

On a case of amnesia and other speech defects of eighteen years' duration with autopsy / by H. Charlton Bastian.

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From the Author
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ON A CASE
OF
AMNESIA AND OTHER SPEECH
DEFECTS

OF EIGHTEEN YEARS' DURATION

WITH AUTOPSY

BY

H. CHARLTON BASTIAN, M.A., M.D., F.R.S.

PHYSICIAN TO UNIVERSITY COLLEGE HOSPITAL AND TO THE NATIONAL
HOSPITAL FOR THE PARALYSED AND EPILEPTIC.

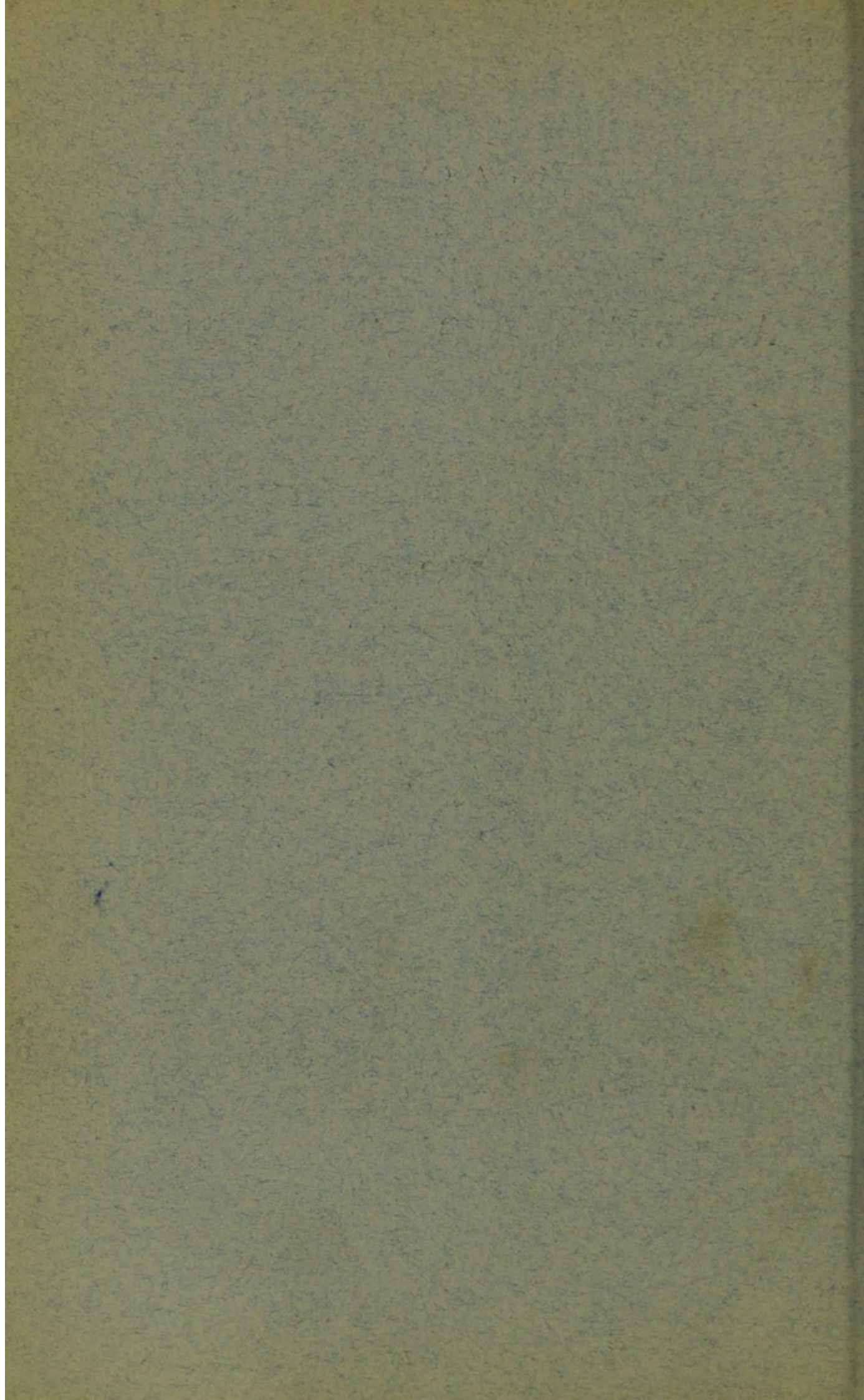
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1897



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Received October 1st—Read November 24th, 1896.

I HAVE ventured to bring this case before the Society as it is one which possesses considerable interest from a clinical point of view, and has important physiological and psychological bearings. It is remarkable also for the constancy of the speech defects over a long series of years, as well as on account of the difficulties in interpretation, looking to the pathological conditions revealed by the autopsy.

It seems almost certain that the lesion found was far more extensive than that which could have existed in the early days of the patient's illness—in other words, that

the lesion must have been progressive, although the patient's symptoms were of a comparatively stationary type. Two consequences follow from this: there is, first, the impossibility, unfortunately, of accurately localising and defining the extent of the lesion that gave rise to a most interesting type of speech defect; and, secondly, there is the difficulty in understanding how the complete destruction of certain convolutions, such as the hinder two thirds of the upper temporal, and the supra-marginal and angular gyri, could have occurred, as they did, on the left side of the brain of a right-handed man, without producing their usual results in the form of "word-deafness" and "word-blindness."

The total symptoms presented by the patient are divisible into two categories, namely, (1) those more immediately pertaining to the right-sided hemiplegia; and (2) those relating to the mental condition with associated speech defects. In the former group there was some evidence of progression; in the latter there was none, and scarcely any evidence of variation even, over a long series of years. This latter will be seen to be a fact of extreme importance in view of what was found at the autopsy. It will be necessary, therefore, to substantiate it by ample evidence, which is fortunately possible seeing that the patient was not only examined by myself, and his case demonstrated to students at very frequent intervals, but was also submitted to careful examination by several of my house physicians, as will be shown by extracts from my case-books of different periods.¹ On account of the interesting nature of his case the man was purposely kept under observation, and encouraged to come to the Hospital from time to time. He was first seen three months after the onset of an apoplectic attack which had left him partially paralysed on the right side.

¹ The house physicians, from whose notes I shall have to quote, were Dr. Boyd Joll (1878), Dr. Beevor (1879), Dr. Halliburton (1882), Dr. Sidney Martin (1883), Dr. Rüffer (1886), Dr. R. H. Castellote (1894-5), Dr. Harold Way (1895-6).

