

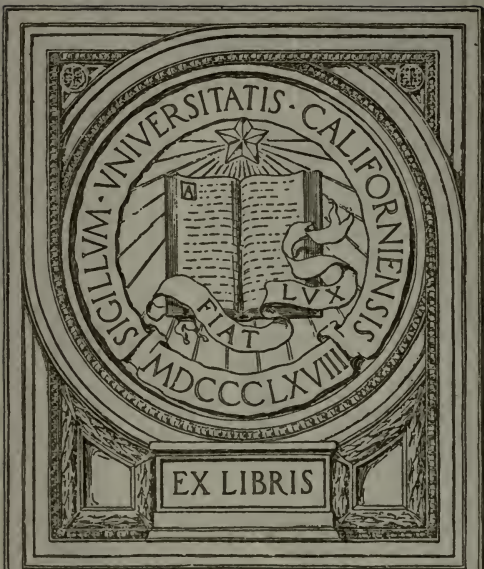
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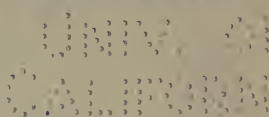
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CONGENITAL WORD-BLINDNESS

CONGENITAL WORD-BLINDNESS



BY

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AND

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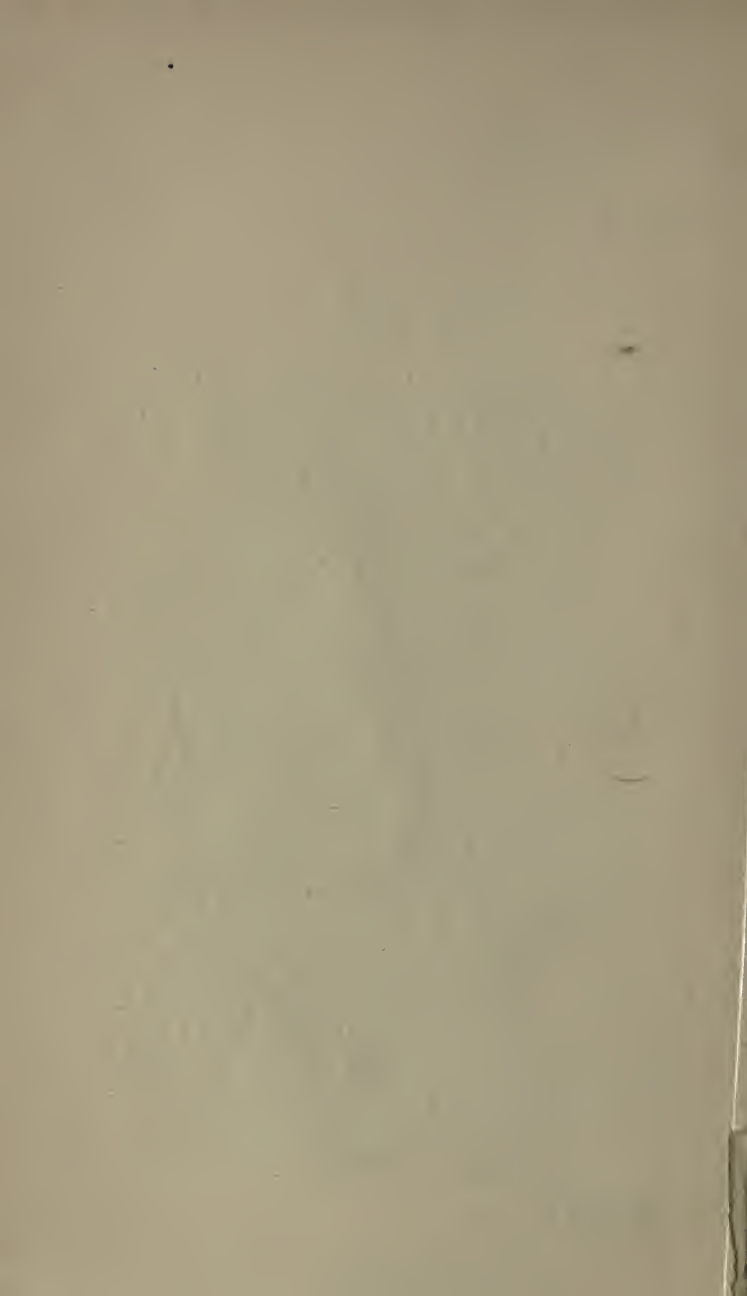
P R E F A C E

CONGENITAL word-blindness is a subject which has been gradually obtaining a greater amount of attention from the medical profession and more especially from that part of it engaged in educational work. It is now generally recognised as one of the congenital defects of childhood and as a subject of considerable interest and importance particularly in its educational aspects. I have therefore thought it advisable to gather together in book form my studies and observations on the subject, which are to be found scattered in contributions to various medical journals during the last twenty years, and a list of which is given at the end of this book. It will be observed that I have devoted considerable space to the subject of acquired word-blindness, without an adequate knowledge of which, in my opinion, congenital word-blindness cannot be properly understood. My aim has been first to furnish the reader with the chief facts regarding acquired word-blindness and then to employ this knowledge in the interpretation and explanation of the various phenomena of congenital word-blindness. Seventeen years ago I published a small volume on acquired word-blindness, and I hope that this complementary volume on the congenital form will help still further to diffuse a more precise knowledge regarding these interesting subjects.

JAMES HINSHELWOOD.

MENTONE, FRANCE,

January 1917.



