BRAIN.

PART 2, VOL. 43.

APHASIA AND KINDRED DISORDERS OF SPEECH.[1]

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IT is my pleasant duty to thank the Master and Council of St. John's College, Cambridge, for selecting me to deliver this lecture. It was founded close upon four hundred years ago by the famous grammarian

[1] The Linacre Lecture for 1920.

and humanist physician, Thomas Linacre, and I feel that I cannot bring a more suitable tribute to his memory than by attempting to penetrate the mysteries of aphasia and kindred disorders of speech.

This paper is a preliminary communication of conclusions to which I have been led mainly from the study of soldiers wounded in the war. I make no attempt here to correlate my results with those of other workers in the field; this I hope to do later in the Hughlings Jackson lecture, when I shall deal with the history of aphasia and kindred disorders. My object in the following pages is to put forward briefly a fresh conception of the clinical phenomena of loss of speech from the physiological rather than from the anatomical point of view.

Physicians first recognized that the acts of speaking, reading, and writing could be affected by a gross cerebral lesion at a time when many still believed in the "localization" of "human faculties" and "moral qualities" in various portions of the brain. At the beginning of the nineteenth century Gall had enunciated this theory, which had found wide acceptance. By a perverted process of reasoning from analogy, the under surface of the frontal lobes had been selected as the seat of the "sense and memory of words." This doctrine was hotly disputed, and by the middle of the century had begun to fall into disrepute. When, however, in 1861, Broca found that local disease of one half of the brain produced definite loss of speech, the theory of "localization" seemed to be confirmed, the more so since he placed the cause of the disorder in the third frontal convolution. The nature of the problem was, however, still obscured by the older idea that it was the "memory for words" or the "faculty of speech" which was situated in the affected parts of the brain.

But from the beginning (1868) Hughlings Jackson protested against the idea that there was a "faculty" of speech that could be destroyed by a cerebral lesion. These defects must be considered, he maintained, "on the psychical side as defects of mind, and on the physical side as defects of the nervous system." We have to consider speech on this wider basis, in order that we may be better able to see how speech is part of mind, and to get rid of the feeling that there is an abrupt and constant separation into mind and speech. "It is," he said in 1868, "the power of intellectual expression by 'movements' of any kind, which is impaired, those most special, as of speech, suffering most; those of simple sign-making, least or not at all." "The question" he adds, "is not, How is general mind damaged? but, What aspect of mind is damaged?'"

Most observers continued to cling to the terms "aphasia," "alexia," and "agraphia," and many cases were published which were supposed to be examples of these conditions in isolated form. But at the same time it was recognized that the acts of speaking, reading and writing, were based on more elementary processes; these were supposed to be "images" of movement, hearing and sight.

This assumption was purely gratuitous. In 1866 Jackson pointed out that, in some cases, images were entirely unchanged; in some, on the other hand, they were grossly disturbed, and to these he applied the special term "imperception."

But, with Wernicke's description of "Sensory Aphasia," the belief that certain instances of disordered speech were due to destruction of auditory or visual images seemed to become a demonstrable fact. Broca's aphasia was attributed to disturbance of the motor mechanism, whilst the other forms were said to be due to destruction of "auditory" or "visual word centres." The terms "motor aphasia," "word deafness," and "word blindness" became firmly established, although they were no more fitted to describe the actual loss of function than "aphasia," "alexia," and "agraphia." As time went on, it was evident that the actual disorders produced by a cerebral lesion did not correspond to any of these categories. Elaborate explanations were put forward, which tended more and more to be based on mechanical diagrams, founded neither on the anatomy nor on the known functions of the brain.

Finally, Marie made a bold attempt to bring theory into consonance with clinical facts; he put forward the view that "motor" aphasia was due to anarthria or disturbance of the higher articulatory mechanism, whilst the "sensory" form was in reality an expression of lowered intellectual capacity.

I hope elsewhere to enter more fully into the history of the various views on the nature of aphasia and kindred disorders. But this short statement must suffice to introduce the observations I am anxious to put forward in this paper.

Chapter I.—Material and Methods.

An inconstant response is one of the most striking results produced by a lesion of the cerebral cortex. During our studies in sensation, we found that a stimulus, exerting a constant physical force well above the normal threshold, was sometimes appreciated and at others evoked no reply. Moreover, a graduated increase of intensity did not of necessity

lead to an equivalent improvement in the answers given by the patient.

Bearing in mind this characteristic want of certainty in the reaction to measured stimuli, it seemed probable that disorders of speech due to cerebral injuries would reveal the same tendency. This is notoriously the case. It is not a sufficient test to hold up some object, and ask the patient to name it; at one time he may be able to do so, at another he fails completely. No conclusion can be drawn from one or two questions put in this way; his power of responding must be tested by a series of observations in which the same task recurs on two or more occasions.

Not only is it necessary to arrange the tests in sequence, but each set must be placed before the patient in several different ways. For example, six common objects are laid on the table in front of him, and he is asked to point to the one which corresponds to a duplicate placed in his hand out of sight. This is repeated for eighteen or twenty-four observations, so that the choice of any one object recurs three or four times in the course of the series. Then he indicates each one in turn, as it is named by the examiner, or makes his selection in answer to printed words set before him on a card. He next gives names to the various objects, one by one, and finally writes them down without saying anything aloud. The order in which the tests follow one another remains the same throughout; this alone makes it possible to draw any conclusion from the inconstant responses, which are so disconcerting, unless the answers are recorded in this manner. Moreover, this method enables us to learn how the patient responds to the same series of tests put before him in different ways.

Before we pass on to consider these tests more in detail, it is necessary to say something of the character of the patients on whom this research is mainly based. In civilian practice most of those who suffer from aphasia and kindred disorders of speech are men with arterial degeneration, and in many the blood tension is greatly increased. They are old, broken down, and their general intellectual capacity is diminished. Such patients are easily tired and are obviously unsuitable for sustained examination.

But the war brought under our care young men who were struck down in the full pride of health. Many of them were extremely intelligent, willing and anxious to be examined thoroughly. As their wounds healed they were encouraged and cheered by the obvious improvement in their condition. They were euphoric rather than

depressed, and in every way contrasted profoundly with the state of the aphasic met with in civilian practice.

There is still another difference between the results produced by gunshot injuries of the head and those vascular lesions which are usually responsible for disorders of speech in the old. The missile strikes the skull from without, and even if it penetrates the brain tends to cause the greatest damage on the surface. Many vascular lesions, on the other hand, destroy the substance of the brain where the fibres are diverging or converging on their path to or from the cortical centres; a small hæmorrhage may in consequence be followed by a profound and widespread disturbance of function. But structural changes produced by a local injury to the external surface of the skull, not only cause less severe and extensive manifestations of cerebral injury, but give greater opportunity for the appearance of loss of function in dissociated forms.

Moreover, with gunshot wounds of the head, the symptoms tend to clear up to a considerable extent, however severe may have been the effect produced by the initial impact of the bullet, provided there are no secondary complications. Some aspects of the disordered function recover more rapidly than others; then it is that the various cerebral activities associated with speech, reading and writing become revealed in isolated forms. As recovery proceeds, some one of them may remain permanently defective, or in the end the patient may recover his powers to such an extent that he no longer fails to carry out the rough and simple tests which can be employed in clinical research.

§ 1.—*Serial Tests.*

Before proceeding to describe in detail the actual tests used in this research, I wish to lay stress on certain general rules necessary for their success. The patient must be examined alone, in a quiet room, apart from all distracting sights and sounds. It is of fundamental importance to record not only what he says or does but also every remark or question of the observer. As soon as it is certain that the patient understands the task he is asked to perform, each series of tests must be carried out in silence; should this rule be broken, both sides of the conversation must be recorded. It is particularly important to write down at the moment any statement which throws light on the ideas or feelings of the patient with regard to the test, or to the difficulties he experiences in carrying it out. If it consists in executing some choice

to verbal command, the observer must say the words once only in the simplest and most direct manner. Should it be necessary to repeat the order at the request of the patient, the fact must be noted, so that we may learn in how far his subsequent conduct is influenced by the repetition. Between any two series of tests, it is well to permit the patient to rest or to talk freely; but as soon as a fresh set of observations has been started, all conversation should be confined to the task in hand, and every word spoken on either side must be recorded.

It is extremely important to avoid all fatigue or loss of temper. Some patients, especially the older aphasics, become depressed or angry when they fail repeatedly to carry out tests which are childishly simple. The sequence of the various sets of observations must then be rearranged, so that the next series belongs to a group that can be carried out easily. It is remarkable how quickly this restores the patient's equanimity. In all work of this kind fatigue and disappointment must be avoided by every possible means, even if necessary by terminating the sitting.

For it must be remembered that we are here dealing with a general function, and not with an affection confined to one half of the body. There are no normal parts that can be used as an indication of the patient's general condition, as was the case when we were investigating the sensory reactions of the cortex. It is not a question of local loss of attention or fatigue; the functions which are disturbed form part of the general activities of the mind.

This opens up another difficulty which was not present in our previous researches. Much in the character of the patient's answers depends on his previous aptitudes, which are entirely unknown. When testing sensation, this was of little importance, because every observation made on affected areas of the body could be compared with the response from equivalent normal parts. Since it is impossible to discover how the patient would have responded before he became aphasic, I have depended mainly on the reactions of young men wounded in the war; for, especially in the case of officers, it was possible to estimate with considerable accuracy the extent of their education, and the ability with which they had carried out the more exacting of their military duties. At the same time the profession or occupation exercised before the war frequently showed that they must have possessed faculties which were subsequently found to be grossly affected. Thus, in one case, an accountant could no longer carry out simple arithmetical operations, and a bank clerk had lost the power of adding up a column of figures with certainty.

The tests I am about to describe in detail vary greatly in the difficulty they present to persons of normal understanding. Most of them, such as naming common objects or colours, the man, cat and dog test, and the coin-bowl test, are childishly simple, and can be carried out perfectly by the stupidest individual. But many normal men are liable to make mistakes in the hand, eye, and ear test, when attempting to imitate the movements of an observer sitting opposite to him. This difficulty seems, however, to be lessened after the instruction in signalling, through which all our young officers were compelled to pass before obtaining a commission.

All the tests in any one group are not of the same order of severity. Some can be carried out with greater ease and rapidity even by normal persons, and these differences may become greatly exaggerated in pathological cases. This is particularly evident when the command requires choice between two or more courses of action. Moreover, words conveying an order always set a harder task than those which indicate an object. Told to put out his tongue, the patient may point to it, but be unable to protrude it; and yet he can do so perfectly to lick his lips.

Throughout these observations it is important to record the rapidity as well as the nature of the response. Frequently the number of erroneous answers is sufficient to show that the power to carry out some particular series of tests is defective. But occasionally every actual reply may be correct, and yet it is evident from the patient's statements and demeanour that he has difficulty in carrying out the task he has been set. A bare record of the number of times he has been successful in his choice would not reveal this defect. In many cases, therefore, it is necessary to time the interval between question and answer with a stop-watch. Speaking roughly, it will be found that the majority of rapid replies are correct, and any task performed with ease is carried out quickly.

(*a*) *Naming and recognition of common objects.*—Six objects of daily use,[1] such as a pencil, a key, a penny, a match-box, a pair of scissors and a knife, are laid on the table. Before starting the observations it is well to record the actual position in which they lie to one another from the patient's point of view. They are then screened from his sight, and a duplicate of one of them is

[1] Sometimes, when my patient was highly educated, I have replaced these articles of daily use by solid geometrical figures, having first ascertained that he was familiar with their proper names.

shown to him; the screen is rapidly withdrawn, and he is asked to point to the object on the table which corresponds to the one he has just seen. From eighteen to twenty-four observations are carried out in this manner, and patient and observer remain completely silent throughout. The power to carry out this form of the test is not affected by any of the disorders of function which are the subject of this research; but it is well to begin with a task that can be performed without difficulty by the patient in order to encourage him, and at the same time to gauge his general powers of comprehension.

Then he is asked to point to an object on the table which corresponds to the name said aloud by the observer. This series is carried out in exactly the same order as the first and all subsequent sets of observations.

Next, he is given cards each of which bears in printed characters the name of one of the objects in front of him, and he is asked to make his choice.

Both these forms of the test may give him considerable difficulty; and I am therefore accustomed to follow them up by placing a duplicate in the normal hand, out of sight, and asking the patient to choose the corresponding object from amongst those on the table. In all cases of uncomplicated disorders of speech of cerebral origin, this can be carried out perfectly.

He is then asked to write down in turn the name of each object indicated by the observer. This must be carried out in silence; but it is impossible to prevent many patients from moving their lips during the act of writing. After carrying out this test, it is often useful to make the patient name the objects aloud, and then write down what he has said. Occasionally he is asked to copy in cursive handwriting the printed name on the cards, or to repeat each name as it is said by the observer. These two tests are inserted when there is doubt as to the patient's power of repetition and copying.

Let us take as an example the answers to these tests given by No. 2, seven months after the injury to his head. (Table I, p. 95.)

Throughout the first series he never hesitated for a moment, but was prepared to indicate the correct object on the table, even before the screen was removed which hid them from his sight.

With the second series he was much slower. At first his lips moved, forming the word said by me, or he actually whispered or uttered it aloud. He said, "I can't remember what they are unless I think. If it wasn't here on the table I couldn't tell you."

TABLE I.

	(1) Pointing to an object on the table which corresponds to one shown to him	(2) Pointing to an object named verbally by the observer	(3) Pointing to an object named in print	(4) Duplicate placed in his left hand out of sight	(5) Naming an object indicated	(6) Writing the name of an object indicated
Knife ..	Correct and very quick	Correct (whispered "knife")	Correct ; silent	Correct and very quick	Correct..	Wrote "Jan"
Key ..	,,	Correct	,, ,, ...	,,	Placed his hand into his pocket, pulled out keys. Said "No, I can't tell you that"	(Gave up)
Penny ..	,,	,, (repeated "penny")	,, ,, ...	,,	Correct..	Wrote "panin"
Matches ..	,,	Correct (repeated "matches")	,, ,, ...	,,	"That's match, mat, mats, match"	Wrote "machin"
Scissors ..	,,	Hesitated, moved lips; then correct	,, ,, ...	,,	"That knap, ker, kur-te . . . No, I can't tell you that"	Wrote "nare"
Pencil ..	,,	Correct, quick and silent	,, ,, ...	,,	"Pentl, permitch; not quite it. Pĕ night. No, I can't"	Wrote "knelers"
Key ..	,,	Correct ; slow ; silent	,, ,, ...	,,	"That's mer, may".. ..	Wrote "no, karest"
Scissors ..	,,	Hesitated ; then correct ; silent	,, ,, ...	,,	"No idea. I know exactly what it is, but I can't tell you"	(Gave up)
Matches ..	,,	Correct ; quick ; silent	,, ,, ...	,,	"That's match"	Wrote "no merest"
Knife ..	,,	Hesitated ; finally correct ; silent	,, ,, slow ..	,,	"Nĕ-ife, Ker-nife"	Wrote "knerreg"
Penny ..	,,	Correct : slow ; silent	,, ,, very quick	,,	Correct	Wrote "pe. penner"
Matches ..	,,	Correct ; slow ; silent	,, ,, ...	,,	"That's . . . match" ..	Wrote "mar, matarc"
Scissors ..	,,	Correct ; quick ; silent	,, ,, ...	,,	"That's . . . No"	(Gave up)
Pencil ..	,,	Very slow ; finally correct ; silent	,, ,, very slow	,,	"It's a p. something . . . No"	(Gave up)
Penny ..	,,	Correct ; quick ; silent	,, ,, ...	,,	Correct..	Wrote "penne"
Knife ..	,,	Very slow ; finally correct ; silent	,, ,, ...	,,	"Kĕ-nife. I always remember that . . . It's canif in French"	Wrote "kerrert"
Key ..	,,	Correct ; quick ; silent	,, ,, ...	,,	Took his keys out of his pocket and said "Mat, latch"	Wrote "wer, karet"
Matches ..	,,	Correct ; quick ; silent	,, ,, quick ..	,,	Correct..	Wrote "marest, maters"

When he pointed to an object named in print, the card was held in front of him all the time until he made his choice. His finger hovered in the air, whilst he looked backwards and forwards at the card, until at last he dropped his finger onto the correct object. Except where he made his choice rapidly he reinforced his memory by frequently consulting the printed name on the card in front of him.

When a duplicate was placed in his hand out of sight, he never had a moment's doubt, but indicated the object with great rapidity. Moreover, he remained silent and his lips did not move.

Asked to name an object to which I had pointed, he showed great hesitation and difficulty. His lips moved and he frequently made several attempts in vain to find the word. Occasionally, however, he enunciated it at once, and without preface, but sometimes a correct answer was preceded by "That's. . . ."

Throughout his attempts to write the name of an object shown him, he said nothing aloud; but it was obvious from the movements of his lips that he was attempting to find the word with the aid of silent articulatory movements. His power of naming was, however, so bad that it gave him little help in writing the name of the object.

(*b*) *Naming and recognition of colours.*—This test is carried out in the same manner as the one I have just described, except that coloured silks are substituted for the objects of common use. Eight strips of different colours are laid in a row and hidden from the patient by a sheet of cardboard; he is then shown an exact duplicate of one of the pieces on the table and, when the screen is removed, is asked to indicate the one which corresponds with it. Should there be hemianopia or any defect of the visual field, it is important to make sure that the whole gamut of colours is visible to the patient from the position in which he is sitting. Provided this source of error is avoided, the test in this form could be carried out correctly in all the cases of unilateral lesion of the brain comprised in this research.

Then the patient is asked to indicate the colour named orally or in print. Next he says the name of each one in turn or attempts to write it down silently. Lastly, he reads the name of each colour aloud, as it stands on a printed card.

The following example (Table II, p. 97), taken from No. 2, shows many of the most characteristic errors. At first sight it might seem as if he were colour-blind; but this is excluded by the rapidity and correctness with which he matched colours in the first series of observations. The defect was one of names and the gross errors were due to want of

TABLE II.

