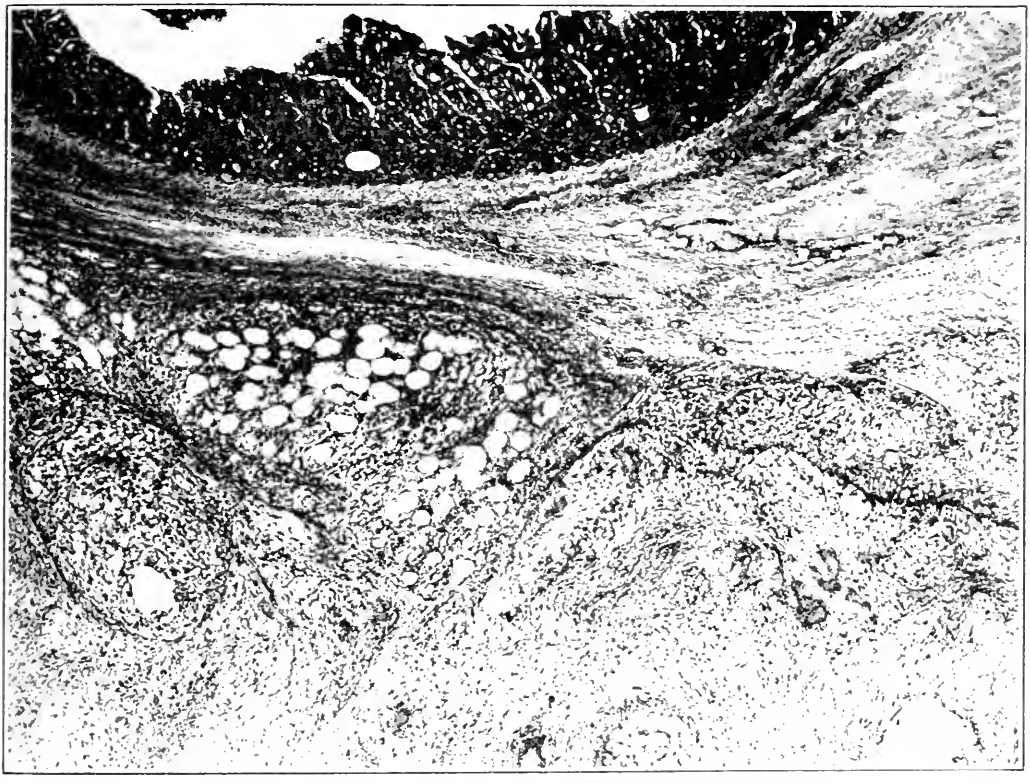

FIG. 2. Growth of sarcoma in gizzard, the mucous membrane is not invaded. Microphotograph, low power.

smaller than those which developed in an equal length of time after inoculation in the other regions cited.

INOCULATIONS IN THE BRAIN. SECOND SERIES

In view of the striking difference between the results of the inoculations into the brain and into other sites, it seemed advisable

to repeat the inoculations into the brain. 25 animals were inoculated and of these 14 died of intercurrent conditions. In 11 animals death was caused by the intracranial growth of the tumor. Chart VII shows the duration of life of the animals, the comparative size

CHART V

Inoculation into Brain. First Series

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	9	S	—	—	—	—	—	—	—	—
2	11	"	—	—	—	—	—	—	—	—
3	11	"	—	—	—	—	—	—	—	—
4	9	"	—	—	—	—	—	—	—	—
5	9	"	—	—	—	—	—	—	—	—
6	8	"	—	—	—	—	—	—	—	—
7	13	"	—	—	—	—	—	—	—	—
8	12	"	—	—	—	—	—	—	—	—
9	8	"	—	—	—	—	—	—	—	—
10	13	"	—	—	—	—	—	—	—	—
11	6	"	—	—	—	—	—	—	—	—
12	13	"	—	—	—	—	—	—	—	—
13	14	"	—	—	—	—	—	—	—	—
14	13	"	—	—	—	—	—	—	—	—
15	9	"	—	—	—	—	—	—	—	—
16	12	"	—	—	—	—	—	—	—	—
17	14	"	—	—	—	—	—	—	—	—
18	11	"	—	—	—	—	—	—	—	—
19	9	"	—	—	—	—	—	—	—	—
20	7	"	—	—	—	—	—	—	—	—
21	15	"	—	—	—	—	—	—	—	—
22	10	"	—	—	—	—	—	—	—	—
23	19	"	—	—	—	—	—	—	—	—
24	10	"	—	—	—	—	—	—	—	—
25	11	"	—	—	—	—	—	—	—	—
26	5	"	—	—	—	—	—	—	—	—
27	10	"	—	—	—	—	—	—	—	—
28	11	"	—	—	—	—	—	—	—	—

of the primary tumors, and the location of the metastases. The average length of life for the operated animals was 8.4 days. In this series again, not a single animal showed the formation of metastasis. The high postoperative mortality and the somewhat shorter duration of life than in the animals of the first series, was probably due to the heat of the season. (These experiments were done in August.)

Inoculations into the Brain. Third Series

A few months later the experiments were again repeated. 18 animals were inoculated into the brain; in all the animals death was due to the intracranial growth of the tumor. Chart VIII shows the

duration of life of the animals, the comparative size of the primary tumor, and the frequency and location of metastases.

CHART VI

CONTROLS TO INOCULATIONS INTO BRAIN. FIRST SERIES

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	32	*E*	*	*	*	—	—	—	—	—
2	24	*M*	*	*	*	—	—	—	*	—
3	31	*E*	*	—	—	—	—	—	—	—
4	38	"	*	—	—	—	—	—	—	—
5	19	*M*	*	—	—	*	—	—	—	—
6	24	*E*	*	*	—	—	—	—	—	—
7	28	"	*	*	*	*	*	—	—	—
8	26	"	*	*	*	—	—	—	—	—
9	21	"	*	—	*	—	—	—	—	—
10	34	*L*	—	*	—	—	—	—	—	—
11	19	"	*	*	—	—	*	—	—	—
12	27	"	—	*	—	—	—	—	—	—
13	31	"	*	—	—	—	—	—	—	—
14	20	"	*	—	—	—	—	—	—	—
15	18	*S*	—	—	—	—	—	—	—	—
16	20	*L*	*	—	—	—	—	—	—	—
17	27	*E*	*	—	—	—	—	—	—	—
18	26	"	*	*	—	—	—	—	—	—
19	29	"	*	—	—	—	—	—	—	—
20	34	*M*	*	—	—	—	—	—	—	—
21	23	*E*	*	*	*	*	—	—	—	—
22	30	"	*	*	—	—	—	—	—	—
23	27	"	—	—	—	—	—	—	—	—
24	26	"	*	—	—	—	—	—	—	—
25	31	"	*	—	—	—	—	—	—	—
26	16	*M*	*	—	—	*	—	—	—	—
27	23	*E*	*	*	*	*	*	*	—	—
28	13	*S*	—	—	*	—	—	—	—	—
29	22	*L*	*	*	—	—	—	—	—	—

The average length of life was 12.5 days. Again no metastases were noted in any of the operated animals. No control animals were used for the second and third series of inoculations into the brain, since there were 78 control animals in this whole investigation available for comparison, and the behavior of the tumor in all the animals in which the inoculation was done in the pectoral muscle was quite similar.

In discussing the results of the experiments, it is advantageous to consider together the results of inoculations into the liver and into the gizzard as well as the controls, in which the tumor was inoculated into the breast muscle, and then to examine separately the results of inoculations into the brain.

As stated above, the tumor, when inoculated into the breast

muscle, grew to a large size, often completely destroyed the muscle tissue and the breast bone, invaded the peritoneal cavity, became disseminated there, and destroyed the vital organs. These animals, then, died of local malignancy, *i. e.*, through loss of function of some vital organ. In several cases, the metastases in the lungs completely replaced and destroyed the organs and thus caused the death

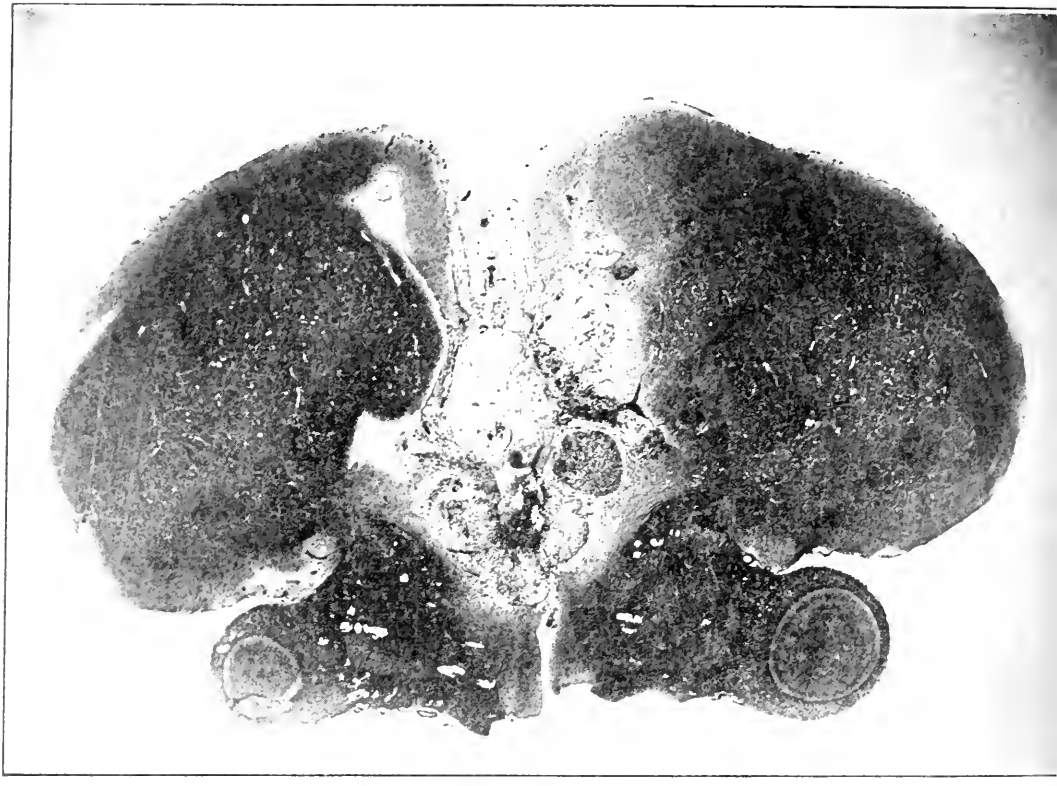

FIG. 3. Growth of sarcoma in brain of a fowl. Low magnification. Microphotograph.

of the animals. The duration of life of those animals in which the tumor was inoculated into the liver or gizzard was shorter than that of the animals inoculated in the chest wall, because in the animals of the first group the tumor immediately attacks and destroys vital organs. The operation as such does not seriously impair the condition of the animal, and if it is performed without inoculating the tumor the animals do not show any ill effects from the operation.

The behavior of the tumors inoculated into the brain is entirely different. The duration of life of the inoculated animals is shorter

CHART VII

INOCULATIONS INTO BRAIN. SECOND SERIES

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	11	S	—	—	—	—	—	—	—	—
2	9	"	—	—	—	—	—	—	—	—
3	8	"	—	—	—	—	—	—	—	—
4	8	"	—	—	—	—	—	—	—	—
5	8	"	—	—	—	—	—	—	—	—
6	8	"	—	—	—	—	—	—	—	—
7	8	"	—	—	—	—	—	—	—	—
8	8	"	—	—	—	—	—	—	—	—
9	8	"	—	—	—	—	—	—	—	—
10	8	"	—	—	—	—	—	—	—	—
11	8	"	—	—	—	—	—	—	—	—

than that of the animals inoculated into the breast muscle, liver, or gizzard, but the tumor itself attains only a comparatively small size and does not metastasize. The smaller size of the brain tumors and the absence of metastases cannot be accounted for by the shortening of life of the animals through the inoculation, since during the same period of time (ten to fourteen days) much larger tumors develop and metastases occur when the inoculation is made in the liver (Chart I animals 2, 6, 8, 15, 16, 17) gizzard (Chart III animals 1, 9, 17, 20), or breast muscle (Chart IV animals 13, 16; Chart VI

CHART VIII

INOCULATIONS INTO BRAIN. THIRD SERIES

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	17	S	—	—	—	—	—	—	—	—
2	16	"	—	—	—	—	—	—	—	—
3	14	"	—	—	—	—	—	—	—	—
4	13	"	—	—	—	—	—	—	—	—
5	8	"	—	—	—	—	—	—	—	—
6	15	"	—	—	—	—	—	—	—	—
7	10	"	—	—	—	—	—	—	—	—
8	17	"	—	—	—	—	—	—	—	—
9	10	"	—	—	—	—	—	—	—	—
10	11	"	—	—	—	—	—	—	—	—
11	13	"	—	—	—	—	—	—	—	—
12	11	"	—	—	—	—	—	—	—	—
13	9	"	—	—	—	—	—	—	—	—
14	11	"	—	—	—	—	—	—	—	—
15	11	"	—	—	—	—	—	—	—	—
16	10	"	—	—	—	—	—	—	—	—
17	14	"	—	—	—	—	—	—	—	—
18	11	"	—	—	—	—	—	—	—	—

animal 28). Neither does deficient nutrition explain this slight growth, since blood-vessels of comparatively large caliber are frequently observed within the tumors (Figs. 4, 5). Moreover, the pres-

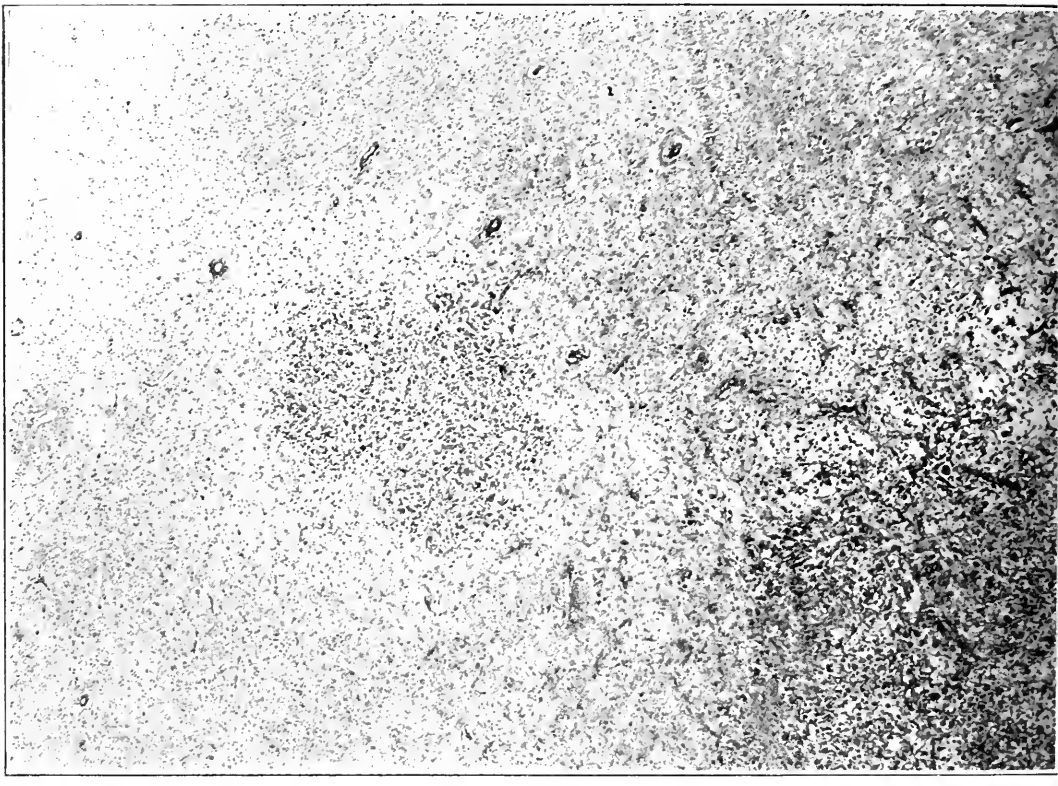

FIG. 4. Growth of sarcoma in the brain, showing bloodvessels. Microphotograph, low power.

ence of these blood-vessels indicates that it is as easy mechanically for the cancer cell to invade the blood-vessel and disseminate from the brain as from another locality.

The location of the growth within an osseous cavity also fails to explain the phenomena, since the tumor from the same source inoculated in the pectoral muscle, frequently breaks through the breast bone and invades the peritoneal cavity as early as two weeks after the inoculation.

The absence of metastases in the animals inoculated into the brain is not due to the lack of means of transportation of the tumor cells, since, as mentioned above, large blood-vessels are observed within the tumor growth. Neither can the small size of the tumors

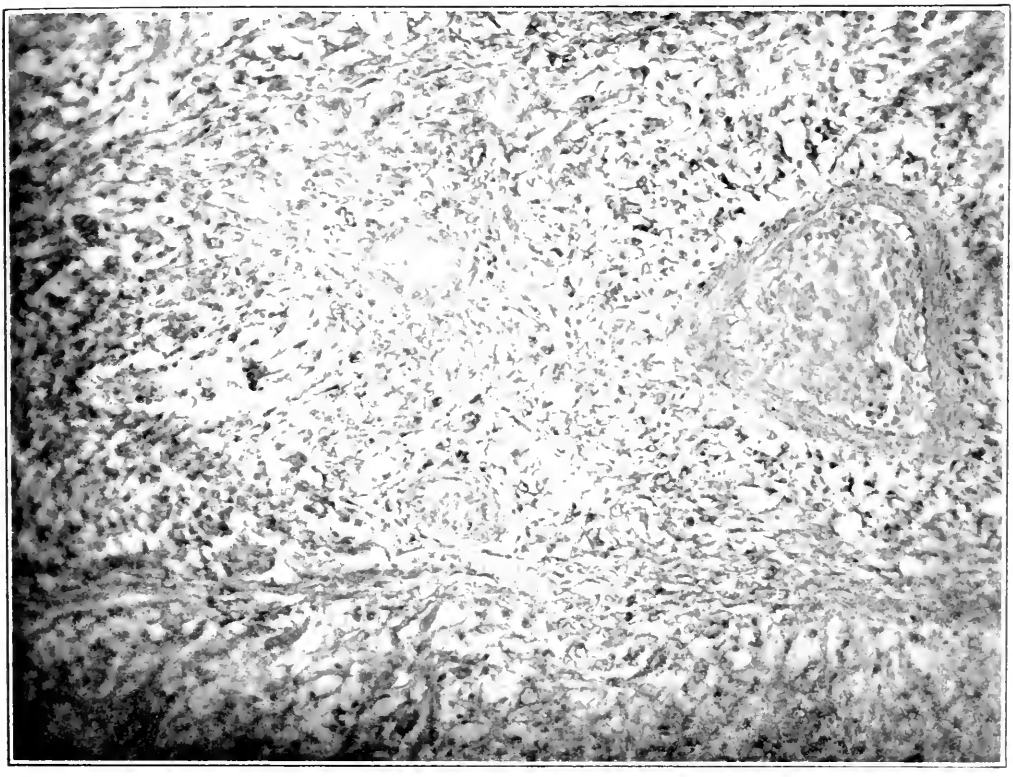

FIG. 5. Growth of sarcoma in the brain, showing bloodvessels. High power.

of the brain explain the absence of metastases. Metastases are observed in animals with small primary tumors in liver, gizzard or muscle (Chart I, animal 14; Chart III, animal 14; Chart VI, animal 28). A possible explanation of the scanty growth of the sarcoma in the brain and the absence of metastases may be found in the supposition that the brain tissue exercises a certain influence on the growth of the tumor.

REINOCULATIONS OF THE BRAIN TUMORS IN THE PECTORAL MUSCLE. FIRST GENERATION

In order to determine whether the immediate contact with brain tissue is the cause of the slow growth of the tumor cells it was thought desirable to observe the behavior of these tumors after reinoculation from the brain into the breast muscle. 30 animals were used in these experiments. Chart IX shows the duration of life of

CHART IX

REINOCULATIONS OF BRAIN TUMOR. FIRST GENERATION

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	17	*S*	–	–	–	–	–	–	–	–
2	19	"	–	–	–	–	–	–	–	–
3	19	*L*	*	–	–	–	–	–	–	–
4	18	*S*	*	–	–	–	–	–	–	–
5	18	"	–	–	–	–	–	–	–	–
6	4	"	–	–	–	–	–	–	–	–
7	18	*E*	*	–	–	–	–	–	–	–
8	19	"	–	–	–	–	–	–	–	–
9	13	*S*	–	–	–	–	–	–	–	–
10	19	*L*	–	–	–	–	–	–	–	–
11	19	*E*	*	–	–	–	–	–	–	–
12	17	"	–	–	–	–	–	–	–	–
13	19	*L*	–	–	–	–	–	–	–	–
14	19	*S*	–	–	–	–	–	–	–	–
15	2	"	–	–	–	–	–	–	–	–
16	19	*L*	–	–	–	–	–	–	–	–
17	18	*M*	*	–	–	–	–	–	–	–
18	19	*E*	–	–	–	–	–	–	–	–
19	19	*M*	–	–	–	–	–	–	–	–
20	19	*S*	–	–	–	–	–	–	–	–
21	19	*S*	–	–	–	–	–	–	–	–
22	19	*M*	*	–	–	–	–	–	–	–
23	19	*E*	*	–	–	–	–	–	–	–
24	19	*S*	–	–	–	–	–	–	–	–
25	29	"	–	–	–	–	–	–	–	–
26	21	*M*	–	–	–	–	–	–	–	–
27	21	*S*	–	–	–	–	–	–	–	–
28	21	"	–	–	–	–	–	–	–	–
29	21	"	–	–	–	–	–	–	–	–
30	21	"	–	–	–	–	–	–	–	–

the animals, the size of the tumors, and the frequency and location of metastases. A comparison with Charts II, IV, and VI shows that while in these series the inoculations formed large tumors in 88.5 per cent. of the animals, and metastases were present in 78.5 per cent., the experiments presented in Chart IX show the formation of a large tumor in 33 per cent. of the animals and the presence of metastases in 23 per cent.