Thomas Andrews, æt. 32, a tin-plate worker, had always been temperate, and had never suffered from syphilis. He had a slight fright about the middle of December, 1877, and two days after, as he was going out to work, about 8 a.m., he suddenly fell backwards on a chair. He was not convulsed, and did not lose consciousness, but he lost power in the limbs of the right side and "did not speak coherently after the commencement of the fit." The limbs seem to have been completely paralysed at first, and there was incontinence of urine and fæces for four or five days. "He also had headache which persisted for some time."

He was admitted under my care into University College Hospital on March 12th, 1878, by which time he had recovered a good deal of power in the paralysed limbs. There was no cardiac bruit at the base or apex. The right angle of the mouth was somewhat lower, and not raised so well as the left. The tongue was protruded considerably to the right. The grasp of the right hand was extremely feeble. He could raise the right foot two feet off the bed, and could resist flexion of the right knee with considerable force. The movements at the right ankle-joint were greatly impaired, though not altogether absent. He walked with difficulty, dragging the right foot somewhat. Tactile impressions were badly appreciated, and painful impressions still more so, on the limbs of the right side. (No mention is made of trunk or face, in this respect.) Sight and hearing good.

He continued to improve slowly, and his condition as regards speech and related powers were thus described on April 2nd:—"He recognises common objects, but cannot name them; repudiates a false name, and recognises the real one at once when he hears it. Can never remember his own name till it is suggested to him. On being asked to repeat it, after a few trials which vary each time, he pronounces it 'Anstruthers' or 'Anstrews.' His first name seems to come more readily, and he can often attempt this without prompting. But

either after it has been repeated to him, or when he says it spontaneously, he pronounces it 'Touvers.' The letter *l* is difficult for him to utter; sometimes he pronounces it like a *d*, and at others like a *v*. He has been taught to count, and can fairly pronounce the numerals from one to twelve; after twelve he is uncertain, the articulation and order becoming rapidly worse. He is conscious when he makes a mistake, but cannot correct himself, and ends in a hopeless muddle.

"In reading from a book, the words he pronounces have no relation to the print, either in length or sound; neither does he seem to understand written characters, as he will not attempt to answer a question written on a slate, though he will at once endeavour to respond when the same question is put to him orally. He, however, recognises figures from 1 to 9 when written, and is conscious when they are not placed in regular order. He cannot name any coins, but seems to have some idea of their relative value. He indicated on his fingers that sixpence was worth six pennies—not being able from sight to utter its name."

The patient was discharged from the hospital on April 6th, but was readmitted on April 16th, on account of his having had two fits on the morning of that day. The first occurred about 5.30 a.m., lasting about five minutes, during which time he was unconscious; the second, after an interval of an hour, was more severe, lasting about ten minutes. His wife said "his whole body was in a great tremor, and though his right limbs were free from the jerking, they were sometimes clenched tightly." The second fit left his speech rather worse than it was before, and his right limbs also became quite powerless.

On examination he was found to be quite unable to stand, or even to move the right leg to any appreciable extent. The right arm was also quite powerless. The right angle of the mouth was distinctly lower than the left; and the protruded tongue deviated considerably to

the right side. The sensibility of the right side of the body did not seem to be further impaired. His speech was rather more limited than when he went out. He could say "Yes" and "No," and "Very well" distinctly, but could not pronounce his name clearly. He could just manage to count from one to twenty, but made many mistakes after ten.

Three days later the increase of limb paralysis had passed off, and the patient was again able to walk about the ward dragging his right foot slightly; and he could raise his right hand as high as his mouth. Two weeks after admission, though he had gained further power in his right arm and leg, it was noticed that his speech was as bad as ever. He could name any simple numeral that was written and pointed out to him, and he could also correctly add columns of three or four figures; but he altogether failed to name individual letters of the alphabet, however plain or large they might be. He could recognise common objects, such as a dog, a fowl, or a tree, in an engraving, and point out any one of them when asked to do so. But he could not volunteer the name even of the most familiar object to which he pointed.

May 8th.—Asked successively to name large, separate, printed capitals O, K, and G, from sight, on each occasion he said "P," and on D being pointed to, he called it "M"—though he repeated the name of each of these letters, without a moment's hesitation, after hearing it pronounced. Although there is this inability to name letters, words, or objects from sight, the patient now seems to understand simple sentences written or printed; thus, when the sentence "Have you a wife?" was written on a slate, it was perfectly evident that he understood the writing. His condition, however, in this respect seems to vary from time to time. In the sentences the meaning of which he comprehends, he is still quite unable to pronounce the individual words from sight, though after hearing them uttered he can articulate them at once, more or less distinctly.

Two days later he was observed reading something in the newspaper, and on being asked if he understood it (the report from a police court of a case of poisoning), he at once said he did, and unmistakably indicated by his gestures that this was true. With his left hand he could write his own name after a copy, but not easily without, and sometimes not at all. A less familiar word he did not even attempt to write from the sound, even when it had been distinctly heard and comprehended.

Discharged on May 14th, and sent to the Convalescent Home at Eastbourne.

It will be observed that this patient's state in the early part of the month of May was distinctly different from what it had been in the early part of April, previous to the occurrence of the two fits on April 16th. At the later date, whilst the patient's utterance in repeating words which he had heard had become more distinct, he could not even emit an unintelligible jargon in attempting to read. At the same time he had become able to understand what he read, though he still could not name a single letter at sight, nor could he write a single word from dictation—both these processes requiring for their performance the proper relation between the visual and the auditory word-centres, and therefore the integrity of the commissures by which they are united. That half of the commissure which conveys stimuli from the visual to the auditory word-centre (as in reading aloud), seems to have been more extensively damaged after the two fits than it was before (Fig. 1).

His speech defects had, in fact, now taken the form which they subsequently retained throughout the remainder of his life; these were (1) the inability to read aloud or name at sight, together with the inability to write anything from dictation, which, in the absence of "word-deafness" or "word-blindness" implied a damage to the commissures between the auditory and the visual word-centres; (2) the almost complete loss of voluntary speech,

whilst imitative speech was retained, implying a lowered functional activity of the auditory word-centre; and (3) the mere aphemic difficulty of utterance, implying some damage to the outgoing fibres between the third frontal