	(1) Pointing to similar colour to that shown	(2) Pointing to colour named by the observer	(3) Pointing to colour named in print	(4) Naming colour shown	(5) Writing name of colour indicated	(6) Printed name read aloud
Black ..	Correct and rapid	Pointed to white saying "Black"	Chose white ..	"Green—red; no, not red. I can only call it dead."	Wrote "Red" ..	"Red"
Red ..	,,	Correct, whispered "Red"	Chose red very slowly	"Ber-lu. I know what it is. It's what the Staff . . . the same colour I had here. I think it's red"	Wrote "Bell"..	"Green. No, that's red, blue. No, it isn't blue, it's red"
Blue ..	,,	Correct, whispered "Ber-lu"	Chose violet ..	"Ber-lu"	No response ..	"Green"
Green ..	,,	Correct, whispered "Green"	Chose white ..	Whispered "Green." Compared it with blue band on his arm and rejected it. "I don't know this one. . . . Ber-lu"	Wrote "Gren"	"Green"
Orange ..	,,	Chose yellow, said "O-age." Then chose orange	Chose orange ..	"It's like Pil . . . I think that's red"	Wrote "Read"	"Red"
White ..	,,	Chose yellow silently ..	Chose yellow ..	"That's green"	Wrote "Gernd"	"Red, that's red"
Violet ..	,,	Correct; silent	Chose violet ..	"Ber-lu, ber-loor. . . It's more like mauve"	Wrote "Moved"	"Blue, green; no, mauve"
Yellow ..	,,	"I have no idea. Yellow. I don't know." Finally chose orange	Chose white ..	"That's red"	Wrote "Grena"	"Red"
Red ..	,,	Said "Pred" and chose red	Chose red ..	"What the Staff is again. I can't remember what it is"	Wrote "Blead"	"Red"
White ..	,,	Said "White" and chose white	Chose white ..	"Green"	Wrote "Red" ..	"Green"
Yellow ..	,,	Correct; silent	Chose violet ..	"That is . . . I know what I am trying to remember . . . Kark-too, tark-loon, kar-ki . . that's right"	Wrote "Run"..	"Red"
Blue ..	,,	Said "Ber-lu; I think it's this one." Very slowly chose blue	Looked at the blue band on his arm, and after great delay chose blue	"Ber-lu"	Wrote "Movy"	"Ber-lu"
Green ..	,,	Said "Dreen, green." Chose white	Chose black ..	Touched his arm, shook his head and said "Mauve. It's not quite mauve, but it's rather like, I think"	Wrote "Gernat"	"Red"
Black ..	,,	Said "Black" and chose correctly	Chose blue ..	"That's red"	Wrote "Mat"..	"I know this is an ordinary one. Green. No; red; no"
Orange ..	,,	Said "Or-ridge." Chose yellow	Chose orange ..	"I think it's pink".. ..	Wrote "Grend"	"Mauve"
Violet ..	,,	Said "Violet." Very slowly chose violet	Chose violet ..	"Mauve"	Wrote "Moved"	"This one is mauve"

nominal recognition; even the printed names, when read aloud, showed the same striking defects as the choice of the colour to oral command.

(*c*) *The man, the cat, and the dog test.*—This test is designed to investigate the power of reading and writing in its simplest and most elementary form. Every word employed comprises three letters only; the patient is, therefore, precluded from guessing at the constituents of the phrase by their length, a fallacy which is otherwise liable to vitiate all observations of this class. But, on the other hand, the task set is childishly easy, and the defect in speech must be severe, before it shows traces on so simple a test.

First, the patient is made to read aloud the different combinations from printed cards. Then he is shown pictures of a man, a cat, and a dog in pairs, corresponding to those he previously read aloud. Next, he is asked to write the phrases from pictures or from dictation. Finally, he is made to repeat the words said by the observer, to read what he has written, and to copy from the printed card.

The commonest form of error revealed by this test, as shown on the following table, is a tendency to substitute one name for another. Occasionally this may go so far that the patient inserts "woman" into his answer, oblivious of the fact that no word of this length occurs in the series.

I have chosen for reproduction a set of observations where the six combinations were put once only; it is, however, advisable to repeat them once or more, varying the order each time. (Table III, p. 99.)

(*d*) *The clock tests.*—Two clock faces are prepared, about twelve centimetres in diameter, fitted with metallic hands, which are adjustable. On each, the figures of the hours are clearly marked in Arabic numerals. One of these clocks is given to the patient, and he is asked to place the hands in an exactly similar position to that of the other one, set by the observer. This direct imitation can be carried out correctly, unless the power of comprehending the nature of the task is considerably diminished.

Next, the patient is told to set the clock to oral and then to printed commands, and in each instance the sequence of tests is the same. The hands of the clock are now moved by the observer into various positions and the patient tells the time aloud, or without speaking writes them on paper.

Most of the characteristic errors discovered by this set of tests can be seen on the following table, compiled from observations on

TABLE III.

	(1) Reading aloud	(2) Reading from pictures	(3) Writing from pictures	(4) Writing from dictation	(5) Repetition	(6) Reading what he has written	(7) Copying
The dog and the cat	Correct; quick	Correct	Correct	Correct	Correct	Correct	Correct
The man and the dog	"The man and the . . . dog" (slow and hesitating)	,,	,, ...	,, ...	,,	,,	,,
The cat and the man	Correct; quick	,,	,, ...	"The cat and the dog"	,,	,,	,,
The cat and the dog	"The cat . . . the cat and the . . . dog" (slow and hesitating)	,,	,, ...	"The cat and the man"	,,	,,	,,
The dog and the man	Correct; quick	,,	"The cat and the man"	Correct	,,	,,	,,
The man and the cat	Correct; quick	,,	Correct	"The man and the dog"	,,	,,	,,

TABLE IV.

	(1) Direct imitation	(2) Clock set to oral command	(3) Clock set to printed command	(4) Telling the time shown on a clock set by the observer	(5) Writing the time shown on a clock set by the observer
5 minutes to 2 ..	Correct..	Set 2.10	Set both hands at 2 ..	Correct	Wrote nothing. Said "I seem to be getting confused between the hands"
Half-past 1 ..	,, ..	Set 1.10	Set both hands at 1 .. "I seem to think there is something wrong"	,, ...	Correct
5 minutes past 8..	,, ..	Both hands set at 8. "I've forgotten"	Set both hands at 8 ..	,, ...	"Ten minutes past eight"
20 minutes to 4 ..	,, ..	Both hands set at 4. Then set 4.25	Long hand at 4; short hand at 7	"25 minutes to 4." ..	Gave up
10 minutes past 7	,, ..	Long hand at 7; short hand at 5	Correct..	"10 minutes past 8 . . . 7"	Correct
20 minutes to 6 ..	,, ..	Set 6.20	Set 6.15	"25 to 6. . . I seem to get in a maze, when I go back to it again"	"Ten minutes past seven"
10 minutes to 1 ..	,, ..	Set 1.10	Set both hands at 2 ..	"5 to 8. No, that's 10"..	Correct
A quarter to 9 ..	,, ..	Correct	Correct..	Correct	"Quarter to eight"
20 minutes past 11	,, ..	Long hand at 11; short hand at 10	Long hand at 11, "I've no certain opinion. It will be a case of tossing up"	"10 minutes past 11. . . I get confused between the long hand and hour hand"	"Ten minutes past four"
25 minutes to 3 ..	,, ..	Shook his head. Set long hand at 3. Then gave up	Set 3.35	"Quarter past 7".. ..	"Half past seven"

No. 10. (Table IV, p. 100.) The patient mistook "to" and "past" the hour, or confused the two hands; thus he set the long hand at the hour and either placed the short hand in some erroneous position, or became confused and gave up the attempt. Except when he was imitating the position of the hands on the second clock set by the observer, he usually placed the short hand exactly on the number of the hour. For example, when asked to set "twenty minutes to four," he placed it opposite four, so that when the minute hand was brought to seven, the ordinary reading would appear to be 4.35. This inability to divide the space between the figures of the hours led to much difficulty in recording the position into which the hands had been placed, unless that assumed by each one was noted separately.

(*e*) *The coin-bowl test.*—Four bowls or saucers are set upon the table and in front of each is laid a penny. The patient is told to count them from left to right; he is then shown the nature of the task he has to perform, which consists in placing a coin into one of the bowls according to a series of numerical commands. First, the order is given orally, or by means of a printed card, which is read silently. Then the patient is asked to read it aloud, and to carry out the action demanded under the influence of words spoken by himself.

This is so simple a test that no normal person fails to carry it out correctly; but in some instances of aphasia and kindred disorders it may cause considerable difficulty, as seen by the example given on table. In this case both verbal and printed commands were poorly executed, although when asked to read the order aloud he did so correctly. (Table V, p. 102.)

It is sometimes useful to make two sets of observations with the printed cards under somewhat different conditions. First, the orders are given in numerals only, e.g., "1st into 3rd"; then the whole phrase is set out in full, as for example, "First penny into third bowl." In cases of aphasia the second form of this test usually presents greater difficulty to the patient, and may reveal defects that do not appear when the command is given in numbers only.

(*f*) *The hand, eye and ear tests.*—First of all the patient, seated opposite the observer, attempts to imitate a series of movements which consist in touching an eye or an ear with one or other hand. Before beginning these tests it is well to make sure that he knows his right hand from his left, and understands the nature of the task he has to perform. He is asked, therefore, to name each hand as it is raised by the observer, and then to lift the one which corresponds

TABLE V.

	(1) Oral command	(2) Printed command (not read aloud)	(3) Printed command read aloud	
			(a) Said	(b) Action performed
Second into third	Slow; correct	Correct	"Two . . . Three"..	Correct
First into third	Hesitated; finally correct ..	Very slow; much hesitation; correct	"One . . . Three"..	,,
Second into first	Second coin . . . "I forget which one." Order repeated; quickly correct	First coin . . . Corrected to second coin. No further response	"Two . . . One" ..	First coin . . . into first bowl, saying "One, one"
Third into second	Third coin . . . "I forget which it was." Order repeated; correct	Second coin into third bowl ..	"Three . . Two" ..	Third coin . . . into third bowl
First into fourth	First coin . . . No further response. Order repeated; correct	First coin . . . After two minutes' hesitation, correct	"One . . . Four" ..	First coin . . . "Was it four?" pointing to fourth bowl. "I forget." Did nothing further
Fourth into third	Third coin into second bowl ..	Third coin into fourth bowl ..	"Four . . One . . Three"	Third coin into third bowl
Second into fourth	Correct	Correct	"Two . . . Four" ..	Correct
Fourth into first	Fourth coin . . . "I forget which one." Order repeated; correct	Correct	"Four . . . One" ..	First coin. "Four" . . . into fourth bowl
Third into first	Correct	Third coin . . . "I forget which one I've got"	"Three . . One . . Three"	Correct
First into second	Second coin to first bowl; quickly	Correct	"One . . . Two . . . Two"	Correct. "Was that it? I don't know"
Third into fourth	Extremely slow but correct ..	Third coin . . . "I forget which one to put in. It's one of these," pointing to third and fourth bowl	"Three . . . Four"..	Third coin into third bowl. . . . Removed it and replaced it in third bowl
Fourth into second	"I forget which it was." Order repeated: fourth coin into first bowl	Correct	"Four . . . Two"..	Correct

to it, bearing in mind the face to face position. When we are certain from these preliminaries that he appreciates the action demanded of him, the observations are begun.

Some normal persons find difficulty in performing these movements correctly over a series of from sixteen to twenty-four tests; many, however, can carry them out perfectly, especially if they are young and intelligent, and belong to the class from which so many of my war patients were drawn. There is a natural tendency to select the hand opposite to that used by the observer; this error is in most instances checked consciously. But none of the normal men I have examined failed to recognize that when the left hand was in contact with the right ear it had crossed the face; and yet this want of appreciation of crossed movement was one of the commonest pathological mistakes. Moreover, in certain cases, I have been able to watch a steady improvement in the records, resulting finally, after a considerable lapse of time, in a perfect series of answers.

Then the patient is placed in front of a large mirror, and is asked to imitate the reflected movements of the observer standing behind him. In all normal persons and in most of those suffering from disorders of speech, this can be carried out perfectly; it is an act of direct imitation uncomplicated by considerations of right and left, and not attended by the necessity for internal speech.

The next form of this test consists in handing the patient cards, each of which represents a human figure carrying out one of the desired movements. These drawings are simplified to the highest degree consistent with their significance, and a line is drawn down the centre to separate the right and left halves of the body. Most patients, when shown these pictures, make exactly the same kind of mistakes as when seated opposite the observer. But as soon as they are allowed to see the reflection in the glass, every movement may be executed rapidly and correctly.

Then the patient is made to carry out the same series of actions in response to oral and to printed commands. He is next asked to read aloud each order, and to execute it under the reinforcing influence of words said by himself. Finally, he is asked to write down in silence the movements made by the observer sitting opposite him. Occasionally, where the power of writing is in question, he is asked to copy the orders printed on the cards.

Table VI, p. 104, illustrating these tests, was obtained from observations on No. 4, a case of so-called "motor aphasia."

TABLE VI.

	(1) Imitation of movements made by the observer	(2) Imitation of movements of the observer seen in the glass	(3) Carrying out pictorial commands	(4) Pictorial commands seen in the glass	(5) Oral commands	(6) Printed commands (not read aloud)	(7) Reading aloud and executing printed commands	(8) Writing down movements made by the observer
Left hand to left eye	Correct	Correct	Right hand to right eye	Correct	Correct	Correct	Correct	"Left left eye"; correct
Right hand to right ear	Left hand; then right hand; correct	,,	Left hand to right ear	,,	,,	,,	,,	"Right hand right ear"; correct
Right hand to left eye	Correct	,,	Left hand to right ear	,,	,,	,,	,,	"Right hand left eye"; correct
Left hand to right eye	Left hand to left eye ..	,,	Right hand to left eye	,,	,,	,,	,,	"Left hand, right eye"; correct
Left hand to left ear	Correct	,,	Correct	,,	,,	,,	,,	"Left hand" ("I forget which it was")
Right hand to right eye	Correct	,,	Left hand to left eye	,,	,,	,,	,,	"Right hand right eye"; correct
Left hand to right ear	Left hand to left ear; "I have to think"	,,	Right hand to left ear	,,	,,	,,	,,	"Left hand right ear"; correct
Right hand to left ear	Right hand to right ear	,,	Left hand to right ear	,,	,,	,,	,,	"Right hand left ear"; correct
Left hand to left eye	Right hand; then correct	,,	Correct	,,	,,	,,	,,	"Left hand left eye"; correct
Right hand to right ear	Correct	,,	Left hand to left ear	,,	,,	,,	,,	"Right hand" ("I think it was the same side")
Right hand to left eye	Right hand to right eye	,,	Left hand to right eye	,,	,,	,,	,,	"Right hand left eye"; correct
Left hand to right eye	Right hand to right eye; then right hand to left eye; "I see the mistake"	,,	Right hand to left eye	,,	,,	,,	,,	"Left hand to right eye"; correct
Left hand to left ear	Correct	,,	Correct	,,	,,	,,	,,	Wrote nothing ("I've forgotten")
Right hand to right eye	Correct	,,	Correct	,,	,,	,,	,,	"Right hand right eye"; correct
Left hand to right ear	Correct	,,	Right hand to left ear	,,	,,	,,	,,	"Left hand right eye"
Right hand to left ear	Left hand to left ear ..	,,	Left hand to right ear	,,	,,	,,	,,	"Right hand left ear"; correct

This is the most difficult of all the serial tests, and the only one where the answers of a normal person may be at fault. But, if we bear this possibility in mind, it is capable of giving valuable information concerning the nature of the different defects of speech of cerebral origin.

§ 2.—*Further Tests employed in this Research.*

It is customary to test a patient, who suffers from one of these disorders of speech, with the alphabet and, if he shows any difficulty in naming the letters, he is given a pencil and told to write them in their proper order. But this is not sufficient to determine his disability; his capacity to carry out this test must be examined systematically. He is told to say aloud, to write and to read the alphabet; then he takes it down from dictation, copies it from printed capitals in cursive handwriting, and finally, if the formation of the sounds is defective, he is asked to repeat it letter by letter after the observer. Occasionally he is given the letters of the alphabet printed on separate cards, and is asked to arrange them in order.

A similar set of observations are carried out, using as a basis the days of the week or the months of the year.

Another valuable method of examination belonging to this order is to choose some paragraph in the newspaper of interest to the patient, and then to ask him to retail the information in different ways. For example, he is allowed to select an account of the latest boxing match, and asked to read it to himself silently; after the paper has been removed he narrates what he has gathered, and then writes down his own account of the fight. Then he is asked to write it from dictation, to copy the printed account in handwriting, and to repeat it verbally; phrase by phrase, after the observer. Finally, he attempts to read aloud what he has written, however defective it may be. The order of these operations is determined by the class of patient with whom we have to deal, and the nature of his defect. It is extremely important, however, that the task selected should be of interest to him, and it must not be long or difficult to remember; moreover, it should be strictly adapted to the extent of his education.

It is customary in these cases to place a picture before the patient, and to ask him to describe in spoken or written words what he sees. Sometimes a combination of this pictorial test with the comprehension of printed matter in the following way makes a useful method of

examination. A picture is chosen to which is attached a short printed description, so common in the daily press. At first the legend is covered up; the patient is asked to say what he sees in the picture, and the manner and nature of his observations are carefully recorded. Then he is allowed to see the printed description; after reading it silently to himself he writes down what it conveys to him, reinforced by the pictorial representation. He then reads it aloud and writes it to dictation. Finally, he is told to fix his attention on the picture, and to say what it conveys to him. An excellent example of this combined test is given on p. 139.

To be of any value arithmetical tests must be simple and carried out systematically in the order of their progressive difficulty. I am in the habit of beginning by asking the patient to add two simple numbers of three figures each, such as 235 and 462, which do not necessitate carrying over. This is followed by a couple which require one act of carrying over, and then by another where it is necessary to perform this operation twice.

From this he passes to the subtraction of one number of three figures from another, where no carrying over is required; the difficulties are then increased progressively in exactly the same manner as with addition. All these tests are absurdly simple to the normal man, provided he is not illiterate.

Great stress will be laid on the patient's ability to play games, such as chess, draughts, cards and billiards. "Jigsaw" and other puzzles may also give valuable indications of his aptitudes and disabilities.

His power of drawing must be tested in a more systematic manner than is usually the case. First, he is asked to draw from a simple model, such as a bottle or a vase. If he is fond of drawing and naturally intelligent, I sometimes put before him a glass spirit-lamp, because of the difficulties presented by the wick; for the parts above and below the collar must be shown as a continuous structure interrupted by the metallic neck of the lamp. This forms a useful problem in significance. Then both the model and drawing are removed, and he is asked to reproduce it from memory.

Another valuable test, which has been used by Marie and others, is to ask the patient to draw an elephant. Fortunately most of my patients were familiar with the appearance of these animals, and many had seen them in India during their military service. If possible, the patient should also be induced to draw images which come into his mind spontaneously, apart from any external command.

He is also asked to sketch roughly a ground plan of some room with which he is familiar, such as his ward in hospital. In some instances this is carried out with ease, whilst in others it is entirely impossible. But although the patient may be unable to put down on paper any of the significant objects in the room, his visual images are not of necessity defective. For if I draw an oblong in the centre of the paper to represent his bed, he may be able to indicate to me the position of the windows, doors, furniture, and other appurtenances of the ward with absolute correctness. He may know their position, but be unable to represent their relation to one another.