REINOCULATIONS OF THE BRAIN TUMORS IN THE PECTORAL MUSCLE. SECOND GENERATION

In this series of experiments the tumor for inoculation in the breast muscle was taken from the animals of the first generation described above. 18 animals were used for this series. Chart X shows a better result than Chart IX; large tumors were observed in 55.5 per cent. of the animals, and metastases were formed in 27.7 per cent.

Reinoculations of the Brain Tumors in the Pectoral Muscle. Third Generation

For this series of experiments the inoculation in the breast muscle was done with tumors obtained from the animals of the second generation reported above. 30 animals were used for inoculation. Chart XI shows the results of these experiments. 60 per cent. of the animals presented large tumors and 33 per cent. showed metastases.

The three series of reinoculations indicate that the power of the tumor to form large tumors upon inoculation, and to metastasize, is impaired during its growth in the brain and that subsequently this capacity for growth and the formation of metastases is partially recovered through subsequent reinoculations in the muscle.

CHART X

Reinoculations of Brain Tumor. Second Generation

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	19	*L*	–	–	–	–	–	–	–	–
2	19	*S*	–	–	–	–	–	–	–	–
3	19	*L*	*	–	–	–	–	–	–	–
4	19	*S*	–	–	–	–	–	–	–	–
5	19	"	–	–	–	–	–	–	–	–
6	19	*M*	*	–	–	–	–	–	–	–
7	19	*L*	–	*	*	–	–	–	–	–
8	19	"	–	–	–	–	–	–	–	–
9	19	"	–	–	*	–	–	–	–	–
10	19	"	*	–	*	–	–	–	–	–
11	19	"	–	–	–	–	–	–	–	–
12	19	"	–	–	–	–	–	–	–	–
13	20	*S*	–	–	–	–	–	–	–	–
14	18	*L*	–	–	–	–	–	–	–	–
15	20	*S*	–	–	–	–	–	–	–	–
16	20	"	–	–	–	–	–	–	–	–
17	20	"	–	–	–	–	–	–	–	–
18	20	*L*	–	–	–	–	–	–	–	–

As a result of this investigation the conclusion is reached that it is possible to inhibit artificially the power of proliferation and metastasis formation of a fowl sarcoma by inoculating it into the brain. A complete duplication of these experiments on inoculable tumors of white rats and mice is exceedingly difficult, since the latter tumors do not take so malignant a course as the fowl sarcoma. The inoculable tumors of the white rats and mice do not form metastases with any regularity and usually not sooner than six weeks after inoculation. The life of rats and mice inoculated subcutaneously is

also a great deal longer than the life of fowls inoculated into the breast muscle, while the life of any animal inoculated in the brain is short and does not average more than 10 days. As a consequence, the experiments with brain inoculation in mice and rats cannot be controlled satisfactorily by subcutaneous inoculations in the same animals.

The writer (23) was the first to inoculate tumors of white rats into the brain. The graft took in every animal but the size of the tumors was much smaller than that of a subcutaneous tumor, which would have developed during the same period of time. No further comparisons could be made between these two kinds of inoculations since the Ehrlich rat sarcoma, which was used for the experiments, does not form any metastases.

CHART XI

REINOCULATIONS OF BRAIN TUMOR. THIRD GENERATION

Chicken Number	Days After Inoculation	Tumor	Metastasis							
			Lungs	Heart	Liver	Spleen	Kidney	Gizzard	Intestine	Pancreas
1	18	*M*	–	–	–	–	–	–	–	–
2	18	*L*	*	–	–	–	–	–	–	–
3	18	"	*	–	–	–	–	–	–	–
4	18	"	–	–	–	–	–	–	–	–
5	18	*M*	–	–	–	–	–	–	–	–
6	13	*S*	–	–	–	–	–	–	–	–
7	18	*L*	–	–	*	–	–	–	–	–
8	18	"	–	–	–	–	–	–	–	–
9	18	"	–	–	–	–	–	–	–	–
10	18	"	*	–	–	–	–	–	–	–
11	19	"	–	–	*	–	–	–	–	–
12	19	*S*	–	–	–	–	–	–	–	–
13	19	*L*	–	–	–	–	–	–	–	–
14	19	"	–	–	–	–	–	–	–	–
15	19	"	–	–	–	–	–	–	–	–
16	19	"	–	–	–	–	–	–	–	–
17	14	*M*	–	–	–	–	–	–	–	–
18	19	*L*	–	–	–	–	–	–	–	–
19	15	*M*	–	–	–	–	–	–	–	–
20	19	"	–	–	–	–	–	–	–	–
21	19	*L*	*	–	–	–	–	–	–	–
22	20	*M*	–	–	*	–	–	–	–	–
23	21	*L*	*	–	–	–	–	–	–	–
24	21	"	–	–	*	–	–	–	–	–
25	21	*M*	–	–	*	–	–	–	–	–
26	21	*L*	–	–	–	–	–	–	–	–
27	21	"	–	–	–	–	–	–	–	–
28	21	*M*	–	–	–	–	–	–	–	–
29	17	*S*	–	–	–	–	–	–	–	–
30	21	*M*	–	–	–	–	–	–	–	–

Investigations by other observers on inoculation of tumors in the brains of mice and rats have brought out certain facts which seem

to be in harmony with the results of the present investigation. Thus DaFano (24) observed that the energy of growth in intracerebral grafts seems to be somewhat lower than in other organs. Ebeling (25) found that when a graft from a subcutaneous carcinoma was inoculated into the brain of another animal it took in only 7.3 per cent. of the trials, while grafts from a brain tumor inoculated in brains of other animals took in 82 per cent. This difference in the takes the author attributes to the fact that the tumor gradually becomes adapted to the new soil. Here is apparently another instance in which the brain at first exerts an inhibitory influence on the development of the tumor. Ebeling further states that he saw no metastasis formation after inoculation in the brain, though it is not clear from his description whether the tumor which he was using produced metastases upon subcutaneous inoculation.

The mechanism of metastasis formation in malignant tumors consists of the following phases: (1) the detachment of a group of cancer cells from the primary tumor; (2) the transportation of this group of cells through the blood or lymph channels into distant parts of the organism; and (3) the proliferation of these cells in the new location and the consequent formation of metastatic tumors. This latter phase cannot be explained adequately by mechanical conditions and ease of transportation alone, and the possibility of interaction between the tumor cells and the cells of the various organs must be taken in consideration.

Such an interaction is quite evident in the case of a sarcoma of the fowl growing in the brain and is extremely probable in the case of malignant tumors of the rats and mice growing in the same organ.

Report of Clinical Cases

The result of the experimental studies reported above indicates that the brain of a fowl has the power to depress the development of an inoculated particle of sarcoma tissue into a tumor; in other words it impedes the growth of the artificial metastasis, which every inoculation of a tumor into a lower animal practically represents. It is reasonable to suppose that the comparative infrequency of the formation of metastases in the human brain may also be due to the fact that the latter organ inhibits the formation of metastases, though the tumor emboli may have reached it.

The clinical investigations here reported also seem to bear out the opinion that metastasis in the brain is comparatively rare. During the last three years 3 cases of metastasis in the brain were observed, and certain peculiarities in the clinical course of the cases

may tend to support the deductions obtained from the analysis of the experimental study. It is advisable therefore to give a detailed history of the cases.

Case I. Mrs. D. W. Age 41 years. Present illness began in August, 1914, with constipation, rectal tenesmus and loss of weight. 3 weeks after the onset of symptoms the patient entered St. Luke's Hospital. A diagnosis of carcinoma of the rectum was established and operations were performed, which consisted in a left inguinal colostomy followed 3 weeks later by sacral resection of the rectum. In December, 1914, the patient entered the Montefiore Home and Hospital. The examination on entrance did not reveal the presence of a recurrence, or of metastases of carcinoma anywhere. The general condition of the patient was good.

In July, 1915, the patient began to complain of general weakness. An examination through the colostomy wound showed a diffuse tumor mass in the peripheral segment of the sigmoid.

In August, 1915, the patient began to complain of severe headaches.

August 27, 1915. A neurological examination by Dr. I. Abrahamson showed no tenderness along occipital nerves, movements free, pains radiating around neck and into the cranium, and no radiation to the shoulder. Knee jerks lively on both sides. Achilles tendon reflexes exaggerated on both sides. No Babinski, no clonus. No evidence of any organic disease.

An ophthalmoscopic examination by Dr. A. Wiener revealed a choked disc in the left eye, outline of the right disc, hazy. There were small hemorrhages in the background.

September 23, 1915. Patient developed a transitory squint of the left eye and impairment of vision.

September 26, 1915. An ophthalmoscopic examination by Dr. A. Wiener revealed the following condition: Neuro-retinitis on both eyes. The backgrounds of both eyes show striated swelling with whitish patches. Incipient cataract of both eyes.

November 11, 1915. Patient shows bilateral convergent squint, suffers from nausea and vomiting and is delirious greater part of the day.

December 9, 1915. An ulcerated area appeared around the anus.

December 11, 1915. The sacral scar opened along its entire length. On separating the skin flaps, the underlying tissue of the sacral region is covered with a dirty grayish substance, which on the touch appears to be firmly adherent to the deeper layers of tissue. The condition presents the picture of a moist gangrene.

December 17, 1915. Destruction of cornea and xerosis developed in the right eye and xerosis and diplopia of the left.

On December 25, 1915, the patient died.

The autopsy was performed 52 hours post mortem by Dr. R. A. Lambert and the following is the report:

Anatomical Diagnosis

Recurrent carcinoma of rectum with extension to perirectal tissues and uterus. Metastases to retroperitoneal and cervical lymph glands, thyroid, lungs, meninges and brain. Acute cystitis and pyelonephritis. Old tuberculous foci in bronchial lymph nodes. Emphysema (moderate). Extreme emaciation. Ulcers of cornea.

The body is that of an elderly woman measuring 153 cm. in length, showing extreme emaciation. Post mortem rigidity present. Moderate hypostasis—present in dependent parts. The skin of the abdominal wall shows a bluish discoloration. In the left inguinal region there is a healed colostomy wound showing slight excoriation of the skin in the immediate neighborhood. The opening is about 1½ cm. in diameter. In the midline of the abdominal wall, extending from the pubis to a point about 3 cm. below the umbilicus, is an apparently old, perfectly healed, surgical wound. There is extreme atrophy of the muscles everywhere, especially marked in the extremities. No edema of the legs. The nails show distinct lateral and longitudinal curving, but there is no clubbing of the fingers. The superficial lymph nodes are nowhere readily palpable. The thorax appears somewhat rounded and prominent, probably on account of the great emaciation. The breasts are quite atrophic. No nodules are felt in them. There are no definite skin lesions anywhere and no nodules in the skin or superficial tissue. (The rectum and anus were removed at operation—see clinical history notes.) In place of the anus there is a wide opening measuring at least 3 cm. in diameter which leads into a kind of smooth-walled sac in the lower pelvis. There is no discharge from this opening. All the upper teeth are absent, except one molar at the right side. Some of the lower teeth are carious. No discharge from nose or ears. The cornea of the right eye is completely sloughed away and the eyeball beneath feels soft and flabby. The sclera is rather opaque and injected. The left eye shows a marked opacity of the cornea with apparently superficial ulceration. The conjunctivæ very slightly injected.

Abdomen.—The intestines in general are freely movable. There are no old adhesions except in connection with the sigmoid and rectum (to be described later). The liver extends about 2 cm. below the costal margin in the right mammillary line. The spleen lies high up in the costal arch. The mesenteric lymph glands are not very large but feel rather firm.

Thorax.—The thymus appears to be completely atrophied. There is practically no fat in the mediastinum. The left lung is not adherent anywhere. The right is bound to the chest wall by old adhesions over almost its entire surface, with the exception of its anterior margin. The pericardial cavity contains a slight excess of clear straw-colored fluid. The thoracic duct is not readily found, but pretty certainly not obstructed.

Heart.—The heart weighs 220 gm. The cusps of the tricuspid and pulmonary orifices are quite thin and delicate, show no vegetation. There is slight thickening in places near the margin of the

mitral leaflets, and they show also a few patches of atheroma. The aortic cusps are delicate. There are quite a number of arteriosclerotic patches in the sinuses and these extend also to the leaflets of the valve. In the coronaries a few arteriosclerotic patches are found. None of the chambers of the heart are dilated: the musculature is pale: no scars are found. The aorta is fairly elastic, and very few arteriosclerotic patches are found. These are chiefly of a fatty nature and are more numerous in the lower abdominal portion.

Lungs.—The left lung weighs 275 gm. It is quite collapsed. The pleura is thin and smooth everywhere. In places there is an excessive accumulation of pigment. On palpation several hard nodules are felt, chiefly in the posterior portion of the lower lobe. There is one in the lower portion of the upper lobe, just anterior to the hilum. On section these nodules are especially marked off from the adjacent lung tissue, and are exceedingly hard. They are made up of radiating strands of early connective tissue which separate in yellow foci of varying size. They are evidently metastatic tumor nodules with, in places, necrosis of the larger nests of tumor cells. The bronchial lymph nodes are heavily pigmented, and on section one of them shows an old caseous tuberculous focus. The largest of the nodules measures about 2½ cm. in diameter. They are roughly spherical in shape. There are no tumor nodules in the pleura, although in one place the mass in the lung appears to be attached to the pleura. The bronchi and blood vessels appear to be practically normal. The picture of the lung is rather coarse, and along the anterior margin there are several lappets of emphysematous lung tissue.

The right lung weighs 450 gm. The pleura everywhere presents tags of old adhesions, fibrous. On section several large tumor nodules are found in the lower lobe. These measure from 3 to 5 cm. in diameter. They are similar to the smaller nodules in the other lung. In the upper lobe there are several similar nodules, and some areas which are quite different. They are firmer than the adjacent lung tissue, gray in color and slightly translucent. It is difficult to say whether these are patches of pneumonia or invasion of the alveoli by tumor—a sort of "cancerous pneumonia"—where the tumor cell fills the alveolar spaces—the septa remaining practically normal.

Liver.—The liver weighs 1,100 gm. and measures $22 \times 16 \times 8$ cm. It is normal in shape, except that the gall bladder notch is exaggerated. The capsule is thin and smooth. The lobulation is visible, but the lobules do not stand out clearly. The periphery is gray and the center grayish-red. No tumor nodules are found.

Spleen.—The spleen weighs 85 gm. and measures $11 \times 6 \times 3$ cm. The capsule is wrinkled, not thickened. The organ is soft, doughy, in consistence. On section the cut surface retracts from the capsule. The follicles are numerous, fairly well outlined: the trabeculæ are possibly a little thickened: no tumor nodules found.

Pancreas.—No fibrosis and no marked fatty replacement.

Adrenals.—The adrenals are rather large, each weighing approximately 20 gm. On section they are normal.

Kidneys.—The left kidney weighs 120 gm. The fetal lobulations have persisted. The capsule on removal leaves a smooth surface. The cortex measures about 7 mm. The markings in most places are distinct. The tissue is pale, especially the cortex. The pelvis appears to be slightly dilated. No tumor nodules or abscesses are seen.

The right kidney weighs 140 gm. On removing the capsule a number of irregular yellowish gray foci are seen shining through. They appear to be slightly elevated. On section these areas extend through the cortex into the pyramids, where they are more numerous and appear as pearly yellow lines running toward the pelvis. These are clearly abscesses. In places where these abscesses are absent a normal architecture is presented. There is slight dilation of the pelvis; its mucosa is injected but apparently not ulcerated anywhere.

Pelvic Organs.—The bladder is contracted, the mucosa is of deep red color and edematous in places here and there. The epithelium appears to have disappeared. The musculature on section looks fairly normal, so that the inflammatory process is probably recent. (Urine was normal up to 10 days before death.) Uterus—normal in size. Small myoma about 4 mm. in diameter is found in the fundus, just beneath the peritoneum. On the posterior side there appears to be an invasion of the uterine wall by tumor mass growing in the rectum. The vagina-mucosa is somewhat congested, otherwise normal.

Neck Organs.—Palate, tongue, larynx and trachea normal. The thyroid—the right lobe somewhat enlarged and hard on section; it is seen to be almost completely replaced by a tumor nodule of the same character as that observed in the lung. The left lobe shows also a tumor nodule occupying about half the organ. In the right upper cervical region a hard lymph node is found, measuring about $1 \times .6$ cm. in diameter which on section is found to be occupied by a metastatic tumor growth.

Alimentary Tract.—The esophagus is normal. Stomach—there are a few hemorrhages in the mucosa not far from the pylorus. In addition to this there is a circumscribed area about 2 cm. which suggests early ulcer, but may be only post mortem (block taken). Small intestines—normal. Large intestine—the sigmoid flexure is attached to the abdominal wall, and shows an opening to the outside (see note above—colostomy wound). The sigmoid ends in a blind pouch in the pelvis, which is probably the upper end of the amputated rectum. There is a marked dilatation of this sac, which is almost filled with a necrotic, fungating, ulcerating mass which springs up from its bottom. The growth, which is clearly neoplastic, extends through the wall of the intestine into the perirectal tissue, and to a slight extent into the posterior wall of the uterus.

Bone Marrow.—The bone marrow is yellowish red in color, rather opaque.

Brain.—The brain removed and placed immediately into formalin. In the pia covering the upper portion of the right hemisphere of the cerebellum there is a small nodule about 1 cm. in diameter which has pressed inward and occupies a depression in the cere-

bellum itself. It is possible to palpate several hard masses in this cerebellar hemisphere, although they do not extend quite to the surface. In the upper posterior position of the frontal lobe of the cerebrum similar hard nodules are palpable. The hypophysis appears normal. No tumor nodules are found in either the orbit or about the optic nerves.

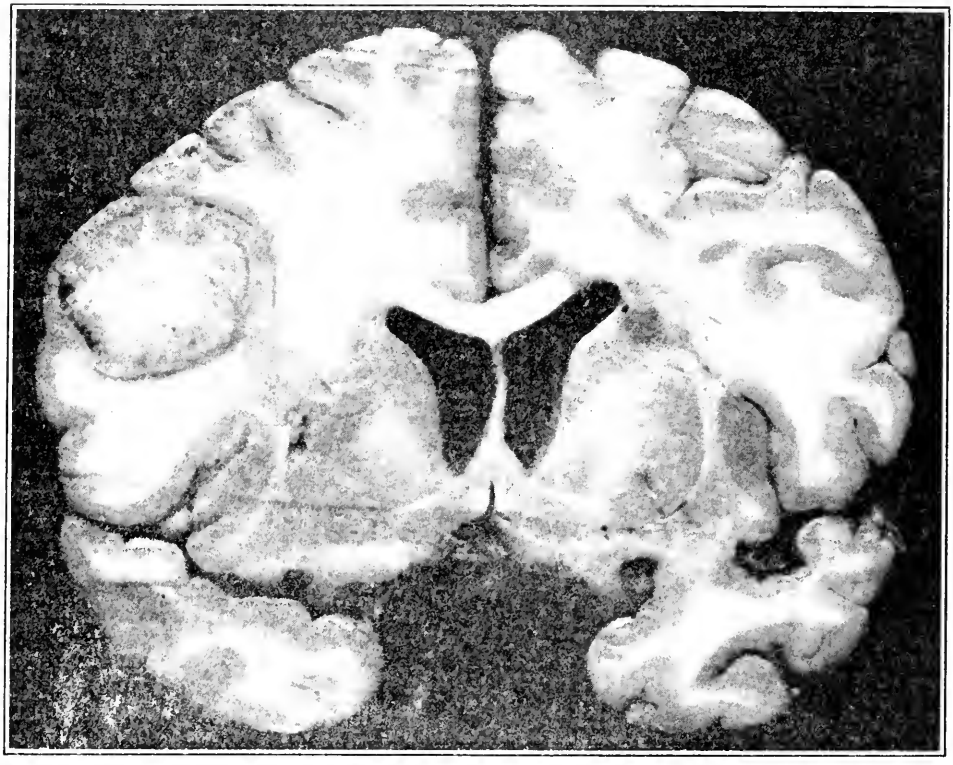

FIG. 6. Gross photograph of a frontal section of the hemispheres passing through of the anterior commissure showing a metastasis in the right hemisphere.

On a frontal section of the hemisphere passing through the middle anterior commissure there is a metastasis in the right hemisphere (Fig. 6), there are also two metastases found in the right occipital lobe (Fig. 7) and two metastases in each hemisphere of the cerebellum (Fig. 8).

CASE II. Mrs. A. B. Age 45 years. Present illness began a year ago with pain in the left hand, radiating down from the shoulder. She consulted a physician, who called her attention to little lumps in the left breast. She went to Mount Sinai Hospital, where her left breast was amputated. After leaving Mount Sinai she experienced great pains in various regions of her body, chest, legs, back, etc. The pains grew progressively worse, until 6 months

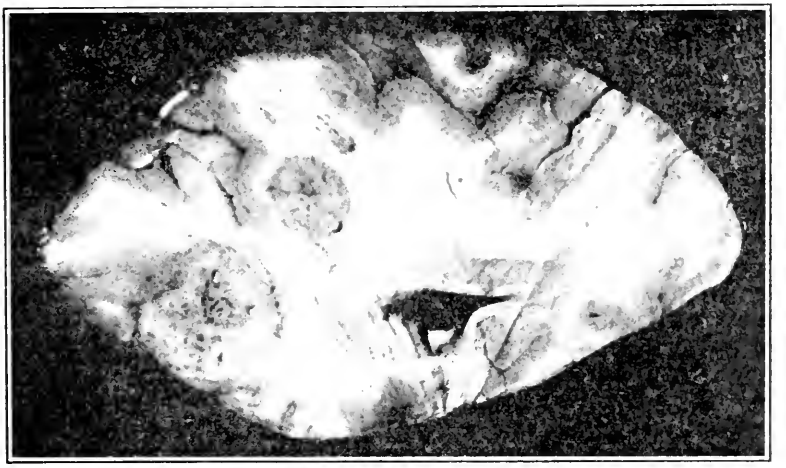

FIG. 7. Gross photograph of a section of the right occipital lobe, showing 2 metastases.

later, she went to Gouverneur Hospital, where she stayed 14 days. She became gradually weaker, paler and complained of headaches, pains in various regions of body, loss of weight, and impairment of vision.

On October 1, 1915, the patient was admitted to the Montefiore Home and Hospital.