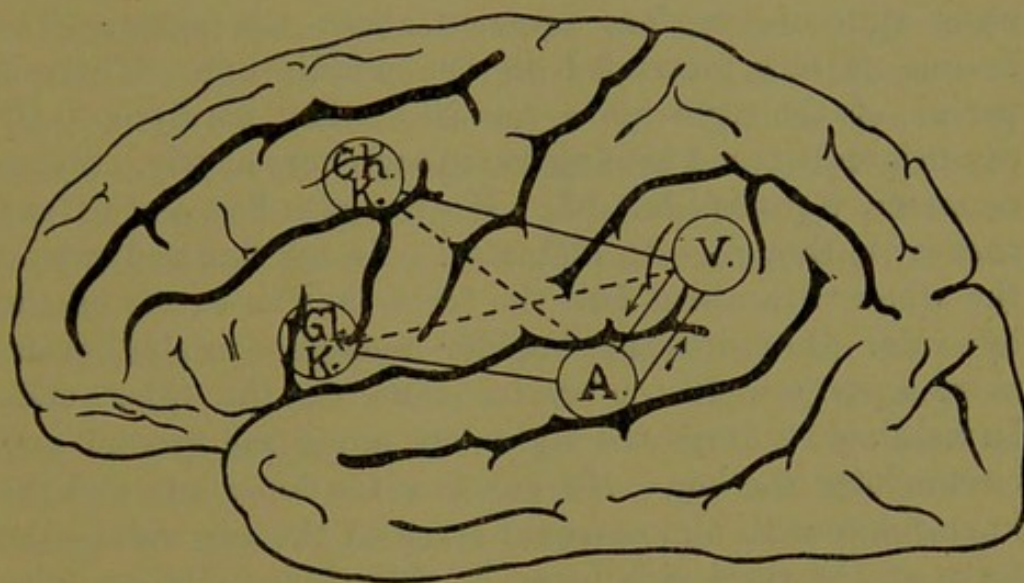


FIG. 1.—Diagram showing the approximate sites of the four word-centres and the commissures by which they are connected. The two broken lines indicate occasional rather than customary routes for stimuli.

convolution and the bulbar motor centres for speech, though it might possibly have been due to the lowered activity of the auditory word-centre.

While his speech defects preserved a constant character through so many subsequent years, evidence of the extension of the original damage done to the patient's brain was furnished by the recurrence of fits from time to time, and by the increase, especially during the last two years of his life, in the amount of paralysis of the right limbs and in the degree of right-sided hemianæsthesia.

It will, I think, conduce to clearness if we deal first of all with the progress of the case in reference to the fits and the hemiplegia; reserving for subsequent consideration the study of the patient's mental condition and speech defects.

CONCERNING THE FITS, HEMIPLEGIA, AND HEMIANÆSTHESIA.

1879.

January 21st—February 6th.—Has had no distinct fit since he was in hospital last year. The paralysis of the right side of the face remains about the same. The tongue is now protruded in the middle line. There is paresis of the right limbs, but no distinct paralysis. He can flex and extend his fingers, though very slowly. Dynamometer, right 25, left 85. He can also flex and extend the wrist, though with difficulty. He can flex and extend the elbow with about half the force that he exerts on the left side. He moves the shoulder-joint quite freely, but the movements are less powerful than on the other side. In walking he drags the right foot along the ground, and circumducts the leg. He can flex the hip-joints and the knee-joints with almost equal force on the two sides—the force on the right side being slightly less. He can also move the right ankle-joint freely. Over the right arm the patient can feel the light touch of a finger as far down as the wrist, but below that, over the back and front of the hand, he can only appreciate a pin's point. Sensibility in the right leg is fairly good.

1882.

July 15th.—Has had no fits for twelve months. Motor weakness on the right side remains about the same. Sensibility to touch, pain, heat and cold are distinctly impaired all over the body on the right side, including the face. He is short-sighted, but vision is otherwise normal. He hears a watch eight inches from each ear.

October 28th.—He is in much the same condition. He has had five fits since last seen, of a one-sided character.

1883.

April 20th.—Patient had four or five fits last week.

About the end of May he had two fits, each of which, according to his wife's statement, only lasted two or three

minutes. She says that during the fits he sometimes does not lose consciousness; that the right leg is drawn up, but that there are no actual convulsions.

1886.

November 1st.—He can move the fingers of the right hand, but slowly. He can bend both his elbows perfectly, and can lift his arms at the shoulder-joints, but the right not quite so well as the left. He can walk well, but the right leg is stiff in its movements as compared with the left. There is no rigidity in the joints of either limb.

Plantar and patellar reflexes exaggerated on the right side; ankle-clonus absent. He can feel the slightest touch on both sides of the body, but he himself intimates that he can feel it more distinctly on the left side. Sensation to pain is distinctly blunted on the right side, a pin's point not being felt as a prick, unless it is pushed in with some force. Sensation to heat and cold is also impaired on the right side, patient not being able to discriminate slight differences of heat and cold, and the application had to be made with some force for him to distinguish heat from cold. These defects of sensibility exist over the right side of the face as they did in 1882. He now hears a watch only within about half an inch of either ear. The paralysis of the right side of the face is a trifle less, as there is now no distinct asymmetry of face, and he is able to whistle. The tongue is protruded in the middle line. The field of vision is less extensive on the right side.

1894.

November 23rd.—Paresis of right arm and leg, with slight rigidity of all joints. He can only just grip with the right hand; right 20, left 75. Flexion of the right knee is easily prevented. In walking there is obvious weakness of the right leg, which is brought forward with some difficulty, the toes dragging. There is slight right

facial paralysis. The tongue is protruded markedly to the right. Tactile sensibility is completely lost over the right hand and foot; above it is diminished. There is partial analgesia all over the right side of the head and neck, limbs, and trunk. Sensibility to heat and cold is lost all over the right side, except in the right side of the tongue, where it is only diminished. He complains of pains of a dull, aching, and intermittent character, not increased on movement, in the right side of the head, the right arm and leg, and in the right side of the trunk. (He seems to have come into the hospital this time principally on account of these pains. They soon diminished, however, under the influence of potassium iodide and phenacetine; his power of walking also slightly improved.)

Hearing.—On right side hears watch at one and a half inches; on left side only with contact.

Vision.—Has to wear glasses; without these he can only distinguish fingers with the right eye at a distance of about six inches. Sight much better with the left eye.

1895.

February 25th.—One week ago patient had a very severe fit,¹ after which he remained unconscious for three hours, and was unable to speak for some hours after recovering consciousness. He then had pains in the right arm, trunk, and leg, and very slightly in his head. He found himself quite unable to move the arm or the leg, and remained in bed till he was brought to the hospital in the ambulance.

On admission the following notes were taken concerning his condition. He still complains of pains in the right side of the body, and slightly in the head. He cannot raise the right foot from the bed, and the arm only to a very slight degree. He has great difficulty in moving the fingers. Tactile sensibility is lost below the elbow of the right arm, and is very much diminished over the rest of

¹ The last previous fits of which there is any record being in 1883.

the right side of the body. Sensibility to painful impressions is also very considerably blunted over the whole of the right side, but is absent nowhere. The loss of sensibility in the leg is most marked distally, being almost complete below the knee. There is considerable rigidity of the right arm and leg.

The knee-jerk is exaggerated, and ankle-clonus is present on the right side; left side normal.

March 3rd.—Under treatment the pains have disappeared, the rigidities are passing off, and he is recovering more power in the right arm and leg. He is able to walk about the ward with some difficulty.