So far, all the tests I have described are new or, if commonly used, are employed by me in an unusual manner. They are not in any way complete, and are capable of profound improvement; but I have set them out in detail to show what methods have actually been employed in this research.

Chapter II.—Previous Explanations of Aphasia.

Gross injury confined to one cerebral hemisphere can disturb the power of speaking, reading, and writing, without producing any other severe loss of intellectual capacity. Evidently there must exist a group of functions indispensable for language in its widest sense, but not equally essential for all intellectual performance; it is these functions which form the subject of this investigation in as far as they can be affected by destruction of certain parts of the brain.

An organic lesion can only cause a disorder of speech by disturbing underlying physiological processes; the structural changes prevent the orderly performance of certain cortical functions, and speech suffers in consequence of a disturbance of vital processes, which may never directly influence consciousness. These abnormal reactions are apparent to the external world in terms of a disorder of language, just as some defect in the mechanism of a clock is manifested by failure to keep correct time. The physiological activities of certain portions of the cerebral cortex are responsible for the capacity to make use of language in a normal manner; when they are imperfectly carried out, from whatever cause, the acts of speaking, reading, and writing become more or less disordered.

Before we can determine anatomically what parts of the cortex are responsible for these manifestations, it is essential to discover the

nature of the disorder itself. Unfortunately the actual phenomena of disordered speech have been dismissed for the most part in a very summary manner, although an immense amount of time and energy has been expended on the distribution of the structural changes. Clinicians assumed that the defects in the use of language corresponded to three more or less independent groups, loss of speaking, reading, and writing; these in turn were attributed to destruction of "motor," "auditory," and "visual" images. On the other hand, to Marie and his followers loss of speech is in reality a high-grade change in the mechanism of articulation, whilst all other "aphasic" manifestations are attributed by them to a lowering of general intellectual capacity.

This chapter is devoted to considering in how far the actual nature of these disorders of language corresponds to the categories generally laid down. I shall attempt to show that they cannot be classed under the headings of speaking, reading or writing; for, whenever the structural changes affect one half of the brain only, disorder of one of these "faculties" is accompanied by some analogous change in the others. Then I shall bring evidence to show that such affections of language are not based on a destruction of "images." They obey the law laid down by Jackson fifty years ago, that the negative manifestations of a lesion are expressed in some disorder of the affected function; in this instance they appear in terms of language in its widest sense, and not as a disturbance of images, "motor," "visual" or "auditory."

Finally, I shall examine the suggestion that the "motor" aspect of aphasia is in reality an "anarthria," and shall bring evidence to show that this is not an adequate explanation. But the full consideration of the second half of Marie's theory must be postponed to a later period, when I consider more fully the effect on general intellectual capacity of the disorders of language which I am about to describe.

§ 1.—*Disorders in the use of Language, due to an Unilateral Lesion of the Brain, cannot be classed under the Categories of Speaking, Reading and Writing.*

Had it not been for the trend of scientific thought at the time when the facts of "aphasia" were discovered, no one would have imagined that a lesion of the brain could affect exclusively such complex acts as speaking, reading and writing. But it was assumed that man had been endowed at his creation with certain "faculties," situated in different

parts of his brain, and these were thought to be disturbed by the cerebral injury.

This theory seemed to receive support from the fragmentary and insufficient examination of the earlier observers. The patient was said to be able to read and write although he could not speak. Sometimes, on the other hand, he could speak but could not write. But as observations accumulated and the first novelty of the discovery wore off, it became obvious that pure instances of "aphasia," "alexia" or "agraphia" must be extremely rare, and most patients were said to show a "mixed affection" of speech.

From 1866 onwards Jackson opposed such conceptions, and laid stress on the importance of recognizing that there was no such thing as a "faculty" of language. In the same way he insisted that there is no "faculty of memory" apart from the things remembered. But although the doctrine of human faculties may have passed out of fashion, the ideas upon which it was based are still enshrined in the terms "aphasia," "alexia" and "agraphia." Many still hold that it is possible to say that a man has been deprived of the power to speak, to read, or to write by a cerebral lesion, without specifying the conditions under which these complex activities are impossible. It is therefore worth while to demonstrate how little such terms correspond to the actual clinical phenomena.

These "speechless" patients are not "wordless," for they can swear or even ejaculate appropriately on occasion; a man usually speechless may at times produce a complete phrase. But the words of a speechless patient are not at his disposal for voluntary use; they exist for comprehension and can be called up under emotional stress. Voluntary power is diminished with retention of the capacity to evoke the same movement in a more automatic manner. A patient who was unable to find the name for "ink" finally said, "That's what I should call a china pot to hold ink." The disturbance of voluntary speech had destroyed the power of finding the more selective answer "ink," but permitted a more descriptive response. In considering the power to use words we cannot say that the patient is totally speechless; we have to determine under what conditions speech is or is not possible.

In the same way a man may be apparently unable to read a single word, but when a series of printed names of colours are placed on the table, he may be able to point to the one which corresponds to a coloured object in front of him.

The majority of those who are said to be suffering from "agraphia"

can write their names and addresses. One patient under my care wrote without difficulty his name, followed by the full address of his home including the county, but he could not do the same for his mother with whom he lived. In this case the words could be written, when they applied to himself and were more nearly automatic, but not in connexion with another person.

We are face to face with exactly the same difficulties when attempting to determine the power of appreciating spoken words. What, for example, is the condition of a man who cannot draw a "square" when asked to do so, but told to draw a "block of wood" at once draws a perfect square?

Obviously, therefore, we have no right to be satisfied with the statement that the patient cannot speak, read or write. It is our business to discover the conditions under which he can or cannot perform any of these acts. As soon as we examine the clinical phenomena from this point of view, we find that no one of these three categories of language is affected alone by any unilateral lesion of the cerebrum. A disturbance of one aspect of speech is associated with some other disorder in the use of verbal symbols.

This is true even of the form usually called "motor aphasia." For although at first sight it may seem as if the difficulty was confined to the act of speaking, closer observation shows that other functions are also disturbed. For example, in No. 17, writing revealed the same kind of defects as speech: even when well on towards a full vocabulary he addressed a letter to his "Bank Man-ger" and, when silently recording the names of geometrical figures, wrote "pymared" and "pymerad," an exact reproduction of his method of pronouncing these words.

Jackson pointed out the close association between speaking and writing, insisting on their coincident variation. He thought of internal speech as words that had not passed over the vocal organs, and he used writing as a means of testing its condition. Now, internal speech in this sense plays an essential part in many other acts besides speaking and writing. When the patient, sitting opposite to me, attempts to imitate movements of my right or left hand brought into contact with one or other eye or ear, internal verbalization occurs as a phase of the normal act. No word may be uttered, but the words "right" and "left," "eye" and "ear" are essential to correct imitation of this kind. Such imitative acts may, therefore, suffer profoundly in cases of so-called "motor aphasia" [*vide* Table VI, p. 104]. For the same reason these

patients may find considerable difficulty in carrying out the hand, eye and ear tests, when the command is pictorial, although they can execute them correctly when asked to do so by word of mouth. Their difficulty is in evoking the words they require, and verbal command supplies the necessary want.

Much has been made in the past of "agraphia" as a nosological entity. But, provided the lesion of the brain is unilateral, inability to write is always associated with some other loss of function. This is particularly evident when the power of naming is defective; the patient not only finds difficulty in writing down the time as part of the clock test, but he also fails to set the hands correctly to verbal or to printed command. Even in those cases where word formation, naming and reading aloud can be carried out perfectly, writing may suffer badly, and the patient may be unable to execute verbal, printed or pictorial commands.

Thus it is impossible to classify the disorders of language produced by a unilateral lesion of the brain as exclusive affections of speech, reading or writing. For this reason, such words as "aphasia," "alexia," and "agraphia" should never be employed to record the actual phenomena in any instance of speech defect.

§ 2.—*These Disorders of Language are not due to Destruction of Images.*

In 1879, at a time when everyone assumed that destruction of auditory and visual images was a sufficient explanation of the phenomena of aphasia, Jackson recognized that images, together with those unconscious processes on which they depend, might remain intact in the speechless patient. He cannot speak, he cannot write, he cannot read, not because he has lost "images" or "memories" of words, but because he has lost the use of words in speech. In cases where images are disordered, there is a peculiar defect which Jackson called "imperception." Speechlessness may exist without imperception, and it is from such instances only that we can obtain a clear analysis of the processes which make up speech.[1]

I could bring forward innumerable examples from my records of the truth of these statements. In fact, it is difficult to understand how any observer who had studied patients with these disorders of

[1] I hope to consider in a further communication the clinical manifestations of "imperception" and "mind-blindness."

speech or had listened to their own account of their disability, could ever have supposed that "images" were destroyed. They repeatedly insist that they can "see" the dog you ask them to draw, or the room they are attempting to describe. Moreover, most of them have little difficulty in drawing from memory an object that has been shown to them and then removed from sight.

This dissociation between visual images and those activities of language which have usually been attributed to them is well shown by asking the patient to draw a rough plan from memory of some room, such as his hospital ward, with which he is familiar. In many cases, he is entirely unable to do so. But if the observer places a mark on a sheet of paper to indicate the bed on which the patient habitually lies he cannot infrequently indicate correctly the site of windows, doors and fireplace, together with the position of the familiar objects by which he is surrounded. Visual images are intact, but they cannot be represented in the conventional manner. In the same way, No. 2 produced to command the most fantastic and absurd representation of an elephant, although his spontaneous drawings of animals were remarkably good. Images were present but they could not be reproduced to order. The same patient could play an excellent game of chess, which in his case seemed to depend on a strong power of visualization; cards, however, puzzled him and he was quite unable to score.

Auditory images were supposed to be responsible for "memories" of words and they were said to be "stored up" in certain areas of the cortex. But this hypothesis is entirely incapable of explaining the phenomena of aphasia. An officer, who in consequence of a bullet wound of the head had lost the power of speaking, reading and writing, kept beside his bed a list of his possible wants. He would ring his bell and, when the nurse arrived, point without fail to the name of the object he required.

The elderly man, whose condition is described on p. 115, could not speak, read or write. If a card bearing the name of a colour was placed in his hand he was unable to read it: the letter conveyed nothing to him. In the language of the older theory he had "lost the memory for words." But if eight cards, each bearing the name of a colour, were placed on the table in front of him, he could pick out the one which corresponded to an actual colour shown to him.

It is useless further to labour this point. For there is not a single manifestation presented by the defects of language, due to a unilateral lesion of the brain, that can be explained by destruction of auditory or

visual images. The theory had its birth in the study and is contrary to the facts of clinical observation.

§ 3.—*The "Motor" Aspect of these Disorders of Language is not a pure "Anarthria."*

In 1906, Pierre Marie broke away from all the orthodox views of aphasia and propounded the theory that the "motor" aspect of disorders of speech was due to "anarthria," a high-grade disturbance of articulation. On the other hand, he held that the "aphasic" aspect was nothing more than a manifestation of diminished general intelligence. "Il n'y a rien d'aphasique," he says, "dans le trouble *moteur* de l'anarthrique. L'anarthrique comprend, lit, écrit. Sa pensée est intacte, et l'expression en est possible par tout autre moyen que la parole, le langage intérieur n'étant pas altéré."

This statement had the advantage of clearing the ground of older preconceptions, but unfortunately substituted a theory which does not agree with the results of more extensive clinical observation. Marie contends that the anarthric patient, in his sense of the word (or the "motor aphasic" as it was the custom to call him), understands, reads, and writes; his thought is intact, he can express himself by every other means except words, and internal speech is unaffected.

Now it is true that such patients may be able to read and write; but the statement of Marie and his followers implies that these acts can be performed perfectly, and that emissive speech is alone disturbed as a consequence of the brain lesion. Closer observation shows that this is not strictly correct. Amongst my military patients were three who would have been spoken of as uncomplicated examples of "motor aphasia"; they could read and write, and showed no defect of general intelligence or memory, and would so far correspond to Marie's definition of anarthria.

Further investigation, however, showed that other functions were affected besides emissive speech, and this was borne out by the statements of the patients themselves. No. 17 talked slowly and was frequently at a loss for a word; he said: "I sometimes — — have to — — alter the whole — — to alter the sentence — — because — — I — — have — — difficulty — — in finding — — the word." Often he substituted some more picturesque expression, such as "dig it up" for "remember." "I want to say a word — — at the back of my mind — — I can't just — — dig it up." He added,

"At first — — I — — don't think — — I'd more — — than a twenty-word — — voc — — abulary." When saying the alphabet aloud he stumbled over "R"; this he explained by saying that, when he had trouble over "R," it was not that he did not know it, but he wanted to say "A" instead of "R," because he was thinking of "are." If he was not certain of a thing he wrote it down; "I may write it wrong — —, but when I see it — — I know it's — — wrong."

He recognized that he frequently found difficulty with adjectives. "I said a person was strong-willed and strong-headed, and I knew it was not what I wanted to say; half a day afterwards I said, 'You wanted to say headstrong.'"

He could understand what he read if he went slowly, and he never misinterpreted the meaning. But he confessed: "I can't read a book to myself because I'm bothered when I say the words. I can get the meaning of a sentence if it's an isolated sentence, but I can't get all the words. I can't get the middle of the paragraph; I have to go back and start from the preceding full-stop again."

When asked to read a few lines from a book to himself and to write shortly what he had remembered, he did so slowly and with great effort. Moreover, his errors were exactly of the same order as those in speaking. He explained that though he could write he did so with difficulty: "I always have to spell out every word, even the little ones. I have to say 'of'; I know it's a preposition, but then I have to think, Is it 'to' or 'from' or 'of'? Prepositions are always a bother to me."

He was shown a set of geometrical figures and named them correctly, although his pronunciation was defective; he was then asked to write down their names without speaking, and although he never failed to indicate their shape, he wrote "pymared" and "pymerad" instead of pyramid. This closely corresponded to the sort of mistakes he made in pronunciation. Another highly intelligent officer described his disability as follows: "I'm confine (confined) to the words I've got back since my speech came back. I try to make a statement—I have to use the words I've got back—when they say, 'What do you mean by so and so?' I haven't got a further example of what I've said, to explain. My vocabulary (pronounced 'vocab-lery') is still small. When I try to explain I haven't got the words I want, and when they say over a set of words, I then say 'Yes, that's the one.' I have to go over the roots; I trace the root back to the Latin or that, and get it eventually (pronounced e-venchaly)."

Even stronger evidence, that this condition is something more than

an uncomplicated disturbance of emissive speech, is given by the hand, eye and ear tests. The patient sits opposite to the observer and imitates his movements exactly; in this class of case, the task is carried out slowly, and with a varying proportion of mistakes. But as soon as the observer stands behind the patient, and the movements are reflected in a mirror, they are executed perfectly and with great rapidity. An exactly similar phenomenon occurs when the order is given by means of a series of pictures; the patient has much difficulty in executing the movements when he holds the card in his hand, but none when it is reflected in the glass. No. 17 explained his difficulty as follows: "I've always said it is like translating a foreign language, which I knew but not very well. It's like translating from French into English." This patient entirely recovered his speech except for a certain hesitation, and three years later carried out this test in all its forms, without the slightest difficulty.

All these facts and many more, which will be brought forward as examples of the nature of the disturbance produced by these unilateral lesions of the brain, show how little the "motor" disorder of speech can be explained as an uncomplicated "anarthria."

Chapter III.—The Nature of the Functions disturbed in Aphasia and Kindred Disorders of Speech.

No conception that we have so far considered is in harmony with the clinical manifestations of these disorders of language: for any satisfactory hypothesis must be capable of explaining why the patient succeeds in reading or writing under certain conditions, although he fails completely if the task is presented to him in a different manner.

Let us then first of all consider, from this point of view, an ordinary case of so-called "aphasia" with "alexia" and "agraphia." On the evening of May 13, 1911, a man of 56 suddenly lost all power of speaking naturally; next day he was drowsy and the disorder of speech increased. On May 17, he came to my out-patient department, and was admitted to the wards, suffering from severe aphasia without hemiplegia. He was discharged a month later, and remained constantly under the care of Dr. Percy Kidd, until his sudden death on January 6, 1920. His condition throughout this period of nearly nine years remained unchanged; but I was able to make an extended series of observations in November, 1919, and it is on these that the following conclusions are based.

He was almost completely speechless, but could reply "Yes" and "No" correctly: asked to say "Yes," he answered "No, I can't" and told to repeat "No" he usually shook his head, but once said "No, I don't know how to do it." He could at times use the expression "Thank you" appropriately, and when puzzled would say "Can't get it; I know what it is, I try." Once when excited by the request to draw an elephant, he said: "Yes, I've been all over; seen lots! I've got some on my what you call it," alluding to figures on his sideboard at home.

He could not name a single object or tell the time set for him on the clock. But when the hands were placed at 1.30, he held up one finger and bisected it with the other hand; shown 1.55, he held up five fingers and then two, to indicate five minutes to two.

He carried out oral commands excessively badly. Even with the coin-bowl test, he failed in twelve out of fifteen attempts to place the penny named in the right bowl; and yet he had no difficulty in pointing to any one of a series of objects, or choosing the correct colour named to him verbally. It was not words that were lacking, but words used in a certain manner.

Asked to imitate my movements, when I touched the right or left eye or ear with my right or left hand, he failed grossly, sitting face to face. But when my actions were reflected in the glass, he never made a mistake and did not even hesitate. An exactly similar result followed on pictorial commands of the same kind; holding the card in his hand, he was wrong every time, but with the picture reflected in the glass, he carried out the movements perfectly and with great rapidity.

The most remarkable incongruity was shown, however, when he attempted to read. Given a printed command, such as to touch eye or ear with one or other hand, he made no effort to carry out even the slightest movement. He shook his head, saying, "I can't, I know what it is, I don't know what it says." In the same way with the coin-bowl test, he did not attempt to carry out a command given either in printed words or numbers.

But in spite of his inability to execute printed commands, there was no doubt that he could read. He was able to point correctly, on seventeen out of eighteen consecutive occasions, to an object named in print. This exactly corresponded to the results obtained when they were named orally. He was able to carry out an even more severe test on similar lines. The six printed cards of the man, cat and dog test were laid on the table in front of him. Then he was shown

pictures of one pair of the series, for instance, the man and the dog. He picked out correctly, ten times in succession, the card which corresponded to the combination he had seen. Once he chose a card with the inscription, "The cat and the man," but rejected it for one bearing "The man and the cat," the order from left to right in which the figures had been presented to him. Later in the same series, he again chose a card with the right names in the reverse order, but immediately corrected his mistake. Thus, he was not only accurate with regard to the verbal significance of the card he selected, but also paid attention to the order of the words in print.