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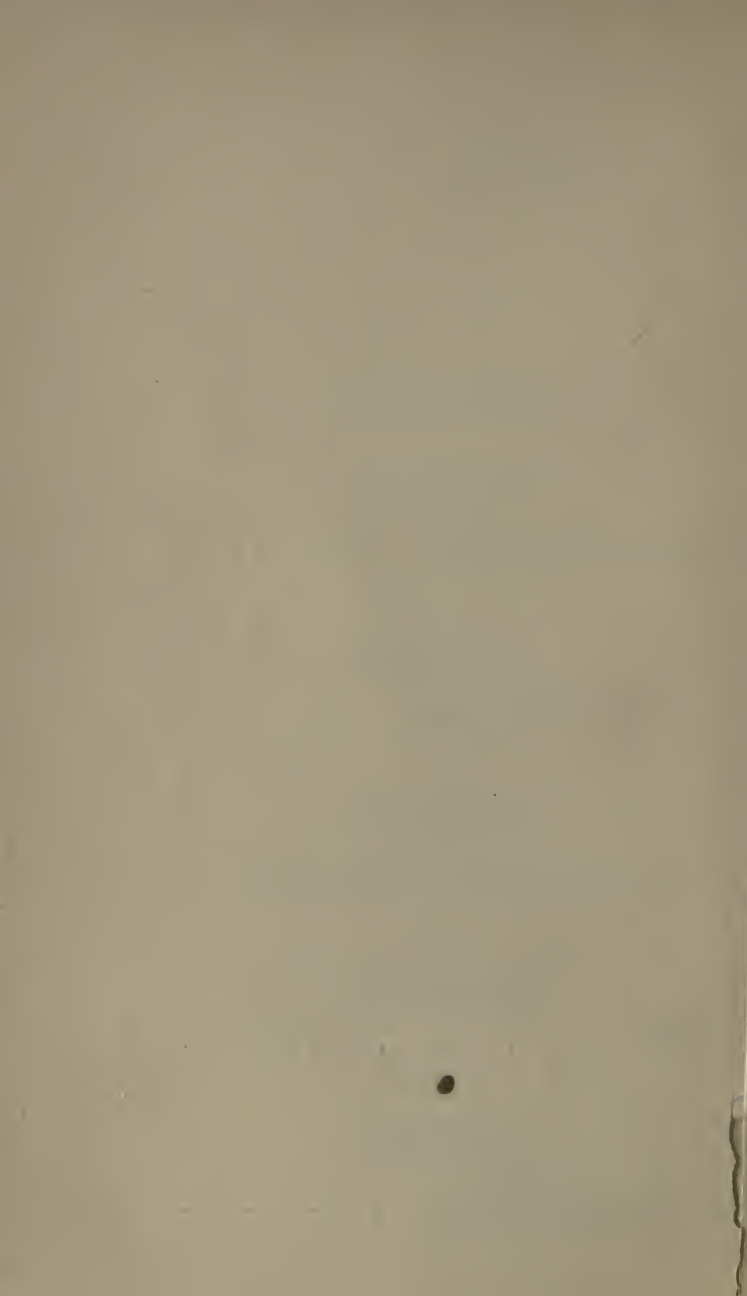
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CONGENITAL WORD-BLINDNESS

CHAPTER I

ACQUIRED WORD-BLINDNESS

IT was Kussmaul (¹) in 1877 who first clearly pointed out that blindness for words is capable of being met with clinically as an isolated condition, and that it represents the pathological condition of a special faculty. Sir William Broadbent (^{2a}), five years previously, had already called attention to cases where the patients were unable to read printed and written words, but in these cases the inability to read was accompanied by speech disturbances such as verbal aphasia, or amnesia in a greater or less degree. To Kussmaul, therefore, must be given the credit of first recognising the possibility of this inability being met with as an isolated symptom. Kussmaul's exact words are "a complete text-blindness may exist, although the power of sight, the intellect, and the powers of speech are intact." He invented the term word-blindness for this condition in which the patient, though not blind, is unable to read visible words. Sir William Broadbent (^{2b}), in a criticism on my first paper in *The Lancet* (^{3b}) on this subject, remarked that in his judgment the employment of the term word-blindness has been misleading and

unfortunate. Now I quite agree that the word has frequently been used by writers loosely with different meanings attached to it, and therefore it may have frequently been misleading. The fault, however, lies not in the word, but in the fact that those who use it have not always a clear conception of what Kussmaul meant by it. By the term word-blindness is meant a condition in which with normal vision and therefore seeing the letters and words distinctly, an individual is no longer able to interpret written or printed language. With a clear understanding of this definition there is nothing misleading about the term, which I think has now become permanently fixed in our medical vocabulary.

The case we are about to study in detail in this present chapter is one of singular purity and completeness, and so will be most helpful in enabling the reader to obtain a clear idea of the true nature of acquired word-blindness. The case is one of singular purity, the word-blindness being uncomplicated by any other cerebral symptoms except hemianopsia. I had the privilege of keeping the patient under close and continuous observation over a period of nine years. At his death the brain was examined and reported on by a skilled anatomist and pathologist, so that our record of the case is exceptionally perfect and complete. The following is the history of the case :

The patient was a teacher of French and German, and a man of intelligence and education. He was 58 years of age and had always enjoyed good health with the exception of occasional attacks of bronchitis in winter. Of recent years he had a large amount of mental work, and before his present visual difficulties appeared he had considerable mental worry. He first came under my notice at the Glasgow Eye Infirmary

on August 29th, 1894, and gave the following history. About one month previously he was greatly startled to find that one morning in his own house he could not read the French exercise which a pupil gave him to correct. On the previous day he had read and corrected the exercises just as usual. Greatly puzzled, he went into an adjoining room, and having summoned his wife, he asked her if she could read the exercise. She read it without the slightest difficulty. He then took up a printed book to see if he could read it, and found that he could not read a single word. He remained in that condition until I saw him.

On examining his visual acuity with the test-types, I found that he was unable to read even the largest letters. He informed me that he could see all the letters plainly and distinctly, but could not say what they were. He made the most absurd mistakes, and only very rarely, after guessing several times, did he hit upon the proper name of the letter. What attracted my special attention was the fact that he read at once the number standing at the top of each paragraph of the test-types. I found on examining him further with figures, that he did not experience the slightest difficulty in reading any number of figures quite fluently and without making any mistakes whatever. He could read figures printed on the same scale as Jaeger No. 1, the smallest of the test-types, and from other tests it was evident that there was no lowering of his visual acuity. His inability to read was thus manifestly not due to any failure of visual power, but to a loss of the visual memory for words and letters. The page of a printed book appeared to him exactly as it appears to a person who has never learned to read. He saw each individual character distinctly enough, but the character was no longer a visual symbol, as he no longer remembered

the special significance attached to it. His difficulty with written characters was equally well marked, and it was the same for Latin and Gothic characters. He was ignorant of music, and I therefore could not test his power of reading musical notes.