14th.—Power of arm has greatly improved, and of leg also. There is almost complete loss of muscular sense in the right arm.

Readmitted December 4th, 1895. On November 24th he had another fit in which he fell down completely unconscious. The twitching was confined to the right side of the body. Twenty minutes later he had a second fit of the same character. In the course of a few hours he regained consciousness, and then found himself considerably weaker on the right side than he had been before. Since then he has kept to his bed, up to the day of admission, when the following notes were made:—The whole of the right side is partially paralysed. He has considerable power of movement at the shoulder and elbow, but all the right fingers are completely paralysed, there being no power of flexion or of extension. The right leg is much weaker than the left. The knee-jerks are exaggerated on both sides.

December 12th.—Tactile sensibility is diminished all over the right side of the face, and he is not able to localise the points where he is touched. There is loss of sensation to touch and pain all over the right arm; that of pain is completely lost, while touch is only diminished. Sensation to heat and cold is also completely lost in the right arm, but not completely in the face—cold being much more readily distinguished than heat. The

muscular sense, as far as it can be tested, seems to be almost completely lost. There is considerable rigidity of the right arm with exaggerated wrist-jerk, also rigidity of the right leg with exaggerated reflexes. Sensibility to pain, heat, and cold are lost in the right leg, and sensibility to touch is very deficient. Muscular sense also seems to be lost. Discharged January 4th, 1896.

CONCERNING THE MENTAL CONDITION AND SPEECH DEFECTS.

1879.

Patient is quite rational, and able to play games such as draughts.

The Auditory Word-centre with its Afferent and Efferent Fibres.

He readily understands any question put to him. He can repeat short words correctly, but there is often an aphemic difficulty in utterance. Thus, he cannot properly pronounce words beginning with the labials, but those beginning with gutturals he pronounces much better. He can count quite correctly up to twenty, but beyond this gets rather confused with the repetition of the first word. When started, he can say the alphabet correctly as far as "i," after that very badly. His spontaneous speech is very limited; but one day before returning to the hospital he said, "Never mind, they may come to-morrow;" and on another occasion, "Mrs. Foster will come to-morrow." Otherwise his speech has been limited, as at present, to "Yes" and "No," "No, it isn't," "Good morning," and some simple expressions of this kind.

The Visual Word-centre with its Afferent and Efferent Fibres.

He understands any written question. He reads books and newspapers much. He says he understands what he reads, and there is every reason to believe that this is

true. He could detect mistakes in his wife's accounts, but could never explain the error to her. He can add two rows of simple figures. Subtraction he finds more difficult, but can get a simple sum right after a short time. Over a simple sum in multiplication he requires some prompting before he gets it right. He can copy writing well with his left hand; but he cannot transfer from printed to written characters, or *vice versâ*. Can write nothing spontaneously, not even his own name.

Commissures between the Auditory and the Visual Word-centres.

a. He cannot read aloud at all either from print or writing. He cannot read aloud the simplest words or even name single letters, except that occasionally he can name *a* or *o* correctly. (His disability in this respect is always most striking when contrasted with the rapidity with which he pronounces the same word or letter as soon as he hears it uttered.)

b. He cannot write anything from dictation; but if a short word is spelt for him he can sometimes write the letter just named after a long time and with much difficulty. (His inability to write a single word from dictation always contrasts notably with the readiness with which he will copy the same word as soon as it is written.) Simple numerals, such as 7, he can write from dictation; 12 he finds more difficult, making it 31, then 10, and shortly afterwards 12. He puts on the 5 at the right place to make it 125.

1886.¹

He appears to be a man of ordinary intelligence. He is well-behaved, and seems perfectly happy and good-tempered. He takes a great interest in what goes on

¹ He was examined as to his mental condition and speech when he was in the hospital in 1882, and also in 1883, when his condition was found to be substantially the same as it was in 1879, except that he could not on either occasion name a single letter at sight—not even A—and in the former year

about him, and busies himself reading the newspaper and playing draughts—a game he plays remarkably well. His memory is fairly good, but since his admission he has given his age differently several times, and he also varies as to the date at which he was in the hospital last. He, however, recognised the ward and bed in which he was when first admitted in 1878.

The Auditory Word-centre with its Afferent and Efferent Fibres.

He comprehends everything that is said to him, and listens to the conversation of the other patients. He can distinguish one tune from another perfectly; *e. g.* when asked whether he knew "Home, sweet home," he said "Yes," and he did recognise it at once from other tunes. Can repeat short words correctly, but makes a hopeless muddle with some long ones like "constitution." When started, he can say the letters of the alphabet pretty correctly as far as *n*, afterwards with mistakes and omissions. He can name all the days of the week. Cannot name the day of the week without beginning "Sunday, Monday, &c.," and then stopping at the right day. He can say the names of the months as far as July, but cannot recall the rest. His spontaneous speech, apart from associational trains, is extremely limited. He says "Yes" and "No," and "Very well" when asked how he is. If asked his name he can say "Andrews" correctly, but not "Thomas;" and is unable to say where he lives. He can also say "beer," "bacca," and a few words such as "tea" and "dinner." When asked how old he is, he says "forty," and then counts on his fingers 1, 2, 3, 4, 5, 6, 7, 8, 9, and stopping nods his head—his age being forty-nine. He has not used a verb or adjective since admission, except to say "No, it ain't."

it was found that he could write numerals spontaneously with the aid of an associational nexus. Thus he wrote them from 13 to 70 correctly, except that on each occasion he missed the 9 and wrote 7 instead—writing, "15, 16, 17, 18, 17, 20," and so with each subsequent decade.

The Visual Word-centre with its Afferent and Efferent Fibres.

He understands all that he reads, and passes most of his time reading a newspaper or a book. He is able to show by signs what he is reading about. He can copy any numeral, letter, or word with his left hand. He will not, however, attempt transfer copying. He can write spontaneously and correctly the numerals from 1 to 10. He cannot write a single letter or word spontaneously.

Commissures between the Auditory and the Visual Word-centres.

a. He can sometimes name at sight certain familiar objects having short names, such as "pen," "book," "pin," these being about his only achievements in this direction. Cannot name numerals except by counting up to them from the beginning. He cannot name any letters except occasionally *a*, *b*, or *c*. The same applies to words, though very rarely he can name a short word correctly, *e. g.* "so," "goat," "dog." He is quite unable to read aloud even the shortest sentence.

b. He can often write numerals and simple numbers correctly from dictation, *e. g.* 7, 12, 78—but not numbers with three figures. For 281 he wrote 1249. As a rule he cannot write a single letter from dictation. Rarely, however, he can write *a* or *b*, but no other letter. He was never able to write even the shortest word from dictation, though he will immediately copy any word that has been written and placed before him.

1894.

The Auditory Word-centre with its Afferent and Efferent Fibres.