His signature was reduced to one word, "Beaden" (Beaton), and he was totally unable to write the alphabet when asked to do so; but if it was dictated, seventeen of the letters were perfectly formed and many of the remainder were recognizable.

He could not name a single coin, but indicated the relative value of any two of them by holding up the exact number of fingers. Thus, when a penny and a shilling were laid on the table, he raised his hand with all five fingers extended; said "Nover" (another), held up his hand again and then added two more fingers, making twelve in all. He could even give the relation between a penny and a half-crown, raising his hand six times in succession: and yet he could not count above nineteen, and was unable to carry out simple addition or subtraction.

Asked to draw an elephant, he produced an absurd figure bearing no relation to any living creature. He marked in what appeared to be an eye; asked what it was, he said, "Don't know" but pointed to his own eye. Questioned about a peculiar horn-like projection on the front of the drawing, he caught hold of his own ear; and when I asked "What is that?" pointing to the object hanging down in front, he passed his hand over his own face, moving it upwards, saying, "Sometimes up that way." This was evidently intended to represent a trunk.

It is obvious that this patient had not lost the power of reasoning and was in many ways highly intelligent. Although he was almost entirely deprived of speech and could not name anything placed before him, he could indicate the object or colour named to him orally or in print. He imitated movements extremely badly, and if I sat opposite him or if the order was given in the form of a picture; when however such commands were reflected in the glass, they were carried out perfectly. For, in the first case, the words right and left, eye and ear, must be silently interposed between the reception and execution

of the command; but when reflected in the glass the movements are purely imitative and no verbalization is necessary. When shown a common object of daily use or a colour, the patient had no difficulty in pointing to the corresponding one amongst a group on the table before him. Immediate or intuitive recognition caused him no difficulty.

What then is the function which is disturbed by such lesions of the brain? It obviously cannot be comprised under the headings of speaking, reading and writing; for not only may the loss of power to carry out any one of them be partial, but the disturbance extends beyond their limits and affects other mental activities.

All patients suffering from the disorders dealt with in this paper can choose from amongst a set of common shapes and colours the one which corresponds to that which they have been shown. If a simple geometrical figure or one of a series of objects in everyday use be placed in his normal hand out of sight, the patient can indicate without hesitation the similar one from a group in front of him. He is able to set one clock in imitation of another without difficulty. He can, in fact carry out any operation not demanding symbolic formulation. All forms of immediate recognition are possible which do not require the intervention of some symbol; but all acts of symbolic thinking and expression are liable to be affected, more or less, in the cases of disordered language.

Words are the commonest and most obvious symbols used in thinking, and any action is liable to suffer which demands for its perfect execution any form of verbalization. A gesture which can be accurately imitated, when reflected in the glass, cannot be performed with certainty if patient and observer are seated face to face; for this attitude necessitates translation of the movement into words before it can be carried out. If, however, the command is given in spoken or printed words, it may be executed correctly, because the necessary symbols are provided in the order itself. The patient is not compelled to formulate them, as when he attempts to translate into action gestures made in the face to face position or their pictorial representations.

Any act, demanding for its correct execution a formulated proposition, will certainly be affected, whilst the more closely it corresponds to the matching of two patterns the less it will suffer from these disorders.

This conception almost exactly corresponds to the views put forward by Hughlings Jackson from 1868 onwards. He stated that the words removed in consequence of unilateral lesions of the brain were those

employed in the "formation of propositions"; those which remain to the "speechless" patient are the same words used "non-propositionally" or in the lowliest form of "proposition." Less severe destruction of speech disturbs the use of words in such a way, that the higher and more abstract the "proposition" the more likely is the patient to fail, not only in the emission of a correct verbal equivalent, but in the recognition within himself of the full value of the "proposition." As Jackson expounded this theory in paper after paper, it assumed a form which includes the greater number of the facts I have observed.

It is with the greatest reluctance, therefore, that I venture to change his nomenclature; for I believe that under the uncouth word "propositionizing" is included what I understand by "symbolic thinking." This, Jackson contrasted habitually with what he called "lower forms" of speech or thought. But the question as to what constitutes a proposition is so disputable that it is better to avoid a term which is liable to be misunderstood, and to lead to controversy. Moreover, it is doubtful whether the term is strictly accurate even in Jackson's sense; and it certainly does not cover all the abnormalities observed in cases of aphasia and kindred disorders.

I would therefore suggest that the function affected in those pathological conditions might be called "symbolic thinking and expression." The following chapter is devoted to the various forms assumed by the clinical manifestations, and, after a description of these abnormal states, it will be possible to enter more fully into the nature and limits of this disordered function.

Chapter IV.—Dissociated Forms of Symbolic Thinking and Expression.

In the previous chapter I have suggested that the various disorders of language produced by a unilateral lesion of the brain might be grouped together as affections of symbolic thinking. Every manifestation of this aspect of psychical activity is not, however, of necessity disturbed in any one case: but the more acute and severe the lesion, the graver and more extensive will be the disorder it produces. Sometimes all the specific tests yield an abnormal result; in other instances, if the injury is slighter and more strictly local, many of them may remain unaffected. This leads clinically to the appearance of those dissociated manifestations which gave rise to the conception of various forms of aphasia.

But the consequences of this dissociation are expressed in terms of the function itself, and not as a destruction of auditory and visual images or other processes, which do not form an integral part of the act of symbolic thinking. They belong to the same level of psychical activity, and under normal conditions form correlated factors in the production and comprehension of language in its widest sense. Each of them, however, requires the orderly performance of certain physiological processes, which are disturbed by the destructive or paralysing effect of the lesion. These are not all dependent on the functional activity of the same region of the cortex, and consequently may be affected more or less independently. Each aspect of symbolic thinking is associated more closely with the physiological life of certain parts of the brain, and a local lesion can therefore produce a more or less partial disturbance. The nature of these various defects forms the subject of the present chapter.

But before passing on to describe the actual clinical phenomena, I must utter a warning against the erection of new " types " of aphasia. All the disorders described in this paper are affections of symbolic thinking, and it is this psychical function which is disturbed in consequence of the organic lesion. An exactly analogous dissociation may accompany a lesion of the so-called sensory cortex. All the physiological activities associated with the discriminative aspects of sensation are not uniformly distributed within this area, and a local injury, provided it is not severe, can affect some and not others. The sensory loss is partial; certain tests are affected whilst others give normal results. Such dissociation does not express the elements out of which sensation is primarily composed, but reveals the various forms into which this complex act can be broken up in man. It shows that, with the gradual development of the highest strata of the nervous system, certain parts became more peculiarly associated with the physiological processes underlying particular aspects of sensation. Thus, injury to the sensory area of the cortex may produce complete loss of all sensory discrimination on some portion of the body, or the disturbance of sensibility may be partial, affecting one aspect more than another.

The defects of language which form the subject of this paper follow the same principles. A severe lesion of any part of the brain which gives origin to the physiological processes underlying symbolic thinking and expression may destroy all forms of speech; the patient becomes dumb and cannot read or write. But if the lesion is not associated with widespread disorder of structure or physiological function, some power

will certainly return, and the various tests may not be uniformly affected. Finally, when the period of neural shock has passed away, the abnormal manifestations may be confined, for a time at any rate, to disturbance of some one or more aspects of symbolic thinking. These are not the primary elements out of which speech has been evolved, but the forms assumed when the complete and highly developed function is broken up.

The majority of observers have fallen into the error of supposing that these dissociated manifestations revealed the elementary basis of the acts of speaking, reading and writing. On the contrary, they show the components into which the complete psychical procedure can be split up. At first the whole of symbolic thinking and expression may be rendered impossible, but gradually certain forms return, whilst the recovery of others may be indefinitely retarded. When a man has received a severe injury to his foot, at first he may not be able to walk at all; but after a while he is found to be walking in a peculiar manner according to whether the wound affects his toe or his heel. The gait he assumes is not an elementary component of his normal method of walking; it is due to the fact that he cannot place some one part of his foot on the ground.

Provided we bear these principles strictly in mind, we are justified in recognizing the existence of various forms of aphasia. For the clinical manifestations are so obviously different, according to whether the loss falls mainly on one or other aspect of symbolic thinking, that some differentiation is necessary. But it must be clearly understood that the highest functions are first and most severely affected; tests which are less difficult may be carried out perfectly, although they seem to depend on the same act of speaking, reading, or writing.

§ 1.—*Verbal Defects.*

In severe cases of aphasia the power of using words both in external and internal speech is gravely affected. The patient may be reduced to "yes" and "no," together with a few stereotyped phrases or emotional ejaculations. When due to some lesion originating within the substance of the brain, so profound a disorder of speech is usually accompanied by other defects of language. It is the less severe injuries that reveal a loss of the verbal aspect of symbolic expression in an uncomplicated form.

Amongst my patients with gunshot wounds of the head were three who showed this disability alone. They were unable to produce at will

and without effort the word required, although they could recognize it when it was offered to them either verbally or in print. If they were able to utter the requisite word, they could use it correctly for naming objects, although it might be so badly pronounced as to be scarcely recognizable. They could repeat just as much, or perhaps a little more than they could say voluntarily, and executed without difficulty commands given by word of mouth or in writing. All the remaining forms of symbolic thinking were carried out perfectly and these patients were acutely conscious whether the words they uttered or otherwise used were rightly or wrongly produced.

Let us examine more in detail the manifestations of this purely verbal form of aphasia. External speech is profoundly affected; one patient, who was admitted to the London Hospital five days after he was wounded, could not utter a single word. He rapidly improved and within a fortnight was making sounds which bore a remote relation to the words he was seeking. Both my other patients appear to have passed through this stage, but they came under my care after they had already gained a considerable vocabulary. But it is these slighter disabilities that throw the most light on the true nature of this affection of speech; they not only allow us to study the various forms assumed by defective verbalization, but also permit us to hear some account of their difficulties from the patients themselves. Fortunately No. 17 and No. 4 were highly intelligent officers, who were able to give valuable introspective information.

No. 17 said, "At first I don't think I had more than a twenty-word vocabulary." "I want to say a word, but it is at the back of my mind, I can't dig it up. I sometimes have to alter a whole sentence because I have difficulty in finding the word." He frequently substituted a more metaphorical expression for the usual and more direct word, as for example "dig it up" for "remember." This tendency can be observed in the speech of many normal Englishmen, who are unaccustomed to choose their words carefully.

No. 4, who from the beginning showed a less severe disturbance of speech, said he found difficulty with "tenical terms" (technical terms). "Yesterday I had diff-ulty in remembering what you do with a skull — — Tri — — Tre — — Trephine." "I'm confine (confined) to the words I've got back."

This condition leads to gross faults in pronunciation; No. 6 spoke of "the claration of war by the Ollies" (the declaration of war by the Allies), and all these patients were liable to lapse into similar errors.

These always assumed the character of defective word formation; the sentence might be halting and words were either lacking or mispronounced, but the essential rhythm, both of word and phrase, was intact.

But it must not be supposed that the loss of function in such cases was purely articulatory. Internal speech was profoundly affected; writing showed exactly the same faults as uttered speech. Thus No. 4 said, "At first I used to talk, missing out words; now I don't do that." As a matter of fact this tendency still existed at the time of this confession and was evident when he wrote to dictation. For he complained, "I can't carry many words at a time. If you give me a phrase containing four words I can do three, and then have to get you to dictate further. I find on reading over I leave these small words out, quite often."

When No. 17 was asked to read a short printed passage silently, and to write what he had learnt from it, he wrote slowly, and with great effort. He then said: "I always have to spell out every word, even the little ones. I have to say 'of'; I know it is a preposition, but then I have to think: is it 'to,' 'from,' or 'of'? Prepositions are always a bother to me." "It's not the long words that stop me. It may be words of four or five letters. It's not specially the long words that are the trouble. When I am puzzled over a word like 'help,' I have difficulty in knowing if the l or p come last. My bankers are Holt and Co.; at first I had difficulty in knowing whether the l or the t came last. Now I've written to them so often, I've learnt it." "My spelling of Latin derivatives is better than that of other words."

"I can't spell. I think I can write if I have tried on the blotting paper. I have difficulty in finding the words, because I speak the thing out when I write it. When I write a letter hurriedly, I hurry on and leave out lots of to's and at's and words. The easiest way for me to correct is to get somebody to read aloud, and I say, 'Wait a minute, I want to put in an 'of' or a 'to.'" "I'm teachable. If I spell a word wrong, my wife tells me; I get it right. When I wrote to my bank man-ger (manager) I always spelt 'man' and 'ger.' She told me that; now I get it right." Here his pronunciation of manager was exactly as he had been in the habit of writing the word. "It's no use my trying to spell out the words when I'm blocked with a word. But if I can visualize it, I'm all right; visualize the word as it is written."

The form assumed by written words corresponds in a remarkable way with the errors of external verbalization. In the speechless stage these patients write with extreme difficulty, and may be reduced to

their signature only. As they improve in speech, the power of writing increases, but it tends to show defects analogous to those of pronunciation.

The most striking evidence of the disturbance of internal speech was given by the hand, eye, and ear test (Table VI). These patients found considerable difficulty in imitating my movements correctly when we were face to face. At first sight it might seem as if this had nothing whatever to do with speech. But analysis of our own experience under similar conditions shows that such imitative movements are accompanied by more or less internal verbalization. Although we may not be conscious of saying to ourselves "eye" and "ear," we undoubtedly formulate some such words as "right" and "left"; and this is fully borne out by the patient's own statements.

When, however, he is told to imitate my actions reflected in a mirror, he can carry out the test perfectly without hesitation. For under such conditions the movements can be performed correctly without the use of words. They are direct and intuitive. No verbal symbol intervenes between the reception of command in gesture and its execution.

In order to test the truth of this explanation I asked the patient not to imitate, but to record my movements in writing. This he did badly, sitting face to face as might have been expected from previous experience. But when told to write down my actions, as seen in the mirror, he found exactly the same difficulty. Writing necessitated the interpolation of words into what would have been otherwise an act of non-verbal imitation; this spoilt the response to a test that had otherwise been carried out perfectly. No. 4 explained: "I say to myself, 'left hand'; then I have to say to myself: 'left ear or eye.' When I've said it, when I've decided, I can write it quite easily."

An exactly similar result is obtained in this group of cases, when the order is given pictorially. A series of cards are prepared, each bearing a drawing of the essential factors in one of these movements; these are handed to the patient in order, and he is asked to carry them out without speaking. If he holds the card in his hand, as he would normally look at a picture, the records are bad, just as with face to face imitation. No. 17 said: "It's like translating a foreign language that I know, but not very well. It's like translating from French into English."

But when the figure on the card was reflected in the mirror, his imitative movements were carried out perfectly, and without hesitation.

For no verbal intervention is necessary between the visual reception of the order and its performance.

These patients suffer from a defective power of verbalization; they cannot produce with certainty the word they want either for external or internal speech. They usually appreciate the significance of words presented to them, and can therefore execute both oral and printed commands; but they are liable to become confused in general conversation, or if the order is given too rapidly. No. 4 said: "Some words, when I listen to them, I can't collect the meaning. Nurse said something about your coming this morning; but she said it too quickly, I couldn't collect it; she had to say it again."

An exactly similar difficulty occurs when they attempt to read to themselves. No. 17 said: "I can't read a book to myself because I'm bothered when I say the words. I can get the meaning of a sentence if it is an isolated sentence, but I can't get all the words. I can get the middle of a paragraph. I have to go back and start from the preceding full-stop again."

Reading aloud conveyed the meaning better than when he read to himself; for the sound of the words, though badly pronounced, reinforced his understanding of the significance of the paragraph as a whole.

Writing to dictation is slow, and words may be omitted. No. 4 said: "I can't carry many words at a time. If you give me a phrase containing four words, I can do three, and then have to get you to dictate further—or read it again." On reading what has been written to dictation, such patients notice the omissions, and attempt to correct them. They find no difficulty when the various combinations of the man, cat, and dog test are dictated, and never substitute one word for another, as is so commonly the case in other forms of aphasia.

The verbal aspect of numerals may be affected, but not their significance. Thus, in the early days after the injury the patient may be unable to count, because he has not those verbal symbols which are numbers. With gradual recovery this is replaced by various troubles with compound numbers, and inability to carry a long list of figures in the memory. Thus No. 17 said: "When I first began to look at reference books like the Army List, I couldn't say it was 982 when I looked the page up; but if I didn't try to say it, I could look up the page without difficulty. When I tried to say it I would say different numbers, and then I would muddle myself and have to look it up again. Silent thought was easy, but vocal thought was muddling."

He played an excellent game of bridge, but complained: "When I am scoring in a game, I say 28, when I mean 41. But this makes no difference to my score. I count 41, though I may say 28. I do the sum right, but get the figures I say wrong." Addition and subtraction were correctly carried out, and he kept his own bank-book.

No. 4, however, found some difficulty in carrying over a number when adding or subtracting, although the actual calculations were correctly performed. He had worked in a bank before the War, and was accustomed to add up long columns of figures in his head; this he now found difficult. Such loss of capacity to verbalize figures may lead to actual faults in simple sums if the disturbance is severe and the patient poorly educated [No. 6].

None of these patients failed to name coins correctly if they could find the requisite words; however badly pronounced, the sound bore some relation to the actual name. They could always indicate the relative value of two pieces of money placed in front of them, even if they were obliged to do it in dumb show on their fingers.

Provided they could speak sufficiently, they had no difficulty in naming a series of common objects or even geometrical forms, if sufficiently well educated. They could choose any one of them either to verbal or written command, if the order was given in one word, and not in a complex phrase.

Asked to write the names of such common objects or of colours, without saying them aloud or under the breath, the words produced were recognizable, and corresponded to the object shown; but they displayed the same faults as if they had been pronounced. Thus, pyramid became "pymared," "pymerad"; scissors "sissiors" and ovoid "oboid" throughout one series of written tests.

Drawing is not affected and the outline of a simple model can be reproduced from memory. Told to draw an elephant the result is recognizable and exhibits all the salient parts of the beast. These patients have no difficulty in drawing a plan of some room with which they are familiar; this is a true ground plan and does not show that tendency to lapse into details of elevation so common in other forms of disturbed symbolic thinking. They have no difficulty in finding the way, and can describe a journey from one place to another without difficulty or confusion.

They can look at pictures with pleasure and understanding. They are able to appreciate jokes expressed pictorially or in print, and are capable of playing games at an early stage of recovery. No. 4 found "jig-saw" puzzles very "re — edji — kate — ive" (re-educative).

One of the most striking faculties possessed by this group of patients is the power of recognizing their errors. On one occasion, No. 17 remembered that six months before he had been forced to substitute another word for "economy," which he had read but could not remember. On looking up the actual record it read as follows: "I never found we were much in pocket over her — her — thrift or her — I want another word but I can't get it."