✓ To put it briefly, he had lost the visual memory of all the printed and written characters with which he was previously familiar. He could, however, write with fluency and ease to dictation, although afterwards he could not read what he had himself written. No other mental defect could be ascertained on the most careful examination. He spoke as fluently as ever, nor had he since the beginning of his attack ever experienced the slightest difficulty as regards speech. His mental powers were as vigorous as ever, nor was there any defect of memory apart from the loss of memory for the visual symbols of language. I was struck with the fact that in trying to read he always carried the book well to the left hand, and could not see it at all when carried to the right. On examining the visual fields with the perimeter, there was found loss of the right half of each visual field—*i.e.*, he had right lateral homonymous hemianopsia. No other defect could be found, and the fundus of each eye was perfectly normal on ophthalmoscopic examination. His general health was good, and with the exception of atheromatous vessels there was no evidence of disease present on the most careful examination of all his organs.

Such was the condition of the patient when I first saw him in 1894, and I had him under continuous observation till his death in 1903. During the first six months his condition was stationary, but during this period I advised mental rest, and he made no attempts at reading unless when I examined him now and again. I then advised him to start the process of

re-education and to begin to relearn to read. He got a child's primer and began again to learn the letters of the alphabet. After six months' daily practice he learned again to recognise all the letters of the alphabet, and slowly and laboriously to spell out the words letter by letter like a child. He was never able to re-acquire the visual memories of words except only a few of the short, familiar ones, such as the, on, to, etc. He could therefore only read by spelling out each word letter by letter, and thus appealing to his auditory memory, and after a year's hard work he never got beyond this stage. He came to me one morning after his twelve months' continuous effort and said that he had given the task up. It took so much out of him, as he expressed it, and required such intense mental effort, and he was making so little progress that he felt constrained to abandon all further efforts towards learning to read. Not being able to read, he had to give up all his appointments and withdrew entirely from teaching. During the interval of nine years which elapsed between his attack of word-blindness and his death, I saw him from time to time and frequently examined him.

The last time I examined him carefully was about six months before his death, and more than eight years after the onset of his trouble. I found that he had lost the visual memory of letters, which he had re-acquired with so much difficulty. He was again letter-blind as well as word-blind. The visual memory of letters, which he had acquired with so much effort, had been completely lost in seven years from want of practice. This was in striking contrast to the visual memory of figures, which had never been affected, and which remained quite intact. He read figures up to millions with correctness and fluency. He could still write as before, to dictation, although he could not

read a single word of what he had written. His right lateral homonymous hemianopsia remained unchanged. Up till his death, his symptoms remained practically the same—inability to read by sight letters or words; ability to read figures, ability to write to dictation, and right lateral homonymous hemianopsia. During the last few years of his life he became much more irritable and there was perhaps a gradual falling-off in his mental powers. He was not mentally so quick and alert as before his attack. There was also a gradual falling-off in his general strength. He became weaker on his legs, was more easily tired out, and could not walk so far, but there was no paralysis or paresis of any kind.

His death occurred suddenly in 1903. He went out one evening to visit a friend. Whilst in the friend's house he became very unwell and asked to be allowed to lie down. He was carried home in a comatose condition and died there a few hours afterwards. Permission to examine the brain having been given, this was done by Drs. MacPhail and Ferguson, and their conjoint report together with my comments thereon will be found at the end of this chapter.

We have seen that the inability to read words and letters in the case just recorded was not due to any visual defect. The fact that he could read easily figures, no matter how small they were, proved this conclusively. He saw the words and letters quite distinctly, but could not say what they were. In fact, he was reduced to the condition of a person who has never learned to read. He had lost in a night the visual memories of the words and letters which he had acquired after years of training and education. In order to understand this clearly, we must know exactly what is meant by the terms "memory" and "visual memory."

It is customary and correct to employ the term

“memory” in a general sense to express the power which all rational beings possess, of preserving and of reproducing impressions previously received. The older psychologists regarded “memory” as a special faculty and indivisible unity. But the new psychology, expounded with lucidity by Ribot (⁴) and by Binet (^{5a}), teaches that the word memory is simply a general term reducible to particular cases, that such a unity as memory does not exist, but that individual memories do exist—*e.g.*, memories of vision, of hearing, of taste, of smell, of movements and so forth. The facts of mental physiology and pathology have clearly shown that we must not regard the memory as a single faculty having a definite location in the brain. The memory is really the sum total and result of a number of distinct mental processes. There exist partial, special, or local memories, each of which has its own special domain—all of which have intimate connections with one another, yet possess an independence of each other such that one of these special memories can be enfeebled, lost, or developed to an abnormal degree, without any of the other forms necessarily presenting any corresponding modifications. These special or local memories are both motor and sensory; of these the sensory memories form a most important group. Each organ of sense has its cortical centre in the brain, where not only fresh sensory impressions are received, but also previous sensory impressions are stored up and linked with associated sense impressions stored in other centres. Our primary and most simple ideas of objects are formed by the revival in our minds of these sensory memories.

The member of this group which concerns us is the visual memory. There is in the visual memory centre, situated in the angular and supra-marginal convolutions, a storehouse of past visual impressions. These can be

called into the sphere of consciousness at will, when we form what we call a mental picture or, according to the French nomenclature, a visual image. To put it concisely, the visual memory means the power of preserving and recalling to consciousness at will past visual impressions. As to the nature of the impressions received and preserved by the nerve cells in the visual memory centre, we can form no idea. Neither the microscope, nor chemical reagents, nor histology can reveal to us the modifications in the cerebral cells, yet consideration of the mental processes involved in vision makes it clear that a visual memory, a storehouse of past visual impressions has a real existence. It is only through the help of this visual memory, of this storehouse of past visual impressions, that we can interpret the fresh visual impressions that are constantly passing to the brain. Sweep away all the visual memories or images from the brain, and you have the condition commonly known by the term "mind-blindness." Sweep away only the visual memories of words and letters from the brain and you have the condition of word- and letter-blindness as exemplified in the case at present under consideration. In the condition of "mind-blindness" the object is seen, but there is no intelligent recognition of it. There are no past visual impressions to compare it with, and through the medium of the visual memory to arouse the other sensory and motor memories regarding it. The object, though seen, has no significance whatever for the mentally blind. Mind-blindness, then, is simply loss of visual memory, and it reduces the individual affected to a very helpless and pitiable state. For some interesting examples of this condition I would refer the reader to Chapter II of my book (^{3a}) on *Letter-, Word-, and Mind-Blindness*. Word-blindness is only a special

form of mind-blindness due to loss of a special group of visual memories, *viz.* those of words and letters.