Understands all that is said to him. He can repeat all simple common words, but uncommon polysyllabic words he is unsuccessful with, producing mostly a mere jumble

of sounds. He can repeat the numerals up to 20; and can say the alphabet when started as far as *m*, but cannot go beyond without missing many letters. Can name the days of the week, but often omits Sunday. His spontaneous speech is limited to his name (he cannot give his address), together with short affirmative or negative answers, and occasionally very short phrases such as "Never mind."

The Visual Word-centre with its Afferent and Efferent Fibres.

He understands what he reads. Recognises all words, letters, numerals, common objects, and pictures. He can copy numerals, letters, and words quite well, with the left hand. He can go on writing numerals when the first one is given, but letters and days of the week cannot be written in the same way. He cannot write a single letter or word spontaneously.

Commissures between the Auditory and the Visual Word-centre.

a. Cannot name at sight words, letters, numerals, or common objects.

b. He can write simple numerals from dictation. Cannot write a single letter or word from dictation.

No systematic examination of the patient's mental condition and speech defects was recorded after this date, but when admitted to the hospital on February 25th, 1895, after the very severe fit with increased paralysis in the limbs, there is a note in these terms:—"His mental condition and speech defects remain the same as when he was in before, except that he is rather less demonstrative and cheerful, being somewhat despondent over his relapse." Again, when he came to the hospital after two other severe fits on December 4th, 1895, there is the following note:—"His speech remains in the same condition

as on previous occasions. There has been no alteration in his condition except increased weakness in the limbs on the right side." Later, on December 16th, there also appears the following note:—"Patient can name some common objects, but cannot put together any sentence. He can count readily up to twenty. He can begin the alphabet, which he had not been able to do on previous occasions. Can say the days of the week. Cannot repeat a sentence after one with more than two or three words, but can repeat single words fairly readily. Can copy words with the left hand, but cannot write words from dictation or spontaneously. When shown a boot to-day, he wrote 'boot' on a paper fairly well. He can read the newspaper and understand it, but cannot read aloud."

He was discharged from the hospital on January 4th, 1896. He came to the ward to see me on two occasions subsequently, the last time being about the beginning of March, when I demonstrated his condition to the students, and found it to have undergone no appreciable change.

He died on March 29th, and as to the manner of his death I will give a few particulars, kindly furnished to me by Mr. Naunton Ruck, of Ealing, who was called to see him. He writes:—"I can add little to his wife's account of his illness.¹ He was apparently in his usual health on the morning of the 28th, and was standing when the seizure came on. He fell down, and must have rapidly lost consciousness, for I saw him at 11 o'clock, soon after the seizure, and he was then quite insensible. He was very much convulsed, and the convulsions lasted for two hours. He became and continued comatose till his death at 9.30 p.m. on the following (Sunday) evening. He was unable to swallow, and at no time did he show any signs of rallying."

Permission having been obtained to examine the head, my then house physician, Dr. Harold C. Way, was good enough to go to Ealing and remove the brain. This was

That is some particulars which she had sent to me.

done about thirty-eight hours after death. There was nothing unnatural about the skull-cap or the dura mater, but on the left side of the brain there was what appeared to be a large pseudo-cyst. The organ was subsequently handed over to Dr. J. S. Risien Russell for careful preservation and subsequent report. This service he was kind enough to render, and I am indebted to him for the following careful report, the accuracy of which I have been able to verify.

Report on the Brain of Thomas Andrews.

"The brain showed evidence of old softening resulting in complete atrophy of the left hemisphere throughout the whole of the area of distribution of the middle cerebral artery, with the exception of the area usually supplied by the first cortical branch of this artery, which area was intact, and thus Broca's convolution had escaped softening and subsequent atrophy. There was, however, well-marked extension of the atrophy into the posterior portion of the second frontal convolution, corresponding to the area of distribution of a branch of the second branch of the middle cerebral which supplies this area.

"An unusual amount of the upper part of the ascending frontal and parietal convolutions had escaped softening and subsequent atrophy, viz. $4\frac{1}{2}$ cm. of the former, and $3\frac{1}{2}$ cm. of the latter, which portions presented a healthy and unaltered appearance. The total lengths of these convolutions on the right side were, ascending frontal $10\frac{3}{4}$ cm., and ascending parietal 10 cm.

"The angular and marginal convolutions were destroyed; but almost the whole of the superior parietal convolution had escaped, the width of the intact area of cortex in this region amounting to a little more than 3 cm.

"The superior and inferior occipital convolutions were intact, but the atrophy had extended to an unusual degree into the middle occipital convolution, 3 cm. of this convolution being intact, however.

"The whole of the superior temporo-sphenoidal convolution was destroyed with the exception of the anterior one third, $4\frac{1}{2}$ cm. in length. Of the middle temporo-sphenoidal convolution, the anterior 5 cm. were perfectly intact; but posteriorly only a narrow portion of the inferior part of this convolution remained, and that was in a discoloured and degenerated condition.

"The whole of the atrophic area that has been described (from which all trace of brain tissue had completely disappeared) was occupied by a large pseudo-cyst which was continuous with the lateral ventricle, the fluid with which it was filled being shut in by the slightly thickened pia arachnoid" (Plate XV, fig. 2).

"On examination of the thrombosed branches of the left middle cerebral it was impossible to ascertain in which of these the process had commenced. The trunk of the vessel and all its branches had now become much attenuated. When the brain had been hardened and the membranes completely removed from the left hemisphere a great gap was found in the region indicated, 11 cm. in length by $3\frac{1}{2}$ cm. broad, and 4 cm. in maximum depth (Plate XV, fig. 3). The upper part of the descending and nearly the whole of the posterior cornu, together with the posterior half of the body of the lateral ventricle, were opened up. Much of the posterior segment of the internal capsule together with the greater part of the thalamus had disappeared, the latter being represented only by a small rounded portion, having rather less than one third of the bulk of a normal thalamus. Anteriorly the atrophy had extended into the white substance up to the corpus striatum, which was also much diminished in size. All other portions of the cortex of the left hemisphere beyond the region above defined presented a perfectly healthy appearance. The left half of the pons was slightly flatter than the right, whilst the left pyramid was very distinctly smaller than its fellow. The lateral lobes of the cerebellum showed no inequality.

"The right middle cerebral artery was occluded by a

recent thrombus. There was practically no evidence of softening of the cortex of this hemisphere (nor were there lesions of any other kind), but there was extensive softening of the basal ganglia and internal capsule, probably accentuated by post-mortem changes."

Comments.—The details furnished concerning the first attack in December, 1877, were not sufficient to enable one to decide positively whether it was caused by thrombosis or by hæmorrhage; and, curiously enough, the sudden onset and rapid termination of the final apoplectic attack would also rather have suggested hæmorrhage than thrombosis, especially to those who are not fully aware of the extreme difficulty that often exists in deciding between these two causes of an apoplectic or simple hemiplegic attack.