On admission the patient presented the following status: notable protuberance of eye balls, anxious expression. On the left side of the chest there is a scar of a radical breast amputation. In the axillary line of scar there are a few subcutaneous nodules of recurrence; also one nodule at the lower part of the axilla. No lymph nodes enlarged anywhere. Severe pain on pressure at the right elbow

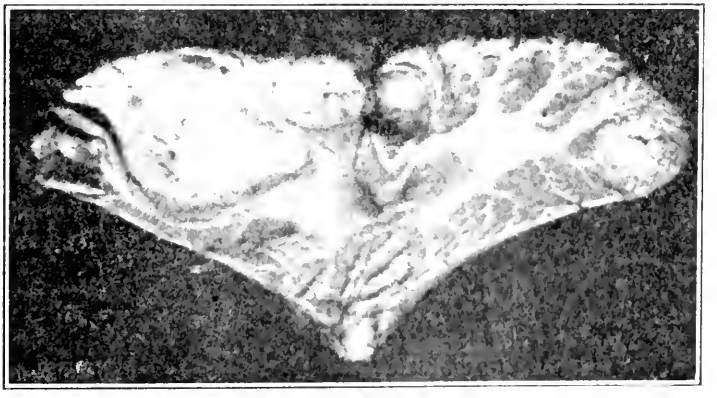

FIG. 8. Gross photograph of a section of both hemispheres of the cerebellum, showing 4 metastases.

joint. Same amount of pressure does not elicit as much pain at left elbow joint. No pain or deformity at hip joints. No pain along femurs.

A metastatic subcutaneous nodule is noted over the region of the left scapula.

Arm jerk elicited on right. Knee jerk increased on right. No Babinski, but marked Oppenheim on right, also present on left. Hemifacial paresis. Atrophy of right upper extremity including intrinsic muscles of hand.

October 14, 1915. An ophthalmoscopic examination by Dr. A. Wiener showed the following condition:

Right Eye.—Disc is blurred. Very few of the vessels can be seen in the disc, on account of the edema and hemorrhage. These hemorrhages are flame-like and streaked in appearance and extend beyond the periphery. There are some round hemorrhages. There are no exudations. The appearance just beyond the disc is pinkish and grayish white, due to edema. There are hemorrhages scattered around the macula, some superficial and some deep. The whole picture is one of thrombosis of central vein.

Left Eye.—On the outer portion of fundus, distinct detachment of retina well defined, showing vessels creeping directly over it; looks like a solid mass whitish in appearance and in periphery down below, are scattered hemorrhages over the mass. The disc cannot be seen. All outlines are blurred, its position being occupied by a star shaped pinkish white mass, dotted with streak like hemorrhages. Emerging from this mass one can see here and there some blood vessels. There are hemorrhages scattered about fundus, but the whole fundus is more or less indistinct.

Significance.—May be explained by metastasis occupying the outer portion of fundus, and either a papillitis pure and simple, or a metastatic infiltration of the nerve.

An X-ray examination of nearly the whole skeleton of the patient was made with the following results:

Hips.—Marked irregular bone destruction of the upper half of both femora, and all the bony parts of the hip joints.

Shoulders.—Advanced irregular bone absorption of all the bones entering into the formation of the shoulder joints.

Ribs.—The posterior portion of almost all the ribs, especially on the left side, shows a great number of spots of bone destruction.

Skull.—All the bones of the skull show a great amount of irregular bone destruction of both tables.

All the abnormalities in the skeleton stated above were due to multiple metastases of carcinoma in the bones.

December 24, 1915. Patient in clonic convulsions, duration about 2 to 3 minutes, no froth.

December 30, 1915. The palpation of the skull shows a protuberance over the left temporal region, consisting of a soft diffuse mass, about 2 inches in diameter (a massive bone metastasis).

Palpation of left side of chest wall is painful. Second, third and fourth ribs feel rough nodular. The left knee joint is swollen and painful. An enlargement is apparent on the head of the tibia.

An indistinct swelling is present in the lumbar section of the spine.

January 13, 1916. A swelling has developed in the middle of the right clavicle, which is soft on palpation and indicates a complete destruction of the bone in this section of the metastatic area.

January 19, 1916. Patient's speech is not clear, slow and confused. Complains more of pain than heretofore and in addition to the swellings already found she developed a swelling over the right Poupart's ligament, which is soft, doughy and easily compressible, but not tender.

January 22, 1916. Patient was unconscious for the last 2 days.

The patient died on January 22, 1916. An autopsy could not be obtained. The presence of metastases in the bones were proven by palpation and X-ray examination, metastases in the left eye were shown by an ophthalmoscopic examination and metastasis in the brain appeared quite certain from the clinical course of the disease.

CASE III. Miss R. S. Age 42 years. A radical amputation of the right breast was performed in August, 1915, for carcinoma with involvement of axillary and supraclavicular lymph glands. Four months later there has developed a kyphosis, a swelling at the regions of both trochanters and inability to walk.

Two months later the patient began to complain of severe headaches, became delirious, then developed a right hemiplegia which was followed by death two days later. No autopsy could be obtained, but the patient unquestionably died of a metastasis in the brain.

The characteristic feature of the three cases of metastasis of carcinoma of the brain described above consisted in the extensive metastatic dissemination of the carcinoma in various organs and in the extremely severe course which the disease took. The symptoms of the metastasis in the brain appeared comparatively late in the course of the disease. The impression may be gained from the analysis of these cases that the brain resists the invasion of the carcinoma longer than the other organs. Lung involvement apparently took place in two of the reported cases. The frequency of the involvement of the lungs observed in cases of metastases of carcinoma of the brain is taken by some authors to indicate the importance of mechanical conditions for the formation of these metastases. It is presumably easy for carcinoma emboli from the lungs to reach the brain. The weak point of this hypothesis consists in the fact that metastases in the lungs are found in over 25 per cent. of cases of carcinoma, while metastases in the brain, as stated above, are found in only 4.77 per cent. of cases. In other words only a small number of the cases of carcinoma which develop metastases in the lungs also metastasize in the brain.

Metastases in the cord are even less frequent than metastases in the brain. The writer found only seven cases of metastases in the cord reported in literature, and of these only one case that of Taniguchi (18) was described in detail.

Comparatively more frequent are metastases in the meninges and in the spine. The latter condition is of interest both from the theoretical and the clinical standpoint. The theoretical importance of the condition consists in the fact that while the metastatic tumor destroys the vertebræ, grows into the spinal canal and causes clinical symptoms of compression of the cord it does not invade and form a metastasis in the latter organ. Apparently here is another instance of the resistance of nerve tissue to the growth of carcinoma. Clinically these conditions must be classed not with skeletal metastases but with metastases in the central nervous system, since they very early give rise to symptoms characteristic of tumors in the central nervous system.

Three such cases came under observation of the writer recently.

Case IV. Mrs. B. F. Age 56. Admitted to the Montefiore Hospital on July 6, 1915.

Present History.—Patient relates that while walking along a street she fell, could not rise and had to be carried to the house. She was treated at home for a while, then taken to the Lebanon Hospital where a plaster cast was put on. She wore this cast for 5 months, and when it was removed, she was unable to walk or stand.

Physical Examination.—On admission showed the following condition: The patient is very restless, markedly emaciated, unable to walk or stand. *Lungs*—right hyperresonant; left—dull on percussion anteriorly and posteriorly, flat at base. On auscultation, broncho-vesicular breathing at apex anteriorly and bronchial breathing lower down. Posteriorly breathing is intensified at apex. Diminished breathing at middle, and almost absent breathing at base. *Inguinal glands* enlarged on left side. *Spine*—marked tenderness over lower dorsal and upper lumbar spine; entire spine is very rigid.

July 12, 1915, entire left lung dull, on auscultation posteriorly breathing almost absent at base; bronchial breathing in left axilla.

The patient died on July 25, 1915. The autopsy was performed by Dr. Pappenheimer, 24 hours post mortem. The following is the report.

Pathological Diagnosis.—Primary adenocarcinoma of lung, metastasis in pleura, liver, adrenal, ribs, vertebræ, lymph gland in left axilla. Chronic pleuritic adhesions and suppurative pleurisy (left side). Bronchiectasis, suppurative pericarditis, duodenal ulcer, brown atrophy of viscera, slight compression of filum terminale and cauda equina by metastases in 2d lumbar vertebra.

The body is that of an elderly woman measuring 150 cm. in length and of slight frame. There is much general emaciation.

The breasts are flabby and atrophic. The eyes are sunken, the pupils equally contracted. Most of the teeth are carious, only a few stumps remaining. The mucous membrane is extremely pale.

The abdomen is slightly prominent and shows post-mortem discoloration. Rigidity is present in all limbs. The subcutaneous fat is less than 1 cm. in thickness.

The peritoneal cavity contains only a small amount of blood-stained fluid. The large gut, especially the cecum and sigmoid, is much distended with gas. There are fibrous adhesions between the ascending colon and the transverse colon, the latter is much elongated and extends as far down as the symphysis. The stomach is contracted and reaches to about the umbilicus. The spleen extends to the edge of the ribs. The left lobe of the liver reaches 7 cm. below the ensiform cartilage, the right lobe about 2 cm. below. The diaphragm extends to the lower border of the 5th rib at the left, and is convex at its inferior surface.

On removing the sternum the right lung is found to extend slightly beyond the median line over the upper lobe. It is adherent by organized bands to the pericardium and very firmly along the posterior border to the chest wall, particularly over the apex. The pericardial sac is considerably distended, it contains 60 c.c. of turbid brownish fluid, in which are many coarse flakes and threads of fibrin. Left thoracic cavity—the lung is very much shrunken and bound down most firmly to the pleura in the upper portion of the thoracic cavity. The greater part of the left pleural cavity is filled with a very thick chocolate viscid fluid containing many large threads of soft fibrin.

Heart.—The heart weighs 300 gm. The epicardium is rather dull, and covered in places by a firm fibrinous exudate. Over the anterior surface of the right ventricle there is a large tendinous patch, and over the posterior surface of the left ventricle the epicardium is much thickened, but quite opaque. There has obviously been some atrophy of the epicardial fat, as the vessels are quite tortuous. The right auricle is distended with cruor. The foramen ovale is closed. The tricuspid ring measures 13 cm. The edges of the valves seem a little edematous. No marked deformity. The right ventricle is about 2 to 3 mm. in thickness. The pulmonary ring is 8 cm. The cusps are normal. The mitral ring measures 8 cm. in circumference. The valves are normal. The aortic opening measures 7 cm. The cusps are normal. The muscle of the left ventricle is quite thin near the apex, 1 cm. or less; it is rather flaccid and distinctly brownish. The coronaries are wide and not sclerotic. The ascending portion of the aorta is inelastic, showing a few slightly sclerotic patches.

Lungs.—The right lung is voluminous and weighs 600 gm. There are adhesions at the apex and between the lobules. One can see through the pleura very numerous slightly elevated translucent grayish plaques, which appear to lie beneath the pleura rather than in it. They do not obviously follow the pleural lymphatics. None of them are more than 2 or 3 mm. in size. They are not distinct in

the posterior portion of the lower lobe. The bronchi contain frothy yellow fluid, and are somewhat congested. On section, both the upper and lower lobes appear to be studded with numerous miliary nodules, which are felt even more distinctly than they can be seen. They are all quite well circumscribed, translucent, firm and not caseous. There seems to be rather more scar tissue in the upper lobe than elsewhere. There are no definite tuberculous foci. The bronchial lymph nodes are large and pigmented.

The left lung weighs 520 gm. The entire lung is covered with a very thick opaque but rather smooth pleura, which can be separated from the lung only with effort. On section both the upper and lower lobes are found to be only slightly air-containing; they contain a good deal of pigment. Just above and below the remains of the inter-lobular septum there is a large irregular cavity filled with turbid brownish fluid. Scattered through the remaining lung tissue there are occasional fairly distinct small grayish nodules. The small blood vessels and bronchi are thickened and project above the surface. The texture of this contracted lung tissue is exceedingly leathery. The lymph nodes at the hilum are pigmented.

Liver.—The liver weighs 1,050 gm. and appears shrunken, the capsule being wrinkled in many places. The right lobe is crossed by a deep linear fissure which extends as scar tissue a short distance into the liver substance, but only in its central portion. Scattered quite regularly through both lobes, one can see both superficially and on section grayish nodules sharply circumscribed, composed of uniformly firm, almost pearly tissue, showing no central necrosis. The nodules are not surrounded by zones of injection—the largest does not exceed 1 cm. in size, and the smallest 1 or 2 mm. The rest of the liver tissue shows rather more central stasis. The lobules are a little irregular.

The *gall bladder* is distended with thick viscid black bile. The mucosa appears normal. The ducts are patent.

Spleen.—The spleen measures $10 \times 6\frac{1}{2} \times 3$ cm. The capsule is wrinkled and very thick. The spleen weighs 100 gm. The pulp is firm and pale with very well marked trabeculæ and thickened blood vessels. The follicles are quite indistinct.

Kidneys.—The *left* kidney—the capsule adheres somewhat, carrying some of the kidney tissue with it, and leaving a pale granular surface, with rather deep stellate scars. The cortex is slightly narrow, averaging about 4 mm. The striations are quite distinct, but interrupted in places and a little diffuse. The glomeruli are indistinct. The color is grayish yellow, with a somewhat dark pyramid. The *right* kidney is somewhat more congested, but otherwise similar. Together, the kidneys weigh 200 gm.

Pelvis and Uterus.—Normal.

Adrenals.—The *left* adrenal is normal in size; has a very translucent cortex with yellow points and streaks, but one portion of the gland seems rather largely replaced both in the cortex and the medulla by grayish white tissue. The *right* adrenal also contains tumor tissue in the upper pole.

Bladder.—The bladder shows injected venules in the region of the trigonum particularly, and here the mucosa is distinctly granular. There are venules also in the urethra, with small hemorrhages.

Vagina.—The vagina shows very congested mucous membranes with plaques of keratosis in the vulva. The cervix is drawn over to the right and in the right vaginal fornix, beneath the mucosa, there is an ill-defined mass of very firm grayish white tissue. The cervix itself is long. The external is rather scarred. There are numerous Nabothian cysts visible through the mucous membrane. The lining of the corpus uteri is extremely smooth and the cavity contains a slightly turbid thin fluid. The tubes show nothing abnormal. The ovaries are very dense, sclerotic and contain numerous corpora albicantia. The peritoneum lining the cul-de-sac is much thickened and puckered by adhesions.

Rectum.—The rectum contains large scybala. The mucous membrane is normal.

Aorta.—The aorta shows a moderate sclerosis of the usual type. The thoracic and abdominal portion is quite elastic.

Stomach.—The stomach is quite contracted, the mucous membrane is normal.

Duodenum.—The duodenum at a distance of 4 cm. from the pyloric ring, is the seat of a circular ulcer about 1 cm. in diameter with a firm cartilaginous base.

Pancreas.—The pancreas is normal.

Intestines.—The intestinal tract is normal.

Esophagus.—Normal.

Breasts.—The breasts on section are rather flabby and atrophic, but show no tumor tissue. There is a very hard calcareous gland about the size of an almond in the right inguinal region.

Tongue.—The tongue is covered with a thick yellow fur. The base of the tongue is smooth. The *pharynx* is normal. The *larynx* and *trachea* are normal. The *thyroid* is symmetrical and presents the normal appearance of a colloid gland, on section.

There is a marked right lateral curvature. The spinous processes of the first few sacral vertebræ seem to be rather prominent, and with the patient in the prone position the spinal column curves rather forward just above this region. There is found lying to the right of the cord, in the region of the 2d and 3d lumbar vertebræ, a mass of soft, grayish tumor tissue—this has deflected the cord to the left, and apparently caused a distinct flattening and compression of the cord at that point. This tumor on microscopic examination was found to be an adenocarcinoma, identical with the tumor in the lungs.

Case V. Mrs. R. R. Age 43 years. Admitted to the Montefiore Home and Hospital January 16, 1916. Present illness began May, 1915, when the patient noticed a very small lump, the size of an orange seed, underneath the skin of the left breast which grew no better in spite of various salves. In August the breast was amputated at Beth Israel. In October the patient began to complain of pain in lower extremities and back.

Physical Examination.—The patient showed excess of subcutaneous fat. The lungs and heart showed no abnormalities. There is a scar of a radical breast amputation over the left chest. A hard smooth mass is felt reaching from the mid axillary to the mid clavicular line on the left chest. There are also open wounds here bleeding freely. The liver reaches to F. B. above C. M. in R. M. L. There is a bed sore in the upper portion of the left thigh. Tenderness over both thighs.

January 13, 1916, tongue protruded to the right of mid line. To the right of the sternal end of the scar is a round, ulcerated area about 1¼ in. in diameter, the surface slightly elevated. Other ulcerated areas present over the left side of the chest. In the skin there are numbers of shot-like, hard nodules. No lymph glands palpable in either axillæ, supra- or intra-clavicular regions. The liver not enlarged. Pressure over the upper third of left femur causes pain. Pressure over the spine extremely painful.

January 1, 1916. A small superficial bed sore has developed on each buttock. The patient's mind not clear.

January 17, 1916. Partial paralysis of the tongue and the peculiar slowness and abnormality of the speech bring to mind the possibility of the beginning of a metastatic growth in the nervous system.

X-ray January 20, 1916: Eleventh and twelfth dorsal vertebræ showed great absorption of bone. The entire lumbar spine has a worm-eaten appearance. The upper portion of the neck of the right femur presents a combination of bone condensation and absorption. Chest shows markedly diminished aëration of the middle lobe due to small-sized nodular infiltration. The skull shows spots of irregular frontal bone destruction. Abnormally high diaphragm on the right. No evidence of bone destruction of the ribs.

Patient died on February 13, 1916; the autopsy was performed by Dr. B. S. Kline, 25½ hours post mortem.

Anatomical Diagnosis

Carcinoma of breast with recurrence in wound following removal. Metastases to the regional lymph glands, liver, bone, pancreas, lung. Anemia, fatty change of heart muscle, kidneys, liver. Pulmonary emphysema, calcification of bronchial lymph nodes, fibrous pleural adhesions, subserous and submucous fibromata of uterus, colloid adenomata of thyroid, chronic and acute tonsilitis, decubitus ulcers, pulmonary edema.

The body is that of a moderately obese woman, 152 cm. in length, rigor no longer present in the extremities. Moderate hypostasis. Skin and mucous membrane pale. There is a large ulcer over the sacrum, about 10 × 6 cm., a portion of which extends deep into the subcutaneous tissues, the base is covered with foul smelling, necrotic tissue. A smaller more superficial ulcer is seen on the left buttock, and another over the fourth dorsal vertebra of spine. There is a large scar extending across the left anterior chest into the axillæ, healed except in the anterior axillary portion where there is an open-

ing a few cm. in diameter connecting with the sinus which extends deep into the muscular tissues of the upper arms and chest wall. The sinus is filled with a slightly blood tinged, sero-purulent fluid. In the skin of the left anterior chest there are many discrete and confluent, pearly gray, firm nodules. The skin in places is ulcerated. The cervical lymph glands palpable.

Head.—Shows no abnormalities. *Eyes*—palpebral slits narrow. The pupils moderately dilated, equal, slight arcus senilis in each eye. *Ears, Nose*—no abnormalities. *Mouth*—few teeth gone from each jaw, remainder showed erosion of edges, a few showed a moderate to extensive caries. There is moderate infiltration of the gums. *Neck*—no abnormalities.

Chest.—Well formed, superficial veins over the upper anterior portion dilated. The right breast, large, firm dome; no solid masses palpable.

Abdomen.—Normal externally. External genitalia showed no definite abnormalities.

Extremities.—Well formed.

On making the skin incision, a large amount of glistening yellow fat is found in the subcutaneous tissue. On opening the abdominal cavity, the omentum is found of good size, somewhat rolled up, free. The organs normally disposed. The liver reaches to costal margin. The appendix shows adhesions in proximal portion, free distally. The fundus of the uterus and both ovaries lie above the pubic brim. The peritoneum, in an area near the body of Douglas, shows numerous small, discrete, black spots, suggesting old hemorrhages. The diaphragm reaches to the 2d space on the right, 3d on the left.

Thorax.—The anterior borders of the upper lobes retracted a few cm. from the mid line. No adhesions or fluid in the right sac. There are rather thin, fibrous adhesions along the whole anterior border of the left upper lobe, binding the lung to the chest wall and pericardium. A number of fibrous adhesions between the lower inferior medial portion of the upper lobe and the chest wall. There is no excess of fluid. The thymus atrophied, replaced by fat. The pericardial sac is free of adhesions and excess of fluid, the membrane pale.

Heart.—The heart weighs 270 gm. There is a considerable amount of greasy yellow fat below the epicardium. The epicardium is thin and glistening everywhere. The right auricle is of average size and thickness. The endocardium thin; there is some post-mortem discoloration of it due to blood. The fossa ovale closed. The tricuspid valve and chordæ thin and puckered. The right ventricle of average size and thickness; the endocardium thin. The muscle flap pale brown. The pulmonary valve cusps thin and delicate; the base of pulmonary artery smooth. The left auricle somewhat dilated, slightly thickened. The endocardium is as usual. The mitral valve and chordæ thin. The left ventricle slightly dilated. The papillary muscles somewhat flattened. The endocardium thin and glistening. The aortic valve cusps thin and delicate. The base of the aorta smooth except for a few small soft, yellow opaque patches in

the intima near the valve. There is some post-mortem discoloration due to blood within the intima. The coronary vessels are not tortuous, the walls of average thickness. There are, however, numerous soft yellow, opaque patches in the intima of all branches, together with post-mortem discoloration due to blood. The myocardium of the left ventricle is soft, flabby, uniformly pale and brown. Fibers and bundles of average thickness.

Lungs.—Right lung weighs 400 gm. The lobes fairly voluminous, moderately cushiony and inelastic; in addition, they feel slightly soggy. The pleura everywhere thin and glistening. The lymph glands at the hylum, firm and pigmented. Vessels and bronchi show no definite abnormalities. On section a moist, pinkish red surface present in all lobes. On pressure a small amount of thin, frothy fluid exudes from the air spaces. In the center of the upper lobe there is a small pea-sized, fairly firm, irregular, gray nodule, suggesting a tumor metastasis. The posterior portion of the lower lobe is somewhat collapsed, containing no air, deep red in color. *Left lung* weighs 350 gm., fairly voluminous, cushiony and inelastic. The posterior portion of the lower lobe is somewhat collapsed. The pleura in general thin and glistening. There are, however, some tags over the lower anterior portion of the upper lobe. The lymph glands at the hylum are moderately enlarged, firm and pigmented. Two of them show several small areas of calcification. The vessels and bronchi show nothing unusual. On section the lung presents a similar picture to that of the right. There is a small, irregular gray nodule in the center of the lower lobe suggesting a metastasis.