Innumerable examples might be collected of this power of appreciating whether an act of speech is rightly or wrongly performed. It is one of the most characteristic features amongst the manifestations of verbal aphasia.

§ 2.—*Nominal Defects.*

In this disturbance of symbolic thinking and expression, we are not dealing with a difficulty in forming words, but with a disorder of their nominal aspect. A name is a pattern which, if appropriately chosen, fits an external object or state of things around us. When a set of geometrical figures are ranged before me and a cone is placed in my hand out of sight, I know that it resembles one of the objects on the table, and this in spite of a diversity in size, material or colouring. A pattern has been produced as the result of the sensation from my hand, which agrees essentially with what I see. If, however, I give the object a name and call it a cone, I evoke a symbol which indicates that pattern. In the same way, when I give the time as five minutes to eight, I not only utter a series of words, but name a position on the clock; in a few minutes the long hand will reach the hour, and this position is consequently named "five minutes to eight." It differs fundamentally in nominal significance from "five minutes past eight"; the two are as diverse as a cone and a pyramid appreciated by touch.

During the first few weeks, the patient may be almost dumb, with little or no spontaneous speech and unable to write even his signature. But with the passing away of the effects of neural shock he regains his power of speaking. Should he be suffering from a disorder of the nominal aspect of symbolic thought in an uncomplicated form, his enunciation will become almost normal, except where he has difficulty in naming. There is not that profound disturbance of pronunciation which runs through all the utterances of the verbal aphasic.

Thus, exactly two and half months after his wound, No. 7 was unable to name a single one of the common objects presented to him in

order; he moved his lips like a person seeking for a word and said: "I can't say it. I think I know it, but I can't say." In so far as he could find words to express himself they were correctly pronounced. He was unable to repeat these names, although the sound he uttered bore a distinct relation to the word said by me; in some cases it came so close that it might be considered correct. For example, key became "kay," pencil "pintil," matches "mats," and penny was twice repeated accurately. Asked to repeat "scissors" he says "sis—I can't open far enough," pointing to the jaw.

He could not write the names of any of these objects, but he could copy them from a printed card in capitals only; he could not translate the words into cursive handwriting, for this seems to demand a power of consecutive nomination.

When I named one of the objects on the table in front of him, he chose slowly and was evidently puzzled; in three instances he gave up altogether, but in nine out of the twelve observations he made a correct choice. On presenting him with the same words singly in print he failed to select any object on six occasions, but chose correctly, though with hesitation, in the remainder.

When however he was shown one of these common objects or when it was placed in his hand out of sight, he never hesitated for a moment; in every instance his choice was correct and prompt.

This disability does not depend on destruction of images but on a want of names. No. 2, who had reached a further stage of recovery, could choose correctly to verbal command, although his power of naming was very defective. So perfect was his memory of the order in which the objects stood upon the table, that with his eyes closed he could point to each one in turn as I named it; but asked to give their order in words, he was completely unable to do so.

When this patient was told to say the days of the week, the first four were correctly given, but Friday was called "Fysday" and Saturday, "Second—Septen-day—Sutton-day": then after a pause he remarked "Sunday is the only one I can remember after that." Finally, after three attempts he went through the week correctly except that "Second-day" replaced Saturday. He was then given a series of cards, each of which contained the name of one day in print; these he copied perfectly in capitals, letter by letter. His lips did not move and this was obviously pure imitation. When, however, he attempted to translate these printed words into cursive handwriting, he muttered each word under his breath and wrote, "Mondey, Tuersty, Wednersty, Thersteay,

Freray, Satereay, SunDay." Asked to read the printed words aloud he did so with remarkable correctness, until he came to Friday, which was first called "Fys-day" and then "Friday"; he said "Secon-day" but changed it to "Saturday" and finished with "Sunday" perfectly pronounced. When he attempted to write the names of the days of the week to verbal dictation, he failed badly and most of them were left unfinished; Friday, however, he wrote correctly. Told to write them spontaneously, he was equally unsuccessful, although each word began with the appropriate letter. He was then told to repeat the days of the week after me, and to write each one as he said it. His enunciation was perfect, and although he continued to say the word correctly all the time he was attempting to write, the results were little if at all better than when he wrote spontaneously.

Here we see that correct verbal imitation was possible either when repeating the sound of the words or when copying print: but any act which required the intervention of the nominal aspect of symbolic thinking or expression was badly executed. Worst of all was writing to command; for this demanded not only the power of naming, but also the translation of the name into written symbols.

Except in the earlier stages, these patients can read to themselves, but with great slowness and uncertainty. They are particularly liable to grave misunderstandings due to defective appreciation of the nominal value of the words they are reading.

If what they are given to read silently is in the form of a command, this want of appreciation becomes still more apparent; for not only must the patient understand the printed matter, but he is compelled to formulate the meaning to himself before he can carry out the order that lies behind it.

No. 7 was given a series of cards, one by one, each of which contained a simple order such as "Shut your eyes," "Touch your nose," &c. He was told to read it to himself and to "do what it says." This presented great difficulties; sometimes when told to shut his eyes, he brought his hand to his eye, or asked to give his hand, he touched the left with the right. Once only in eight attempts did he carry out such orders correctly. Reading them aloud seemed if anything to cause greater difficulty, and copying the legend on the card did not materially improve his power of carrying on the action demanded. But, as soon as the commands were given him verbally, he made one partial mistake only, touching his eyes with his hand, instead of closing them.

Reading aloud seems to add to the difficulty and is no aid to under-

standing, as with some other forms of aphasia. The patient tries to spell out the words and becomes confused because he is uncertain of the nominal value of the different letters. At a time when No. 2 could both say the alphabet correctly and made no mistakes in writing or reading it, he was unable to read aloud the man, cat and dog series. Given "The man and the dog" in print on a card, he said, "T-H-E.: the next one is M-A day, no D. This is A. This is N. This is — — D T and H and E. This is D. That is O and T. I'm not sure about that one." Asked "What does the whole say?" he answered "The only thing I can tell you is it was a dog." This is a fair sample of a series of observations on his power of reading aloud a combination of simple words not containing a command.

But when pictures of the man, the cat and the dog were shown to him in series two at a time, he never hesitated for a moment but named them accurately. Evidently he still possessed the power of evoking these simple words as symbolic representations of pictures. But when offered the names in print he was confused by want of certain appreciation of the value of each letter. He had no difficulty with the alphabet as a sequence; it was the nominal value of any one of its constituents which was uncertain.

In these observations all the words were monosyllabic and recalled a child's first reading book; much of the difficulty arose from defective comprehension of single letters. The same objects represented pictorially could be translated with ease into their nominal equivalents. But as soon as pictures were made to carry a command, as in the hand, eye and ear test, the action demanded is as badly carried out as if the order had been given in print. The necessity for formulating the significance of the picture gave it a high nominal value.

The nature of this disturbance of symbolic thinking comes out particularly clearly with the clock-tests. There was not the slightest difficulty in setting one clock in direct imitation of the other; even the short hand was moved into a proportionate position between the two numbers of the hours. But none of these patients could tell the time or write it correctly. They set the clock badly to oral command or when the order was given in printed words; but when it took the form of figures, so called "railway time," it was perfectly carried out. For to set a clock when given such a number as 4.45, the patient first places the hour hand at 4, and then sweeps round the other one to the position he associates with 45 minutes; but if he is asked to set "a quarter to five," the temptation is to set the one hand at 5, whilst the

other hovers uncertainly between "a quarter past," and "a quarter to." This difference does not, however, apply when the patient attempts to tell the time; it is equally difficult for him to evoke the name "4.45" as "a quarter to five."

Throughout these tests there is a profound tendency to muddle up "to" and "past." The number of the hour has an overwhelming attraction; for example, when setting twenty minutes to six the long hand may be rightly placed, but the hour hand points to six. Not infrequently the nominal value of the two hands was mistaken and the long one set to the hour.

All this does not signify that the patient does not know the time. No. 2 said, "That is when you eat," or "when we were there," of some particular event, and is always right, although he cannot reproduce the time in either case. Moreover, when shown the test-clock set at some definite hour, he could pick out a card on which the corresponding time was printed in figures, ten times in succession without a moment's hesitation. It is not knowledge of the time that is lacking, but the symbolic means of expressing even to themselves what they know; at the same time they have difficulty in understanding the nominal aspect of words, spoken or printed, in which they are told how to set the clock.

Although it is impossible to name an object with any certainty, the patient may be able to do so by using some metaphorical expression instead of a single word. For example, during the tests with colours, No. 2 was wrong in eleven out of sixteen attempts to name one of them set before him (Table II, p. 97). So bad were his mistakes that he might have been thought to be colour blind; for white was called "green," black "red," and green "blue." Exactly the same kind of error occurred when he chose a colour from its printed name on a card; in this case he even chose white for black, and black for green. When asked to read them aloud eleven out of sixteen were wrongly named.

From the observations we might be tempted to think that he was devoid of all knowledge of the nature of colour, in fact that he was "mind-blind." But in his attempts to explain to me his difficulty in reading the printed cards he began to point to my white coat, his khaki tie, the blue band on his arm, which he wore as a wounded officer, and the green of the trees just outside his window. Instead of the names of the colours, he was encouraged to use a series of similitudes; black was "what you do for the dead," red "what the staff wear," or, pointing to the lapel of his tunic, "where the staff have it"; blue was

" my arm," green " what is out there " (pointing to the trees), white is " what you wear " (a white coat), yellow " this one " (holding his tie). Twelve times he was shown cards bearing the name of one of these colours, and in every case he gave the right answer.

I then reversed the procedure, saying to him " the dead " and he chose a black piece of silk from a set of colours on the table in front of him; for " what is on your arm " he selected blue, " what the staff wear " red, " what is out there " green, " like your tie," which he was not allowed to look at, led to his choosing yellow. For violet, we had agreed on a lamp-shade that stood by his bed; this had been removed from the room before these observations began, but to the words, " like a lamp shade," he chose violet. Throughout he made no mistakes in fourteen consecutive tests. This shows that he had an acute sense of colour, but that names were wanting for expression, and were badly understood when presented, both verbally and in print.

The power of counting or uttering numbers in sequence usually returned step by step with that of saying the alphabet. No. 2 had no difficulty with either when first he came under my care; but this did not mean that he could employ any particular numeral directly and with certainty in arithmetical operations. He could pick up five things when told to do so, but asked to add five to any number, he would count on his fingers, or would place five dots on the paper; the figures 2, 3, and 5 rapidly became associated with two, three and five dots, which he visualized around them; but 4, 6, 7 and 8 were counted on his fingers or dotted on the paper.

He confessed that numbers puzzled him at first; if " eighteen " was said, the meaning did not come until he had counted it up. In the same way, he could say the alphabet perfectly, but the nominal value of any single letter was frequently defective. This difference in the facility with which a name is appreciated in series and as an isolated word is familiar to all of us in a foreign language; many who can rattle off French numerals without difficulty, experience a moment's hesitation when told that the price is " quatre vingt douze francs."

No. 2 experienced the same sort of difficulty when he was informed that some engagement was fixed for "Tuesday the twentieth of March." Telling him the day of the week or the month did not convey to him the part of the week or of the year in which it fell.

All three patients failed to carry out even simple arithmetical exercises. They could add 356 to 231 on paper, but all of them failed over such a sum as adding 275 to 856, which required the carrying over of a

number from one column to the next. Captain C. (No. 2), who was by far the most highly educated, counted up to five, and then on for another six, giving the answer correctly as eleven ; he then counted seven, and one more, making eight; from this he went on for five more, saying "thirteen." He wrote "3" but was wrong with the last column of figures because he forgot to add the 1. Both the other patients wrote down the sum of each pair of figures separately ; thus No. 7 wrote :—

2	2	8			3	4	5
7	3	4	and		8	6	8
9.	5.	12			11.	10.	12

All of them broke down completely when asked to do simple subtraction, and No. 7 took the lowest number from the highest, whether it was in the upper or lower line of the sum ; No. 18 always worked from left to right throughout.

As might have been expected, there was considerable difficulty in finding the usual names for coins, although it was obvious that they were still recognized correctly. Thus, a sixpence was called "half a shilling," two and six was "two and a half," a ten shilling note was "half a pound" ; and yet, in a series of twenty-four observations, many coins were given their usual names, and there was no evidence that any one of them was mistaken for another of a different value.

But when the attempt was made to give the relative value of two coins, such as a sixpence and a shilling, laid in front of him, the patient became confused; he tended to add them, saying "one and a half." With 1d. and 6d. Captain C. said "seven." When, however, the question was put in the form, "How many of that [6d.] would you have to give me for that [1s.] ?" he answered "Two: one more of that [pointing to the 6d.] to get one of that [the 1s.]." Then he suddenly burst out, "One more sixpence to get a shilling." Throughout this series of tests he could never name the relative value directly of any two pieces of money, and yet by these indirect means it was possible to show that he understood perfectly. No. 7 showed exactly the same difficulty in formulating the relationship, but was able to pile up a heap of coins on the one side which exactly equalled the larger one in value. Given a shilling, he collected together a sixpence, a threepenny bit, and three coppers; a two-shilling piece was placed before him, and he chose from the money on the table a sixpence, a threepenny bit, a shilling, and quickly added three coppers. Yet when asked, "How many of this [6d.] go into that [2s.] ?" he said, "Two — two — two shillun —," and with 1s. and 2s. replied, "Three shillun." But behind

this difficulty in expression lay a correct and intuitive comprehension of the relative value of the coins to one another.

Nearly two years after the injury Captain C. (No. 2) was able to fill up a cheque spontaneously; but he could not be certain that the written words and the figures corresponded with one another. On the occasion when he drew a cheque in my presence for eighty-five pounds, ten shillings and sixpence, he filled in the figures as £80 10s. 6d. He noticed this discrepancy and succeeded finally in making the correction; but the cheque would not have passed the bank.

All these patients could draw from a model, and, after its removal, reproduced the drawing from memory. But when No. 2 and No. 7 were asked to draw an elephant, the result bore no relation to this animal; it was without trunk, tusks or ears. This was the more remarkable as Captain C. (No. 2) used to amuse himself by drawing pictures of the animals he had shot in Cashmir; on one occasion, when talking about transport in the East, he drew spontaneously a spirited rough picture of a camel. Visual images are not destroyed, but they cannot be evoked with certainty at will or to command.

This is particularly evident when the patient is asked to draw a rough plan of some room he knows well. No. 7 was asked to put down on paper the relative position of the objects in the ward he could see from his bed; he failed completely. But when I drew an oblong on the paper, saying, "That is your bed," and asked him to point to the situation of the various things he could remember, he was astonishingly accurate. For instance, he pointed to the left, saying, "There's only my bed," and to the right, "There's a bed; no one there now"; he then indicated the head of the bed, and touched the wall of the examining room in which he was at the time, to signify that here was a wall. All these details and many others were correct, but he could not put them down himself on paper. Captain C. (No. 2) started to draw a plan, but filled it in with details in elevation. Images were certainly intact, but they could not be reduced to a symbolic formula.

Orientation is unaffected and such patients have no difficulty in finding their way, provided they are not asked how they intend to go from one place to another. No. 2 succeeded in explaining this to me as follows: "I have no streets in London; no names at all. Suppose I was going from the Army and Navy, that's what it's called, just round here (the Army and Navy Stores), I should then say some place to a hospital about a quarter of a mile away. I remember the hospital is

on the left on the way to the War Office, about half-way. I believe it's the Abbey. No, it's near the Abbey on the way to the War Office." Later he added, "I saw the Hospital." I put as a question, "The Abbey?" and he replied as follows: "It's here, but then it's gone again and I have to feel for it again. The only thing I can remember of it is the opening, the big opening, where everybody goes in. I can get that" (moving his hand in the form of a large arch). Since it was obvious that he had described Westminster Hospital and Westminster Abbey, I asked, "Have the Hospital and Abbey anything to do with one another?" He answered, "Nothing except my focus, the place of them; the distance, that is all. I should say how far the Hospital is to the Abbey in re- —, in re-, — that's where I go wrong. I want to say in re- something [relation]. There are just little bits in expressing what I want to say; little bits in which I have to turn my brain another way to get what I want to say, whereas a year or two ago I should have said it without thinking. You see, it's like this: with me it's all in bits. I have to jump like this," marking a thick line between two points with his pencil. "Like a man who jumps from one thing to the next. I can see them but I can't express. Really it is that I haven't enough names. I've got practically no names. The easiest thing is what I do now. I say what I can, it's all wrong; but they get an idea of what I want to say."

It is evident from this conversation that he was able to recall visual images of objects on his way from the Empire Hospital in Westminster to the War Office in Whitehall. First of all, he saw the Army and Navy Stores and then Westminster Hospital on his left, with the great door of Westminster Abbey on the right; but want of names prevented him from connecting the two, except in position, and he was forced to jump from one image to another without the cohesive links of verbal formulation.

Pictures apparently conveyed their full meaning so long as they did not imply a command to carry out some action. No. 18, when shown a picture of an aeroplane looping the loop, explained the manœuvre by pointing and gestures, helped out by words. No. 2 saw all the points in a Bairnsfather picture of "Old Bill" boxing with Hindenburg. But jokes frequently present considerable difficulty if they demand nominal formulæ for their comprehension.

These patients enjoyed games and could play dominoes and draughts. Captain C. (No. 2) was above the normal average at chess, but could

no longer play bridge. "The names of the cards bother me," he said. "It's just names; I used to play a good game of bridge."

§ 3.—*Syntactical Defects.*

This form of disturbance of language can be distinguished by the fact that the patient talks jargon. In either verbal or nominal aphasia he cannot easily evoke the words and names he desires to use, and consequently speaks slowly and with difficulty. In this group, on the other hand, he talks with great rapidity when once started; the words may be recognizable but badly put together, or, if the loss is more severe, they may be pure jargon. The rhythmic movements of the phrase are affected; they are hurried and slurred, and the patient cannot "touch off" the words so as to produce a correctly coherent sentence. In the lighter forms of this defect there is no difficulty in finding words or names, which may be intelligible, especially if the subject of the conversation is known. Thus, when No. 15 was given quinine as one of the tests for the sense of taste, he said, "Rotten to drink it. Something medicine or that. Make you drop of water after it, so to take out of your mouth." Sometimes speech closely resembles baby language; for example, asked what his right hand felt like, No. 13 said, "Tiff-rent from uffer 'n — ka tell ooh, know zis un seems strong."

But at times even this patient became unintelligible; describing to me a picture of a tramway car with a woman at the wheel and a man conductor he said: "Here's lay, here handle, the man conduker, on the nines, shot steats on it, zee passengers, two man, lady" (Here is the lady; she's at the handle; the man conductor. On the lines; it's got seats on it. Three passengers, two men and a lady.) He then read the the legend at the top of this picture as "Mins bixet o-er men" (Woman's victory over man).