We must carefully distinguish between simple perception of an object and an intelligent knowledge of it. If retina, optic tract, and percipient centre in the occipital lobe are intact, then we shall be conscious of the image of any object which falls upon the retina, and may assign it to its proper position in the external world; but we may have no intelligent knowledge of it. The visual memory centre in the angular gyrus must be communicated with, the present visual impressions must be compared with similar past visual impressions, and through the medium of the visual memory we arouse the other sensory memories regarding it, all of them being closely associated. The visual memory, then, plays a most important part in every conscious exercise of vision; but it is evident from the study of the facts of mental pathology that this visual memory is not a unity. Clinical experience clearly demonstrates that the visual memories for words and letters, for numbers, and for musical notes have a functional independence of each other. Each group of visual memories may be entirely lost, whilst the others remain intact and unaffected in the slightest degree. Hence we are led to infer that they must possess an anatomical independence. We can as yet only localise the visual memory of words and letters, but from the frequency with which these three groups of visual images are simultaneously lost we can infer that the regions affected, though not identical, are probably very close together. Further, these three groups have this in common, that they are highly specialised visual memories, requiring for their retention in the brain a considerable amount of mental concentration and education.

There are other groups of visual memories which are

not so highly specialised, and for the acquirement of which comparatively little mental concentration or special training is necessary. The visual memory of form and colour, of objects, persons and places, furnishes us with a mental picture gallery which enables us to find our way with unerring accuracy through the intricate streets of a great city, which enables us to recognise a friend after the lapse of years, and which puts us in an intelligent relationship with the objects around us in our daily life. That this form of visual memory is distinct from the highly specialised visual memories of words, numbers, and musical notes is clearly shown by the clinical evidence. Word-blindness and note-blindness are but seldom accompanied by any impairment of this larger group of visual memories, and in the present case the word-blindness is not accompanied by the slightest disturbance of any of the other forms of visual memory. Further, this form of mind-blindness for form and colour, for objects and places, is of very great rarity, whereas the loss of the highly specialised visual memories, word-blindness, etc., is comparatively common. The forms of visual memory thus fall into two main groups: first a group of highly specialised visual memories, words, letters, figures, and musical notes, for the acquirement of which great mental concentration is necessary, and which are possessed only by those specially trained; and secondly, a group of visual memories for form and colour, for objects, persons, and places, for the acquirement of which no great mental effort is required, and which are possessed by all men who have the sense of vision. We are led to infer from the complete functional independence of these two groups of visual memories an anatomical independence, and a plausible suggestion has been offered as to why the loss of the first group should

be comparatively common as compared with the loss of the second.

The organs of sense that are concerned in the reception and interpretation of speech are represented bilaterally in the cerebral cortex. Since each eye and each ear are connected with both hemispheres, destruction of the cortical percipient centre in one hemisphere will not make the patient deaf in one ear or blind in one eye. Destruction of the primary visual centre in one occipital lobe causes, as we see in the present case, only loss of the half of the field of vision in each eye, homonymous hemianopsia. But with regard to language the education of the sensory memory centres is unilateral. In the auditory and visual memory centres of one hemisphere only are the sensory impressions of language, auditory and visual, retained and stored up. The hemisphere selected is always that in which are situated the motor centres for speech and writing. It is thus the left hemisphere in right-handed people, and the right in left-handed people. A lesion on one side of the brain, in the vast majority of cases in the left angular gyrus, will completely obliterate the visual word memories and make the individual word-blind, as is well exemplified in the present case under consideration. The visual memories of numbers and musical notes are also unilateral and in the immediate neighbourhood of the word centre, for as already pointed out, all three groups of visual memories are frequently lost together. It has been suggested that the second group of visual memories—those of objects, of persons, of places, of form and of colour, which do not require such an effort of attention and concentration—are efficiently imprinted and stored up in the visual memory centres of both hemispheres. Hence it will require a bilateral lesion to produce mind-blindness for objects,

etc., and hence, as can be easily understood, its much greater rarity. This, however, is a subject which awaits further investigation. A very interesting case with pathological examination reported by Sérieux (6) supports the suggestion of a bilateral lesion.

One feature of this case to which I wish to direct particular attention is the fact that this patient could read figures as fluently as ever, and continued to do so for a period of nine years until his death; indeed, it was this feature which first made me suspect it was a case of word-blindness. On trying him with the test-types I was at once struck with the fact that although he could not read a single word or letter, he read without hesitation the number standing at the top of each paragraph of the test-types. I then tested him further, with large combinations of figures, and all these were read with the greatest fluency and without any hesitation whatever. This was a point in these cases which had met with very little attention previous to the publication of my first paper in *The Lancet* on December 21st, 1895, when I insisted in every case of word-blindness upon the necessity of carefully examining the patient's power of reading figures. Skwartzoff (7), who collected fourteen cases of word-blindness, only recorded one where it was stated that the power of recognising figures was preserved, and appended to it the remark that generally we find no difference in word-blindness as to the reading of figures and letters. I ventured to throw doubt on this statement, and suggested that the scarcity of recorded cases, where the reading of figures was preserved, was probably due to the fact that the cases were not carefully examined as to their capacity for reading figures. I quoted four cases already reported by Mierzejewski (8), Brandenburg (9), Déjerine (10), and Joly (11), where patients, although

word-blind, could read figures. My own increasing experience, however, was the most convincing proof of the great frequency with which the power of reading figures is preserved in cases of word-blindness. Out of eight cases of word-blindness recorded by me in various papers (^{3e, f, h}), six cases retained the power of reading figures, so that the fact was clearly established that in cases of word-blindness the power of reading figures is very frequently preserved intact. Alfred Binet (^{5b}) has presented us with a very interesting aspect of this same question from another point of view. In his psychological study of MM. Inaudi and Diamandi, who startled the scientific world by their great feats in mental arithmetic, Binet points out that whilst their memory for figures had acquired an abnormal extension which excited astonishment and admiration, the other forms of memory—*e.g.*, that for words—presented nothing special, and in fact in some respects they were below normal. In the case of Diamandi, his extraordinary memory for figures was a purely visual memory. When he learned a series of figures by looking at them for a moment, he could repeat them in any order. He explained the mental process by saying that he had a precise mental picture of the figures with all their peculiarities of printing and even of colour. His visual memory for figures was so exact as to resemble a mental photograph which he could read off at leisure, as he would from the pages of a book. Yet the visual memory for words was by no means above normal. Experience thus clearly proves the complete functional independence of the visual memories of words and figures, for, as we have seen, the one form of visual memory may be completely lost, whilst the other remains intact, and the one form may be developed in excess, whilst the other is even below the average.