It seems clear that in the first attack of 1877, there could not have been a complete occlusion of the middle cerebral artery. The transitory nature of the complete paralysis, as well as some of the other symptoms, were unfavorable to this view. It was, moreover, negatived by the post-mortem revelation that the third frontal convolution was intact. The occlusion of the vessel was, therefore, evidently beyond the point whence the first cortical branch is given off, which is the nutrient artery of this convolution.¹

It is even difficult to suppose that at first the whole of the other cortical branches of the middle cerebral were involved. Had this been so it seems clear that there must have been a more than usually free anastomosis between the terminal ramifications of these branches and those of the corresponding anterior and posterior cerebral arteries. That there was such a free anastomosis

¹ In the 'Transactions' of this Society for 1884, Dr. Sharkey has recorded an interesting case where death occurred seven years after a complete thrombosis of the right middle cerebral artery, in which the third frontal and also a part of the orbital convolutions had undergone softening and atrophy. The lesion in this case being on the right side, speech was "but slightly affected."

between the second and third cortical branches of the middle cerebral artery seems evidenced by the unusually small amount of the customary territory of these vessels which underwent softening and atrophy. The same kind of evidence does not, however, tell in this direction for the fourth branch, in the territory of which there was found a full amount of atrophy.

It is the clinical evidence that makes it improbable that the whole of the territory of this fourth branch was at first cut off from its blood-supply. Had this been the case, word-deafness as well as word-blindness would have been produced. But no word-deafness seems ever to have existed in the early stages of this man's illness; and though there was word-blindness at first, this had completely cleared up early in May—that is about five months after the onset of the hemiplegia.

At this latter date the speech defects assumed the form that they maintained during the following eighteen years, and were of such a kind as (apart perhaps from the mere aphemic difficulty in articulation) to imply a lowered condition of functional activity in the auditory word-centre (*i. e.* in the posterior half of the upper temporal convolution), a fairly healthy condition of the visual word-centre (*i. e.* of the supra-marginal and angular convolutions), together with great damage to the important commissures connecting these centres with one another (Fig. 1).

Though this was in all probability the condition existing for an indefinite period from May, 1878, onwards, the results of the post-mortem examination showed that a progressive destruction must have taken place in these auditory and visual word-centres. This being so, one of the most remarkable features of this case will be found to be the unvarying character of the speech defect, notwithstanding the progressive destruction of such centres.

A similarly progressive destruction of brain tissue must have extended even into parts of the hemisphere beyond the field of distribution of the terminal ramifications of

this fourth cortical branch of the middle cerebral—that is into the contiguous territory of some of the anastomosing branches of the posterior cerebral. This is shown by the amount of atrophy that had taken place in the white substance of the hemisphere, in the posterior part of the internal capsule, and in the thalamus.

The increased sensory and motor paralysis that occurred during the last two years of the patient's life was almost certainly due to the destruction of the posterior part of the internal capsule. This would account also for the almost complete loss of muscular sense reported to exist (in 1895) in both limbs, when the motor paralysis was still very incomplete, and for the loss of tactile and other modes of sensibility in the foot and lower part of the leg, whilst the foot and leg areas of the convolutions were intact.

In regard to the clinical indications as to the actual nature of the speech defects, not much remains to be said after the detailed and classified notes that have been given. The deductions that seem warranted are these :

(1) That a marked degree of amnesia existed, due to an impaired functional activity of the auditory word-centre.

That the activity of this centre was merely impaired, and not abolished, was shown by the fact that the patient understood speech perfectly, and that his own imitative speech was preserved, although spontaneous speech was almost lost.

(2) That the activity of the visual word-centre did not seem to be appreciably impaired.

This was shown by the complete absence of alexia, and by the patient's ability to copy writing.

(3) That there was more or less complete destruction of the double commissure existing between the auditory and the visual word-centres.

That the *visuo-auditory commissure* was interrupted seemed shown by the fact that the patient could not read aloud, or name at sight, though he could understand what he read, and recognise all common objects.¹

¹ His only achievements in this direction that have been recorded are these.

In patients showing the degree of amnesia present in this case it has often been found that the auditory word-centre will respond to a strong stimulus coming to it from the visual word-centre, as is shown by the fact that these patients are able to read aloud quite readily though their power of spontaneous speech is almost lost. The destruction of the visuo-auditory commissure, however, made this achievement impossible in the case of Thomas Andrews.

That the *audito-visual commissure* was interrupted seemed shown by the fact that he could not write a single word from dictation,¹ though he could copy any such word at once; and that he could even, on the last occasion of his being in the hospital, write "boot" on being shown that article. That he could write numerals from dictation and also name them at sight is difficult to understand. But a greater power of understanding, of naming, or of writing numerals, as compared with letters of the alphabet, has been very commonly met with in the investigation of speech defects.

The patient's greatest power of writing spontaneously

In 1879 he could sometimes name the letters *a* and *o* correctly; in 1886 he sometimes named *a*, *b*, or *c*, and once or more named the short words "so," "goat," and "dog;" whilst in this same year, when, as I have noted, he was at his best, he also succeeded in naming "pen," "book," and "pin," when these common objects with short names were shown to him. There is, of course, the possibility that he may have been able to succeed to this extent by stimulating Broca's convolution direct from the visual word-centre, thus avoiding the necessity for the passage of the stimulus by way of the visuo-auditory commissure to the auditory word-centre and thence on to Broca's convolution. This more circuitous route is, as I believe, the rule in reading aloud and in naming at sight. The majority of writers on speech defects seem, however, to think that the more direct route is habitually followed by the stimuli concerned in the execution of these acts—a view that is not at all borne out by the case now under consideration.

¹ His only achievements in this direction that have been recorded are these. In 1879 he could sometimes write single letters from dictation, and generally single numerals. In 1886 he could write numbers with two figures, but not those with three, though he could rarely write letters from dictation other than *a* or *b*. In 1894 he could still write numerals, but not a single letter from dictation.

was shown in 1878, when he sometimes succeeded in writing his own name more or less correctly. This ability did not persist; but subsequently in 1883 and also in 1886 he was found able to write numerals in series spontaneously, and almost correctly. His inability to do anything more in the way of writing spontaneously was, I think, due to two causes: (1) the low activity of his auditory word-centre, which also prevented his spontaneous speech (activity in this centre being for most persons the necessary first stage for the initiation of spontaneous writing); and (2) the fact of the damage to the audito-visual commissure, which would have prevented the passage of stimuli across to related portions of the visual word-centre. His ability occasionally to write such a very familiar word as his own name or simple numerals spontaneously was, I think, due to the fact that in each of these cases the necessary images and stimuli may have been called up primarily in the visual centre, just as, on the occasion above referred to, the sight of a boot enabled him to revive the associated literal symbols, and write the word "boot."