The power of naming an object in sounds that are comprehensible varies with the severity of the affection. Thus, in No. 13, single words could be produced perfectly as names so long as they were applied to familiar objects; but when attempting to name colours he "jargoned" orange, green and violet; in every instance, however, the sound was recognizable as a name. No. 15 was extremely unstable in his nomenclature, using "blacking," "pencil" and "black-lead" indiscriminately for pencil. In naming colours he also found difficulty with orange, violet ("volley") and to a slighter extent with green; but all the truly monosyllabic colours he named correctly.

But in No. 14 the sounds, though emitted volubly, seemed to bear no

relation to the name of the object; thus, matches became "Stes-miss-ness." He then seized a pencil and wrote "match," showing that he knew the name. With a penny he shook his head, said "No" but wrote the name correctly; in some instances, however, he could neither say it intelligibly nor write it at all. Here the jargoning had become so severe as to destroy all power of producing some names at will.

He could say "yes" and "no" correctly, and answered "Come in" to a knock at the door. He was extremely intelligent in the manner in which he employed his jargon, and was particularly fond of using "there" and then pointing to the map, the book or the picture to which he wished to refer. He used words or short phrases, but could not amplify or repeat them at will. On September 15, 1915, he was reading a French account of Napoleon's Russian campaign, and wanted to tell me how closely the dates coincided with the Russian retreat which was then taking place. He took the book in his hand, pointed to the date "15 Septembre," saying, "Now — just the same — there — yes — over there."

One day during a set of observations he said, "Funny thing — this worse — that sort of thing." Then he seized his note-book and wrote, "as, at"; I asked "You mean conjunctions and prepositions?" and he replied, "Yes — that sort of thing."

The grammatical structure of the phrase is liable to be badly affected. The patient talks fluently in short jerky sentences, slurring or omitting many of the junction words. Even when they are present, it is difficult to hear the articles, prepositions and other components of syntax. Asked what he had done since his admission into the London Hospital, No. 15 said, "To here—only washing—cups and plates. That's about all you've got to do here." "Have you played no games?" "Played games—yes—played one, daytime, garden."

The power of writing suffers on the whole less than external speech, because the defect is essentially one of balance or rhythmic utterance. Thus No. 14 made unintelligible sounds when asked to name a set of common objects lying on the table before him; but in thirteen out of eighteen serial attempts he succeeded in writing names for them, which were recognizably correct. Single words used as names were so much more easily written than spoken, that this patient always carried about paper and a pencil to help him in his conversational difficulties.

After the acute phase of shock has passed away, it is always possible to obtain some recognizable signature, and usually the address can be correctly written. But No. 15 who wrote his name and address

perfectly could not write that of his mother, in whose house he lived; the unfamiliar beginning inhibited the almost automatic remainder of his action.

Patients with a severe degree of this disorder cannot write a letter, but in the milder cases such spontaneous writing is carried out far better than might have been expected from the character of external speech. This is evident when the patient is asked to read what he has written; No. 13 wrote a perfectly coherent and well-spelt letter, but jargoned badly on attempting to read it aloud.

The power to write from dictation shows all grades of disturbance from almost complete loss in No 14 to a difficulty with consecutive phrases, but not with isolated words or sentences. Thus No. 13 succeeded perfectly in writing the man, cat and dog series to dictation, but failed badly with a passage chosen by himself from the newspaper.

All these patients could copy correctly and transcribed print with cursive handwriting without hesitation.

Reading to themselves was their favourite recreation and, although they showed evidence of remarkable powers of comprehension, they were hampered by the disorderly structure of the phrase. No. 15 confessed, "Don't always know what they mean going to talk to." No. 14 followed all the movements at the Front on large scale military maps, and enjoyed demonstrating to me the changes reported day by day in the newspapers. But any attempt to impart this information verbally revealed his disabilities in an acute form. Moreover, he was quite unable to follow up a conversation suggested by what he had read to himself and understood. After he had pointed to "15 Septembre" in his French book on Napoleon's Russian campaign, I answered, "Yes, that was also a beautiful summer and the snow came early." He replied, "Yes—oh! did it?—oh! yes." He showed so much interest that I asked him when Napoleon first had difficulty with the snow; but he turned the pages aimlessly. I then questioned him as to the date on which Napoleon reached Moscow (September 14, 1812), the starting point of our conversation, but he shook his head and could not answer. Spontaneous thought was rapid and correct, but the power of reproduction was evidently defective.

The following incident in his life whilst under our care shows how accurate may be the processes of intuitive comprehension even with a severe syntactical disturbance. He was walking in Kew Gardens with the medical officer in charge of the Hospital, when he pointed out

a new variety of heath. The doctor said, "Scotch," to which the patient answered, "No, no, you and me." It was an Irish heath and both the patient and his companion were Irishmen.

The nature of this disturbance of symbolic thinking was clearly demonstrated by a series of observations carried out with No. 13. He chose a picture from the daily paper showing a box for the receipt of flowers for wounded soldiers, placed on the platform of Snaresbrook Station. Underneath was the legend, "This box has been placed on the platform at Snaresbrook Station as a receptacle for flowers for the wounded. Many of the passengers contribute nosegays daily from their gardens, and these are forwarded without delay to the Bethnal Green Infirmary." As a Londoner in an East End hospital this interested him greatly.

Asked to write down what he had gathered from his reading and from the picture, he wrote, "At Sanbrook station they have large box which are collicting flowers for the wounded soldiers, and they are sending to the Velnah Green Hospital." I dictated the printed description with the following result: "This box has been placed on the platform a smatbrook station as sesful for the wounded many of the passengers contic nonsgay from there garndens and these without delay to the Belnelth Green imfirmary"; but he was able to copy the printed sentences in perfect handwriting without a fault or omission. Given the paper and asked to read it aloud, he produced the following jargon: "Zis box had been place on the plakform at Senbrook Station as a . . . for flowers for the wounded . . . Many ob le pasn-gers contibute nosezays from their gardens and these are for-boarded without delay to Besnal Green Internary. . ." Shown the picture, he pointed out all the various significant objects without hesitation, giving them recognizable names. "Box, Flowers for wounded shoulders. On the back, plakform, Senfbrook. Ladies see, putting flowers into box."

He evidently understood the significance both of the printed legend and of the picture, but he could not reproduce his conception in coherent words or in writing, although he could copy correctly.

In the more extreme cases, disorders of expression make it impossible to test the power of reading or writing from pictures. With a less severe disturbance, however, a simple test, such as the man, cat and dog series, can be carried out, when two of the three pictures are presented to the patient together. But the response, both oral and in writing, tends to take the form of the correct names with no junction words. Thus, No. 13 had been through the variants of this test in

which he had read aloud and had written to dictation a series of combinations of the man, the dog and the cat. But when shown simultaneously any two pictures, for example, the man and the cat, he replied systematically, " Man, Cat," &c. After this series, expressed in spoken words, he was again shown the pictures and asked to write silently what he had seen; he wrote " Man, Cat," without articles or conjunctions.

Another peculiarity of this set of answers was as follows: The normal man when shown two such pictures, that of the man to the left and the cat to the right, frames his answer as if he was reading, and says, " The man and the cat." But No. 13 showed a remarkable inconstancy, both when giving his reply in words or writing. Sometimes he placed the left hand figure first, sometimes that to the right. This inconstance of direction appears again in some of his answers to the clock test given in detail later.

These patients can count and carry out simple addition and subtraction perfectly. No. 14 could make out a cheque for the correct amount spontaneously; but when told to fill it in for a certain sum he inserted figures in the place of the words and wrote, " Five pound 10/6 " where he should have written numbers only.

All these patients could recognize the relation between two coins placed on the table in front of them, and none of them experienced any difficulty with change.

The clock tests proved unusually interesting, because, according to their results, the three patients could be arranged in conformity with the known severity of the disturbance. In every instance the clock was set correctly both in imitation and to printed command; to oral command No. 14 made gross errors, No. 15 was slow, but No. 13 made no mistakes. On attempting to tell the time No. 14 failed in every attempt; No. 15 made two errors in substance, but adopted an extraordinary nomenclature; No. 13 was slow but substantially correct. Telling them to write down the time set on the test-clock led to identical results, and No. 15 showed the same extraordinary method of recording the time as when telling it aloud. At one time he wrote 45 to 9, at another 20 past 11; he called 8.10 " 2 past 8," because the long hand, pointing to ten minutes past the hour, stood over the figure 2. A similar instability of nomenclature was shown throughout this case, whether he was giving names to common objects and colours or telling the time in speech or writing.

Drawing from a model, or from memory of the same object shortly

after it had been removed from sight, was not affected; in fact No. 15 produced a remarkably successful picture of a spirit lamp and said, "I was a good drawder — drawer — at school." But when he was asked to draw an elephant, which he had seen during his service in India, the outline of the body somewhat resembled this animal, but was without trunk or tusks. He proceeded to fill in the mouth, saying the word aloud; then he said "Highons," "Irons" (horns) and immediately added horns to the drawing. After he had finished I asked, "What has an elephant got in front?" He answered, "They carry big trees — — tied round a bit of an iron thing." I then said, "Behind you have given him a tail, what has he in front?" He replied, "He has a big one, quite straight, about a yard long." "What is it called?" "Same what you drink water with." "Has your elephant got a trunk?" "He's lost it," and at once he wanted to add the trunk.

I then pointed to the horns he had drawn on the head of his figure, asking, "Has an elephant got horns?" He replied, "Yes, silver, what you stick out" (pointing to the corner of his mouth and placing his pencil into the position of a tusk). "What are they made of?" "Kind a white bone one, what grows in the mouth — — on the roof — — on the edge of the mouth." Evidently he was confused by saying the jargon words representing horns, and impulsively added them to the figure; but he was finally able to explain his error by gestures giving a correct interpretation of his intention.

No. 13 was more successful, but added the trunk afterwards, saying "Tump."

None of these patients had any difficulty in finding their way, or in pointing out from memory the position of the principal objects in the ward.

They enjoyed games, and both the privates played dominoes well.

They seemed to recognize that the words they uttered were inadequate to express their meaning. Thus, when No. 15 talked jargon so badly that I could not understand him, he drooped his head, blushed and laughing sheepishly did not care to try again to express that particular thought. He was intelligent and useful in the ward, waiting on the other patients, washing up and laying the table correctly for meals; but as soon as he attempted to formulate and express some want he became confused and could not make himself understood. No 14 helped himself out of his conversational difficulties by writing single words in a notebook which he carried about with him. Any gross failure to make himself under-

stood produced an outburst of intense irritability; this was calmed immediately by giving him some test he could perform with ease.

This patient was musical and played me Chopin No. 20 Largo very slowly, reading the notes and giving the change of key correctly. The right hand was clumsy owing to the cerebral injury; but he succeeded in bringing his fingers on to the right notes of the chord, and if he was wrong immediately corrected his error. Keeping his eyes on the music, he recognized by ear when he had struck a false note and that it did not correspond with the text of the music. He played to me other pieces of Chopin, correcting the faults due to the clumsiness of his right hand; but the slow pace of the Largo was in his favour, whilst the complexities of the change in key showed how clearly musical notation conveyed to him the notes intended.

§ 4.—*Semantic*[1] *Defects.*

I have described the various changes in speaking, reading, and writing, produced by affections of the verbal, nominal, and syntactical aspects of symbolic thinking and expression. One other form of disorder emerges from analysis of the clinical phenomena due to unilateral lesions of the brain. This may be called "semantic," because it is comprehension of the significance of words and phrases, as a whole, which is primarily affected.

This has usually been spoken of as an "amnesia," and the patient is said to have lost "the memory of words." But there is no such thing as a "faculty of memory" apart from things remembered; a man who has lost his "memory for words" from a local and unilateral lesion of the brain is suffering from an affection of speech. This may be of the same order as the disturbances of word formation we have considered under the terms verbal, nominal, and syntactical aphasia. The difference lies in the fact that in this case the defect is manifested by an inability to appreciate and retain the full significance of words and phrases.

These patients suffer from no difficulty in pronunciation; intonation and syntax are perfect. They can name common objects correctly, and indicate the one that has been mentioned orally or in print. But

[1] From σημαίνειν, to signify. This term was used by Bréal in his well-known "Essai de Sémantique," a study in the science of the ultimate meaning of words. Since I am dealing here mainly with a loss of power to comprehend the full significance of words and phrases together with a want of capacity to use such modes of expression, I have not hesitated to adopt this term, which has already become part of the English language.

when similar experiments were carried out with colours, the answers were less certain, and the patient showed some hesitation and confusion. Oral commands might be badly executed, although the choice made in answer to the printed name was correct. Moreover, he did not seem to remember the relative position of the coloured materials on the table before him; when shown a colour on a printed card bearing the name, he passed his hand backwards and forwards over the row of specimen colours before him until he found the one he recognized. Normal persons rapidly learn the order in which the eight colours lie on the table, and, after the first few experiments, go straight to the one which matches the pattern without groping. This also occurs both with verbal and nominal aphasia; in the latter condition I was able to show that the patient retained a perfect memory of the order in which the colours lay, although he could not name any of them with certainty.

The nature of this disorder of symbolic thinking is clearly revealed by the clock-tests. In none of the other forms was there the least difficulty in setting the hands of one clock in strict conformity with those of another; but all the patients of this group carried out this manœuvre slowly, with hesitation, and one of them showed definite evidence of confusion. They could tell the time correctly, but when asked to set the clock in response to either oral or printed command, the errors were extremely gross. The long hand was set as if it was the short one; "to" and "past" were mistaken for one another, and even the hour was wrongly indicated in some instances.

Since the patient could tell the time correctly, his inability to set the clock must have been due to some want of apprehension of the significance of a spoken or written order. No. 10 confessed: "If I can't get the hands exactly where I want, I lose grasp; I get thinking"; and No. 8 said: "I can't make out the difference between *past* and *to* six. I don't know from which side to approach it."

Here we find expressed that inability to recognize significance or to appreciate intention, which is at the root of these semantic disorders. It is not surprising, therefore, that the hand, eye, and ear test was extremely badly executed, necessitating as it does accurate choice between three pairs of possible actions. Moreover, most patients with other disorders of symbolic thinking recognized, when the observer touched his left ear with his right forefinger, that such a movement implied crossing of the hand to the opposite side of the face. One of the most characteristic errors of the semantic group was due to want

of appreciation that the action was crossed. Eye and ear might be mistaken, and the patient was particularly liable to give up before completing the action. No. 10 said: "My initial difficulty seems to be right and left; it confuses me; I forget the rest of what I've got to do." Even in the selection of the right or left hand he was obliged to employ a "memoria technica"; "I clench my fist, and then I think of boxing, delivering a blow with the right or left hand; but then, in touching the eye, that feeling is gone."

In all normal persons and with other disorders of symbolic thinking, movements reflected in a mirror can be imitated with much greater ease than when the patient and observer sit opposite to one another. This also applies to the same actions, when given in the form of a pictorial command. But in the semantic group, though the number of errors may be less when the required movement is reflected, there is not the conviction, so characteristic of most of the other disorders of symbolic thinking, that the action is extremely easy. No. 8 said, "When I imitated you I had to think: is that his right hand or his left? When I'm looking in the glass it is easier because the sides are the same; but then I begin to think it out and get puzzled." After he had made an extremely bad record to pictorial commands reflected in the glass, he explained, "Somehow or another I didn't seem able to get the right part of the picture; sometimes I seem to look at one, sometimes at the other. I have to reason out the meaning of the whole picture."

Everything tends to be appreciated in detail, but the general significance is lacking. This is evident when the patient is given a picture, and told to say what he sees in it. He looks at it like a child, pointing out one thing after another, and not uncommonly misses some important feature; asked what it means, he may be entirely at a loss and may then invent some preposterous explanation. No. 5, who was a gardener from the country, chose from the paper the picture of a man riding a cow, over which stood the legend, "Mayor's Curious Steed." He said, "That's a man riding on a colt. No, sir, it isn't, sir, it looks more like a cow — — or a young cow — — no, it isn't — — heifer, sir." After he had read the legend, I asked, "Who is the man?" and he replied, "A farmer, sir. No, Major — — No, the Mayor curse sted — — the Mayor curious stid. It's something you don't see every day, that stid; something very uncommon that animal. It's in a horse's place instead of where it is. I should think myself they are going to show that animal; it's uncommon, that stid, more so to see a man riding on it— —. You don't often see a man riding on a

stid." When I asked, "What is a stid?" he replied, "It's something the same family as a cow."

Lieutenant M. (No. 10), an able officer, had been an accountant before joining the Army. I showed him a picture which alluded to the putting forward of the clocks in consequence of the Daylight Saving Act. Standing beside a clock, whose hands point to two, the bride of a day says to her bridegroom, "Look, it's 2 o'clock, and yesterday at this time it was 1," and he replied, "Yes, darling; and yesterday at this time we were two and now we are one!" The patient remarked, "I've got the drift of that. It's not much of a joke. They've stupidly been married; the bridegroom has something stupid to say about yesterday, we were one and now we are two, the same old stupid thing about yesterday, we were two and now we are one — — I could have told the time there better than when you were trying me — —2 o'clock." Q. "What happened at two o'clock just a fortnight ago?" A. "Oh! I see, Daylight Saving Act." Q. "What happened to the clocks?" A. "They were put back an hour. That's a thing I'm rather hazy about. I have to think of that — —forward — — back — —. No, I have to give that up; I've been trying to think that out, and I haven't got to a conclusion yet somehow."

In consequence of this difficulty in appreciating either the full significance of pictures or of printed matter, most jokes become incomprehensible. Suppose, however, the humour consists solely in the detail of the drawing, it is appreciated; but any demand for co-ordination between its various parts or with the text beneath it, meets with little or no response.

These patients cannot play games such as chess, draughts or cards. Nor can they put together "jig-saw" puzzles; No. 8 complained, "I can see the bits, but I cannot see any relation between the bits; I could not get the general idea." This is revealed in another interesting way; he was unable to play billiards because he had no idea how to play off the cushion. He could hit the ball directly, but could not make an indirect cannon.

This want of ability to relate things to one another came out when testing memory for the position of objects in the room or on the table. The patient had no difficulty with his eyes closed in pointing to the position of the window, fireplace, washhandstand, chest of drawers, door, and other pieces of furniture. But asked to say how the washhandstand stood in relation to the fireplace, or the latter to the door, he entirely failed to do so; allowed, however, to say, "The fire is there

and the door there," he pointed with complete accuracy. He knows exactly where they are; he is certain that he can "see them" in his "mind," but he cannot express their relative position.

