recent study Déjérine concludes that it is not separate from the speech centre.

There is a form known as *mixed aphasia*, or *paraphasia*, in which the patient understands what is said, and speaks even long sentences correctly, but he constantly tends to misplace words, and does not express his ideas in the proper words. All grades of this may be met with, from a state in which only a word or two is misplaced to an extreme condition in which the patient talks jargon. In these cases the association tract is interrupted between the auditory perceptive and the emissive centres, hence it is sometimes known as Wernicke's aphasia of conduction. The lesion is usually in the insula and in the convolutions which unite the frontal and temporal lobes. Lichtheim's schema will assist the student in obtaining a rational idea of the varieties of aphasia:

1. In the condition of apraxia or mind-blindness the ideation centres, I, are involved, often with the auditory and visual perceptive centres, A and O.

2. A lesion at A, the centre for the auditory memories of words (first left temporal gyrus), is associated with word-deafness.

3. A lesion at O, the centre for visual memories (angular and supramarginal gyri), causes word-blindness.

4. Interruption of the tracts uniting A M and O M causes the conduction aphasia of Wernicke—*paraphasia.*

5. Destruction of the centre M (Broca's convolution) causes pure motor aphasia, in which the patient cannot express thoughts in speech.

A lesion at M usually destroys also the power of writing, but, as stated, it is believed by many that the centre for writing, W, is distinct from that of speech. In this case a lesion at M, which would destroy the power of voluntary speech, might leave open the connections between O W and A W, by which the patient could copy or write from dictation.

The problems of aphasia are in reality excessively complicated, and the student must not for a moment suppose that cases are as simple as diagrams indicate. A majority of them are very complex, but with patience the diagnosis of the different varieties can often be worked out.

The following tests should be applied in each case of aphasia: (1) The power of recognizing the nature, uses, and relations of objects—i. e., whether apraxia is present or not; (2) the power to recall the name of familiar objects seen, smelled, or tasted, or of a sound when heard, or of an object touched; (3) the power to understand spoken words; (4) the capability of understanding printed or written language; (5) the power of appreciating and understanding musical tunes; (6) the power of voluntary speech—in this it is to be noted particularly whether he misplaces words or not; (7) the power of reading aloud and of understanding what he reads; (8) the power to write voluntarily and of reading what he has written; (9) the power to copy; (10) the power to write at dictation; and (11) the power of repeating words.

Prognosis and Treatment.—In young persons the outlook is good, and the power of speech is gradually restored apparently by the education of the centres on the opposite side of the brain. In adults the condition is less hopeful, particularly in the cases of complete motor aphasia with right hemiplegia. The patient may remain speechless, though capable of understanding everything, and attempts at re-education may be futile. Partial recovery may occur, and the patient may be able to talk, but misplaces words. In sensory aphasia the condition may be only transient, and the different forms rarely persist alone without impairment of the powers of expression.

The education of an aphasic person requires the greatest care and patience, particularly if, as so often happens, he is emotional and irritable. It is best to begin by the use of detached letters, and advance, not too rapidly, to words of only one syllable. Children often make rapid progress, but in adults failure is only two frequent, even after the most pains-taking efforts. In the cases of right hemiplegia with aphasia the patient may be taught to write with the left hand.

III. Inflammation of the Brain

(Suppurative Encephalitis; Abscess).

Etiology.—Suppuration of the brain substance is rarely if ever primary, but results, as a rule, from extension of inflammation from neighboring parts or infection from a distance through the blood. The question of idiopathic brain abscess need scarcely be considered, though occasionally instances occur in which it is extremely difficult to assign a cause. There are three important etiological factors:

(1) Trauma. Falls upon the head or blows, with or without abrasion of the skin. More commonly it follows fracture or punctured wounds. In this group meningitis is frequently associated with the abscess.

(2) Extension of the inflammation from the neighboring parts, more particularly in caries of the petrous portion of the temporal bone, less frequently necrosis of the other bones, or extension of disease from the orbit. In this group otitis is the most important factor. There may be extension through the bone and involvement of the lateral sinus as already mentioned; but in other instances no direct connection can be traced and the infection is probably carried through the lymph channels.

(3) In septic processes. Abscess of the brain is not often found in pyæmia. In ulcerative endocarditis multiple foci of suppuration are

common. Localized bone-disease, suppuration in the liver, but, above all, certain inflammations in the lungs (particularly gangrene, bronchiectasis, and fetid bronchitis), are liable to be followed by abscess. It is an occasional complication of empyema. Abscess of the brain may follow the specific fevers. Bristowe has called attention to its occurrence as a sequel of influenza. The largest number of cases occur between the twentieth and fortieth years, and the condition is more frequent in men than in women.