This complete functional independence of the visual memories of words and figures leads us to the inference that these groups are deposited in distinct areas of the cerebral cortex. The fact, however, that the visual memories of words and figures are often lost together would lead us to the further inference that the cerebral areas in which they are deposited, though distinct, are probably very close together.

Another very interesting form of loss of visual memory is that of the loss of visual memory for musical notes—note-blindness. Professor Edgren of Stockholm has published a most interesting paper⁽¹²⁾ in which he gives fifty-two cases collected from various sources in which the power of musical expression was partially lost, and which he has designated by the term "amusia." Professor Edgren regards the following conclusions as admissible from the study of the fifty-two cases: (1) that a pathological process can cause partial or total loss of the power of musical expression—amusia; (2) that the various forms of amusia possess a certain degree of clinical independence in their relation to each other and to aphasia; (3) that the clinical forms of amusia appear to be analogous to the clinical forms of aphasia, and are often, but not necessarily, accompanied by the analogous form of aphasia; (4) that amusia can exist without aphasia, and aphasia without amusia; and (5) it is probable that certain forms of amusia possess an anatomical independence, the region affected being near to, but not identical with, that affected in the analogous form of aphasia. Of the different forms of amusia described in this paper, one of the most interesting is note-blindness—*i.e.*, loss of the visual memory for musical notes. The patient can see the notes as usual, but has no longer the faintest idea of their significance, just as if

he had never learned to read music. This note-blindness may occur as an isolated symptom, there being no other impairment of the patient's powers of interpretation or expression of musical sounds, and the patient being able to read all other printed and written symbols. The patient may be able to read the words of a song, but be no longer able to read the accompanying music. Word-blindness is very frequently accompanied by note-blindness, but not always, the patient sometimes retaining the power of reading musical notes.

In my own experience I have met with two cases of word-blindness where the patients preserved quite intact the power of reading musical notes. One of these was a case (^{3^h}) where the patient retained his power of reading Greek, whilst he was partially word-blind to English, French, and Latin. The other was that of a girl of fifteen years of age, who had become completely word-blind from cerebral disease. She could not read a single word of a song, but could read the music. Being a good musician and not being able to read books, she spent a large part of her time at the piano, playing page after page of music. It is evident, then, that the visual memory for musical notes is quite distinct from the visual memory of words, since the one form of visual memory may be entirely lost, whilst the other is not changed or modified in any way, and just as in the case of figures, this complete functional independence entitles us to infer a corresponding anatomical independence.

There are many varieties of word-blindness, but all the varieties have this point in common, that the inability to interpret written and printed language is not dependent upon any ocular defect, but upon disorder of the visual centres in the brain. The case which

I have just reported in the present chapter as being the most helpful to the study of the phenomena of word-blindness is an example of complete letter- and word-blindness, where the patient was unable to read a single word or letter, but there are many peculiar varieties of this condition where the word-blindness is only partial and which only affects certain groups of words and letters. Michel (¹³) quotes a case where the patient could read the Gothic but not the Latin characters. Charcot (¹⁴) records a case where a patient knowing French, German, Latin, Spanish, and Greek lost the memory of a few of the Greek and German characters only. Bruns and Stoelting (¹⁵) record a case in which the patient's inability to read printed letters and words was complete, but only incomplete for written characters. In *The Lancet* (^{3^h}) I recorded a case where a patient, a highly educated man, retained the power of reading Greek, whilst he became partially word-blind as regards Latin, French, and English. This case is so interesting, as an example of the remarkable partial forms of word-blindness sometimes met with, and as affording some insight into the mechanism of the visual memory, that I will quote some of the more interesting details from my paper in *The Lancet*:

“ In the case of an individual knowing more than one language, can he become word-blind to one language alone, leaving the others intact? Or if the word-blindness extends to all the languages with which he is familiar, may it vary in degree in the case of different languages? The following case is, I think, a very important one in giving a definite and affirmative answer to these questions. The facts were observed with great care, and the patient, an inspector of schools, being a highly intelligent and educated man, was therefore able to render every assistance in making our examination

accurate and reliable. The patient, who was familiar with four languages, English, French, Latin, and Greek, had discovered for himself the painful fact that he had become word-blind and could no longer read English ; but neither he nor his medical attendants had ever thought of testing his power of reading the other languages with which he was familiar. When, having been brought to see me, I put a Greek book into his hand, he was both surprised and delighted to find that he could read it correctly. I made him read passages from Homer, Xenophon, and the New Testament, all of which he read correctly. It was evident then, that so far as Greek was concerned, there was no evidence of word-blindness. I then tested him with Latin, and found that there were evidences of partial word-blindness, although the great majority of words he read correctly by sight. Now and again he came to a word which he did not recognise by sight and which he had to spell out letter by letter before he could interpret it. Although he did not read Latin with the absolute correctness and fluency with which he read Greek, his reading was a very great contrast to his almost complete word-blindness for English. On testing him with French, a greater degree of word-blindness was manifested than in the reading of Latin, but still it was not nearly so pronounced as that manifested in the reading of English. He recognised by sight a large number of French words, although he made many mistakes, and many of them he could not recognise at all without spelling them out letter by letter. It was observed, however, that even with English, the word-blindness was not absolutely complete, and there was no letter-blindness, thus showing that the interference with the functional activity of the centre was only of a partial character. He knew all the letters of the alphabet,

and could pick out by sight a word here and there, especially the shorter and more familiar words, such as the, to, of, etc., but he could not read a single sentence by sight. He could only read if you allowed him, slowly and laboriously, to spell out each word letter by letter, and thus interpret the words by appealing to his auditory memory. Thus of the four languages which he could read, the word-blindness extended only to three, and the degree of word-blindness was very different in each of the three languages affected, being greatest in English, less in French, and least in Latin. The Greek language had entirely escaped, and no trace of word-blindness was manifest so far as it was concerned. He read numbers also with fluency and correctness both individually and in the most complex combinations. He read musical notes as fluently and as correctly as ever he did, without manifesting the slightest hesitation."