We can only understand the peculiar affection of writing and reading produced by this disorder of symbolic thinking if we bear in mind that the fault is essentially a want of appreciation of relative significance and intention. At first, as in the case of No. 10, the patient may find it impossible to write the name of an object, although he had no other difficulty in nomenclature; but even at this stage he not uncommonly succeeded in writing the first letter of the word he was seeking. At this time he showed a tendency to use the same symbol "$\mathcal{D}$" for the letters D, F, O, R, T and V. Five months later each name was correctly given, but he wrote at a tremendous pace as if in a desperate hurry. The words were carelessly written; cylinder became "cilande" and "cylander," ovoid "ovoad," and cube was shortened to "cub." This excessive rapidity was also evident during the man, cat and dog tests, when he wrote from dictation or from pictures. He said, "I write very hurriedly so as to keep track of it." But if he was given the printed card and asked to copy it, he wrote with much greater deliberation and his handwriting improved considerably.

One form assumed by the errors that occur in this group of tests is the tendency to substitute one word for another; "man" is written for dog, "cat" for man, &c., and the order is not uncommonly reversed. This is evidently due to inconstant appreciation, although the task set was childishly easy. One of these patients asked if he might leave out the articles and conjunctions because he could then "do it better" if he wrote "cat, man" only.

Spontaneous writing, such as a letter to friends or relatives, is coherent and reasonable; but these patients complain, "I cannot pull it together very well yet," or, "If I'm writing I am apt to write on and then to wonder if I've put two l's or one; I'm not sure if I've written it wrongly or not." They have, however, a remarkable memory of the general contents; for instance, when No. 10 wrote a test letter to me nearly a year and a half after he had first come under my care, he began: "I have written you three letters, one about flouwers, one, a while later on, on same subject, and a third while I was at Northampton trying to tell you of my progress." This was entirely accurate; and yet he possessed no record by which he could have refreshed his memory.

These patients have no difficulty in reading aloud; when, however, they read silently, they are liable to miss the general sense of the

passage, and to omit words or phrases essential to the argument. This tendency becomes particularly obvious if they are asked to write an account of what they have just read to themselves. For instance, I handed No. 5 his own story in print: "My name is Charles Hewitt and I live at Laurel Cottage, Pilley. Before I joined the Army I worked for Miss Drummond for nearly two years. I worked in the garden and looked after the pony. He was a forest pony, bay, with a dark mane and tail." This he read to himself and wrote, "I was worked for Miss Drummond and looked after a pony and Trap"; then he said, "That's all I remember." He was then asked to read it aloud, which he did perfectly and without hesitation; but all he could communicate in writing was as follows: "I worked for Miss Drummond and I looked after a pony and trap and helped in the garden." This loss of capacity was not based on any defect in the power of writing, for he copied his own story perfectly in cursive handwriting and was able to write a coherent letter to his relatives, mentioning the friends who had visited him by name. Here again symbols could be better utilized for spontaneous thought than for an intellectual effort made to command.

This is not due to want of education, for Lieutenant M. (No. 10) showed exactly the same disability. He read to himself the following passage from the newspaper: "News has been received from the Piraeus that the Greek Government proposes to proclaim martial law throughout Greece, and arrest M. Venizelos and his principal political friends." He at once wrote, "News received from Biraeus, that the Greek Government intend to proclaim martyal law throughon grace." He then read the paragraph aloud correctly, and asked to say what it contained replied, "News has been received from — — from — — that the Government of Greece intends to proclaim martial law throughout the country — — something wrong there — — because the political friends of Venizelos somewhere — —." His account died away in an unfinished sentence.

Drawing, even from a model, shows this want of consecutive memory and intention. These patients do not, as a rule, block out the drawing but tend to begin at some one point and follow round the outline of the object; this is also evident when they attempt to reproduce it from memory. Told to draw an elephant, No. 8 succeeded in producing a four-legged creature with no trunk or ears; but No. 10 and No. 5 could not form a coherent figure of any kind.

None of these patients could draw a plan of a room with which they were familiar. No. 8, who was an excellent draftsman before the

injury, started well, but forgot the windows and the doors; moreover, he placed his seat alongside the fireplace, whereas it was in the middle of the room. He forgot the table in front of him but filled in several details, such as my weighing machine and typewriter, of little comparative importance.

The act of counting was perfect, but simple arithmetical operations were a trouble to all of them. They were subject to curious lapses, such as 6 + 8 = 10 in a simple addition sum, otherwise correctly carried out; sometimes an integer was carried over, sometimes it was forgotten. No. 10, who had been an accountant, could neither add nor subtract; he said, "I seem to get tangled up in the process." In every case coins were named correctly, but there was profound difficulty in stating the relation of any two of them to one another; for example, when a sixpence and a halfcrown were laid on the table, No. 10 said, "Let me see — — twenty-two — — I thought of twenty-four, but it's not"; and yet he gave many of the relative values correctly.

This tendency to confusion comes out perpetually in the operations of daily life. For instance, No. 8 complained, "When I'm going to shave I can't collect my things. I have to look hard at them all and then I am sure to miss some of them. In the same way I have to look at the things on the breakfast table. I see them all but I don't 'spot' them. When I want the salt or the pepper or a spoon I suddenly tumble to its presence. After my belt had been cleaned, the runners had gone back and I could not for the life of me think how to bring them into place." Patients belonging to the semantic group are much troubled by the movement of the streets, which puzzles and bothers them.

§ 5.—*Differences between these Various Forms of Disordered Speech contrasted.*

It has been universally recognized that the clinical manifestations differ greatly in individual cases of aphasia, and such differences have been attributed to a multitude of causes. I have attempted to show that they are produced by dissociation of a definite mental process, which I have called symbolic thinking and expression. They are not due to a loss of motor or sensory power, to destruction of images or to a diminution of general intellectual capacity, but are caused by the breaking up of one aspect of psychical activity analogous, on a higher level, to the sensory dissociations, which may follow a lesion of the post-central cortex. Certain physiological processes necessary for the normal

exercise of the functions of language are disturbed by organic destruction of the brain. At first, in consequence of the widespread effects of this injury, the patient may be unable to speak, to read or to write. But as this state passes away all aspects of the disordered function may not be equally disturbed; some actions are more easily performed and certain tests are carried out normally, whilst others are grossly affected. Such dissociation of symbolic thinking and expression is responsible for the clinical forms assumed by aphasia.

To each of these clinical forms I have given a name chosen to indicate its characteristic verbal defects. But it must be remembered that, although the power of using words shows the most extensive and gravest disturbance, other actions are affected which have nothing directly to do with such symbols. The name applied to each group of aphasic disorders is drawn from a grammatical source, because it is in the use of language that the changes are most evident and characteristic; but the functions which suffer extend beyond the limits of verbalization.

Moreover it is well to remember that in each of these pathological groups both word formation and also the correct production of the phrase are affected. Thus in verbal aphasia words are evoked with difficulty and tend to be abnormal in structure. Nominal aphasia leads to defective use and understanding of words as names or indicators. Loss of syntactical power disturbs the internal balance of a word as an orderly rhythmic expression and so leads to jargon; whilst semantic disorders interfere with capacity to comprehend and retain the general significance of a word as part of a complete act of language.

In the same way the orderly structure or intention of the phrase is affected in one way or another, whatever form the disturbance of symbolic thinking may assume. In verbal aphasia words cannot be evoked at will and retained so as to form parts of a perfectly constructed sentence. When the power of naming is affected, the nominal portions of the phrase are either absent or defective and may be replaced by gestures. But the structure of the phrase suffers most obviously with syntactical disorders. The normal rhythm of the sentence is destroyed, speech becomes syncopated, and those words which serve to bind together its constituent elements are absent or ineffective. Lastly, the patient who suffers from a semantic affection of speech pauses in his conversation, like a man who has lost the thread of what he wanted to say; he falls back on expressions such as, "Well, you see it's like this," and sentences may die out unfinished.

All these disorders have both a formative and emissive aspect. In verbal aphasia the latter is the more prominent and obvious, but

it must not be forgotten that there is also another side; these patients cannot retain with certainty a series of words or some unusual expression and this makes it difficult for them to read to themselves with ease and complete understanding. Moreover, the words uttered internally may be badly formed and so lead to confusion; No. 17 complained, "I can't read a book because I'm bothered, when I say the words to myself"; this comes out particularly clearly on attempting to write to dictation. With nominal aphasia the disturbance is evident both on attempting to name an object, and to carry out a command given orally or in print. Syntactical aphasia consists of a gross disorder of the emissive side of speech; but there is also difficulty in executing orders communicated by word of mouth. Spoken language is not perfectly understood, although comprehension of print may be undisturbed. In semantic affections the predominant feature consists in failure to receive a uniformly correct impression of the general significance of words or phrases; on the emissive side the defect appears as a loss of executive intention. This is particularly evident in drawing and in games such as billiards.

It must not be supposed that the various aspects of symbolic thinking and expression usually appear in these isolated forms. Most cases of aphasia, especially in the earlier stages, show evidence of widespread disorders of language. Many of these changes disappear with the passing away of neural shock; but the loss of function becomes confined to one of these groups in a few cases only. On the following tables I have put together those instances where the disturbance seemed to correspond most nearly to a dissociated affection of one aspect of symbolic thinking and expression, and I have attempted to show how the patients behaved to some of the tests. It is impossible on a general table to give an exact account of the nature of the responses, but the diagrams may help to make clearer the contrasting features of the different varieties of disordered speech. In all cases where the series of answers was in any way abnormal some indication is given in words of the form they assumed. Where the space is filled by a O the act was performed perfectly.

When aphasia is looked at from this point of view, it is obvious that no single test can be expected to reveal one form only. All the methods of examination I have described were designed to show how the patient behaves when a certain task is set before him in different ways. But, when the results obtained with such tests, in the various cases, are put together, certain conclusions emerge which can be summarized as follows:—

TABLE VII.—Articulatory Speech.

	Word formation	Intonation and stress	Syntax	Repetition of words said by observer
Verbal.				
No. 4 ..	Great difficulty ..	Syncopated and broken	O	Good
No. 6 ..	Profound loss; at first dumb	Syncopated and broken	O	Good
No. 17 ..	Great difficulty ..	Syncopated and broken	O	Good
Nominal.				
No. 2 ..	Good except when doubtful of a name	O	O	Words perfect; content inaccurate
No. 7 ..	Extreme difficulty of expression	O	O	Slow; tends to change content
Syntactical.				
No. 14 ..	Jargon	Hurried and jerky	Grossly affected	Impossible
No. 15 ..	Jargon	Hurried and jerky	Grossly affected	Very bad; jargon
No. 13 ..	Jargon	Hurried and jerky	Grossly affected	Jargon
Semantic.				
No. 10 ..	O	O	O	O
No. 5 ..	O	O	O	O
No. 8 ..	O	O	O	O

TABLE VIII.—Common Objects Chosen and Named.

	Choosing object similar to one shown	Choosing object named aloud	Choosing object named in print	Naming object indicated	Writing name of object indicated	Duplicate placed in normal hand
Verbal.						
No. 4 ..	O	O	O	Slow; articulation defective	Spelling bad..	O
No. 6 ..	O	O	O	Slow	Slow	O
No. 17 ..	O	O	O	Slow; articulation defective	Writing and spelling bad	O
Nominal.						
No. 2 ..	O	Slow	Slow	Gross loss ..	Gross loss ..	O
No. 7 ..	O	Slow	Defective	Gross loss ..	Impossible ..	O
Syntactical.						
No. 14 ..	O	O	O	Incomprehensible jargon	Affected ..	O
No. 15 ..	O	O	O	Tendency to jargon; sense correct	—	O
No. 13 ..	O	O	O	O	O	O
Semantic.						
No. 10 ..	O	O	O	O	Grossly affected	O
No. 5 ..	O	O	O	O	Slow; badly spelt	O
No. 8 ..	O	O	O	O	O	O

TABLE IX.—Clock Tests.

	Imitation	Oral command	Printed command	Telling time	Writing time
Verbal.					
No. 4 ..	O	O	O	Content correct; articulation bad	O
No. 6 ..	O	O	O	Same ..	O
No. 17 ..	O	O	O	Same ..	O
Nominal.					
No. 2 ..	O	Gross loss ..	Gross loss ..	Gross loss ..	Gross loss
No. 7 ..	O	Gross loss ..	Gross loss ..	Impossible ..	Gross loss
Syntactical.					
No. 14 ..	O	Definitely affected	O	Impossible ..	Correct in sense, extraordinary nomenclature
No. 15 ..	O	Slow; hesitating	O	Slow; hesitating	Same
No. 13 ..	O	O	Almost perfect	Slightly affected	O
Semantic.					
No. 10 ..	O	Gross confusion	Gross confusion	Some loss (later perfect)	Definite loss; confuses hands
No. 5 ..	O	Gross confusion	Confusion ..	O	Confused
No. 8 ..	Somewhat confused	Confused ..	Gross confusion	O	O

TABLE X.—Hand, Eye, and Ear Tests.

	Imitation, face to face	Imitation in mirror	Pictorial command	Pictorial command in mirror	Oral command	Printed command
Verbal.						
No. 4 ..	Affected ..	O	Affected ..	O	O	O
No. 6 ..	Affected ..	O	Affected ..	O	O	—
No. 17 ..	Slightly affected	O	Slightly affected	O	O	O
Nominal.						
No. 2 ..	Grossly affected	Not quite perfect	Grossly affected	Affected ..	Grossly affected	Grossly affected
No. 7 ..	Grossly affected	Very slightly affected	Grossly affected	Affected ..	Grossly affected	Grossly affected
Syntactical.						
No. 14 ..	Slow, but correct	O	Slow, but correct	O	Affected ..	O
No. 15 ..	Slow, but correct	O	Slow, defective	O	Affected ..	Affected
No. 13 ..	Affected ..	O	Affected ..	O	O	O
Semantic.						
No. 10 ..	Gross loss..	Affected ..	Gross loss	Gross loss	Gross loss	Gross loss
No. 5 ..	Gross loss..	Slightly affected	Gross loss	Affected ..	Affected ..	O
No. 8 ..	Affected ..	Slightly affected	Gross loss	Affected ..	O	O

(*a*) *Verbal aphasia.*—In severe forms of this disorder the patient's utterances may be reduced to "Yes" or "No," and even the words cannot always be evoked for voluntary use. As speech returns his vocabulary increases, his enunciation is slow and halting. Any word he is able to recall can, however, be used for naming an object; it may be so badly pronounced as to be scarcely recognizable, but it is applied correctly. When the patient attempts to repeat what has been said to him the articulatory sounds are imperfect, but he can usually utter more words than are possible spontaneously. It is characteristic of this form of aphasia that words are evoked with difficulty and tend to be abnormal in structure.

After the stage of neural shock has passed away, the power of choosing an object to oral or printed commands becomes perfect; for in this case the words he requires are presented to the patient by the observer. Even orders necessitating choice, such as the hand, eye and ear tests, can be carried out correctly if given in print or in words spoken aloud.

At first writing may be extremely difficult, or almost impossible. But as his spoken vocabulary increases the power of writing is regained, although to the last it tends to show the same errors as articulatory speech. These patients cannot spell, and find difficulty in remembering the order of the letters even in simple words. They write more easily to dictation, but are unable to carry in the memory a string of words or a long phrase. They can copy with ease printed matter in cursive handwriting.

The power of reading to themselves with enjoyment is spoilt by the difficulty in remembering a series of words accurately; they are frequently compelled to look back to the beginning of a long sentence in order to obtain its full meaning.

The verbal aspect of numerals is affected, but not their significance. Thus, when looking up the page of a book or scoring at cards the patient may utter the wrong number, but acts as if he had said the right one. Simple arithmetical operations can be carried out correctly, except in very severe cases; then it is not the process of addition or subtraction which is forgotten, but the act fails because of difficulty in remembering the requisite figures.

These patients can draw, play card games and enjoy jokes set out in print or in pictures. In fact, the disorder from which they suffer affects mainly verbal structure and words as integral parts of a phrase; their nominal value and significance are perfect.

(b) Nominal aphasia.—From the verbal point of view this is essentially a defective use of names. Not only does the patient fail in naming objects placed before him, but he has difficulty in employing expressions which give to words their value as a distinctive nominal indicator. For example, the only difference between "five minutes to eight" and "five minutes past eight" lies in the prepositions "to" and "past," and it is here that the patient is liable to fall into error rather than over the numbers five and eight.

When asked to point to an object named aloud or in print, the choice, if correct, is made slowly and with difficulty; for it is the nominal value of the word which is affected and not, as in verbal aphasia, its structural formation. This comes out strongly when the words are made to carry a command requiring choice, and the hand, eye and ear tests are badly executed to verbal orders given aloud or in print.

This inability to find correct names applies to the letters of the alphabet. The patient may be able to utter them in sequence to a varying extent, but he cannot be sure of naming isolated letters correctly. This greatly hampers his power of reading; for, when arrested by a word, he attempts to spell it letter by letter and is confused by the false names he is liable to give them.

Writing is gravely affected, and, although the patient can copy printed matter correctly in capitals, he may be unable to do so in cursive handwriting.

Repetition *viva voce* is perfect provided nothing further depends on the act; but writing to dictation, or any other action demanding choice, is performed with difficulty to spoken commands.

These patients can usually count, but suffer from defective appreciation of the value of single numbers. Thus No. 2 did not fully recognize the significance of such a number as 18 until he had counted up to it. This want of immediate comprehension of the nominal meaning of figures leads to want of ability to carry out simple arithmetical operations. This defect varies greatly in form and extent, but it was present to an obvious degree in my most highly educated patient (No. 2).

Games, such as cards, which demand rapid and correct recognition of names and the power to register a score, are impossible. No. 2 was, however, excellent at chess and could put together a puzzle without difficulty, whilst other patients of this group played draughts and dominoes with pleasure.

They could draw from a model or from memory after it was removed from sight; but, when asked to draw some such figure as that of an

elephant, the result was extremely unsatisfactory. All the distinctive parts of the beast were usually omitted ; and yet No. 2 made spontaneously excellent drawings of the animals he had shot before his injury.

These patients had no difficulty in appreciating the full significance of pictures and could understand jokes provided they were not conveyed in long and complicated phrases.

One of the most instructive forms assumed by this loss of function is the difficulty experienced by the patient in drawing a ground plan of some room with which he is familiar. However badly the verbal aphasic may draw, he succeeds in indicating the relative position of the windows, doors and principal pieces of furniture. But the patient with nominal aphasia fails to produce a correct plan, and usually slips away with an attempt to express the constituent parts in elevation ; and yet if he is asked " Where is the table ? " or " Where is the window ? " he can usually point to their situation. A similar want of power to indicate relative positions appeared during the tests for naming common objects or colours. They were laid on the table in front of the patient and he soon became familiar with the position of each one of them. They were then hidden from his sight, and when a duplicate was shown to him he usually had no difficulty in pointing to the situation of the similar object, although he could no longer see it. But if the name only was given to him, either aloud or in print, he had difficulty in pointing to the relative position of the object on the table ; for, given the word, he attempted to remember the names of the test objects in their order and became, in consequence, confused.