(4) That he had an aphemic difficulty of utterance, rather more marked in the early years of his illness than it was later, which might have been due to a defect in the co-operative action of the weakened auditory word-centre with the kinæsthetic centre in Broca's convolution, though it is more commonly due to a defect in the outgoing channels leading from the latter centre.

How are the Clinical Peculiarities of the Speech Defects to be reconciled with the Post-mortem Record?

The difficulties in reconciling the persistent and often-verified clinical condition with the post-mortem record are extreme. As I have said, in the absence of word-deafness and word-blindness as initial symptoms, one cannot suppose that complete softening at first existed in the auditory and the visual word-centres.

The total atrophy in these regions found after a period of eighteen years seems, therefore, as above stated, irreconcilable with the fact shown by the clinical records that during this long series of years there had been no appreciable change in the speech defects. How, then, it must be asked, could this complete atrophy have occurred in the region of the auditory and the visual word-centres without manifesting itself clinically?

We must, I think, conclude that the destruction of these parts had been gradual. Had it been sudden, all present knowledge entitles us to conclude that it must have revealed itself by the occurrence of well-known symptoms, namely, word-deafness and word-blindness in combination. And assuming that the destruction had been gradual, we can only suppose that this process must have coincided with a gradual development in the functional activities of the corresponding convolutional regions of the right hemisphere.

We know next to nothing as to the relative degree of organisation of the right as compared with the left auditory and visual word-centres. *A priori* considerations would make it probable that corresponding auditory and visual word impressions impinging on each side of the brain of a person whose hearing and sight were good on both sides, ought to become associated with similar structural organisations in relation with these afferent impressions.

It is well known, however, that the executive functions in connection with these two centres are carried on in right-handed persons wholly, or in the main, by the left side of the brain; and this fact must, it would seem of necessity, entail an arrest in the development of the commissures between the auditory and the visual word-centres in the right hemisphere, answering to those by means of which these executive functions are carried out on the left side of the brain. The development of the right centres being thus arrested, their autonomy would necessarily be hindered.

In many cases where recovery from different kinds of

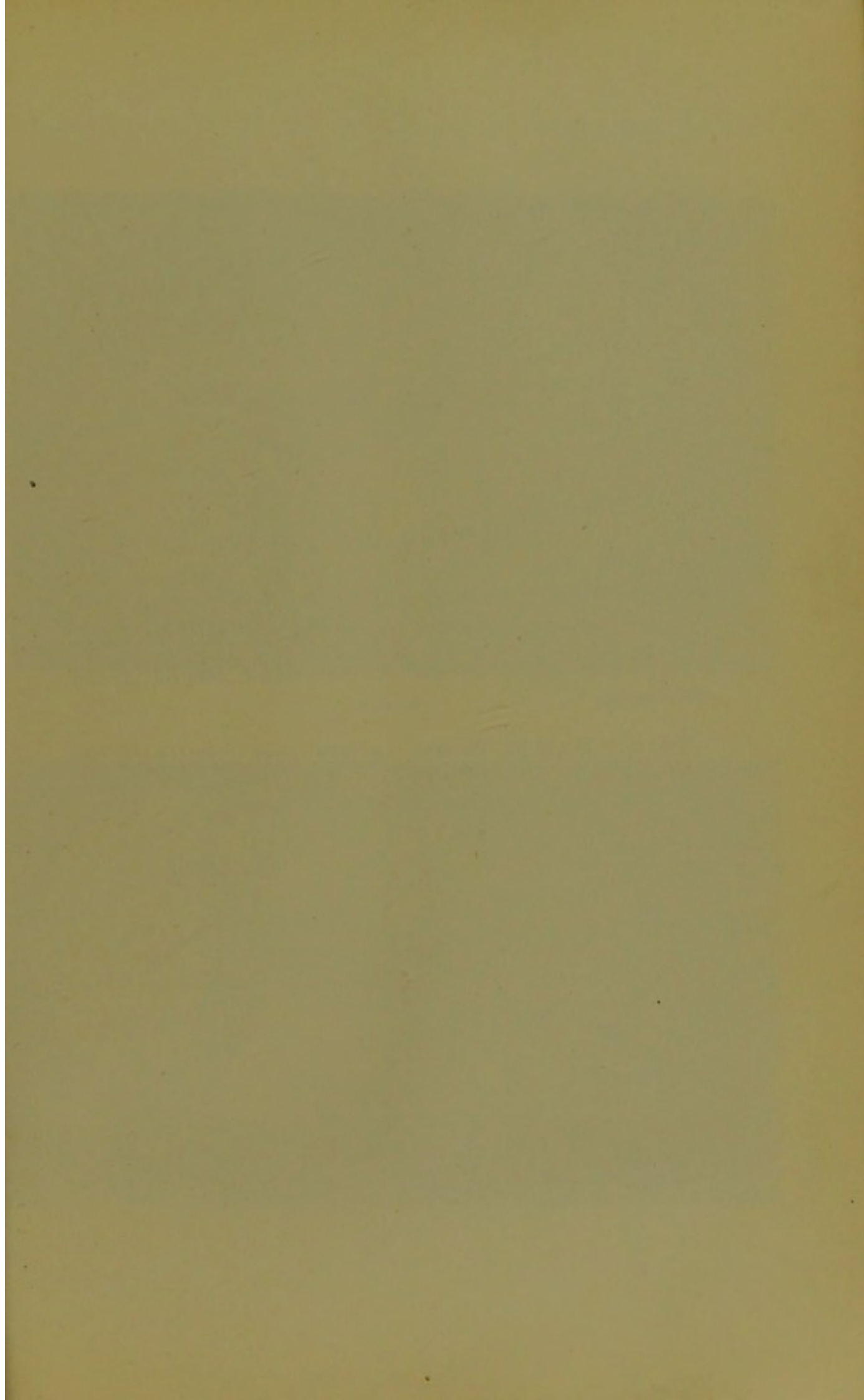
speech defects occurs (the nature of which I need not now particularise) we are compelled to assume that centres and commissures in the right hemisphere gradually undergo further organisation, so as to compensate for the destruction of corresponding structures in the left hemisphere.

It can only be supposed, therefore, that something similar must have occurred in the case of Thomas Andrews.

What is altogether novel and surprising, however, is that restoration should only have taken place in such a very imperfect manner—that imperceptibly, as it were, the imperfect functioning of the left hemisphere, and no more, should have been taken on by the right hemisphere. It may, perhaps, be supposed that the low, though unequal, activity which was alone attained in the right auditory and visual word-centres did not even suffice to develop the usual commissures between these two centres, and that thus the exact clinical pattern and combination of speech defects should have been preserved, even when the cerebral activity on which they were dependent had been gradually transferred from the left to the right cerebral hemisphere.