Spleen.—Weighs 180 gm. $12 \times 8 \times 4\frac{1}{2}$. Consistency moderately increased, the organ apparently swollen. The capsule stretched. The nodules are fairly prominent on medulla and lateral borders. On section a rather firm, red surface presents, in which many small gray, Malpighian bodies are seen. The trabeculæ increased moderately in number and slightly in thickness. The larger splenic vessels somewhat more prominent than normal. No areas suggesting metastases seen.

Liver.—Weighs 1,300 gm. $24 \times 18 \times 7$. The consistency moderately less than normal. The surface quite smooth. In it can be seen many roughly circular gray, translucent areas of different size. The capsule thin, the edge soft, thin. On section a somewhat greasy, yellow brown surface presents, in which are many circular, gray, translucent areas, with circumference varying in size from 1 mm. to 6 cm. The lobulations of the liver fairly distinct, fairly regular; the lobules of good size. The vessels and ducts show no abnormality. The gall bladder moderately distended with viscid, greenish black bile. The mucosa thin.

Pancreas.—Average size. The consistency in general is somewhat lessened. In the region of the tail, however, there are firm gray, translucent lymph glands and firm gray, translucent tissue, apparently extending between the pancreatic lobules. In general the lobules are small, close together, greasy, yellow in appearance. The islands are made out distinctly.

Adrenals.—The right shows marked post-mortem digestion of medulla and portion of cortex. The left is of average size, shows slight digestion of medulla, the cortex is a uniformly brown instead of yellow color.

Kidneys.—Together weigh 280 gm. The right measures 12 × 5¾ × 3½. The left 11 × 6 × 3½. The cortex slightly uniformly adherent. The surface quite smooth. On section the cortex is fairly regular in width, average 5–6 mm. The striations not apparently distinct, but apparently regular. The glomeruli are not prominent. The tubular parenchyma greasy, yellow, opaque. The medullary portions show nothing abnormal. The pelvis not dilated. The mucous membrane pale. The ureters of average circumference, the membrane pale.

Pelvic Organs.—The *bladder* slightly dilated, the mucous membrane pale, some injection of the urethra. The *vagina* shows moderate diffuse thickening of the mucosa. The internal lip of the cervix is smooth, the *outer lobe* fused with the vaginal vault. The uterus is slightly enlarged, the musculature of average thickness. Below the serosa of the fundus, at the right side, there is a large, firm nodule with smooth surface, somewhat larger than a walnut in size. On section had a gray translucent to opaque surface, the tissue arranged in whorls. On opening the uterus, the greater portion of the cavity is filled by a walnut-sized nodule; smooth, firm, spherical, covered by normal looking endometrium. On section this nodule is of an unusual appearance: in great part it is similar to the subserous nodules, but in one portion the tissue is softer, slightly yellow in color and sharply marked off from the remainder of the tumor, the edge of demarcation, however, is irregular. This portion of the mass has a diameter of about 12 mm. There is a hazelnut sized area quite like this latter tissue below the serosa near the cervix. The tubes and ovaries show no abnormalities. The rectum 15 cm. in circumference. The mucosa smooth, in one place there is a small recent hemorrhage or post-mortem extravasation.

Vessels.—Dissection of the inferior vena cava and larger branches shows nothing unusual. *Aorta* thin walled throughout, elasticity fair. There are a few scattered small, soft, yellow opaque patches in the intima.

Neck Organs.—One of the bronchial lymph glands found moderately enlarged, gray, translucent in appearance. The thyroid is considerably enlarged, each loop bifurcated. On section sharply circumscribed areas containing translucent to brown to greenish colloid material, varying in size from a pea to hazelnut are seen in each lobe. The remainder of the skin has a pale brown appearance. The *trachea* and *larynx* show nothing abnormal. The *tonsils* small, scarred, each shows a few crypts which are filled with purulent and chalky white material.

Alimentary Tract.—The *tongue* average size. The *papillæ* not prominent. The *esophagus* shows no abnormalities. The *stomach* of average size and thickness, the mucosa shows considerable digestion.

Brain.—Weighs 1,350 gm. Shows no definite abnormalities externally.

Cord.—Shows no apparent abnormalities.

Bones.—The calvarium when held up to the light shows numerous areas of apparent thickening. On sawing through a few of these nothing suggestive of metastases was found. The vertebræ, lower thoracic and upper lumbar, very friable, almost crumbled under saw. The body of the twelfth dorsal vertebra almost entirely gone. The disc above and below it are separated from each other by only a few mm. The sixth rib on the left side fractured at a point of greatest curvature. The right femur diaphysis shows an increased amount of compact bone except the upper portion, where in places the bone of the shaft is somewhat thin, the marrow apparently fairly active, fleshy red and greasy yellow. In addition, the upper portion shows a few discrete firm, grayish yellow nodules, grape seed to pea size, apparently metastases. In the upper shaft, neck and head cancellous bone in places is increased in amount. The bone in the neck and head has a grayish appearance. The neck of the right femur much more friable than normal. (Broken through on removing it from the body.) The left femur on section in general quite similar in appearance to the right; the neck, however, not so friable.

Microscopical examination of the bone of the vertebræ shows an infiltration with carcinoma tissue.

Case VI. Mrs. D. L. Age 40 years. Present history dates back 14 months, when the patient noticed a hard painless mass in the lower and medium portion of the right breast. She was operated upon at Mount Sinai Hospital six months ago.

On leaving the hospital the patient felt perfectly well for 2 weeks, when she began to experience pain for the first time. This pain was situated in the region of the lower lumbar vertebræ, the patient claiming that the pain was similar to that felt during child birth. The above has persisted ever since. With the onset of pain there developed loss of weight and general weakness. The pain was so severe that the patient has been confined to bed ever since.

The patient was admitted to the Montefiore Home and Hospital on November 10, 1915, her complaints on admission being lancinating pain in the region of the lower lumbar vertebræ and anterior aspect of thigh, loss of weight, general weakness.

The examination of the patient on admission showed the following condition. Right side of chest wall presents a comparatively recent scar of breast amputation. No nodules of subsequent recurrence can be felt along this course.

Axillary and supra-clavicular regions free from palpable glands.

Head of right humerus is painful on pressure. Percussion of anterior surface of chest wall shows no dullness anywhere. Liver does not seem to be enlarged on percussion and is not palpable.

Left lower extremity is bent slightly on account of painful rigidity of flexor muscles. Right lower extremity is freely movable. Upper fourth of right femur is somewhat painful. Same condition exists in upper fourth of left femur.

December 8, 1915, pain at the region of the sacral bone diminished. The patient is generally better able to move around than previously.

February 7, 1916, there seems to be localized pain on pressure over the spinous process of the last lumbar vertebra and over the surface of the upper third of the sacral bone. There appears an edema in both lower extremities after walking.

March 15, 1916, X-ray examination. *Lumbar Spine.*—Slight destruction of the contiguous portions of the second and third lumbar vertebræ with some bone condensation and very marked new bone formation in form of bridge formation on both sides.

The patient is still under observation and is under treatment by X-rays both in the region of the chest and over the region of the second and third lumbar vertebræ, in which the X-ray examination showed with great probability a metastasis in the vertebræ.

At present the condition of the patient is greatly improved, and she walks around freely. A later X-ray examination showed an increase in the bone formation in the region of the second and third vertebræ.

Discussion

The experimental and pathological study of the metastatic tumors of the central nervous system, as was shown above, presents many points of theoretical interest. The investigations on the subject may be helpful in the elucidation of the complex phenomena of the interrelation between the development of a malignant tumor and the soil in which it grows.

The practical value on the other hand of the clinical reports of the cases of metastases of malignant tumors in the central nervous system consists in the aid they may offer in the recognition of the cases, as they present themselves to the clinician.

The fact that these metastases occur very rarely is in itself an important reason for the frequent failure of the clinicians to make an early diagnosis.

There are two more factors which increase the difficulties.

In the first place metastasis in the central nervous system may give no clinical symptoms during its entire course. It is even probable that those cases which ultimately develop severe clinical symptoms may have existed for a certain time without causing any manifestations attributable to the nervous system. The reason for it is the following.

Benign tumors of the brain are encapsulated and during their growth compress the brain, increase the intracranial pressure and therefore produce early symptoms. Carcinoma and sarcoma grow invasively and destroy brain tissue during their growth and consequently the combined amount of tissue inside of the skull does not

change and therefore no symptoms manifest themselves until a vital portion of the brain is destroyed (Fig. 9).

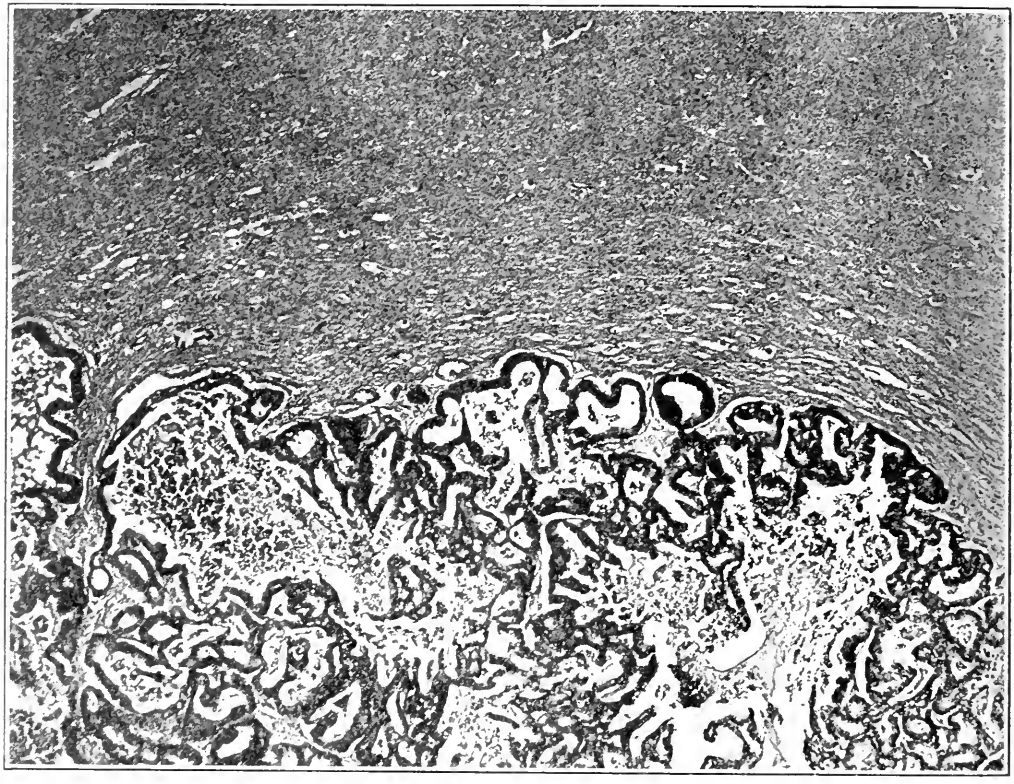

FIG. 9. Adenocarcinoma of the brain, metastatic, showing invasive growth. Microphotograph, low power.

The second and by far the more important handicap to the correct diagnosis of a metastasis in the central nervous system is presented by the fact that the primary tumors may be so insignificant in comparison with the condition in the central nervous system that they escape recognition. In other cases the primary condition, though easy of recognition, may simply have been lost sight of by the clinician. As a result of all this, a faulty diagnosis may be made, and incorrect methods of treatment instituted. A case recently reported by S. H. Brown (19) is characteristic in this respect. The patient suffered from a primary carcinoma of the sigmoid. An exploratory laparotomy was performed on May, 1913. From December 8, 1913, to June, 1914, the patient was given X-ray treatment.

At the end of the year there developed a trophic ulcer of the cornea and severe pain in the region of the trigeminus. On December 7, 1914, an operation for the removal of the Gasserian ganglion was performed. The metastatic carcinoma of the brain was only recognized post mortem. It would seem that in this case the operation for the removal of the Gasserian ganglion was too severe, and large doses of morphine should have been the method of choice.

In metastases of carcinoma of the spine the primary malignant tumor escapes notice even more frequently. Case IV presents such an instance. The primary carcinoma of the lungs gave no clinical symptoms. The paraplegia was considered to be the primary disease and was thought to have been caused by a trauma of the spine. It would seem that in this, as well as in many other similar cases, an X-ray examination could have cleared up the diagnosis. The application of a plaster cast for five months for a metastasis of carcinoma of the spine was also a useless procedure.

Another case of a primary carcinoma of the thyroid with a metastasis in the spine, which was admitted to the Montefiore Home and Hospital, and in which faulty methods of treatment were applied and the correct diagnosis made late in the course of the disease, will be reported in detail later.

Very little can be said in regard to the *therapy* of this condition. In view of the invasive growth described above, surgical interference is quite out of question. Very recently, Küpferle and Szili (20) described a case of carcinoma of hypophysis greatly improved under the influence of X-ray therapy. Their patient was operated upon and his condition improved for a time, then the growth recurred and the patient became totally blind. X-ray treatment was instituted, the vision improved and this improvement lasted until the report was published ten months later.

The condition of the spine in the Case VI reported here was also apparently favorably influenced by X-ray therapy, though it is too early to draw any definite conclusions. Pfahler (21) and the writer (22) reported cases recently in which metastases of carcinoma in the ribs were benefited by X-ray therapy. In a word, the fact that metastasis of the central nervous system is encased in a bone does not interfere with the action of the X-rays, and it appears probable that when the diagnosis is made sufficiently early, distinct benefit may be obtained by this method of treatment.

The very important *conclusion* to be drawn from the analysis of the clinical cases of metastasis of carcinoma in the central nervous system is that the clinician must keep in mind the probability of

cancer just as steadily as of syphilis or of tuberculosis. As a result, there will follow a better coöperation of the specialties concerned in the subject and as a consequence a more prompt diagnosis and more efficient methods of treatment.

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THE RÔLE OF CONSCIOUSNESS IN THE DEVELOPMENT OF DELUSIONS

By Ralph C. Hamill

CHICAGO

Life considered from the psychological or philosophical point of view may be thought of as a struggle of self against the world. In man, life from this aspect is the modification and mediation of the internal instinctive forces by the external educational forces. By the internal forces I mean the forces having an egoistic origin from the instinct of self-preservation: pride, self-reliance, belief in one's self. They are the driving, impulsive forces which lead to self-expression and independence. By the external forces I mean all those which are in part due to relationship with one's environment; those which affect us as we gain in information and knowledge. In this category I include conscience, ethical and social points of view, society and its laws and customs.

Life can be thought of as a continuous line whose direction is determined by these two forces, the internal and the external, meeting at an acute angle as two winds, coming from slightly removed points of the compass, might meet. The direction of the air current resulting from the meeting may be in a line bisecting the angle of meeting in case the two winds exert equal pressure. Or it may go first to one side and then to the other in case the winds differ in strength from time to time. If the winds remain equal a continuous straight current is formed, turning neither to one side nor the other; if their relative strengths vary from time to time, then the line formed does not continue straight but points now towards the left, now towards the right.

The line of life, the resultant of the two forces, the internal and the external, runs straight so long as these two forces are equal. As soon as one becomes the stronger then the line points towards a weakness of the other. As the weakness is pointed out, as the line of conduct varies far towards either side, that side is stimulated to exert itself and attempts to straighten out the line.

As an example I would cite the working of the forces in the man who because of some instinctive force such as hunger, jealousy, or fear, contemplates the commission of a crime. He pictures him-

self going through the action. His conduct line is showing the relative weakness of the educational forces. It is swinging over to the left, invading and encroaching upon the ethical, the social field. This invasion stimulates the forces of correction. He sees the punishment. The swinging of the line towards the left diminishes. His mind searches in his previous experience for some way out that is compatible with the laws of society. If he finds a way that does not call for a submersion of self, we may say the line runs straight. If self, *i. e.*, pride, ambition, etc., must suffer, then we can consider the line as swinging towards the right, invading the instinctive field.

In case the educational forces are not strong enough to protect the ethical realm against invasion then the crime is committed: the conduct line goes beyond the prescribed boundaries. Temporarily the individual loses balance.

The satiety that this expression of self gives causes the instinctive forces to lose in strength. The resultant line of conduct is turned so far to the right that it presents a flank to the external forces; conscience, the opinions of others, fear of punishment, turn it back straight or even turn it over to the left, resulting in an encroachment of the realm of self; a feeling of self-abasement.

That which is true of the criminal is also true of the normal individual, if such a distinction can be made. He, his conduct, is being continuously blown to left and to right. As it is blown to the left by the forces of instinct we say he is tempted; if blown too far we say he sins. As it is blown to the right by the educational forces we say he is restricted, repressed, mediated; if too far he fails, there is no expression of self.

The middle line, then, is the line of progress, is the result of the nice adjustment between self and the world which permits of self-expression without social or ethical offense.

It is this middle line that we seek. It represents a balance of give and take with our environment.

In order to keep to this middle line it is necessary to have the forces in balance.

Keeping these forces in balance is one of the chief functions of consciousness. It is upon this assumption that I base my title.

We might say consciousness acts as a stabilizer, throwing its weight now on the side of the instinctive force, as when a man threatened with defeat *knows* himself as strong as the forces against him, and again on the side of the educational forces as when, strongly tempted, he voluntarily brings up before his mind's eye the various ways in which his conscience or society can punish him.

This function of consciousness constitutes one of the chief ingredients of that condition we call tension or strain.

It is the duty of consciousness to make the proper valuation of our conduct, to make excuses and to furnish laudable motives.

Consciousness can be thought of as an engineer, the rest of the mental processes and the body as the engine he must be informed about.

That this duty of consciousness is a difficult one is indicated by the fact that sleep is necessary. In sleep it is consciousness that ceases functioning. The eyes, the ears, the nose and the skin continue to function; a bright light held before the closed eyes of the sleeper, his name spoken gently into his ear, a hand laid on his face, will waken him.

In the nervous adult sleep is frequently spoken of as a chance to get away from oneself.

Next to the rest which sleep gives to consciousness, betterment of working conditions is to be desired. This is accomplished by changing, as much as possible, the balance between self and the external forces, in favor of self.

It may be considered that this change is brought about in both a normal and an abnormal manner. The process involved in the normal change is called imagination, in the abnormal, delusion. Delusion often calls hallucination to its aid. Hallucinations furnish the proof of the correctness of the delusion.

The make-believe life of the child is the first opportunity we have of studying this function of consciousness in its defensive activity, in its changing of the balance in favor of self.

The child comes to consciousness in a world of superior forces. The people about it are all much larger than it is. They are filled with superior physical, mental and moral force. They toss the child about, they solve its problems and they do their utmost to rule its mind and conduct. The child is being constantly corrected by people with power to enforce their corrections. All its impulses that lead it to activities at variance with what is considered correct and proper by the surrounding adults, are curbed.

The child is constantly being reminded of its inferiority. This is true even when it is being given affection, since the affection is always given by a stronger to a weaker, because of the latter's weakness. As instance of this I would call to mind the *compassionate* tone of the mother's caressing voice.

It is against this sense of inferiority that the child builds up its make-believe life. It creates little brothers and little sisters to play

with and its play consists in taking care of the weaker younger creation.

The make-believe child is made to go to bed, to wash its hands, to put away its toys. It is told it must not do this and must not say that. In fact its creator rules its conduct just as the elders rule the conduct of the creator.

It appears to me that this is a conscious effort of the child to square himself with his environment. No conscious individuality is content to be subordinated by all the forces in its entourage. Consequently, the child creates the little brother or sister in order to have some one it can assume superiority towards.

I wish to emphasize the action of consciousness in this creation. I would also insist upon the apparent reality of the make-believe child. Great concern, even panic may be shown by the creator who says to its elders: "Don't! Don't sit down there, you'll sit on little brother!" Or, "No I can't come, I can't, I can't, little sister isn't ready to·come." And then as soon as the child is allowed its own way the concern all disappears, and again it becomes quite tractable.

In this same early period of childhood, between the third and seventh years, the child will show other ways of protesting against correction where the protest is more obvious. For instance, a little girl of three upon being told by her mother that she must be quiet in a certain part of the house so as not to waken her baby brother, goes directly into another part of the house and pulls the toilet utensils off its mother's toilet table, or when told she must not touch some flowers she is reaching for, bursts out in a cry of temper, holds her hands in close to her body and jumps up and down in an obvious fit of rage.

These are the obvious and immediate responses and are often followed by contrition. The creation of the make-believe child is the less obvious response and entails no sense of shame. It is no offense against the other people about. There is no suggestion of wrong-doing connected with the creation.

Another creation of the child's imagination which appears a few years later is that of the high-born parentage. The child says its parents are not its real parents. It really is the child of a king, a millionaire, or some other person who is imagined as being superior to the real parents. By creating the superior parents the child makes its own parents inferior not only to these superiors but to itself as well, since it is of noble birth. Cinderella, the Winter's Tale, and other mythological stories are based, at least in part, on this motive.

Up to eight or ten years of age there is so much in the environment of the child which is not understood that any flight of the imagination is permissible both by the child and by the elders. There are so many strange things constantly coming to consciousness that these fantastic creations of necessity or desire are not thought of as impossible, are not considered as incompatible with reality.

About the end of the first decade, however, reality has become much more of a factor in the determination of thought and conduct, and so such flights are no longer allowed, or at least they are known by the child to be merely desires or flights of the imagination. They can no longer be indulged in, consciously, seriously, and used as a refuge from reality. Consciousness corrects and pulls the mind back to reality. Also the mind has been informed that certain thoughts are forbidden, so that when imagination wanders into these forbidden fields, consciousness corrects the wanderer, consciousness begins to become conscience.

As the child grows into the adult, responsible behavior is demanded. The individual has to meet competition in conduct and thought. This again produces the element of strain spoken of before.

This competition is present everywhere except in the realm of imagination: we can picture ourselves in possession of such position, wealth, creative powers, moral superiority, etc., as to be beyond fear of competition. In fact it is a question if these day dreams and our ideals are not made from the same mental stuff and belong to the same pigeonhole.

Competition being the omnipresent condition or status that it is forces the individual at times to take refuge in his imagination as the only place of escape.