Morbid Anatomy.—The abscess may be solitary or multiple, diffuse or circumscribed. In the acute, rapidly fatal cases following injury the suppuration is not limited; but in long-standing cases the abscess is enclosed in a definite capsule, which may have a thickness of from two to five millimetres. The pus varies much in appearance, depending upon the age of the abscess. In early cases it may be mixed with reddish *débris* and softened brain matter, but in the solitary encapsulated abscess the pus is distinctive, having a greenish tint, an acid reaction, and a peculiar odor, sometimes like sulphuretted hydrogen. The brain substance surrounding the abscess is usually œdematous and infiltrated. The size varies from that of a walnut to that of a large orange. There are cases on record in which the cavity has occupied the greater portion of a hemisphere. Multiple abscesses are usually small. In four fifths of all cases the abscess is solitary. Suppuration occurs most frequently in the cerebrum, and the temporo-sphenoidal lobe is more often involved than other parts. The cerebellum is the next most common seat, particularly in connection with ear-disease.

Symptoms.—Following injury or operation the disease may run an *acute* course, with fever, headache, delirium, vomiting, and rigors. The symptoms are those of an acute meningo-encephalitis, and it may be very difficult to determine, unless there are localizing symptoms, whether there is really suppuration in the brain substance. In the cases following ear disease the symptoms may at first be those of meningeal irritation. There may be irritability, restlessness, severe headache, and aggravated earache. Other striking symptoms, particularly in the more prolonged cases, are drowsiness, slow cerebration, vomiting, and optic neuritis. In the chronic form of brain abscess which may follow injury, otorrhœa, or local lung trouble, there may be a latent period ranging from one or two weeks to several months, or even a year or more. In the "silent" regions, when the abscess becomes encapsulated there may be no symptoms whatever during the latent period. During all this time the patient may be under careful observation and no suspicion be aroused of the existence of suppuration. Then severe headache, vomiting, fever, set in, perhaps with a chill. An Arab was admitted to my wards at the University Hospital in a condition of profound anæmia, having been picked up by the police in the street, covered with blood. There was a small localized area of dulness in the third and fourth interspaces on the right side close to the

sternum, and although no tubercle bacilli were found, it was thought to be probably a localized tuberculosis. He recovered rapidly from the anæmia, and within three months was strong and well. A few days before his intended discharge he began to complain of headache, which became aggravated. He had vomiting, fever, and gradually increasing coma. A large, solitary encapsulated abscess was found in the parieto-occipital region of the left hemisphere, and in the middle lobe of the right lung a circumscribed cavity, probably bronchiectatic, surrounded by fibroid tissue and containing a very offensive pus. So, too, after a blow upon the head or a fracture the symptoms of the lesion may be transient, and months afterward cerebral symptoms of the most aggravated character may develop.

The localization of the lesion is often difficult. In or near the motor region there may be convulsions or paralysis, and it is to be remembered that an abscess in the temporo-sphenoidal lobe may compress the lower motor centres and produce paralysis of the arm and face and on the left side cause aphasia. A large abscess may exist in the frontal lobe without causing paralysis, but in these cases there is almost always some mental dulness. In the temporo-sphenoidal lobe, the common seat, there may be no focalizing symptoms. So also in the parieto-occipital region; though here early examination may lead to the detection of hemianopia. In abscess of the cerebellum vomiting is common. If the middle lobe is affected there may be staggering—cerebellar incoördination. Localizing symptoms in the pons and other parts are still more uncertain.

Diagnosis.—In the acute cases there is rarely any doubt. The history of injury followed by fever, marked cerebral symptoms, the development of optic neuritis and rigors, delirium, and perhaps paralysis, make the diagnosis certain. In chronic ear-disease, such cerebral symptoms as drowsiness and torpor, with irregular fever, supervening upon the cessation of a discharge should excite the suspicion of abscess. It is particularly in the chronic cases that difficulties arise. The symptoms resemble those of tumor of the brain; indeed, they are those of tumor plus fever. In a patient with a history of trauma or with localized lung or pleural trouble, who for weeks or months has had slight headache or dizziness, the onset of a rapid fever, intense headache, and vomiting point strongly to abscess.

It is not always easy to determine whether the meninges are involved with the abscess. Often in ear-disease the condition is that of meningo-encephalitis. I have already referred to a condition sometimes associated with ear-disease, which may simulate closely cerebral meningitis or even abscess. Indeed, Gowers states that not only may these general symptoms be produced by ear-disease, but even distinct optic neuritis.