These phenomena, which at first sight may seem strange and inexplicable, are in perfect harmony with our knowledge of the brain and afford further clinical proof of the correctness of the views expounded and developed in my book (3^a) on *Letter-, Word-, and Mind-Blindness* that "all the varieties of word-blindness met with in clinical experience can be intelligibly explained by regarding them as disorders of the visual memory produced by lesions affecting more or less completely a definite area of the cerebral cortex, in which are preserved these past visual impressions arranged in definite and ordered groups."

In the case of a person who is able to read several languages, the letter and word visual memories of each language will be grouped together, forming thus a series of separate groups within the centre. If the whole centre is destroyed or its functional activity abolished,

the individual will be blind to all languages, as is exemplified in the case first described in this chapter; but if there is only a very partial interference with the centre, then the word-blindness also may only be very partial and may be limited to a single group of these visual memories, *i.e.* to a single language. Hence this, at first sight, singular phenomenon of an individual being word-blind to one language and not to another is just what we would expect from the views enunciated as to the separate grouping of the visual memories within the visual memory centre.

Although this is the only case in which I have met with different degrees of word-blindness in different languages, I had previously met with a case in which a patient knowing two languages was word-deaf to one but not to the other. This condition, of course, is easily explained in the same way as the partial word-blindness—*viz.* that in the auditory memory we have the different languages arranged in separate groups, and hence in a partial lesion one group may be interfered with or destroyed whilst the others are preserved. The patient referred to was a Frenchman, a teacher of French in Glasgow. Manifesting certain cerebral symptoms he resigned his position in Glasgow on my advice and returned to France, where he died about a year later, right-sided hemiplegia and some degree of aphasia having manifested themselves before his death. His wife wrote to me after the event, and mentioned as a very curious fact that for some time before his death he could not understand French, his native tongue, but could only understand what was said to him in English. In his last illness this was a matter of grave inconvenience, as the doctor in attendance could only speak French, and therefore he could only communicate with his patient through the medium of his wife, who,

knowing English, could act as interpreter. In other words the patient had become completely word-deaf to French but not to English. The partial word-deafness manifested in this case thus forms an exact analogy to the partial word-blindness described in the previous case, and as we have seen, can be explained in precisely the same way.

I would refer the reader, who is interested, to my book on *Letter-, Word-, and Mind-Blindness* for further examples of the peculiar partial forms of word-blindness which may be met with. From amongst these I will select, as worthy of special notice, one example of each of these interesting groups, *viz.* word- without letter-blindness and letter- without word-blindness. In the former condition, the patients, although completely word-blind, could still read fluently the letters of the alphabet, in the latter they were able to read words but were not able to recognise the individual letters of which the words were composed. The following is an example of word- without letter-blindness:

A man, *æt.* 53 years, came home from his business about two o'clock in the afternoon, saying that he did not feel well and had to give up work in the morning, as he could not see to read or write. He was brought to see me some time thereafter by his medical attendant to ascertain the precise nature of the visual defect which prevented him from reading. On examining him with the ophthalmoscope, nothing was found in the eye to account for the inability to read. On testing him with the distance test-types composed of separate letters, he could read the letters quite fluently, but on testing him with the reading test-types composed of words and sentences, I found he could not read words when made to rely on vision alone. If allowed to spell out aloud each word letter by letter, he could read

slowly and laboriously by appealing to his auditory memory; but when prevented from doing this, and made to rely upon sight alone, he could not read words at all. His difficulties in reading words were precisely the same with the largest as with the smallest test-types. He had precisely the same difficulty in reading written as in reading printed words. On testing him with figures he could read them rapidly and fluently even in the most complex combinations without the slightest hesitation. It was thus clearly evident that the inability to read printed or written words was not due to any ocular defect, but was a cerebral disorder of vision, which had the striking peculiarity that the inability to read did not extend to the individual letters.

The following is an example of the converse condition—letter- without word-blindness—where the patient is able to read words but not the individual letters of which the words are composed: This patient, a young man, 24 years of age, whilst lying in the Glasgow Western Infirmary recovering from an attack of hemiplegia and aphasia, was found on examination to manifest visual symptoms of a somewhat remarkable character. On testing him with words and letters, it was evident that a peculiar condition was present, which was manifestly not of ocular but of cerebral origin. On testing him with letters it was found that he could neither read nor write a single letter of the alphabet except "T" which he generally recognised. Nor could he point out any named letter except T. The inability to recognise them was the same with all sizes and forms of letters both written and printed. On testing him with words, however, he could read almost every word presented to him, even words of three or four syllables and very unfamiliar ones, while at the same time he was quite unable to point out a single

letter of the word he had read. Such words as "stethoscope," "telescope," "electricity," "infirmary," etc., were read at once. The word "Job" was read at once, but when the letters were arranged "obj" and he was asked to read them, he could not name a single one. The contrast between the fluency with which he read words and his inability to make anything out of the individual letters was very striking. Slight intentional mistakes in spelling and even reversing letters were not observed by the patient, who read the words just as if no alteration had been made, and did not seem conscious of anything peculiar about the word. Numerals he recognised and named as far as nine, but not beyond that.

The two cases just recorded, though uncommon, are by no means unique, and in my book I give four examples of word- without letter-blindness and five of letter- without word-blindness, so that these two conditions may be regarded as forming definite varieties of word-blindness. The principle already mentioned, of the preservation in the visual memory centre of past visual impressions arranged in definite and ordered groups, explains the phenomena in these varieties, which at first sight seem very remarkable. Since the visual memories of letters can be lost whilst those of words are preserved intact and *vice versa*, it is evident that there is complete functional independence of these two groups of visual memories. We are therefore justified in inferring that, just as in the case of numbers and musical notes, these are deposited in different areas of the cerebral cortex, but since the visual memories of letters and words are usually lost together, it is practically certain that the areas in which they are stored are contiguous, that is, the visual memory centre. When there is only partial destruction of the centre,

and that part of it in which are stored the visual memories of letters remains intact, then the patient can read individual letters but not words; on the other hand, when the letter area is destroyed and the part in which are deposited the words is still functionally active, then the patient, though he cannot recognise an individual letter, can recognise words. When the destruction of the centre is partial and irregular, part of each area being destroyed, then the patient will be able to read some words and some letters, as in some of the peculiar cases which I have met and recorded (^{3e,4}). The view here expounded has the merit of simplicity and of rendering intelligible the manifold phenomena met with in all these varieties. The complexity of the visual memory as revealed by the study of these partial cases of word-blindness has a special interest for those engaged in the education of the young, and the conception of varying degrees of development in the different areas of the visual memory centre enables us to understand how children manifest in their school career such varying aptitudes for the learning of different subjects.