Whilst offering these mere suggestions concerning a very difficult problem, I fully realise how much they fall short of anything like an adequate explanation of the very puzzling riddle presented by this case.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. ix, pp. 20, 25.)



DESCRIPTION OF PLATE XV.

On a Case of Amnesia and other Speech Defects of Eighteen Years
Duration, with Autopsy (H. CHARLTON BASTIAN).

Fig. 2. — Brain of Thomas Andrews before removal of the
membranes.

Fig. 3. — Brain of Thomas Andrews after removal of the
membranes.

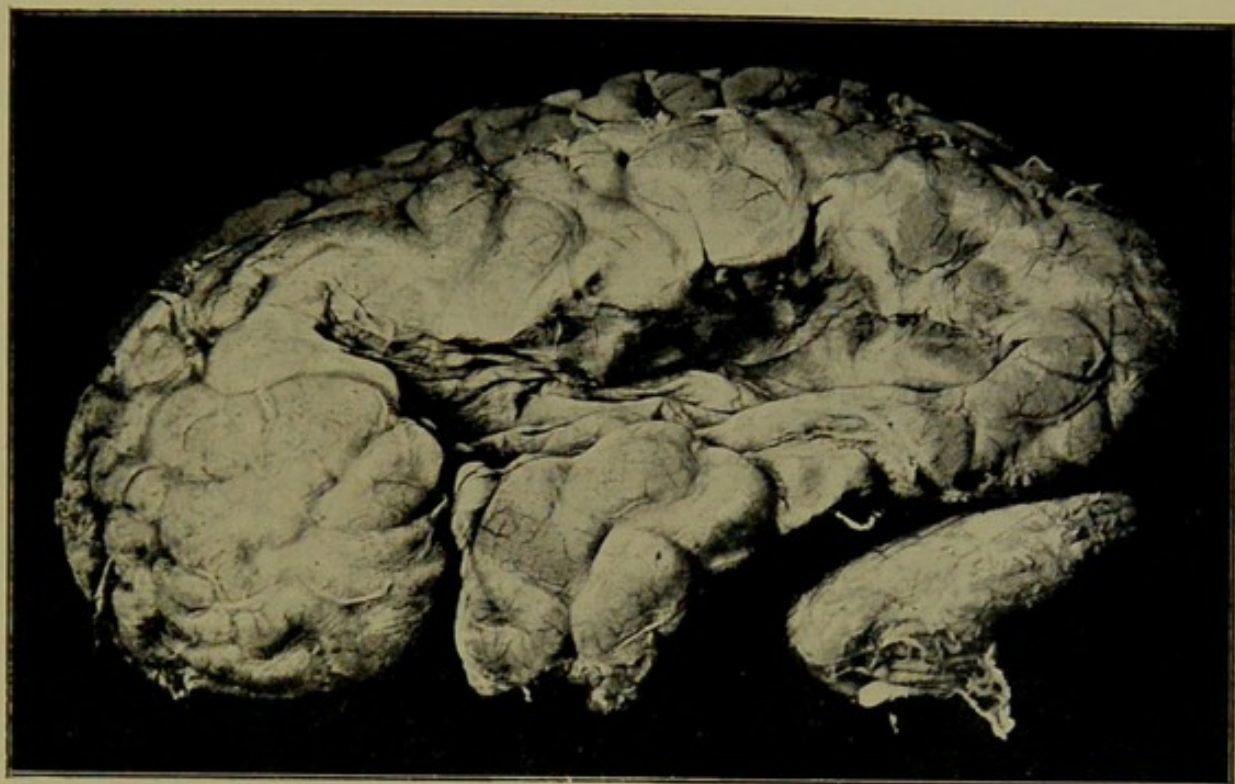


Fig. 2.

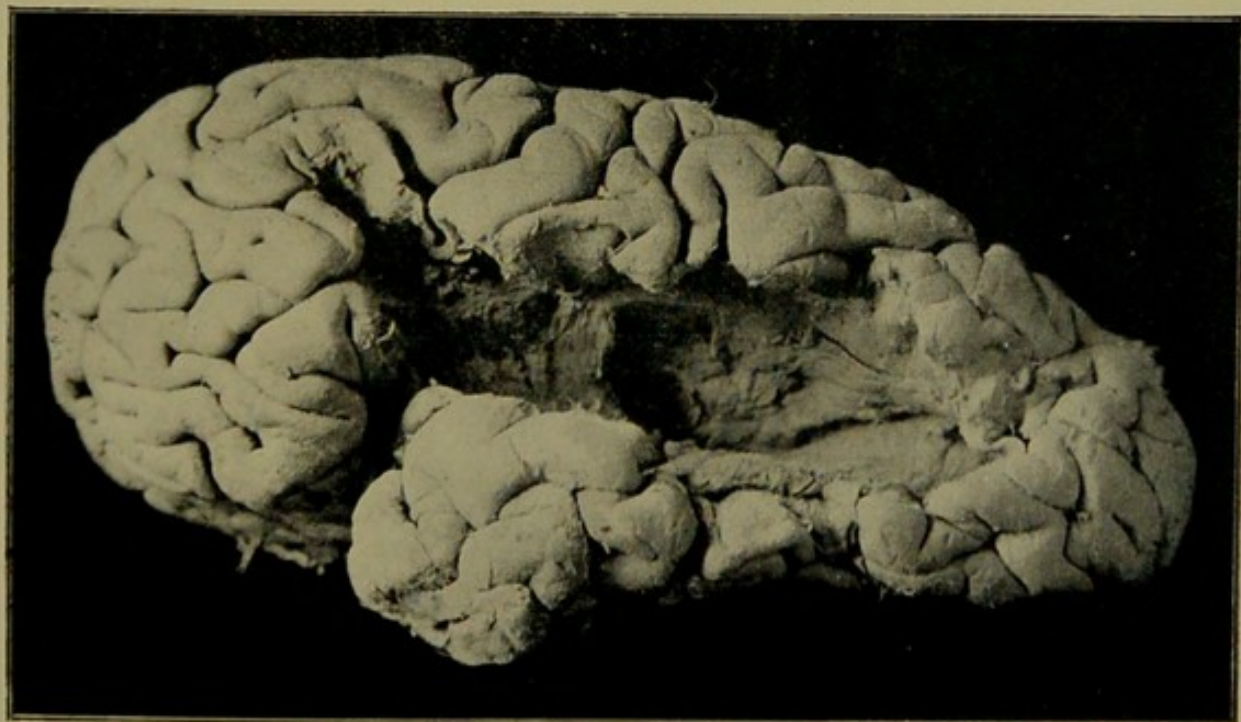


Fig. 3.

Adlard, imp.