Treatment.—A remarkable advance has been made of late years in dealing with these cases, owing to the impunity with which the brain can be explored. In ear-disease free discharge of the inflammatory products should be promoted and careful disinfection practised. The treatment of injuries and fractures comes within the scope of the surgeon. The acute

symptoms, such as fever, headache, and delirium, must be treated by rest, an ice-cap, and, if necessary, local depletion. In all cases, when a reasonable suspicion exists of the occurrence of abscess, the trephine should be applied and the brain explored. The cases following ear-disease, in which the suppuration is in the temporo-sphenoidal lobe or in the cerebellum, offer the most favorable chances of recovery. The localization can rarely be made accurately in these cases, and the operator must be guided more by general anatomical and pathological knowledge. In cases of injury the trephine should be applied over the seat of the blow or the fracture. In ear-disease the suppuration is most frequent in the temporo-sphenoidal or in the cerebellum, and the operation should be performed at the points most accessible to these regions.

IV. HEMIPLEGIA AND DIPLEGIA IN CHILDREN.

It is as yet hard to say, without fuller knowledge of the etiology of these common conditions, where they should be classified. In a majority of the cases, whatever the nature of the primary pathological change, the final state is one of a chronic encephalitis, often with great atrophy of the convolutions or the formation of large cyst-like spaces—porencephalus.

I. Hemiplegia.

Etiology.—Of 135 cases, comprising those from the Infirmary for Diseases of the Nervous System, Philadelphia, from the Elwyn Institution for Feeble-minded Children, under Kerlin, and from my clinic at the Johns Hopkins Hospital, 60 were in boys and 75 in girls. Right hemiplegia occurred in 79, left in 56. In 15 cases the condition was said to be congenital.

In a great majority the disease sets in during the first or second year; thus of the total number of cases, 95 were under two. Cases above the fifth year are rare, only 10 in my series. Neither alcoholism nor syphilis in the parents appears to play an important *rôle* in this affection. Difficult or abnormal labor is responsible for certain of the cases, particularly injury with the *forceps*. Trauma, such as falls or puncturing wounds, is more rare. The condition followed ligation of the common carotid in one case.

Infectious diseases. All the authors lay special stress upon this factor. In 19 cases in my series the disease came on during or just after one of the specific fevers. I saw one case in which during the height of vaccination convulsions developed, followed by hemiplegia. In a great majority of the cases the disease sets in with a convulsion, in which the child may remain for several hours or longer, and after recovery the paralysis is noticed.

Morbid Anatomy.—In an analysis which I have made of 90 autopsies reported in the literature, the lesions may be grouped under three headings:

(*a*) Embolism, thrombosis, and hæmorrhage, comprising 16 cases, in 7 of which there was blocking of a Sylvian artery, and in 9 hæmorrhage. A striking feature in this group is the advanced age of onset. Ten of the cases occurred in children over six years old.

(*b*) Atrophy and sclerosis, comprising 50 cases. The wasting is either of groups of convolutions, an entire lobe, or the whole hemisphere. The meninges are usually closely adherent over the affected region, though sometimes they look normal. The convolutions are atrophied, firm, and hard, contrasting strongly with the normal gyri. The sclerosis may be diffuse and wide-spread over a hemisphere, or there may be nodular projections—the hypertrophic sclerosis. Some of the cases show remarkable unilateral atrophy of the hemisphere. In one of my cases the atrophied hemisphere weighed 169 grammes and the normal 653 grammes. The brain tissue may be a mere shell over a dilated ventricle.

(*c*) Porencephalus, which was present in 24 of the 90 autopsies. This term was applied by Heschel to a loss of substance in the form of cavities and cysts at the surface of the brain, either opening into and bounded by the arachnoid, and even passing deeply into the hemisphere, or reaching to the ventricle. In the study by Audrey of 103 cases of porencephalus, hemiplegia was mentioned in 68 cases.

Practically, then, in infantile hemiplegia cortical sclerosis and porencephalus are the important anatomical conditions. The primary change in the majority of these cases is still unknown. Porencephalia may result from a defect in development or from hæmorrhage at birth. The etiology is clear in the limited number of cases of hæmorrhage, embolism, and thrombosis, but there remains the large group in which the final change is sclerosis and atrophy. What is the primary lesion in these instances? The clinical history shows that in nearly all these cases the onset is sudden, with convulsions—often with slight fever. Strümpell believes that this condition is due to an inflammation of the gray matter—polio-encephalitis—a view which has not been very widely accepted, as the anatomical proofs are wanting. Gowers suggests that thrombosis may be present in some instances. This might probably account for the final condition of sclerosis, but clinically thrombosis of the veins rarely occurs in healthy children, which appear to be those most frequently attacked by infantile hemiplegia, and post-mortem proof is yet wanting of the association of thrombosis with the disease.

Symptoms.—(*a*) The onset. The disease may set in suddenly without spasms or loss of consciousness. In more than half the cases the child is attacked with partial or general convulsions and loss of consciousness, which may last from a few hours to many days. This is one of the most striking features in the disease. Fever is usually present. The