The question of the exact localisation of the visual centres in the brain has given rise to considerable controversy in the past. For a considerable time Ferrier and Munk carried on a discussion on this subject. Ferrier originally held that the cerebral centre of vision was situated in the angular convolution, and Munk that it was in the convolutions in the posterior part of the occipital lobe. Later clinical and pathological observations (^{6, 7, 10, 16, 17}) have reconciled these apparently antagonistic opinions by showing that both Ferrier's centre and Munk's centre have important parts to play in the function of vision. We must distinguish between the mere perception of an object as occupying a certain position in our visual field and the

recognition of it, as to its exact nature and qualities. Those distinct functions of perception and recognition, both of which are necessary in every visual act, are now generally acknowledged to be discharged by Munk's and Ferrier's centres respectively, so that the co-operation of both is requisite for the successful accomplishment of every visual act. Although the boundaries of the visual centres cannot as yet be laid down with precision, yet the mass of pathological evidence tends to show that the occipital lobe, especially in the neighbourhood of the cuneus and the calcarine fissure, is the centre for primary visual impressions, the perceptive centre. Henschen (^{16b}), in his report on the cortical centres of vision to the International Medical Congress at Paris, expressed the opinion that the primary visual centre is localised in the cortex of the calcarine fissure and its immediate neighbourhood, and as we shall see later, this opinion is confirmed by the pathological examination, the report of which is to be found in the appendix to this chapter.

It is now a matter of general agreement that this primary visual centre is connected with the half of the retina in each eye, the left occipital lobe with the two left halves and the right occipital lobe with the two right halves. But since the left half of each retina corresponds to the right half of each visual field, a lesion in the left occipital lobe would produce blindness in the right halves of both visual fields, or right homonymous hemianopsia, as is exemplified in the case reported at the beginning of the chapter. A constantly increasing pathological experience (^{6, 7, 10, 16, 17}) tends to prove that the centre in which are stored the visual memories of words and letters includes the supra-marginal and angular convolutions, but that the more important part of the centre is situated in the angular gyrus. This

visual centre forms no exception to the law that with regard to language, the education of the motor and sensory centres concerned is unilateral. As the hemisphere selected is always that in which are situated the motor centres of speech and writing, in right-handed people, forming the vast majority of cases, the visual memory centre for letters and words is situated in the angular and supra-marginal gyri on the left side of the brain. This visual memory centre in the left angular gyrus is connected with the primary visual (perceptive) centres in both occipital lobes. Hence destruction of the left occipital lobe causes right homonymous hemianopsia, but not word-blindness, since the right occipital lobe is still connected with the visual memory centre in the left angular gyrus. To have complete word-blindness this centre must itself be destroyed or its connections with both right and left occipital lobes must be cut off. In the former case, where the lesion is cortical, the word-blindness is accompanied by agraphia, but in the latter, where the lesion is sub-cortical, the power of writing to dictation is preserved intact. There are thus two classes of cases of word-blindness: first, those produced by a cortical lesion destroying the centre itself and which are associated with agraphia; second, those produced by a subcortical lesion leaving the centre itself intact but isolating it by destruction of the connecting fibres, and in which the power of writing is retained. The case reported in detail at the beginning of this chapter belongs to this second class. The post-mortem examination of this patient's brain revealed, as was anticipated, a sub-cortical lesion causing complete isolation of the left angular gyrus, but with the gyrus itself preserved intact (see Figs. 2 and 3). For further explanations regarding these two classes of cases of word-blindness,

I will refer the reader to my remarks on the report of the post-mortem examination of the brain, to be found at the end of this chapter.

Cases of word-blindness may be divided into two great classes—first, those which recover more or less completely; and secondly, those in which the condition is permanent. The future course will depend upon whether the cerebral centre or the fibres leading to it have been destroyed, in which case the condition will be permanent, or whether its function has only been suspended by the blood supply being interfered with either by pressure of a growth or a hæmorrhage, or by occlusion of a cerebral blood vessel by a thrombus or embolism. In the latter case, when there is no actual destruction of cerebral tissue a restoration of function is possible, if the blood supply is gradually restored to the centre either by a gradual diminution of the pressure or by the re-establishment of the blood supply. If the function is going to be restored signs of improvement will speedily be manifested, as a rule within two or three weeks of the original loss. The improvement is usually only slow and gradual, and it may be months before the patient is able to read again with any degree of fluency. Where several months have elapsed without the slightest trace of any restoration of function, then we may be certain that there has been actual destruction of cerebral tissue and that the loss of function is permanent. The old idea was that nothing could be done for such cases, and they were allowed to remain permanently word-blind for the rest of their lifetime. It is now quite clear, however, that many of these patients can be re-educated and learn to read again. It is important in such cases, however, that the process of re-education should not be started too soon. Complete cerebral rest is essential after the onset of the symptoms

for a considerable time, and no attempt at re-education should be made until all signs of active cerebral disease have disappeared.

In our first case, we have seen that the patient, after a period of six months' cerebral rest, on my advice started the process of re-education. He got a child's primer and began again to learn the letters of the alphabet. After six months' daily practice he learned again to recognise all the letters of the alphabet, and slowly and laboriously to spell out the words letter by letter like a child. He was never able to re-acquire the visual memory of words, except only a very few of the short familiar ones, such as the, of, on, to, etc. He, therefore, could only read by spelling each word out aloud, and thus appealing to his auditory memory, and he never got beyond this stage. After labouring at this for a year, he abandoned the attempt partly because he was making such slow progress, but more especially because the intense mental effort involved in this daily task caused such a great feeling of mental exhaustion. "It took too much out of him," as he himself expressed it. As this patient was now 59 years of age, I did not insist on his further continuance with a task which seemed to produce such great cerebral exhaustion.