When this competition is overwhelming then the individual, forced into his imagination, remains there. That the competition is overwhelming may depend upon constitutional inferiority, absorption of toxins from the intestine, syphilis, senile arteriosclerosis, etc. The need of the individual is the same: the creation of a life that is satisfactory as a refuge from reality. In this created life of the imagination excuses must be made to explain the defeat, values must be adjusted so that self does not suffer by comparison.

It is quite apparent that competition is difficult for many healthy normals. That it is difficult is due partly to external forces and conditions, and partly to internal. I am concerned only with the internal. The terms applied to the chief internal supporting force

are: self-importance, self-confidence, or self-reliance. The strength or weakness of this force, in a large measure, determines our ability to meet new and trying situations; it determines our conduct in the face of competition. That we all started out with enough self-confidence and self-importance is apparent enough to anyone who observes the egotistical conduct of children. Certainly no normal adult has the qualities to the same degree. Education, the mediation of impulses, correction, others showing a lack of confidence in us, failures of various sorts, masturbation, etc., change the egotism of youth to the more considerate attitude of maturity. These factors are the so-called normal forces diminishing self-confidence.

When to these natural causes are added chronic intoxications, fatigue, irritating working conditions, etc., competition becomes more or less impossible. It is then that reality is unbearable and the imagination is called upon to supply a life that satisfies, and it is then that we get the symptoms that we term neurotic or insane.

This mechanism is most clearly seen in the megalomania of dementia paralytica.

Owing to the toxic and mechanical destruction occurring in the brain cortex the mental abilities are diminished. The sufferer becomes less and less able to work out his problems, competition is more difficult, or impossible. The egoism, the ideal of superiority and success, the expressions of the instinct of self-preservation are unaffected, and so he proclaims his infallibility, his power or his wealth. He plans tremendous undertakings, says he is the strongest man in the world, is a millionaire, is president or king, is God and is content in his claims.

In the paranoid forms of dementia præcox a similar egotism is seen, but along with it is elaborated a system of delusions, explanatory of his inefficiency. Because his dementia is not so great but that he can recognize the discrepancy between his claims for greatness and the actual state of affairs he must excuse his lack of accomplishment. He will be suspicious of those around him; they are capable of controlling his actions by electricity or telepathy. To support his excuses he says there is a dynamo in his head, that electricity can influence, or people know, what thoughts are in his mind, an obvious handicap to individual activity. He says there are odors about his body that others object to and so he can't work among others. These delusions are systematized to as high a degree as the individual is capable of reaching; the height depending on education, and the amount of functional ability of the brain over

and above the dementing process. The same effort to systematize is seen in the imaginations of the child, it may even be considered as a resumption of the childish trait—a resumption made necessary by the retreat from reality and its competitions.

The characteristic delusion of alcoholic insanity, the delusion of infidelity of the wife or husband is explainable on much the same basis. It is the conscious attempt of the drunkard to square himself with the person whose life he has ruined. Obviously if his wife is taking on other men he owes her nothing, she is worse than he, according to general moral opinion. I have seen this same delusion in a woman of thirty-nine who had born no children to her husband, and who quite apparently was his inferior in every way. It was evident that he did all the contributing and she all the receiving. The balance on the books was all against her. The menopause was threatening, coming to put an end to the only chance she had of squaring the account: suffering and producing a child. She had to square the accounts; her egotism demanded it. She began to suspect him of having relations with other women, and to further fortify herself she claimed that if these ideas were not correct they were put into her head by the malpractice of Christian Science practitioners. This was taking another crack at her husband, since he was a Christian Scientist. To support her claims, she heard voices talking about her and about her husband in his evil ways.

The causal relation between necessity and the make-believe life is seen without much difficulty in the child. Its reactions are more direct. Its anger at being corrected and its pleasure in "taking care" (correcting) of its younger brothers and sisters, dolls and make-believe children are certainly related. The intensity with which it believes in its imaginations is very nearly as great as that shown by the alcoholic insane. The latter is an adult and demands the right to think as he pleases; all such rights are more or less denied the child.

The causal relationship in the adult is more difficult to bring out. The adult is more complex and we are too accustomed to think of delusions and hallucinations merely as some strange vagaries stuck into the midst of mentality as a pin is stuck into the skin. A pin irritates, causes pain, distracts attention from other things, but is not a real part of the person stuck. In some such manner we are inclined to think of delusions and hallucinations. My belief is, delusions are the result of efforts to square our conduct with our ideals. They are the result of efforts at explanation.

Hallucinations may be created in answer to the needs of delusions: a voice says to the alcoholic delusional lunatic: "Watch your wife;" or hallucinations may be more fundamental and the delusions the efforts of consciousness to explain them.

This paper does not claim that insanity is entirely the individual's conscious effort to square himself with the hard realities of life. I merely claim that certain of the abnormal mental reactions of the individual are of the nature of mental adjustments to circumstances perhaps beyond the realm of the mind, as, for instance, in the case of dementia paralytica. Of course syphilis is destroying the cortex, so important in the elaboration of mental life, but, so far as I have observed, megalomanic delusions never come to the juvenile paretic, whereas, because of the long struggle for success, they are very common in the middle-aged. Also I have not seen megalomania in the old after age has excused the giving up of the struggle.

It is no uncommon thing to have a patient with fairly good self-control complain of various physical symptoms, such as lead him to suspect he is suffering from heart disease, cancer or tuberculosis. When his suspicion is removed he may then for the first time give evidence of delusions and hallucinations. It may be that so long as physical disease seemed to excuse failure, mental symptoms were not necessary. A nurse suspecting herself of tuberculosis was allowed to take her own temperature. Her chart showed a typical fever curve. When another nurse took normal readings per rectum for a few days, the patient began to have a quite violent hallucinatory insanity. She was unbalanced before, but after she was discovered her only excuse and refuge was insanity—irresponsibility. It is a common thing to see marked improvement in the mentality of the insane when they become physically ill. Erysipelas was at one time given to the insane because of this observation.

It does not seem wrong to claim that in childhood consciousness plays a direct defensive rôle in creating and developing imaginations. Also that these imaginations are necessary because of the balance being against self. We do not consider it necessary to picture the child as saying: "I'm made to do just what others want me to do, therefore, I'm going to imagine someone I can rule so as to square matters."

Certain delusions such as I have cited, delusions of megalomania, delusions of influence (as excusing failure) may very well be brought about by the same mental mechanisms as the imaginings (defensive in nature) of children.

SYMPTOMATIC HERPES ZOSTER*

By Ernst P. Boas, M.D.

It is generally recognized that herpes zoster is an acute infectious disease with a self-limited course, one attack of which usually confers immunity against subsequent attacks. The pathological lesion is an acute inflammation of the posterior ganglia. Most of the recent literature has dealt with the infectious nature of herpes zoster,[1, 2, 3, 4] so it is well again to draw attention to other etiological factors which may be concerned in the production of this condition.

First may be mentioned those cases of zoster which have been interpreted as due to a peripheral neuritis. Dubler[5] described two such cases. One of these patients had had an attack of right-sided zoster one and a half years before death. For several months before her death she had intercostal neuralgia in the same zone. A very painstaking autopsy revealed a tuberculosis of the seventh to ninth ribs on the right side. The process involved the intercostal nerves and caused a neuritis which could be traced to the finest cutaneous nerve filaments. The corresponding posterior root ganglia were normal. A second case showed a neuritis of unexplained etiology corresponding to the zoster distribution, with little change in the ganglion. Curschmann and Eisenlohr[6] reported two cases of zoster due apparently to a perineuritis nodosa. In one of these cases the intervertebral ganglia were examined and were found to be normal. In this category we may place two cases of herpes zoster brought on seemingly by a severe twist of the arm.[7] The distribution of the eruption comprised the third to sixth dorsal segments, and was on the same side as the injured arm. The trauma probably stretched and tore the nerve roots and caused a neuritis. Head[8] believes that most of the bullous eruptions following injury to the peripheral nerves are not true zoster, for he finds that they occur only in the territory of the wounded nerve, and do not follow a central distribution.

A second type is that in which the cutaneous zoster is apparently a reflex manifestation of disease in one of the viscera innervated by the same spinal segment. A case reported by Bittorf[9] may be taken as an example. During a prolonged attack of renal colic

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dependent on an intermittent right hydronephrotic kidney, the patient developed a typical herpes in the area of distribution of the right eleventh dorsal segment. A number of similar cases have been described,[10, 11, 12, 13] Kursteiner[14] in an autopsy on a case of herpes zoster found lymphangiectases and cysts in many spinal ganglia. The lesions were far more numerous than the distribution of the zoster would seem to warrant. In addition the patient had an advanced pulmonary tuberculosis. The author therefore interpreted the zoster as a reflex phenomenon induced by the pulmonary lesion in ganglia that were already injured. Head[8] on the other hand states that when zoster occurs in a tuberculous individual, the distribution of the eruption bears no relation to the position of the pain produced by the destructive process in the lung. It is difficult to decide whether or not the zoster in these cases bears a causal relationship to the visceral lesion, but in a number of them the connection appears so close that it seems more than a coincidence. It is interesting to note that the converse of this condition never occurs. The deep organs receiving their visceral supply from the affected roots never become affected in an outburst of zoster. No physical signs suggesting such involvement have ever been found, and no visceral lesions have ever been noted at autopsy. Furthermore when the tenth dorsal segment is affected, the testicle is not tender, as it is when the same area is hyperalgesic because of a renal colic.[8]

Finally we come to a class of cases of zoster due to the involvement of the ganglion by extension of adjacent disease processes. Here belong the tabetics with zoster. The eruption is usually in the region of the lightning pains, and it tends to recur. Other forms of spinal-cord syphilis may cause zoster. A patient who had a level syphilitic lesion at the eleventh dorsal segment received some specific treatment. One year later he developed a herpes zoster over the right ninth and tenth spinal nerve root areas.[15] Similarly in a case of myelitis a zoster may appear at the upper level of anesthesia or in the upper zone of hyperalgesia. Head tells of a man with a fracture of the eleventh dorsal vertebra, a transverse myelitis with much surrounding inflammation, in whom the eleventh spinal ganglion showed a round-cell inflammatory focus which corresponded to a patch of zoster.[16] Another patient of his had a lymphosarcoma on the ventral aspect of the vertebral column. The growth invaded the spine, passed into the intervertebral foramina, and surrounded the posterior ganglia and roots. The fourth right ganglion was particularly involved and the eruption covered the distribution of its nerve root. During acute exacerbations of tuber-

culous spondylitis zoster has been observed in the cutaneous area of the posterior root which was affected by the fresh outbreak of the disease. Extensive zoster is seen at times in cerebrospinal meningitis. Finally we may mention a case in which the skin lesion was in the fourth thoracic segment, and in which a small metastatic abscess was found in the corresponding ganglion.[17]

I have had the opportunity to see two cases of herpes zoster which belong to the last-mentioned group. The first one was a case in which the herpes appeared after an epidural injection for the relief of sciatica. The patient F. M., forty-two years of age, was admitted to Mount Sinai Hospital to the service of Dr. B. Sachs on May 26, 1916. Three years before her admission she began complaining of pain in the small of the back which did not radiate. The pain was severe and made walking difficult. One year later it began extending down the back of the left leg. So it kept on with occasional free intervals. Five months before her admission she had an attack of severe pain radiating down the left sciatic nerve. This lasted two weeks. Four months later the same pain returned and continued up to the time of her admission. The only significant findings on physical examination were slight weakness of the left leg with diminished knee jerk and absent Achilles jerk. There was tenderness along the course of the sciatic nerve as far down as the foot. Extension of the leg caused pain referred to the back of the thigh.

On May 29, an epidural injection of fifty cubic centimeters of normal saline was given. The following day the patient complained of great pain at the site of the injection, and in the left nates. Severe pain continued until June third when a typical herpes zoster was noted on the left buttock in the area of distribution of the third and fourth sacral nerves. At the same time the pain there became less. The sciatic pain had been greatly relieved. The zoster area showed hypesthesia as well as hypalgesia. There was no accompanying fever nor acceleration of the pulse. The zoster vesicles dried up in about a week and the local pain disappeared, in spite of the fact that three more epidural injections were given on June third, seventh and ninth respectively.

The important question here is—what relation did the epidural injection have to the development of the zoster. The epidural space in the adult begins at the lower border of the first sacral vertebra where the dura ends, and extends down to the sacrococcygeal articulation. A long needle is inserted into this space through the lower opening of the sacral canal. The needle projects into the canal for about one and a half inches. A syringe is then attached to the needle and the saline is injected. By collargol injection it has been shown that the fluid fills the epidural space and may escape through the intervertebral foramina.[18] It will be recalled that the sacral ganglia are situated in the sacral canal outside of the dura. It becomes quite clear then how during an epidural injection the

sacral ganglia or nerve roots may become injured either by the needle itself or else by the mechanical, possibly tearing, effect of the sudden introduction of a relatively large amount of fluid into a small space. In the case just cited the left third and fourth sacral ganglia or the corresponding nerve roots were injured by the epidural injection causing the appearance of a herpes zoster in the equivalent cutaneous segment a few days later.

The second case, R. W., was on Dr. Sachs's service a few months later. She had a spinal cord tumor. The symptoms revealing the localization of the tumor appeared while she was under observation. There was a spastic paraplegia of the lower extremities with incontinence of urine and feces. Cutaneous insensibility extended up to the level of the fourth dorsal vertebra. Above this there was an area of slight hyperesthesia. These symptoms had been manifest for some weeks, when one day a typical eruption of herpes zoster was noted on the left side of the thorax, stretching from the midscapular line behind to the midline anteriorly, in the region of distribution of the third, fourth, and fifth dorsal roots. On operation an extradural tumor was found, which could not be completely removed, and which extended from the second to the fourth dorsal vertebræ. This tumor had probably invaded the third, fourth and fifth dorsal ganglia on the left side, causing the appearance of the herpes.

I am well aware that in neither of these cases has the causal relationship of a lesion in the ganglia to the appearance of the cutaneous herpes been proven; but the presence of a known disease process so close to the ganglion supplying the affected area of skin renders it more than probable that the ganglia themselves were implicated in the lesion.

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THE WASSERMANN REACTION IN 1,266 CONSECUTIVE ADMISSIONS TO ELGIN STATE HOSPITAL*

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Recently an effort has been made at the Elgin State Hospital to do a Wassermann test on the serum of each patient admitted. Of a total of 1,339 admissions from June 1, 1915, to October 1, 1916, 1,266 have been so tested, 664 male and 602 female. A report has recently been made by Lowery[1] of Danvers State Hospital on a similar series of 1600, and by Vedder and Hough[2] at the Government Hospital on 616 admissions, but there the proportion of white females is quite small and the proportion of colored males and females quite large. Darling and Newcomb,[3] in a comparison of the Wassermann reaction in the acute and chronic insane, give figures on 452 admissions to the Warren State Hospital. This series is also referred to by Weston and Darling.[4] Southard[5] gives the per cent. positive in 1,671 Psychopathic Hospital cases. These comprise all the reports with which I am familiar in which the conditions correspond fairly closely with ours.

Technique of Test

The Noguchi modification with the human hemolytic circle was used throughout. Rabbit serum ambocepter was sealed in tubes in amounts sufficient for one day's work and was kept in the ice box. Complement was prepared fresh each time. We have used three different antigens at various times, all alcoholic extracts of human heart with 0.4 per cent. cholesterin. These antigens agreed quite closely in their properties, gave complete inhibition with .005 cc.,

* Read before the Illinois State Hospitals' Medical Association, October 27, 1916.

[1] The Wassermann Test in Practical Psychiatry, Am. Jour. Ins., 1916, LXXII, 601.

[2] Prevalence of Syphilis among the Inmates of the Government Hospital for Insane, Jour. Am. Med. Assoc., 1915, LXIV, 972.

[3] Comparison of the Wassermann Reaction among the Acute and Chronic Insane, Jour. Nerv. and Ment. Dis., 1914, XLI, 575.

[4] Value of Routine Laboratory Work in Psychiatry, Am. Jour. Insan., 1915, LXXII, 325.

[5] Statistical Notes on 6,000 Wassermann Tests, Boston Med. and Surg. Jour., 1914, CLXX, 947 (quoted by Vedder and Hough in the above article).

were only faintly anticomplementary in doses of .04 cc., and were not hemolytic in large amounts. Positive, negative, and anticomplementary controls were used. Serums were heated for one half hour at 56° C. Amounts of reagents used were, 1 cc. of a 1 per cent. suspension of human red cells in .85 per cent. salt solution, two units complement, two units amboceptor, 0.1 cc. of a 1 to 10 dilution of the cholesterinized human heart antigen, four drops of inactivated serum or 12 (often more) drops of the spinal fluid to be tested.

Interpretation of Tests

We have tried to be very conservative in making a positive report. As the object of the tests was to aid the clinical men in their diagnoses, and as a doubtful or faint reaction is of no value in determining the presence of syphilis, all doubtful, faint, and unsatisfactory tests were repeated, often a number of times. A doubtful reaction was never called positive unless on repetition it at some time gave a frankly positive result. Negative serum tests in clinical paretics were as a rule repeated as were spinal fluid examinations in clinically doubtful cases. In this report it must be remembered that the figures represent cases and not individual tests, and that cases in which there was not at some time a distinctly positive result are considered as being negative.

Comparison with the figures of others will be made as the different groups are considered.

Wassermann Tests on Serums

We found that 15.7 per cent. of the cases in this series gave positive serum Wassermann tests.

	Male		Female		Total	
	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Cases	664		602		1,266	
Serum Wassermann positive	148	22.3	51	8.5	199	15.7

Lowery found 16 per cent. positive in 1,600, Darling and Newcomb 20.4 per cent. positive in 452, Southard 14.72 per cent. in 1,671, Vedder and Hough 16.72 per cent. in 616. There is a considerably wider difference between males and females in our series than in that from Danvers, Lowery giving 18.98 per cent. of males and 12.5 per cent. of females positive, against our 22.3 per cent. and 8.5 per cent. The other reports do not separate the sexes except that of Vedder and Hough who found no positives among 83 white women and 19.51 per cent. positive in white males.

If to our figures are added those of the paretic group who had positive fluid but negative serum the per cent. will be somewhat higher: male 23.3 per cent., female 8.8 per cent., total 16.4 per cent. This we think probably represents fairly accurately the proportion of syphilitics in our intake.

Excluding those classed as paresis, tabo-paresis, and cerebrospinal syphilis, numbering 161 (131 male and 30 female), we find the per cent. of positive Wassermanns in the remaining 1,105 cases to be, male 5.2 per cent., female 4.4 per cent., total 4.8 per cent. In other words, of our admissions in whom there was no syphilitic involvement of the cerebrospinal axis only 4.8 per cent. gave positive Wassermann reactions, this against 7.6 per cent. in Lowery's series. As the proportion of positives in the different psychoses does not vary materially there would seem to be no reason why the ratio of positive reactions in the acute and in the chronic insane, excluding the syphilitic psychoses, should not be the same. For the chronic insane Darling and Newcomb give 4.94 per cent. positive in 849, quite close to that found by us in this series. Many authors give a much higher per cent. in the insane as well as in medical dispensary patients.

In the following table the results thus far are tabulated.

TABLE I

Male	Female	Total
664	602	1266
Positive Wassermann on Serum or Fluid		
155—23.3 per cent.	53—8.8 per cent.	208—16.4 per cent.
Positives Belonging to the Syphilitic Group of Psychoses		
127	28	155
Positives Not Belonging to the Syphilitic Group		
28	25	53
Per Cent. of Admissions, Excluding Those in the Syphilitic Group of Psychoses, Who Gave Positive Wassermanns		
5.2 per cent.	4.4 per cent.	4.8 per cent.

Distribution in the various clinical groups is shown in the following table.

Aside from the syphilitic group morphinism shows by far the highest per cent., 24.6 per cent. of 65 cases. Lowery notes a similar frequency in a small number of cases (4 positive in 7). Kaplan says that the serology of chronic morphinism is entirely negative. In the Biennial Report of the Illinois State Psychopathic Institute dated October 1, 1914, the intoxication group (morphine and cocaine) is credited with a higher per cent. positive than any other

except the syphilitic group. Most of their figures are, however, higher than ours, so that the excess in this group is not so great as we found it. The test should have been repeated some time after withdrawal in these cases but was not, and lumbar puncture was done on only one of the positive cases, as these patients were mostly voluntary and stayed only a short time. We are unable to attribute any special significance to this high per cent. and think it is probably due to the class of individuals who constitute the group.

TABLE II

FORM OF DISEASE AND PER CENT. OF POSITIVE SERUMS

	No. Cases	Male			Female			Total		Per Cent. Positive
		Pos.	Neg.	T.	Pos.	Neg.	T.	Pos.	Neg.	
Infective-exhaustive	10		2	2		8	8		10	
Alcoholism	61	2	50	52	2	7	9	4	57	6.5
Morphinism	65	12	34	46	4	15	19	16	49	24.6
Paresis	150	114	9	123	24	3	27	138	12	92
Tabo-paresis	9	5	1	6	2	1	3	7	2	77.7
Cerebro-spinal syphilis	2	1	1	2				1	1	50
Senile dementia	41	1	11	12	2	27	29	3	38	7.3
Arteriosclerotic dementia	38	1	26	27		11	11	1	37	2.6
Org. brain disease	11		7	7		4	4		11	
Dementia præcox	437	6	182	188	10	239	249	16	421	3.6
Manic-depressive	190	1	65	66	5	119	124	6	184	3.2
Involutional	22	1	6	7		15	15	1	21	4.5
Presenile	15		1	1		14	14		15	
Non-alco. hallucinosis	1		1	1					1	
Simple depression	3					3	3		3	
Paranoia	8		4	4	1	3	4	1	7	12.5
Epileptic state	26		17	17		9	9		26	
Psychoneurosis	10		4	4		6	6		10	
Traumatic insanity	1		1	1					1	
Defective (all grades)	121	3	76	79		42	42	3	118	2.4
Unclassified	40	1	16	17	1	22	23	2	38	5
Not insane	5		2	2		3	3		5	
Total	1,266	148	516	664	51	551	602	199	1,067	
Per cent. positive			22.3			8.5			15.7	

In none of the other large groups was there any marked discrepancy. In dementia præcox the per cent. positive is quite low. Little credence is given now to the high per cent. of positives in dementia præcox reported a few years ago. One would think from the type of persons who develop præcox that syphilis would be rather uncommon among them.