(*c*) *Syntactical aphasia.*—This is an easy form to distinguish because the patient talks jargon. The verbal aphasic speaks slowly and with difficulty ; each word is produced with an effort. But with uncomplicated syntactical defects, speech is voluble and words are emitted with great rapidity. Sometimes each one is comprehensible, however difficult it may be to gather the full meaning of the phrase ; but in other cases the words uttered are pure jargon. One of the most characteristic features of this form of speech is the want of grammatical coherence ; the words tend to be ejected in a disconnected stream.

The power of naming objects placed before him may be retained by the patient in spite of the jargon by which he is hampered. Not infrequently, when he cannot utter a word or when the sound emitted is incomprehensible to his auditor, he can write the name correctly. In the lighter forms of this affection he may vary greatly in the expressions he uses for the same object, though each of them bears some distinct

relation to its essential nature. Thus a pencil may be called at one time "black-lead" at another "blacking."

These patients can understand what they read to themselves provided they do not attempt to formulate it in words. Thus No. 14 read the daily papers and could demonstrate to me correctly the progress of the War by pointing to large scale military maps; but as soon as he tried to describe some event in words he became confused.

The difficulties experienced in writing show that internal speech is also disturbed by jargon. Single words, especially names in common use, can be written correctly, but any attempt to convey a formulated statement is liable to end in confusion. Patients suffering from the more severe degrees of this affection cannot write a letter, but in the lighter cases writing is easier than speech. They can all copy correctly and transcribe printed matter into cursive handwriting.

This disorder is essentially one of auditory balance and rhythm. Syntax, as the expression of this aspect of phrase formation, suffers greatly and, combined with the destruction of the internal balance of words, leads to jargon.

(*d*) *Semantic aphasia.*—So far the names I have applied to the various forms of disordered speech have borne some relation to the verbal defects. For this group, however, it is difficult to find a suitable designation that will express the essential nature of the disturbance, which extends beyond the limits of organized words. I have chosen the term "semantic" as a label for this form of aphasia because the affection comprises a want of recognition of the full significance or intention of words and phrases. But other functions suffer that have nothing to do directly with verbalization. The patient may be unable to appreciate the complete meaning of a picture although he recognizes all its details. He can carry out a manœuvre, where each action suggests the next, but is unable to do so if he is compelled to formulate it as a whole. Power to bear in mind the ultimate intention of the derived action is diminished and the patient has no firm recognition of the final goal of his efforts.

He has no difficulty in forming words and can repeat what is said to him. But if he is told some simple story and asked to reproduce it aloud or in writing, many of the essential elements are omitted; this also occurs to an even greater degree after he has read it to himself silently. He cannot retain that total conception of episodic sequence which is necessary for complete narration.

The clock-tests reveal the nature of this disorder in a striking

manner. The patient confuses the two hands, does not know how to approach the task of setting them to verbal or printed command, and forgets the meaning of "past" and "to" the hour. Even the attempt to imitate directly on one clock the time set on another may lead to confusion and be carried out uncertainly. For whatever the test the patient is liable to misunderstand the intention of what he is asked to do. On the other hand, except in the gravest cases, he has little difficulty in telling the time provided he is allowed to keep the clock in front of him until he has given his answer.

Arithmetical operations become impossible or are carried out uncertainly and with difficulty. The patient may be unable to add or subtract because the mathematical process itself is incomprehensible.

He fails entirely to comprehend most jokes, especially if they demand the complete understanding of a picture and its printed legend. He cannot play cards games or put together puzzles, which confuse him greatly.

These semantic disorders interfere seriously with the actions of daily life and render the patient useless for any but the simplest employment; and yet his memory and intelligence may remain on a comparatively high general level. He does not forget people or places and can recall accurately events both recent and remote. Thus No. 10 was able spontaneously to remember the subject of the three separate letters he had written to me at various sittings during three years. But had I set him the task of repeating accurately a simple story, which he had been told or had read to himself, he would have become confused and many factors of importance would have been omitted.

Chapter V.—Symbolic Thinking and Expression.

Now that I have described the various dissociated forms assumed by disorders of speech in consequence of a unilateral lesion of the brain, it is possible to consider in detail the general nature of the functions which are affected. These I have grouped together under the title "Symbolic Thinking and Expression"; but I am anxious that this term should not be considered as defining the limits of the disturbance. I should have preferred to adopt some entirely neutral appellation, and to define its meaning by enumerating seriatim the various activities which are found to be affected.

To each of the partial forms of aphasia described in this paper a name has been given, indicating the characteristic disorder of speech,

although the use of words is by no means the only function affected. These terms are not intended to define the limits of the disturbance, but serve simply as a memoria technica. In the same way I have combined the functions which are affected by a unilateral lesion of the brain under the general heading of "Symbolic Thinking and Expression," because, in the majority of instances, the gravest disturbance is shown in the use of such symbols as words and figures. Any mental activity is liable to suffer which demands the perfect reproduction of some symbol between its initiation and fulfilment. I do not, however, believe that it is possible to include within one categorical definition all the activities which experience shows to be affected; and yet from a physiological point of view they form a group as definite as those which underlie sensation.

Since it is impossible to define the exact limits of what I have called "symbolic thinking and expression," I shall enumerate the various actions comprised under this heading, which are affected by unilateral lesions of the brain. For the present I wish to exclude cases of bilateral affections, and all patients who showed evidence of definite destruction of sensory images. These must form the subject of an independent research; but they cannot be understood until the principles laid down in this paper have been clearly grasped.

It is not the "general intellectual capacity" which is disturbed by these lesions of the brain, but the mechanism by which certain aspects of mental activity are brought into play. Behaviour is affected in a specific manner; an action can be carried out in one way, but not in another. Thus, all these patients could choose from amongst a series of shapes or colours, the one that had been shown to them. They had no difficulty in picking out an object, which corresponded to a duplicate placed in the hand out of sight. All these are acts of direct matching; but the more definitely the task demands for its perfect execution symbolic formulation, the more certainly will it be badly executed.

The highest stage is reached in formulating a proposition; and, as Jackson pointed out, it is this form of mental expression which suffers most severely. Many patients who can choose an object correctly to oral or printed commands, can neither evoke the same spontaneously nor read it aloud; for both these actions require symbolic representation. If the word is given, it can be matched with some object on the table, but the adequate symbol cannot be called up at will.

When, however, the same patient is compelled not only to evoke a

set of symbols, but to use them as a preliminary to action, as in the hand, eye and ear tests, he may be unable to execute oral or printed commands. For under such circumstances he must first formulate the proposition and then carry it into action correctly.

Any modification of the task, which lessens the necessity for symbolic representation, will render its performance easier. Thus a patient who finds extreme difficulty in imitating gestures, when sitting face to face, makes no mistakes when they are reflected in a mirror; for this is not a propositional act but one of direct imitation. If, however, he is asked to write down the movements visible in the mirror, he falls into the grossest errors because he is now obliged to formulate in verbal symbols what he sees.

The higher the propositional value of the mental act, the greater difficulty will it present. Thus a patient may execute a printed command to hold up his hand, although he is unable to carry out an order to touch with it his eye or his ear. The addition of the second factor has rendered the task too difficult; in the one case he appears to be able to read, whilst in the other he seems to suffer from "alexia." The larger the number of possible alternatives presented by the order, the more certainly will the desired action be defective. Thus it is possible by means of a series of printed cards to grade the severity of the patient's disability. He is first required to carry out a series of movements such as "lift your hand," "shut your eyes," &c., which name one part of the body only. Then the right or left hand is specified, and the task is gradually increased in severity until at last it is brought up to the multiple alternatives of the full hand, eye and ear tests. Somewhere on this ascending scale of difficulty the aphasic will break down, and this gives a rough indication of the extent of the loss of ability to carry out printed commands.

On this principle we can explain the behaviour of No. 2, who was unable to name colours when asked to do so, but never failed to describe them appropriately if he was allowed to use a simile or metaphorical phrase. For example, black was "what you do for the dead"; finally, during later observations at this stage, he was able to shorten this phrase to "dead." He could now name the colour by a single word "dead," because of its metaphorical significance, although he was unable to call up the more directly nominal expression "black."

The large majority of aphasic patients can copy printed matter into capital letters; this is purely imitative. But to copy it in cursive handwriting is an act of transliteration, demanding a certain degree of

symbolic thinking. It is not surprising, therefore, to find that this form of activity is disturbed in some cases of aphasia.

It is comparatively easy to say the alphabet, the days of the week or the months of the year in sequence, provided it is possible to form the necessary words; long familiarity has made such tasks almost automatic. But to recognize immediately the significance of any single letter, day or month demands a higher order of symbolic thinking. Thus, a patient who can say such a series correctly may be unable to spell out the letters of a word or to comprehend the meaning of a definite date such as "Tuesday, the twentieth of March." He can set the clock at "4.45," but not when he is told to place the hands at "a quarter to 5." For in the first instance he places the short hand at 4, and then swings round the other consecutively up to forty-five minutes; in the latter he sets the hour hand at 5, and then stops, puzzled by doubt as to the nominal significance of the words "a quarter to."

The clock-tests also reveal the existence of symbols, which are neither expressed words nor numbers. The short and long hands have acquired a significance which converts each one of them into a direct symbol, and they are confused or used wrongly in many forms of aphasia (Table IX, p. 152). Moreover, we are in the habit of dividing up the space between any two numbers on the clock face into portions of an hour. If we are told to set half-past one, we not only bring the long hand opposite to the figure 6, but we bisect the space between 1 and 2, and place the hour hand in this position. The space between the two figures marking the hours has in itself a symbolic value. In many cases of aphasia this is affected, and the patient no longer sets the hour hand at a point proportionate to the position of the minute hand; he places the former opposite the figure 1, whilst the latter points to 6. Or, more confusing still, when told to set "a quarter to six," he may place the short hand at 6 and the long hand at 9, so that it is impossible to discover without questioning him whether he intended to set 6.45 or 5.45. Thus, not only the hands of the clock, but their relative position on the face have acquired a symbolic value, which is disturbed in many cases of aphasia.

The activity of the cerebral cortex is particularly associated with determination of the relations between external objects. Man developed the power of speech at a time when he had already acquired discriminative powers of a high order. The line along which the higher cerebral centres progressed was apparent in an increased

capacity to distinguish variations of intensity, similarity, and difference, and spacial relationships. To this speech was added, which, apart from its emotional aspects, is concerned with expressing these relations. Definite symbols such as words and numbers were invented to register these attributes; but they are not the only relative factors, which may be disturbed in disorders of symbolic thinking and expression. So long as the patient has to choose an object from those in front of him, which corresponds to a duplicate shown to him or placed in his hand, he can remember the order in which they lie on the table even when they are hidden from his sight. But as soon as he is asked to formulate their order, that is, their relation to one another, he fails to do so. In the same way he may be unable to draw a plan of some room with which he is familiar, although he can recall and indicate correctly the situation of each single object.

In the same way No. 10 remembered that when buying tobacco he placed two shillings on the counter and received two ounces and threepence change; but he was unable to say how much it cost. He could register the facts correctly, but could not relate them to one another.

In the same way sense impressions and images can be appreciated and recalled, but the aphasic may have difficulty in expressing the relation between them. Thus, when tested with the compass-points, he may be entirely unable to answer correctly in speech or writing although he possesses the necessary words; and yet there is no reason to suppose that sensibility is affected. For if the figures 1 and 2 are written on a sheet of paper, he can indicate correctly whether he has been touched with one or two points. Under the ordinary conditions he is compelled to formulate his sensory impressions and to express their relation to some other condition. But when the test is carried out according to the second method, he has only to match his sensory image with one of two patterns in front of him.

Another form of activity, which is particularly disturbed in the semantic group of speech defects, is what may be called the ultimate intention of the symbol. These patients have no clear or certain conception of the goal of the action they are asked to perform. This is profoundly evident in all that concerns words and figures. But it is not the individual words in their primary sense which are gravely affected. No. 10 understood the words "summer" and "time," and also was well aware that "summer time" signified that the clocks were changed with the advent of summer. But he was entirely unable to say whether they were put forward or back, and tried in vain to work

out the problem. In the same way these patients cannot add or subtract with certainty, because it is the processes of arithmetic which have been lost, and not the direct significance of figures.

This failure to formulate the intention or ultimate goal of a desired action leads to loss of capacity to perform tasks not directly associated with words or figures. Thus, when No. 10 was threading a quadrilateral frame for his bee-hives, he could carry out the operation if the action consisted in bringing the wire across from one side to another, and then back again through neighbouring holes; but as soon as he attempted to go from corner to corner he failed entirely. He could carry out a continuous action, but fell into difficulty when he was compelled by the discontinuity of the task to formulate his intention. In the same way a young officer, No. 8, was unable to put together his belt when the slides had been displaced.

In this chapter I have attempted shortly to bring together the various activities which are disturbed, when symbolic thinking and expression are affected. I believe that they form a group of mental processes, which can be defined at present by enumeration only. Some may object to the name I have selected; but this has been chosen solely because the disorder of these functions is most often and most profoundly manifested in the use of words and figures.

SUMMARY.

(1) The results set forth in this paper are based mainly on the investigation of young men suffering from gunshot wounds in various portions of the head (p. 90).

(2) Certain new serial methods of examination have been adopted; these make it possible to utilize the inconstant answers, characteristic of all cortical lesions, which are so confusing unless the examination is made in a systematic manner (pp. 89-107).

(3) These observations show that disorders in the use of language, due to an unilateral lesion of the brain, cannot be classed under the categories of isolated affections of speaking, reading or writing (pp. 108-111).

(4) They cannot be explained as due to destruction of images, "visual," "auditory" or "motor" (pp. 111-113).

On the other hand, "word-blindness," "mind-blindness," and what Jackson called "imperception," are all associated with more or less disturbance of the power to form images, complicated in some

cases by those affections of language which form the subject of this paper.

(5) The "motor" aspect of these disorders of language is not solely an "anarthria" or high-grade articulatory defect. Careful examination shows that, in cases of so-called "motor" aphasia, not only external speech, but certain aspects of internal verbalization are affected. Thus the patient may find considerable difficulty in imitating movements made by the observer sitting face to face or in carrying out the same actions to pictorial command; and yet they may be perfectly executed, when reflected in a mirror. For in the first case some formulation in words is required, whilst in its second form the test is verbally an act of uncomplicated imitation. Moreover, writing tends to show faults in word formation of the same order as those of articulatory speech and spelling may be affected (pp. 113-115).

(6) I have grouped together the functions, which are affected in aphasia and kindred disorders of speech, under the heading of "symbolic thinking and expression." This name has been chosen because the gravest and most definite disturbance is to be found in the use of words, figures, and other symbols (pp. 115-119).

(7) But this term must not be supposed to define exactly the limits and extent of the actual loss of function, which can be discovered by examination. For not only may the power of using words and figures in speaking, reading and writing be affected, but there are other tasks which the patient cannot execute with certainty and correctness. He may be unable to formulate or draw a plan of the relative position of objects with which he is familiar, although he can indicate the site of each one of them individually. He mistakes the significance of the two hands of the clock and fails to recognize the proportionate value of the space between the figures of the hours. He can draw from a model, but may be unable to reproduce the form of an elephant to command. He fails to comprehend the full significance of a picture, although he recognizes the details of which it is composed. Any act is liable to suffer which requires for its perfect performance the antecedent formulation of the ultimate intention or goal towards which it is directed (pp. 157-162).

(8) The more nearly a symbolic action approximates to a proposition the greater difficulty will it present and the patient will probably fail to execute it correctly. The closer the task corresponds to matching two sensory patterns the less likely is it to be affected by these disorders of language. Highly complex symbolic acts suffer more gravely than those of a lower propositional value (p. 159).

(9) Under the influence of lesions situated in different parts of the brain the various functions comprised under "symbolic thinking and expression" may become dissociated. This is analogous to the effects produced on sensation by injuries to the cerebral cortex. Each of these dissociated forms represents a fraction of the complex and highly developed psychical process (pp. 148-157).

In most cases of aphasia two or more of these aspects of symbolic formulation are affected; but in order to comprehend the nature of the disordered functions it is necessary to select for examination patients in whom the disturbance is as nearly as possible confined to one of these forms of dissociation. Subsequently it is possible to understand the more complex aphasias and to enumerate in full the various actions comprised under symbolic thinking and expression.

(10) The various dissociated forms of symbolic thinking and expression may be comprised under the following headings:—

(*a*) Verbal Aphasia. This is essentially a defect of word formation. Words are evoked with difficulty and the vocabulary is greatly restricted. Enunciation is slow and halting. Writing tends to show the same sort of errors as articulatory speech, and spelling is defective. The patient has difficulty in reading to himself with pleasure, because he is unable to retain in his memory a long series of words. Numerals are affected to a slighter degree; their significance may be recognized and acted on correctly although they are wrongly enunciated. As speech returns, commands given in spoken or printed words can be executed; but orders which necessitate the evocation of some word or phrase may be carried out badly. These patients recognize, however, whether the task they are attempting has been performed correctly or not. They can draw, play card games, and comprehend jokes set out in print or in pictures (pp. 121-127).

(*b*) Nominal Aphasia. This is essentially a defective use of names and want of comprehension of the nominal value of words or other symbols. The patient reads with extreme difficulty, especially if he attempts to spell out the words. Writing is gravely affected and he may be unable to copy print into cursive handwriting. Writing to dictation and all actions demanding choice are performed with difficulty to spoken commands. Counting is possible to a varying extent, but the significance of numbers, the power to carry out simple arithmetical operations and appreciation of the relative value of money are usually more or less affected. The power to draw a strict ground plan of some familiar room is defective. These patients cannot play cards but chess and draughts may be possible (pp. 127-136).

(*c*) Syntactical Aphasia. This is an easy form to distinguish because the patient tends to talk jargon. Not only is articulation of the word ill-balanced, but the rhythm of the phrase is defective and there is want of grammatical coherence. These patients can read if they are not compelled to reproduce the meaning in words. Writing is usually less affected than external speech, although it tends to be disturbed by verbal jargon (pp. 136-142).

(*d*) Semantic Aphasia. This consists in a want of recognition of the full significance of words and phrases. The patient may understand each word or short phrase, exactly as he can comprehend the details of a picture; but the ultimate meaning escapes him. He fails to comprehend the final aim or goal of an action imposed on him from without. He cannot formulate symbolically a general conception, although he can enumerate the details of which it is composed. He can read and write, but the result tends to be inaccurate and confused. Counting is possible and the value of numerals can be recognized, but appreciation of the nature of arithmetical process is defective. These patients cannot play games, and jokes set out in print or pictures are rarely apprehended in their full significance.