The syphilitic group of psychoses forms 10.7 per cent. of males, 4.9 per cent. of females, and 12.7 per cent. of the total in this series. This group with a total of 161 cases had 15 with negative serum, or 90.68 per cent. positive. Of paretics proper 138 out of 150 had

positive sera, a per cent. of 92. Figures given by others on the per-cent. of paretics who have positive serum Wassermanns are, Noguchi 80 to 100 per cent., Kaplan 90.9 per cent., White says 100 per cent. but gives no figures, Kraepelin says one half of one per cent. are negative, Lowery gives 87.5 per cent. positive.

Briefly then, in our admissions we find that 1 in 4 men and 1 in 11 women are syphilitic, and of these about ⅘ of the males and ½ of the females are of the syphilitic group of psychoses. Aside from the syphilitic psychoses only about 1 in 20 are syphilitic, men a little more often than women.

Wassermann Tests on Spinal Fluids

Wassermann tests on the spinal fluid were done on 372 of the 1,266 cases in whom the serum was examined, 294 of these being male and 78 female. Of our total admissions 27.7 per cent. are punctured, of males 42 per cent., of females 12 per cent. Suspected paretics, those having positive serum Wassermann, and cases presenting neurological findings make up this number. In clinically doubtful cases a second puncture was done and at times several, this especially in organic cases when the laboratory findings were negative at the first examination. Of the 199 cases having a positive serum reaction 163 had spinal fluid examinations.

Table III shows the number of cases in each group, aside from paresis, in which a fluid Wassermann was done and the number of these who had positive sera.

Table III

Psychoses with Negative Fluid Wassermann and Number of These Having Positive Serum

	Male		Female		Total	
	F. W. –	S. W. +	F. W. –	S. W. +	F. W. –	S. W. +
Exhaustive-infective	2		1		3	
Alcoholic psychoses	32		3	2	35	2
Morphinism	2	1			2	1
Senile dementia	1		3		4	
Asteriosclerotic dementia	16		1		17	
Organic brain disease	6		3		9	
Dementia præcox	46	2	19	8	65	10
Manic depressive	24		7	1	31	1
Involutional	2		1		3	
Paranoia			1	1	1	1
Epileptic state	5		1		6	
Psychoneurosis	1				1	
Defective (all grades)	18	1	4		22	1
Unclassified	8	1	4	1	12	2
Total	163	5	48	13	211	18

There was no case with a positive spinal fluid that was not classed either paresis, tabo-paresis or cerebro-spinal syphilis. There is no doubt that the serological findings in the fluid of syphilitics may be positive before the development of paresis and there is no reason why these individuals should not develop a functional psychosis, but we have found none that we considered as belonging to this necessarily very small group.

TABLE IV

SERUM AND FLUID WASSERMANN IN THE SYPHILITIC GROUP OF PSYCHOSES

		Number of Cases	S. W. Positive	+ S. W. %	F. W. Positive	+ F. W. %	++ W. W. %	+ W. W. %	+ I W. W. %	I + W. W. %	I I W. W. %	I W. W. %
Paresis	M.	123	114		118		112		2	6	3	
	F.	27	24		26		24			2	1	
	T.	150	138	92.0	144	96.0	136	90.7	2	8	4	2.7
Tabo-paresis	M.	6	5		5		5				1	
	F.	3	2		1		1		1		1	
	T.	9	7	77.7	6	66.6	6	66.6	1		2	22.2
Cerebro-spinal syphilis	M.	2	1		1				1	1		
	F.											
	T.	2	1	50.0	1	50.0			1	1		
Total syphilitic psychoses	M.	131	120		124		117		3	7	4	
	F.	30	26		27		25		1	2	2	
	T.	161	146	90.7	151	93.8	142	88.2	4	9	6	3.7

The serum and fluid Wassermann results in the syphilitic group are tabulated in Table IV. In this group there were 10 with negative fluid Wassermann. Of these 6 were of paresis proper (total of 150 cases), a per cent. positive of 96, 3 were tabo-paresis (total of 9 cases), 1 cerebro-spinal syphilis (total of 2 cases). In 6 cases in this group the serum and fluid Wassermann were both negative (3.7 per cent.), two of these being tabo-paresis (one confirmed at autopsy). Of the 161 cases 142 or 88.2 per cent. gave positive Wassermann on both the serum and fluid. Lowery gives 75 per cent. of 141 with both positive.

SUMMARY AND CONCLUSIONS

Of 1,266 consecutive admissions to Elgin State Hospital 15.7 per cent. gave distinctly positive serum Wassermann reactions. Of the 664 males 22.3 per cent. were positive, of the 602 females 8.5 per cent. were positive.

Including positive spinal fluids in cases showing a negative serum

the per cents are somewhat higher, male 23.3 per cent., female 8.8 per cent., total 16.4 per cent.

Of the 148 males with positive serum 120 belonged to the syphilitic psychoses. Of the 51 females 26 belonged to this group.

Excluding the syphilitic group of psychoses only 5.2 per cent. of male, 4.4 per cent. of female, and 4.8 per cent. of total admissions gave positive serum Wassermann reactions.

A high per cent. of positives was found in none of the other large groups except chronic morphinism where in a total of 65 cases 24.6 per cent. were positive. The explanation is offered that most of the morphine addicts are of a class likely to contract syphilis—more so than our general population.

Of the 1,266 cases 161 belonged to the syphilitic group of psychoses, 131 male and 31 female. Of these, 91.6 per cent. of males, 86.6 per cent. of females and 90.68 per cent. of the total had positive serum Wassermann.

Fluid Wassermann tests were done on 372 of the cases. Excluding paresis it was done on 211 cases and in none of these was the test positive.

Of paresis proper, 96 per cent. had positive fluid, of the whole syphilitic group, 93.8 per cent.

In the syphilitic group 3.7 per cent. had both the serum and fluid negative and 88.2 per cent. had both the serum and fluid positive.

In the differentiation of cases in insane hospital work we find the following to be practical working rules:

1. A positive serum Wassermann usually indicates paresis, especially in males.

2. A negative serum does not exclude paresis.

3. A positive fluid Wassermann practically always indicates paresis.

4. A negative fluid practically excludes paresis.

5. A positive fluid Wassermann is by far the sign most constantly present in paresis and constantly absent in other psychoses, which fact makes the laboratory findings more reliable criteria for diagnosis in *doubtful organic cases*, than uncertain clinical signs.

The mistake is more likely to be made clinically of calling a case paresis when it is not, than of calling paresis something else. An organic case *with physical and mental findings uncertain, but suggesting paresis*, which on examination of the spinal fluid shows a *negative Wassermann* is very much more likely to prove *not* to have a syphilitic involvement of the cerebro-spinal axis.

Society Proceedings

NEW YORK NEUROLOGICAL SOCIETY

March 6, 1917

The President, Dr. F. Tilney, in the Chair

IN MEMORIAM—DR. WILLIAM MABON

By George H. Kirby, M.D.

Dr. Kirby spoke of Dr. William Mabon, late superintendent and medical director of the Manhattan State Hospital who died February 9, 1917, at the age of fifty-six, referring to his birth and his early and later noteworthy psychiatric career, which extended over a period of thirty-two years. In the field of institutional work Dr. Mabon's industry, ability and devotion to duty won him rapid advancement; he held in succession a position on the staff of the New Jersey State Hospital at Morris Plains, at the Utica, N. Y., State Hospital, and as superintendent of the Willard State Hospital, of the St. Lawrence State Hospital, and of Bellevue and Allied Hospitals, as President of the State Commission in Lunacy (now the State Hospital Commission), and finally as superintendent of the Manhattan State Hospital, the largest insane hospital in the world. He gave freely, even when it involved personal sacrifices, his time and his services for any movement which concerned the welfare of the mentally afflicted. His advice and counsel were constantly sought by governors, legislative committees and hospitals boards, not only of New York but of various other states. He was very active in the work of the National Committee for Mental Hygiene, being a member of the Executive Council of that organization. Besides being a member of the New York Neurological Society he belonged to various other medical and psychiatric organizations as well as various social organizations. He was a wonderful teacher, a hard and efficient worker, of a sincere, generous and sympathetic nature, a wise counsellor and steadfast friend, a man of high ideals and great wisdom. To those who knew him his loss was deeply felt and to those who worked under him his memory would ever remain a guiding influence.

THE PLACE OF A PSYCHIATRIC CLINIC IN A PENAL INSTITUTION

By Bernard Glueck, M.D.

The speaker, director of the psychiatric clinic at Sing Sing Prison, spoke of the activities and of the purposes of this clinic, which were to meet the problems that confronted it according to individual reaction and not according to rules laid down for it, thus obtaining a broader view and a keen interest in the vital issues. The functions of a psychiatric clinic might and ought to be made to reach far beyond the limitations of mere diagnostic activity, so

that its usefulness might make itself felt in other directions. The clinic constituted a rational, scientific approach to the problem of anti-social behavior.

One of the functions of the clinic was as a therapeutic agency. In a prison, mental disturbances, not necessarily certifiable psychotic conditions, naturally existed in a ratio of about ten to one as compared with the incidence of mental disease among a free population. Timely interference might frequently prevent the outbreak of a psychosis. As a purely therapeutic agency there had been little for the clinic to do so far at Sing Sing, but the prisoners were fully alive to its inherent possibilities.

As to the value of the clinic as a research agency, material was being accumulated which would ultimately prove to be of considerable value in the study of anti-social behavior. For the present, attention was being especially focused on two problems which seemed to be of particular importance, namely that of the defective delinquent and that of vocational training of prisoners. With respect to the first, it was necessary to determine the precise relationship between mental defect and anti-social behavior. With respect to the second, it was being determined on the one hand which prison industries were most likely to fit the prisoner for greater economic independence upon his release, and on the other hand the suitability of certain prisoners for certain trades.

The third field of the psychiatric clinic was in the nature of an agency for propaganda and education in the broader sense. Prison officials were beginning to realize that the problem of the individual delinquent was primarily a problem in abnormal behavior, and that those experienced in matters touching abnormal behavior might well be consulted. For instance, since August, 1916, when it was established, the clinic had been furnishing reports of examinations of the men about to be paroled to the parole board, and these reports had been consulted before the paroles were issued. In short, the influence of the psychiatric clinic at Sing Sing had been very tangible and its effects very much in evidence. There had even been a tremendous change for the better in the general medical activies of the prison since last August.

The fourth direction in which the psychiatric clinic might and should be active in penal institutions was as a reformative and reconstructive agency. The psychiatric examinations of the men, eventually to be released, necessarily led to a dependable estimate of the individual; of his capabilities and disabilities; of his weak points and desirable qualities; this was all of tremendous advantage in the process of successfully helping the man in a reconstructive capacity.

It was a fact that a large percentage of prisoners were physically or mentally defective. In one instance, out of fifty consecutive admissions, thirty-seven, or seventy-four per cent., were definite medical cases, suffering from various disabilities, such as syphilis, mental defect, alcoholic deterioration, morphine deterioration and insanity; and a number of other grave affections of a physical nature, such as organic disease of the heart and pulmonary tuberculosis, were found. With this type of population, the various activities outlined for a psychiatric clinic would seem to be entirely justified and then if it did not succeed it would not be because the clinic had not made the most of its opportunities.

Dr. Smith Ely Jelliffe said that he had had the pleasure of knowing Dr. Glueck for a number of years and also of having heard him previously give some of the details of his work at Sing Sing. On many previous occasions he had taken opportunity to express himself in regard to a hopeless pessimism into which for years he had sunk every time he contemplated the thoroughly distressing inefficacy of the legal way of handling the problem of the criminal. The impossibility of stirring this legal incompetency always put him in mind of a couplet of Kipling's "Naulaka":

"Now it does not pay for the Christian white
To tackle the Indian brown,
For the Christian writhes and the Indian smiles
And he weareth the Christian down;
And the end of the fight is a tombstone white
And the name of the late deceased
And the epitaph drear, 'A fool lies here
Who tried to hustle the East.'"

But a ray of optimism was beginning to lighten the situation, primarily through Osborne's activities, secondarily through the psychoanalytic movement and now through the studies of Dr. Glueck and their far-reaching consequences; and the community might look, as he did himself, for a more enlightened understanding, on the part of those whose business it was to understand crime, of the reasons why so many anti-social units of the community became criminals.

Dr. B. Sachs said that after hearing the splendid presentation of the subject by Dr. Glueck, no one could doubt the justification for the psychiatric clinic in a penal institution. It must be a satisfaction to old New Yorkers to realize they were living in a progressive state in regard to penal institutions; the manner in which the study of criminology was being conducted at Sing Sing did credit to the industry of Dr. Glueck and of those associated with him.

It made the speaker feel that it was a pity one could not get at some of the other social problems in as thorough a manner. It showed that excellent work was being done for those who offended against the statutes of the law and equally as good work was needed in behalf of those who had other social grievances; who had not succeeded in making a success of life; who were suffering from poverty. Some day perhaps the poverty-stricken would be gathered together and the reason for their social defects studied; their guilt or innocence analyzed.

Coming to some of the details of Dr. Glueck's paper, there were a few thoughts that must have occurred to many. One was that contemplating this exhaustive study of conditions leading to social maladjustment, it was noticeable that every cause that had seemed to lead to this had been taken into consideration; but taking the community at large it was safe to say that the vast majority of those who did not become criminals had known these same conditions somewhere in their course through life; what was there in addition to this list of conditions that helped to develop criminals? There must be some one cause, or perhaps a few, more important than all the others. The offending criminal was the victim chiefly of heredity and environment, but that was true in all diseased mental conditions that did not necessarily develop into criminality. The problem would bear the closest study.

The speaker was glad to hear that Dr. Glueck had a word to say in denial of the general belief that the defective delinquent was necessarily a potential criminal. As he had had occasion to say before, it was a shame that the stigma of potential criminality should be borne by the family of one mentally deficient. By accident of life a defective might become a criminal, but the probability was not as great as had been declared.

The remarkably orderly behavior of 1,500 prisoners when the lights were accidentally turned out might be capable of another interpretation than that given by Dr. Glueck. Among an equally large group of free men this sudden darkness would undoubtedly be met by very different conduct, and it occurred to the speaker that the orderliness of the prisoners was not so much due to the rules of self-government as to the latent fear of punishment.

Dr. Glueck had presented an extremely interesting series of psychiatric studies, and the speaker would watch the further progress of this Psychiatric Clinic with great attention.

Dr. Edward D. Fisher thought that one of the causes that led to criminality had been overlooked. He had recently had occasion to talk with a friend, not a medical man, connected with the Elmira Reformatory who had started on the work there enthusiastically, but, following up the careers of many of the inmates who left there, came finally to the conclusion that there was little hope for the future of those who had been incarcerated in a penal institution.

Dr. Sachs had expressed very much what the speaker thought himself. The conditions indicated by Dr. Glueck as having caused the prisoners to become criminals corresponded to those of many normal individuals. Even from such environments emerged able, law-abiding men. Therefore, it seemed that Dr. Glueck's problem should be to find out what constituted the difference between the ordinary citizen and the criminal both coming from the same environment and with similar heredity.

Another point was this: The speaker did not believe the defective was naturally inclined to do wrong; he had little self-discipline, and the reason he took what he wanted unlawfully and went the easiest way and fell into the list of the criminal class was because it was often impossible to inculcate this in him.

Dr. L. Casamajor said that he had been wondering if it would not be necessary to change the definition of the word "justice" among others. At present the word meant forcing the criminal to give up something of his freedom, his happiness or his property as a recompense to society for having broken its laws. That might be justice to society, but was it justice to the criminal? The work now being done at Sing Sing showed how ineffectual was this old idea of curing criminality. Society had paid too much attention to what the criminal had done to it and now it was time to find out what society had done to the criminal.

There could be no such thing as a "criminal class." Dr. Glueck's diagrams showed some of the conditions which led to the downfall of this group of criminals, and these were the same as those of many other people not in prison. Criminals did not constitute a class, but each one was an individual problem of personal make-up and of environment and that meant society.

The closing years of the eighteenth century saw the birth of ideals of honesty and fairness in the treatment of the insane. Were these opening years of the twentieth century to see the birth of the same ideals in the treatment of another unfortunate group—the criminals?

Dr. William Steinach said that investigations along the line carried out by Dr. Glueck were to be commended and encouraged. There was necessity for a psychiatric clinic at Sing Sing, but there should also be one at the Tombs where the prisoners were first received and from where they were sent to the various prisons and reformatories of the State. Work of this character would furnish a large body of accurate data from which valuable deductions in criminology and anti-social conduct might be made.

The speaker had often wondered, not that there were so many criminals, but why there were not more. The intelligence of children was looked after through compulsory attendance at school, but their ethical and emotional side was supposedly developed at home, or through ethical and religious agencies. However, owing to the necessity of the mother being compelled to go out to work, there was no one to look after many children who, especially in the congested districts such as the East Side, were thrown upon the streets at a tender age; as a consequence, these children, having little or no home influence, grew up like weeds, and what emotional training they received was picked up haphazard. So it was not to be wondered at that they grew up ethical imbeciles, as it were, and as a result became anti-social and even criminal at times.

The problem, then, should also be attacked from this standpoint and an effort made to supply in some way this deficient moral and ethical education.

Dr. Frank Wade Robertson said that he had very much enjoyed Dr. Glueck's presentation, in which subject he had long had a personal interest. It might be a matter of historical interest, and perhaps he would be pardoned if he drew the attention of the Society to the fact, that at the New York State Reformatory, beginning with the year 1895–1896, great attention was paid to the study and treatment of the mentally defective. In 1900, when he left Bellevue and went to Elmira, at the request of the board of managers he made a careful analysis of the population of the Reformatory. This resulted in the discovery that out of about 1,300 men, seventy were insane and they were subsequently transferred to the Matteawan State Hospital. Much criticism resulted, the insanity of these men being attributed to their treatment at Elmira, but as a matter of fact careful examination showed that the insanity had preceded their commitment and had undoubtedly been a factor leading to their criminal behavior. As the speaker recalled the figures, ten per cent. of the inmates at Elmira were epileptics, thirty per cent. were mentally deficient and fifty per cent. were physically below par.

The question of discipline in prison was very important and had much to do with the development of mental disease. Infractions of discipline occurred in ratio with the requirements of discipline; strict rules met more infractions than lax ones.

The treatment of criminals would eventually prove to be a medical problem. Under present conditions, this was not feasible, for the head of an institution containing over a thousand inmates could not give individual care or attention to them; it was impossible for him to actually know that many personally. In the General Superintendent's Report for 1901, the speaker had suggested for Elmira a division of the population into groups of one hundred or more and that a psychiatrist be put in charge of each group that a careful study might be undertaken with a view to securing a better understanding of their mental endowments, thus helping the discipline and assisting the men toward a proper conception of their obligations to society. This had not yet been done. Nevertheless the records of the histories of the men who had been discharged or paroled from Elmira showed that only fifteen per cent. were later convicted of crime; fully sixty per cent. did not again resort to it.

The speaker felt that crime was essentially a medical question and that criminals could be properly handled only with the advice and assistance of medical men and trained psychiatrists particularly, and that their counsel should be sought for and acted upon by parole boards with great advantage.

Dr. Emil Altman said that it seemed to him there was little support for a belief that certain localities, or groups, or races, or religions could be indicted in a discussion of anti-social qualities for each had equally given their quota of high contributions to society and to civilization. There were many people in prison who had never known the environments of the poorer quarters of cities where children had few advantages and yet many grew up right-thinking and right-living men and women. It was a mistake to lay too much stress upon early environment, which did not, as history had shown, invariably predispose to either good citizenship or to criminality.

In closing the discussion, Dr. Glueck said he would answer Dr. Sachs's query by stating that he did not believe it was fear of punishment that made the assemblage of 1,500 men so orderly when the lights were suddenly extinguished. Greater fear of punishment must have existed under the old system of government by force, for punishment was not now what it was under the old regime, and yet in those old days pandemonium would have broken loose under such conditions. The men realized the value to themselves of

good behavior. The group of men outside the prison might riot under such conditions for there was no reason for them to think they would be judged and condemned for it, but the inmates of Sing Sing realized more was required of them and they tried to live up to it. The fact that someone had told them he believed there was good in them brought out the good; they were stimulated to show he was right.

The system at Sing Sing had not changed in any degree under the present warden from what it was during the regime of Osborne. This was in spite of the fact that Warden Moyer came to the prison prejudiced against the system by hearsay. But the idea of self-government had no better friend to-day than the warden who had seen it practically illustrated.

In speaking of some of the seemingly etiological factors of crime, the speaker did not intend to convey that the man who had one or more of them was destined to go to prison, or that they were the essentials of criminal behavior. They were put on the charts for purposes of study and comparison. A man with dementia præcox might not become a criminal, but it was easy to understand how he might become one, if he had delusional ideas, unless he was protected. There were many more defectives outside of prison than in it, and it was largely a question of proper protection, proper home environment and care. If there was any one thing that frequently occurred in the histories of these men it was this: a number of them had never succeeded in adequately differentiating themselves from their environment, never had a clear-cut conception of the rights of the individual. There was no distinction for them between mine and thine and they did not comprehend the laws protecting private property. In their own homes it was no crime to take things from each other, and this easy indifference to the property rights of brother or sister led to crimes of acquisition away from home.

The speaker said he was familiar with the excellent work Dr. Christian was doing at Elmira. But it seemed to be true that most juvenile penal institutions did not lead to reform, but tended to perpetuate criminal tendencies.

THE TREATMENT OF PARESIS BY INTRAVENTRICULAR INJECTIONS OF SALVARSAN

By Norman Sharpe, M.D.

Dr. Sharpe presented five of the cases. He said that most of them had so far responded very satisfactorily, improving mentally and physically and being able to do work they could not do before, which, from a sociological standpoint alone, made this operation worthy of fair trial.

There were thirteen cases in the series reported. In all these, both the clinical symptoms and the serology were positive of paresis. In the first patient injected intraventricularly (January, 1915) salvarsanized serum was used. The remaining twelve cases received solutions of neosalvarsan and salvarsan in blood serum. The first injection in each case was given under ether because of the trephining, but all subsequent injections were given under local anesthesia. There had been no deaths and no accidents. In some of the cases the temperature rose to 101° or 102° for twelve to twenty hours following injections and the pulse to 110. This reaction occurred for the most part in those patients given ether. At no time were the reactions severe enough to give rise to any uneasiness. The majority of cases were out of bed the second day and left the hospital on the fourth day. Of the thirteen cases, five had returned to work following several months of quiet and rest after treatment and had been at work for four months to seventeen

months and were now at work. Examinations were made at intervals in all the cases to guard against possible recurrence.

In the first cases, the dosage for each injection was 6 10 mg. salvarsan. In the cases lately injected double this dose had been given with no more reaction, either of temperature or pulse-rate, than when the smaller dose was used. Thirty-seven injections in all were given and the results showed that this method could be accomplished successfully without any danger to the patient at all. The effect of the injection when made into the ventricle had a far wider distribution than when made into the spinal fluid. Nine of the thirteen cases showed improvement of the clinical symptoms of paresis and in some cases there was apparently definite arrest of the disease process.

The advantages of the intraventricular method were apparent. Placing the serum in the lateral ventricles was placing it subarachnoidally at once, and also insured an even distribution over both hemispheres in juxtaposition to the cortical cells before it was drained out of the cranium. Furthermore, the ventricular puncture obviated the lumbar puncture which was necessary in the subdural method before the serum was introduced. Again the ventricular method brought the serum in contact with tissues that were not reached by the subdural route, namely, the ventricular system itself and the base of the brain. Finally, it had been shown that the perivascular sheath spaces extending between the neurons deeply into the brain substance and draining it of waste products, communicated directly with the subarachnoid space. A serum, therefore, placed beneath the arachnoid membrane, came into contact with the brain tissue and this end was achieved best by the ventricular method.

In regard to the number of injections that could be given, the speaker believed that in this one should be guided by the serology and by the clinical symptoms. But if the serology did not show progressive improvement steadily under treatment, the clinical symptoms should be the guide. The number of injections naturally varied with different patients and according to the extent and the severity of the disease process. It had been found safe to gradually increase the amount of salvarsan in the serum and in this way to reduce the number of injections necessary.

Five conclusions had been arrived at in regard to this method. Summed up, they were: (1) In comparison with the serious nature of paresis, the hazard of intradural treatment, by whatever method, was of little moment; (2) on experimental and clinical grounds, both the subdural and intraventricular methods were superior to the intraspinal route in the treatment of paresis; (3) from an experimental and theoretical standpoint, the intraventricular method was superior to the subdural route and safer; (4) the intraventricular method, with careful technique and a due regard for the anatomy of the brain and the delicate nature of the tissues invaded, was practically free from danger; (5) if the freedom from unfavorable symptoms so far achieved in intraventricular injection could be maintained, it would be imperative so to treat paresis in its earliest stages, with greater chance of marked improvement and perhaps permanent arrest of symptoms.

On account of the lateness of the hour, discussion of the paper read by Dr. Norman Sharpe was postponed until the next meeting of the New York Neurological Society on April 3, 1917.

TRANSLATIONS

VEGETATIVE NERVOUS SYSTEM

By H. Higier, M.D.

Authorized Translation by Dr. Walter Max Kraus, A.M., M.D., New York

(*Continued from page 465*)

The autonomic vasodilators pass through the posterior sensory roots (Stricker).

The following observations indicate that the vasodilator and pain fibers take the same course: (*a*) Stimulation of sensory fibers causes both pain and cutaneous hyperemia; (*b*) paralysis produces anesthesia and cutaneous anemia. Certain pathological conditions as meningitis add to the proof, for there occurs simultaneously increased irritability of the sensory nerves (hyperalgesia) and of the vasodilators (dermatographia). After experimental section of the posterior roots, Bruce found absence of the initial hyperemia of the inflammatory reaction in the corresponding skin area, an evidence of stimulation of the dilators.

The diagram of Rudzki-Hornowski, based upon the work of Ranvier, Schiff and Gianuzzi, shows the course of the vasoconstrictor fibers in the perpihery. According to these authors there is a layer of ganglion cells in the adventitia. From these, fine fibers pass to a new plexus in the media. The fibers from this plexus end in the musculature of the media, *i. e.*, in the elastic, radiate muscle fibers of Dürck or in the intima.

Most of the peripheral vasomotor manifestations are reflex in character, the sensory stimulus going to the spinal cord. We must recognize that a vasomotor reflex occurs in the way as any other reflex activity, as tendon or skin reflexes. A sensory stimulus goes to the spinal cord, the stimulus is now carried to another cell and thence to the motor tract. It is thus possible to divide the disturbances of vascular reflexes according to the location of the causative trouble—

1. Disturbances of the sensory part of the arc.

2. Disturbances of the motor part of the arc.
3. Disturbances of both parts of the arc.
4. Disturbances of the central influencing paths not part of the arc.

According to Langley, vegetative nerve cells cannot of themselves cause true reflexes. The intervention of the central nervous system is necessary to their production.

Under normal conditions the vessels are in a state of medium fulness due to the normal simultaneously acting, antagonistic innervation of the dilator and constrictor nerves. This causes the normal color of the skin. Just where the endogenous vasotonic hormones act, upon vessel musculature or nerve endings, is still not finally settled. The nerve endings are most probably the site of action, in spite of what we know of the action of barium upon vessel musculature, and of antimony upon capillaries.

Physiological variations in the tone of the vessels of the skin occur as soon as there is a flow of blood to or from—

1. The brain .....Sleep. Emotions.
2. The stomach .....Height of digestion.
3. The periphery .....Exercise. Overheating.

Gradual variations are found in individuals with increased irritability of the vascular system (neurasthenia). This manifests itself as dermatographia or exudative wheal production following energetic skin irritation. Reversal of this reaction—local anemia following skin irritation, general pallor after overheating the body—are rare occurrences.

Vasomotor disturbances play a large part in clinical pathology, but their diagnostic value for localization is limited. This is because we do not know the location of the various vascular centers in man, nor the vicarious activities of each of the three centers in cases where there are lesions of one or another.

Many authors believe that there exists an antagonism between the bulbar autonomic centers and the spinal sympathetic centers, similar to that existing for the eye, the lachrymal and the salivary glands. This theory assumes that where the autonomic has any influence, it is vasodilator, while the cervical sympathetic acts as a constrictor. Pharmacological experiments bear out this theory of the antagonistic action of the two vasomotor areas.

The usual bases for conclusions give no clue as to the site of central angioneurotic disturbances. Nor do the results of pharma-

cological investigations (vasotonic, centrally acting drugs), nor do accessory symptoms as the initial pallor of an epileptic attack, or the skin hyperemia in capsular, pontine or bulbar hemorrhages.

Nor is the situation much better as regards the genesis of peripheral hyperemias and anemias.

1. Stimulation of the vasodilator fibers seems to be responsible for the "tonic hyperemias" in neuralgia, neuritis, febrile, toxic and infectious erythema and for certain vasomotor neuroses of the skin as erythromelalgia with spontaneous pain (Weir Mitchell) and erythromelalgia with hyperidrosis and hyperalgesia without pain (Hess-Koenigstein). When erythema follows long-standing cyanosis, there is transudation with stasis following slowing of the blood-stream due to vasodilation. The above-mentioned clinicians in connection with the mechanism of all these states of vascular dilation justly call attention to the newer work of Schwarz and Lemberger. These authors showed that very small amounts of acid in the blood give rise to vasodilatation. They claim that diabetic acidosis as well as the acidosis of fever and severe abdominal disturbances may serve as explanations of the accompanying erythema.

Some authors, Kretschmer and Kleissel, maintain that there is a diminution of the alkalinity of the blood in sympathicotonic individuals. Adrenalin is therefore destroyed more slowly, accumulates in the blood and stimulates the sympathetic system. Under the heading "spastic anemia" due to lasting vasoconstriction of the smallest vessels are to be included all conditions in which, though the color index of the blood is normal, there is an apparent anemia. Among these conditions are pseudo-chlorosis, chronic nephritis, malaria, tropical anemia and neurasthenia. Hess and Koenigstein include pseudosclerosis (Schlayer and Fischer) in this group. In this condition sclerosis is simulated by the vascular spasm.

Those conditions which are purely paroxysmal are also considered of nervous origin: (1) Hemicrania with angiospastic anemia of the corresponding half of the head; (2) asphygmia alternans (Halbey) in which the radial pulse is absent on side; (3) the vasomotor neurosis of Nothnagel with pallor, coldness, and absence of feeling in the affected extremity (doigts morts); (4) Raynaud's disease; (5) intermittent claudication either of the vessels of the periphery or the viscera, the arteries being in some cases normal, in others sclerosed. The pain accompanying this condition is due to stimulation of the fibers and ganglia in the blood vessel walls.

The vasomotor disturbances occurring in Czerny's exudative diathesis of young children, the vasotonic symptom complex of Ham-

burger in young adults and the vagotonia of the blood-vessels occurring in elderly men (Eppinger), all seem to belong to the same group. They may be summed up as vasoneurosis which manifests itself as a regional paroxysmal anemia of the vessels of the brain, heart, face or extremities accompanied by transitory fainting, precordal pain, pallor of the face, and coldness of the hands and feet.

Intermittent intestinal claudication or dyspragia is according to Hess analogous to these vascular crises of the skin. It occurs, however, in the internal organs. The various types are: (1) Paroxysmal constriction of the intestinal vessels (Ortner, Schnitzler); (2) spasm of the renal vessels following sensory stimulation, the dyspragia renalis of Huchard; (3) spasm of the coronary vessels, the angina pectoris vera and vasomotoria of Nothnagel; (4) all the visceral pains associated with rise in blood-pressure, included by Pal under the general heading of *vascular crises*.

Clinically we have made the error of becoming accustomed to attitude all vasomotor symptoms to overt or underfunctioning of the vasoconstrictors.

The example of typical paralysis of the vasoconstrictor nerves is erythromelalgia. The example of typical spasm of vasoconstrictor nerves is Raynaud's disease or angiospastic gangrene and "dead fingers." The example of typical hyperirritability of vasomotor nerves is acute angioneurotic edema (Quincke) in all the varieties either of the skin or mucous membranes, periodic hydrathiosis (hydrops articulorum intermittens), periodic flow of gastric juice (gastrosucchorea periodica), sudden blushing of the youthful either with or without erythrophobia and paroxysmal pallor accompanied by a functional ischemia of the head.

So much for the vasomotor neuroses "sensu strictiori." The occurrence of vasomotor symptoms accessory to diseases of the brain, spinal cord and periphery is very frequent.

The simplest example of a vasomotor abnormality of peripheral origin is that due to mechanical or functional paralysis of the cervical sympathetic on one side. As a result there is unilateral vasodilation of the face. This is not constantly present. The peculiar inconsistency is possibly explicable by incompleteness of the lesion, mixing of stimulation and paralysis or by the experimentally proved hyperirritability of the peripheral part of sympathetic nerves following section.

In disease of the cortex, Jacksonian epileptic attacks are accompanied by severe vasomotor manifestations, pallor or redness.

In cerebral hemiplegia there is not unusually a lowering of pulse-

rate, blood-pressure and temperature as well as edema upon the affected side at the beginning of the disease.

Just how the initial hyperemia due to paralysis of the vasoconstrictors is replaced by coolness and pallor is not definitely known. If the degree of muscular paralysis paralleled the definite residual vasomotor anomaly, this latter could be ascribed to the inactivity of the paralyzed muscles and to the consequent venous stasis and diminished production of heat. Where this parallelism fails to be present, one feels that the bulbar center becomes accustomed to regulate vasomotor activity uninfluenced by the central neurone.

It is probable, that in vasomotor anomalies of spinal origin, neighboring vasomotor centers act vicariously, and replace the centers which are out of commission. In the early stages of myelitis and tabes dorsalis the vasoconstrictor fibers are stimulated as the marked pallor and subjective feeling of cold indicates.

In many respects, clinical data coincides with the results of experimentation. Up to now our knowledge is almost entirely derived from investigations on animals. There have been, however, investigations on the degree of vasomotor reaction following stimulation of healthy and diseased parts. Biach and Bauer have shown that if a normal extremity is cooled, its temperature falls, first, due to a purely physical removal of warmth, and, second, due to vasoconstriction with a resultant, poorer blood supply. This vasoconstriction is due on one hand to the direct effect of the cold upon the ganglia in the walls of the blood-vessels, on the other, to reflex central vasoconstrictor stimulation. It follows therefore that under normal conditions, there is a greater fall of temperature in general biological reactions than can be accounted for by the strictly physical influences. At any rate, an excessive loss of warmth is avoided in this way.

In those cases where there is paralysis of the vasomotors, the reflex vasoconstriction with its resultant cooling is absent, and thus the skin temperature falls less than under normal conditions. Corresponding to this Biach and Bauer have found in hemiplegics that the paralyzed side is cooled less than the healthy side. This does not always hold, since there are also cases in which, in spite of diminished vascular tone, there is no abnormal reaction of the vasomotors, and cases in which, in spite of equal temperatures, before the experiment there is a slight drop in the affected limb, showing that there exists some disturbance of the vasomotors.

The animal experiments of Freund and Strassman upon the spinal cord show how great the control of general body temperature by

the vasomotors really is. After section of the cord in the dorsal region there is immediate paralysis of the vasomotors with a general drop of body temperature. The organism seeks to neutralize the loss of heat by an increase of the internal metabolism, provided the room temperature remains between 18° and 31° C. Temperature regulation is greatly disturbed and the animals become cool if their loss of heat is not diminished by being wrapped up or by raising the external temperature. Section of the cord in the cervical region causes the animal to lose the power of regulating temperature either physically or chemically. Its body heat is only retained at a normal level when the external temperature lies between 28° and 31° C. When the external temperature becomes higher or lower the internal temperature of the vasomotor-paralyzed animal varies considerably.

The plethysmographic observations of Stursberg on patients with normal spinal cords and on those with spinal cord diseases are of distinct practical value. These observations have shown that if one forearm is cooled, the plethysmographic curve of the other arm sinks, while it rises if the feet are cooled. They show furthermore that section of the cord in the mid-dorsal region in man causes a marked disturbance in the innervation of the skin blood-vessels. The vessels are divided into two separate areas. The vessels of the upper half act differently from those of the lower. This is of course not so in the normal individual. This is shown by the fact that upon stimulation of the feet the vasoconstrictor action is found only in the lower limbs, a limitation not normally found. The vessels of the upper half are affected in the opposite fashion. This is due probably to a passive distention of the vessels due to a general increase of blood-pressure.

These same experiments have shown that the vasocontrictor fibers for the upper extremities arise from the spinal cord in man above the seventh thoracic segment. They also show that the nerve fibers which carry the sensory stimuli from the lower extremities to the vasoconstrictor fibers of the upper extremity, also pass through the seventh thoracic segment. Thus the coördination of the vasoconstrictor control of the upper and lower halves of the body lies in this center of the spinal cord. These observations do not differ materially from the older ones, according to which the upper extremities received their vegetative fibers through the roots of the fourth to tenth thoracic nerves, their rami communicantes passing through the ganglionated cord and the stellate ganglion to the brachial plexus, or as Claude Bernard believed through the sympathetic to the arm vessels without the assistance of the brachial plexus.

The Mosso-Lehmann plethysmograph gives the most precise information regarding the large movements of the blood volume resultant upon psychic activity, changes in cardiac activity or the state of contraction of the blood-vessels. The best method of obtaining information about all vasomotor activities is by combined measurement of the volume of the arm and the abdomen (Fig. 8, *a, b*).

If the cause of the vasomotor change be a change in the heart beat then according to Weber there must be equal increase in volume in all other parts of the body. If a vasoconstriction be the cause, there must be an increase in volume in some other part of the body, in this case most probably in the abdominal organs. If this was not the case active dilatation of the measured blood-vessels occurred.

A closer study of the separate results of the investigation of the normal movements of blood during psychic activity may be accomplished with the help of the table arranged by Weber. Many noteworthy facts may be gained from it.

	Brain.	Ext. Parts of the Head	Abdominal Organs	Extremities and Ext. Parts of the Trunk
During movements	×	−	−	×
During mental work	×	−	×	−
During fear	×	−	×	−
During a pleasant feeling	×	×	−	×
During an unpleasant feeling	−	−	×	−
During sleep	×		−	×

× = increase, − = decrease of the volume of blood in the part referred to.

The following conclusions may be drawn:

1. The blood-vessels of the brain act exceptionally to those of the rest of the body.

2. It is controlled by a separate vasomotor center, as has been stated above.

3. During unpleasant feelings there is dilatation, during pleasant, constriction of the abdominal vessels. Thus there is movement of the blood volume from within to without during pleasant feelings, and from without to within during unpleasant feelings.

4. Sudden and conscious feelings of pain cause vasodilatation of the blood-vessels of the face.

5. Emotions (joy, shame, anger, sorrow) cause changes in the vasomotor innervation of the face and skin over the skull.

It is worth adding that the flow of blood into the extremities during activity of the part is not entirely a mechanical result of the movement, but is doubtless also correlated to mental activity. (*a*)

the flow of blood takes place when the other hand is moved; (*b*) the same effect is brought about if no movement is made, and only a suggestion of a movement is during the hypnotic state; (*c*) the flow of blood into the extremities is absent if only passive movements of the extremity are made. (Fig. 9*a*, *b*).

Profuse general or local sweating and mild cyanosis of the peripheral parts are signs of vagotonia in which the tone of the vasodilator autonomic is increased. In vagotonics urticaria occurs in conjunction with eosinophilia and increased tolerance to adrenalin and carbohydrates.

(*To be continued*)

Periscope

Archiv für Psychiatrie und Nervenkrankheiten

Abstracted by Dr. E. W. Taylor, of Boston

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XXVII. Menstruation and Psychoses. P. Jolly.
XXVIII. Recognition of Feeblemindedness through Writing. G. Lomer.
XXIX. Review of Cases from the Navy Treated and Medico-legally Examined in the Psychiatric and Nerve Clinic at Kiel, in the Years 1901–1910. M. Wassermeyer.
XXX. Hysterical and Catatonic Situation Psychoses. Raecke.
XXXI. The Syndrome of Cerebello-pontine Angle Tumors. G. Fumarola.
XXXII. Chronic Paranoid Diseases. R. Krambach.
XXXIII. Death Following the Epileptic Attack. O. Hebold.
XXXIV. Ludwig Edinger's Sixtieth Birthday. A. Wallenburg.

XXVII. *Menstruation and Psychoses.*—As a result of a study of the relation between menstruation and psychoses, Jolly reaches the following conclusions: A cessation of the menses for at least two periods occurs, especially in acute or acute-beginning psychoses, but may occur in cases of chronic psychosis. In general, it is a favorable sign when menstruation is reëstablished, but this must not be too strictly regarded. Amenorrhea often occurs in general paralysis and especially in tabo-paralysis; very frequently, namely, in four fifths of the cases, amenorrhea is found in amentia, a not unnatural consequence when the stormy course of this psychosis is considered and the frequent involvement of the organism as a whole. In catatonic and hebephrenic psychoses, cessation of the menses occurred in half of the observations made. There was seldom disturbance in the paranoid psychoses, and none in chronic paranoia. In melancholia, amenorrhea occurred in half, and in mania, in about a third of the cases. Imbecility, hysteria, and epilepsy showed slight disorder of the menstrual function. The author makes certain observations relative to disturbance of internal secretions in connection with certain psychoses and menstruation.

XXVIII. *Feeblemindedness in Writing.*—Lomer has studied the defects of writing in connection with mental enfeeblement and believes that a definite determination of the degree of feeblemindedness may be reached by a study of the nature and degree of variation of normal writing. The more important graphic symptoms are spreading of letters, tremor, incorrect arrangement of the writing, and very large characters. A definite parallelism may be shown between the mental disturbances and the writing defect, so that a placid temperament, a depressed state, a tendency to untruthfulness, all may show adequate reproduction in the writing. It is the belief of the writer that a definite law may be established which will determine at once the degree of any given dementia. Further investigation is necessary, whether a law of this sort can be regarded as universally applicable. If so, it is deserving of further study.

XXIX. *Medico-legal Problems in the Navy.*—Wassermeyer reviews in detail cases from the naval service occurring in the hospital during a period of

ten years, numbering 234. Of these, 48 suffered from hysteria, 20 from epilepsy, 20 from dementia paralytica, 23 from imbecility, 24 from inebriety, 34 from simple mental disturbance, 11 from neurasthenia, and the remainder from unclassified conditions. The individual history of these cases is given in detail.

XXX. *Hysteria and Catatonic Psychoses.*—Raecke studies the diagnosis of hysterical and catatonic conditions and concludes that in the course of dementia præcox hysterical symptoms may supervene which are alone caused by the situation, and which subside when the situation of the patient is changed. It is desirable to study further the symptomatology of these conditions in order that the differential diagnosis between the two may be more accurately made. The generally-used term *degeneration psychosis* for psychogenic diseases brought about by prison confinement is unfortunate.

XXXI. *Cerebello-pontine Angle Tumors.*—Fumarola presents a clinical and pathological contribution to the subject of cerebello-pontine tumors. He discusses briefly the development of our knowledge of this type of tumor, and reports seven cases. He finds no satisfactory etiology. The symptomatology is in general a review of knowledge already gained, as is the discussion of diagnosis. The writer finds, as has generally been observed, that these tumors are circumscribed and often capable of removal. He recognizes three general types, following Jumentié and Sézary, but acknowledges the variety of histological form of tumors occurring in this region. The importance of the acoustic nerve in relation to these tumors is recognized, and in the early cases the appearance of the tumor wholly within the internal auditory canal. A voluminous bibliography follows this article, together with a number of illustrations.

XXXII. *Paranoid Disease.*—Discussing chronic paranoid diseases, paraphrenia, and paranoia, Krambach believes that in those cases which we may consider as paraphrenics in Kraepelin's sense no sign in the condition of the intellect is to be found which separates them fundamentally from the other chronic paranoid disorders of dementia præcox. In all cases of paraphrenia, in part at the time of observation, in part in earlier phases, symptoms of dementia præcox may be seen of varying degree. Therefore, paraphrenia appears to be merely a condition of a protracted schizophrenic affection in which the appearances of emotional and volitional disturbances are forced into the background by the activity of the paranoid schizophrenic conceptions.

XXXIII. *Epilepsy and Death.*—Hebold reports the observations made through a period of twenty years of deaths in epileptics so far as they stand in relation to the epileptic attack. As a result of this investigation, he finds that death has occurred in the following ways: (1) Brought on by the attack itself through heart weakness, ruptured heart, brain hemorrhage; (2) through broken neck, fractured vertebræ, and, more rarely, fractured skull, in consequence of the fall; (3) suffocation while lying in bed, being caught between objects, or in lying face down on the floor; (4) suffocation through inhalation of materials into the lung or burning through a fall into a fire; (5) suicide in a state of disturbed consciousness at the end of an attack. Death may also occur (6) through the immediate effect of the attack leading to brain hemorrhage brought about by arteriosclerosis or through brain tumor; (7) through striking the head in the attack, with or without fracture or hemorrhage; (8) through a fall into hot fluids; (9) through infection from a wound caused by a fall.

E. W. Taylor.

Review of Neurology and Psychiatry

ABSTRACTED BY DR. CHAS. E. ATWOOD, NEW YORK

(Vol. XIII, Nos. 4, 5 and 6)

The New Psychiatry. W. H. B. STODDART.

These three numbers comprise the Morison Lectures for 1915, delivered at the Royal College of Physicians, Edinburgh, by Dr. Stoddart, lecturer on Mental Diseases at St. Thomas's Hospital, London, and are devoted to the principles and practice of psychoanalysis.

The first lecture treats of Fundamental Psychical Mechanisms and takes up Instinct, the Herd Instinct, the Unconscious, Psychical Determinism, Complexes, Conflict, and the Sexual Instinct. It is largely definitive. A conclusion reached is that our unconscious mind is on a lower, less mental, more neural, and more animal plane than our conscious mind, and is pervaded with sexual thoughts and desires. The lecturer states: "Indeed I believe that I am not misrepresenting Freud when I say that he thinks that the unconscious mind is almost all sexual; but then it must be recognized that he (Freud) uses the word 'sexual' in a very wide sense. Attraction, friendliness, shame, modesty, and disgust are all included under this term by Freud. Nevertheless, psychoanalysis has revealed that, if our repressed mental material had free play, uncontrolled by consciousness, every one of us (quoting Ernest Jones) 'would probably remain a selfish, impulsive, aggressive, dirty, immodest, cruel, egocentric, and conceited animal, inconsiderate of the needs of others, and unmindful of the complicated social and ethical standards that go to make civilized society.' To the ordinary man whose 'herd instinct' has repressed such intolerable features of his character into the unconscious, and converted him into a moral, social, ethical, modest and æsthetic being, it is incredible and absurd that his mental constitution and disposition are fundamentally so brutal. He is prepared to accept the fact that his anatomical and physiological characteristics are identical with those of the lower animals; but his mental characteristics—never! And so from time to time we find in the medical journals energetic objections to our new psychiatry, of course by people who have not studied it. These letters are interesting examples of what is technically known as the 'resistance,' and are unwilling arguments in support of Freudian doctrines."

The lecturer ascribes to Hughlings Jackson a prophecy of the fundamental principles of the new psychiatry. Jackson pointed out, he says, in 1894, that there is a positive and a negative element in every case of insanity, the negative being defect of consciousness or loss of *some* consciousness, the positive being activity of the consciousness remaining (on a lower level). For example, when a patient believes himself to be the Emperor of Europe, Hughlings Jackson pointed out that the chief defect (negative element) of consciousness is that he does not know that he is a clerk in the city, and the notion that he is the Emperor of Europe is due to the positive activity of a lower level of mentation. This is exactly what has been proved by our modern school of psychiatry. So far as consciousness is concerned, we know that it always loses something of its content, a complex which is repressed into the unconscious, while the positive symptoms of an insanity are due to the distorted activities of the unconscious (a lower level of mentation). While, therefore, we study and admire the insight and patient labor of the great Austrian psychologist, Professor Freud of Vienna, let us at the same time pay homage to the great English father of neurology, who taught us to understand the nervous system, Dr. Hughlings Jackson.

In the Second Lecture is contained a description of psychoanalysis, its

aims, objects, uses, and technique. It is mentioned as a method of obtaining a complete history of the patient's illness and an insight into his modes of thought such as can be obtained in no other way. It unearths his hidden, repressed and therefore unconscious complexes, especially those having relationship with his special illness. These are put in their true light, a reëducation takes place whereby the patient acquires self-realization and develops his character and personality. His recovery then results as a matter of course.

Part of the mental equipment of a successful psychoanalyst consists of a knowledge of ancient mythology. Psychoanalysis of the many beautiful stories of the ancients gives him a thorough knowledge of the development of human thought. A study of the symbols of the Church and of the Egyptians, Indians and Chinese, of the totemism of the North American Indians, and the superstitions of uneducated people is also helpful; for they all throw light upon the history of the development of the human mind. In each one of us our mental development is to be regarded as a recapitulation of the mental development of the human race, just as the development of the embryo is a recapitulation of the anatomical development of man.

The classes of mental disorder suitable for analysis are the neuroses, the psychoneuroses, and certain psychoses, notably manic-depressive insanity (between attacks), dementia præcox (katatonia), and paranoia.

Many hysterical patients can be cured by other means, and there is no necessity for psychoanalysis until such means have failed, or unless persistent relapse occurs after the treatment.

For the compulsion neurosis, imperative ideas, obsessions, morbid fears, irrepressible thoughts and morbid impulses, there is no other treatment than psychoanalysis, which is remarkably efficient and satisfactory.

The technique of psychoanalysis is described in the second lecture, including association tests, dream analysis, etc. Libido, transference, etc., are defined, and an attempt is made to simplify the workings of psychoanalysis by a few examples. The mechanism of dreams is alluded to as almost exactly the same as that of the insanities. The mechanisms of distortion in dreams are exactly the same as those which produce symptoms of the psychoses and psychoneuroses, viz., displacement, condensation, symbolization and dramatization.

The main subject of the Third Lecture is "The Applications and Results of Modern Psychological Discoveries in and Therapeutics of the Various Neuroses, Psychoneuroses, and Psychoses." The auto-erotic etiology of neurasthenia is recognized and the necessity, in some cases, of carrying out a certain amount of psychoanalysis in order to trace and uproot the complexes which constitute the foundation of any irregular sexual impulses.

Sexual abstinence is spoken of as the chief cause of the anxiety neurosis. Sublimation of the sexual impulse into other interests is the most practicable remedy and can be obtained as a rule by a short analysis.

The psychoneuroses and psychoses are compromise formations between repressed wishes and the forces which repress them; that is to say, that their mechanism is exactly the same as that of dreams. The obvious differences between dreams and the psychoneuroses are that, in the one, the subject is asleep and desires to go on sleeping, while, in the other, he is awake; and also that dreams are normal while psychoneuroses are abnormal. Yet even these differences are not absolute; for, on the one hand, certain neurotic symptoms, such as somnambulism, night terrors and nocturnal paralyses, are definitely associated with sleep, and, on the other hand, we have to bear in mind the day-dreams of certain hysterical patients. Again, certain anxiety dreams occur in neurotic patients only.

The similarity is therefore closer than appears at first sight, and in both

we have exactly the same mechanisms of distortion—the frequent importance of minor symptoms, condensation, transference of the affect, symbolism, somatic displacement, ellipses, inversion and dramatization.

The repressed "Cinderella" may become an asylum queen, a case of acute mania, develop delusions of persecution, or become a hysteric. The varieties of hysteria are described at some length, and Freud's theory relating to the recognition of the infantile development of sexuality. Cognizance is taken of the fact that the early views of Breuer regarding the effect of incidents of sexual import during childhood have been abandoned by Freud and others for many years. Ordinary infantile ideas tend to fade with time, but sexual infantile memories are accentuated during normal biological development and are reinforced at puberty and during later life in a way in which no other experiences are strengthened; but inasmuch as they can then find no appropriate sexual outlet or reaction, they are repressed into the unconscious, and, if particularly strong, form an abiding focus of mental irritation.

An obsession represents a compensation or substitute for an unbearable sexual idea of *very early* infancy, and takes its place in consciousness, whereas a hysterical symptom is the realization of an unconscious fancy serving as a wish-fulfilment and corresponds to the return of a sexual gratification which was real in *later* infancy, but has been repressed since then, the obsession being due to a conflict between a repressed idea and the repressing forces, and the hysterical symptom to a conflict between the repressed idea and an inhibition.

There are two varieties of hysteria—anxiety hysteria and conversion hysteria. The former comprises hysterical phobias, hysterical day-dreams, and what one may call hysterical attacks; the last includes cases in which the repressed complexes are converted into somatic symptoms.

Psychoanalysis is the most radical form of treatment of hysteria and other functional mental disorders. Other methods in common use are the "rest-cure," which is accompanied by suggestion, and very frequently fails. Hypnotism is often dramatically successful. In manic-depressive insanity the lecturer employs psychoanalysis only during intervals of sanity. Patients suffering from dementia præcox he speaks of as living a dream and in the end retiring from the world of reality (autism). The pathology of dementia præcox is undetermined. By various psychological means, especially by resynthesis, attempts are made to reform the mental structure of these patients in the early stages; but hitherto the results have not been encouraging.

Regarding paranoia, many patients of this class have been analyzed by modern psychological methods all over the world, and the outcome has been the remarkable discovery that paranoia is a psychosis erected on the invariable basis of repressed homosexuality. The researches in paranoia are particularly interesting in that they throw a certain amount of light on the mechanisms of unconscious reasoning. Unconsciously the paranoiac always starts with the premise, "I love the man" (assuming the patient to be a male). The arguments in the several varieties of paranoia then run as follows:

Persecuted Paranoia.—"I love the man"—an intolerable idea, therefore becoming "I do not love him; I hate him." This by projection becomes "He hates me," "I am persecuted by him."

Exalted Paranoia.—"I love him"—again an intolerable idea, therefore "I do not love him, I love myself." This by projection becomes "Everybody loves me," "I am a great person."

Religious Paranoia.—"I love him," being intolerable, becomes "I love Him" (spelled with a capital H), meaning "I love God." This by projection becomes "God loves me," "I am the chosen one of God."

Amorous Paranoia.—The intolerable "I love him" becomes "I do not love him, I love her." This by projection becomes "She loves me."

Jealous Paranoia.—"I love him," as usual, is replaced by "I do not love him; *she* loves him."

The mechanism of hypochondriacal paranoia is similar to that of exalted paranoia, "I love myself" becoming "I must take care of myself," and querulant paranoia is only a special variety of persecuted paranoia.

Although psychoanalysis has been successful in elucidating the psychology of this disease, the method usually fails as a mode of treatment. Some psychoanalysts, however, have effected a cure, and many have alleviated the patient sufficiently to enable him to go about his business with a certain degree of mental comfort without molesting those people with whom he is brought into contact.

That insanity in general is the result of civilization is obvious to anybody who looks the facts in the face; but psychoanalysis has revealed that the essential factor is not hurry, bustle, and brain-fag, but the repression of the instincts, enforced by civilization. Recognizing this fact we can now see the solution of a host of problems in other domains of mental disease.

Our personal impulses tell us to eat, drink and be merry, and gratify our predatory and sexual instinct, but the herd instinct tells us to be above all such animal passions. The Church, as the highest authority of the herd, says that there must be many days of abstinence and fasting throughout the year in order to subdue the flesh; the Church again and many physicians advocate total abstinence from alcohol; instead of being merry, society dictates that we should be sedate. Our predatory instincts are often stigmatized as cruel, and the openly avowed and ostensible attitude of the populace toward sexual matters is restriction, if possible, to abolition and extinction.

Such limitations imposed by society upon the mighty impulses of the sexual instinct cannot be tolerated with impunity by any normal individual; for a man's sexual activity serves as his standard for all his other activities, and, if it is unnaturally repressed, he becomes just as reconciled and submissive in his whole career; while a person who is so venturesome as to gratify his instincts exhibits the same bold enterprise and energy in overcoming the difficulties of everyday life.

Much less can one who possesses a hereditary predisposition to neurosis or psychosis endure such restraint of his animal instincts, for in such a person it must inevitably lead to mental disorder.

It is not to be supposed that the prophylaxis of insanity lies in letting loose the reins of licentiousness and depravity. The problem is far more intricate than this, and it is not likely that it will be solved in the present century, much less in our own time. The mystery at present surrounding sex and birth problems must be removed by systematic education of the young in such matters, early marriage must be made more possible than existing circumstances will permit, and old men and parents will have to remember the days of their own youth when they enact the laws which are to govern society. Moreover, the whole populace will have to be educated in such matters before any serious change can be accomplished.

CHAS. E. ATWOOD, New York.

Book Reviews

Les Blessures des Nerfs. Par J. Tinel. Masson et Cie. Paris. Preface der Professeur J. Dejerine.

Of the many volumes which owe their origin to the recent war activities this book by one of Dejerine's most active pupils is the best we have seen.

It is a complete symptomatology of peripheral nerve lesions produced by war injuries, including the careful analysis of the sensory, tonus, electrical, secretory, trophic and motor changes following such lesions. These cause specific types of syndromes termed by Dejerine the signs of interruption, of compression, of irritation, of regeneration and various partial or dissociated syndromes.

Histological and pathological ideas relative to the lesions and changes of a reconstructive nature are studied very minutely.

Taken all in all this work is to be most highly commended.

Jelliffe.

The Origin and Nature of the Emotions. Miscellaneous Papers. By George W. Crile, M.D. Edited by Amy F. Rowland, B.S. W. B. Saunders Company, Philadelphia and London, 1915.

The eight papers which are brought together in this volume present from slightly different viewpoints the mechanistic explanation of various medical and surgical problems with special emphasis upon the part played by the kinetic system and its place in the physical economy.

The actual effect of surgical trauma is arrived at from the phylogenetic point of view, which affords understanding of the long evolutionary development of the mechanistic reactions to stimuli from environment. Certain regions of the body were particularly objects of attack during phylogenetic injury and therefore there have resulted very deeply laid mechanisms for defense. These mechanisms are again intensively activated through surgical injury to these parts, although the higher centers of consciousness may be completely anesthetized, and the same phenomena of exhaustion results. Surgical shock can therefore only be prevented by blocking the nerve paths between the brain and the seat of operation.

The principle of this establishment of nociceptors or receptors for pain and of the reaction of the body to the stimuli received through these and the fewer beneceptors has evolved the human body as a keyboard "upon which environment plays the many tunes of life." The stimuli may operate directly, through distance receptors or through psychic representation and the result manifests itself in action or through inhibition of the motor mechanisms in the phenomena which we know as fear or other emotion. The motor responses are those of muscular and chemical activity in the interests of self-preservation, daily labor, which is phylogenetically the chase, and race propagation. Under emotion there is the same integration to activity without adequate discharge and therefore consequent impairment of the individual. Actual investigation discovers widespread changes in the brain cells as a result.

Pain serves as a protective agent by compelling to muscular action, by limiting through rigidity the area of infection or by modifying and control-

ling muscular action by demanding rest. The site of pain, Crile believes, is in the brain cell and is the result of a rapid discharge of energy. Laughter and crying also are useful mechanisms, for they serve as neutralizing acts for energy which has been aroused by certain stimuli and which without other motor discharge would be left to smoulder in the body to work injury.

Experiments show that a stage of stimulation in the brain cells is followed by one of exhaustion, the two being the result of fear, fatigue, hemorrhage, infections and the action of certain drugs. The hyperactivity of Graves's disease shows also marked changes, and the same phenomenon exists after prolonged insomnia and in "insanity," which term the author extends to the fleeting mental disturbance of an acute delirium. These changes are not of course necessarily irreparable by rest after the removal of the cause of the hyperactivity and exhaustion.

The mechanistic reaction theory finds also in the phenomena of disease, fever, pain, protective mechanisms against the invading enemy. On the other hand the activating secretions which are primarily intended for acceleration of the motor response to external stimuli throw a heavy strain upon the organs of elimination when action is inhibited and produce harmful effects and disease.

The author's discussion, based also on careful experimental study, of the kinetic system is an important contribution to the knowledge of the process of energy transformation which takes place in the body. Other systems, he says, transform potential energy into kinetic energy each for its specific function, but there is one system which transforms latent energy into motion and heat for purposes of defense and attack or pursuit. The organs which comprise this system are the brain, the adrenals, the thyroid, the liver and the muscles through which the final available transformation is made. The brain, adrenals and liver are mutually dependent and indispensable in the production of kinetic energy and therefore equally vital. The thyroid is the pacemaker for the syndrome through its power of governing the rate of energy discharge. Further experiments throw light upon the increased presence of acidity in the blood in association with death. Alcohol, anesthetics, excessive work or emotion all produce increased acidity in the blood and this in turn interferes with the functions of the cortex and produces lesions in the kidney and the liver.

Constant reference is made to the phenomena of Graves's disease as highly illustrative of the part played by the thyroid in the mechanistic response to stimuli toward action and particularly in the marked effect upon the thyroid of emotional stress which is denied adequate discharge. The exalted state of activity is evidence of the rôle of the thyroid in the kinesthetic syndrome as the author discusses that. This offers much clinical suggestion for the understanding and treatment of the disease.

There is also more than once suggestion of the mechanistic basis for psychotherapy which teaches control through the higher centers of reaction to stimuli and adjustment to environment. This is, however, not so simple as the author's words might seem to imply. The mechanistic theory which would lodge memory in the brain, that finds the degree of consciousness and mental efficiency dependent upon the physical state of the brain cells, leaves out of account the full value of the symbolic use of stimuli. At times the author makes the emotions the result of bodily changes rather than viewing them consistently in their place as the result of external stimuli exerting their influence in the psychic realm through a complex symbolism which demands something more than the mechanistic response in and through the brain cells and related organs for its effect upon conduct and thus upon the bodily reactions and responses themselves.

JELLIFFE.

MECHANISMS OF CHARACTER FORMATION. AN INTRODUCTION TO PSYCHOANALYSIS. By William A. White, M.D. The MacMillan Company, New York.

This book must possess an equal value to those already familiar with psychoanalysis and engaged in applying its principles to social and therapeutic problems as well as to those who would understand its meaning and its growing power in the world of thought.

For the former class it has taken the various developments of psychoanalytic thought and investigation as they have been elaborated by various writers and combined them into a comprehensive whole in which they are so rehabilitated that they acquire a new potency and readiness for application to the daily clinical problems. Through the same means they afford that approach to psychoanalysis which presents it to the student of human nature in its very essence, as a genetic and dynamic psychology which considers man as an energic being unceasingly adjusting himself to his environment in such a way as to develop and express the libido or energy within him.

This fundamentally interpretative attitude toward the psychic factors which enter into character formation White compares with the older descriptive methods which prepared the way for this but could never in themselves reach true explanation. The genetic approach discovers the attempts at adaptation and adjustment at the various levels of biologic reaction culminating in the highest psychical level. It is an effort of the individual to reach that integration of forces which results in the conscious adaptation that produces the greatest effect upon reality.

This conception demands an hypothesis to explain certain facts in regard to this development. Thus the term unconscious has come to denote the historical past which represents the various levels of development along which psychical evolution has passed, that great "portion of the psyche which has been built up and organized in the process of development and upon which reality plays in the form of new and hitherto unreacted to situations, and in the friction resulting strikes forth the spark of consciousness."

For consciousness represents that inevitable moment of conflict when the new adaptation at a higher level must arise out of the accumulated experience of the past. This conflict is based on the universal ambivalency with its corresponding ambitendency in which all force manifests itself. The unconscious is dominated by the pleasure-pain principle while the new adaptation is called for by the demand of reality. Therefore the tendencies of the unconscious present a resistance to the necessary adjustment. The result may be an efficient reaction to reality or the pathological retreat into a world of phantasy.

The incompatibility between conscious and unconscious content and modes of reaction necessitates the use of symbolism in order to bring the unconscious tendency or wish into consciousness in any acceptable form. Not all symbolism is unconscious, but a symbolic mode of expression stands peculiarly at the service of the unconscious. The symbol is thus a bearer and transmuter of energy from one psychic level to a higher one making for further adaptation. It is in the dream that we find most clearly the mechanisms which the unconscious uses in bringing its content to expression through the symbol, and there that the particular value that any symbol has for each individual is found. The dream reveals through its use of symbolism not only the phantasy world into which the wish-fulfilling tendency has dragged the energy but also the teleological effort to find a resolution of the conflict.

The fundamental rôle played by the "family romance" in the conflict between individual desire and necessity for adaptation, which is social, is ably discussed. It is given its valuation not alone as a concrete problem in

relation to the family group but considered likewise in its wider significance as the struggle between the infantile attitude of security and easily attained pleasure in reliance on the family group and the individual breaking away into independent and active contact with reality. The universality of this conflict and its origin in the infantile position of dependence and fixation upon its early miniature world are attested by the prominent place of the struggle against incest, which is traceable throughout early human history and in the literature of all times. This phase of the struggle manifests itself in the attempt to exercise the will to power in the magic ways which sufficed in infancy, through the apparent all powerfulness of thought or simple actions to bring desired pleasure. The libido which is always seeking expression finds partial outlet during early development in areas which are normally only contributory to the complete integration of the adult toward reality, but which may offer points of attachment for the libido in later striving for phantasy gratification along these infantile ways.

Jung's terms extroversion and introversion are used to describe the two great libido trends, that which seeks effectual expression in constructive, creative outgoing and that which is regressive, turned in upon the ego which it seeks to make the goal of all experience. Both tendencies must exist as complementary to one another in the fullest expression of life, but the over emphasis upon the regressive aspect leads to the infantile and primitive undifferentiated identification of the individual with his environment which prevents a useful adaptation to reality.

White discusses Adler's theory of organ inferiority and finds it a valuable concept for arriving at the inner meaning of symptoms, but finds in the dynamic libido theory a conception of wider therapeutic value in the possibility of reëducation through the principle of the conditioned reflex, in Pawlow's sense, applied to the redistribution of energy at the symbolic level. Here in the resolution of the conflict the bipolarity of the symbol manifests its usefulness. The two pathways open for the libido, the regressive and the progressive trends, are repeated in the use of symbolism which represents thus the two sides of the conflict and the attempt to reach complete integration in a higher adjustment in which alone the conflict can be solved.

The author's unifying conception of the dynamic relationship of the human being to his environment has resulted in a synthetic treatment of the various aspects of the psychoanalytic approach to the human problem as comprehensive as it is vigorous and stimulating. Certain points of particular practical value are presented with especial clearness while the relational position of each aspect finds its place in the greater whole.

JELLIFFE.

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Figures with asterisk (*) indicate original articles and are accompanied with title. Figures unaccentuated, accompanied with title, indicate abstracts; without title, book reviews.

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