This case, however, was so far encouraging as the patient re-acquired the visual memories of the letters of the alphabet, and of a few familiar and short words. This showed the possibility of re-education to some extent at least, and encouraged me to try the same method in the next case (^{3^d}) which came under my notice. This patient was a woman aged 34 years, who had been completely word-blind for a period of fourteen months before I saw her. So complete was the word-blindness that she could not recognise a

single letter of the alphabet. On examination I found there was also right homonymous hemianopsia. I recommended that she should learn to read again, beginning with the letters of the alphabet, and then the short words and sentences in a child's primer. This case was a much more favourable one, as the patient was twenty-four years younger. Fortunately also she lived with her brother, who, being a school-master, was naturally greatly interested in this process of re-education, and undertook the supervision of it. I asked her brother to give me some account of his experience in teaching her to read, and I quote the following from his notes which he kindly sent me :

“ On July 19th, 1900, my sister became paralysed on the right side, and also became completely word-blind both for printing and writing, but to a considerable extent could recognise figures. By September 1900, she had recovered the power of her right arm and leg and improved in her general health, but her inability to read remained just as before. Her medical attendant advised that Dr. Hinshelwood should be consulted regarding her word-blindness, and in September 1901, Dr. Hinshelwood, after seeing her, advised that an attempt should be made to re-educate her. Ordinary school primers were recommended, the print being big and the lessons graduated. Generally speaking, the task of re-learning was found to be twice as difficult as the learning of words and letters for the first time, but as the auditory memory was unimpaired, the task was to some extent easier, for she could spell words when she could neither recognise them, nor even the letters of which they were composed. She could not study at first for more than ten minutes at a time, as exhaustion soon came on and she had to stop. Slowly and with great perseverance she succeeded in learning the alphabet

and little words. The first primer (words of four letters) was mastered in about ten weeks, greatly by the help of the auditory memory; and by July 1902, she was reading simple Bible texts, but spelling most of the words letter by letter. Since then her progress has been steady but slow. In common narrative a large proportion of the words are now not spelt at all, and of those which she requires to spell few have now to be spelt aloud. She often stumbles yet at small words, and gets easily over big words, the appearance of the latter being often more characteristic."

In 1911, after an interval of more than ten years, I had an opportunity of again examining this patient and hearing her read. Her homonymous hemianopsia remained unchanged. She read to me an article from a newspaper very fluently, but occasionally stopped and spelt out a word before she was able to read it. This occurred only very rarely, so that she had practically recovered her power of reading by sight. She now, as her brother informed me, reads newspapers and books for her pleasure, just as she used to do.

In April 1905 a girl of 14 years of age was brought to me with the history that eighteen months ago she became paralysed on the right side, with loss of speech. She gradually recovered from her hemiplegia and aphasia, but it was then found she was unable to read, and had remained in that condition ever since. Before her illness she was in the fourth standard at school, and could read very well. When I examined her I found that she had right homonymous hemianopsia, and was completely word-blind, not being able to recognise a single word or letter. Her auditory memory was unaffected, and she still retained the power of spelling. I therefore advised that she should be re-educated, beginning with the alphabet and then with a child's

primer. After learning the alphabet she was allowed to spell out aloud the words letter by letter, and thus appeal to her auditory memory, which was unaffected. I saw her again four months afterwards, and found that she had made considerable progress in that time. She could recognise by sight all the letters of the alphabet, and could pick out by sight a large number of small words, such as "to," "up," "the," "of," and so forth. Larger words she could read by spelling them out letter by letter and so appealing to her auditory memory. Her hemianopsia remained unchanged. I learned later from her medical attendant that her progress in re-learning to read had been continuous. Her education was undertaken by her father, who spent a great deal of time in teaching her, and in two years after I saw her, she was able to read just as well as ever. The comparative ease and rapidity with which this child re-learned to read was very striking as compared with our previous experience in the cases of the two adults. It is evident, then, that age is a very important factor in determining the prognosis as regards re-education in any case of word-blindness, and that the younger the patient the less will be the difficulty experienced in teaching him to read again.

Re-education in these cases just recorded could, I think, only be accomplished by the education of the corresponding centre on the opposite side of the brain, and hence the greater difficulty in teaching such patients to read by sight, as they require for that purpose to use a part of the brain which does not usually discharge that function. The permanence of the right homonymous hemianopsia in all three cases showed that the subcortical fibres communicating with the left angular gyrus had been permanently destroyed, and that the centre itself was thus permanently isolated. So far as

functional activity of a cerebral centre is concerned, destruction of the communicating fibres has the same effect as destruction of the centre itself, *viz.* complete abolition of function. The left angular gyrus in these cases therefore being completely isolated, could take no further part in the process of re-education. In the report of Drs. McPhail and Ferguson on the brain of our first patient they state "that comparison of the left angular gyrus with the right shows that its conformation is notably simpler on the left side, the right being more prominent and more highly convoluted than the left." Now it is evident that the angular gyrus on the left side having been thrown out of use by the destruction of the connecting fibres and its consequent isolation, a greater amount of work must have devolved upon the corresponding centre on the right side of the brain, and that for the prolonged period of nine years. This increased functional activity of the right angular gyrus suggests therefore a possible cause for its greater development.

That the function of a centre on one side of the brain may be taken up by the corresponding centre on the opposite side is, I think, clearly demonstrated by a case of aphasia reported by Barlow⁽¹⁸⁾. We know that in aphasia, particularly in youthful patients, the power of speech is sometimes recovered after complete destruction of the speech centre on the left side of the brain. That the recovery in these cases is due to education of the corresponding centre on the opposite side is shown by Barlow's case of cerebral lesion, first in the left third frontal convolution and subsequently in the corresponding convolution of the right side. The patient, a boy suffering from heart disease, had first an attack of aphasia due to embolism in the artery supplying the left third frontal convolution. He speedily regained

the power of speech, most probably by training the corresponding right third frontal convolution. A second embolism plugged the artery supplying this convolution also. The patient had therefore a second attack of aphasia, which however was permanent, as both cerebral speech centres had been destroyed.

It is worthy of note that in these three cases of word-blindness, in which re-education was accomplished, the auditory centre was unaffected, and hence these patients retained the power of spelling words even when they could no longer recognise them by sight. This made the process of re-education much easier, as it enabled the patient, after acquiring the visual memory of letters, to read words by spelling out aloud each word letter by letter, and so appealing to the auditory memory. All the cerebral centres concerned in language are intimately connected with one another, and experience teaches that the impressions made on one cerebral centre are deepened and strengthened by being associated with the impressions made on other centres. Hence the simultaneous appeal made to both auditory and visual centres strengthens the impression made on the new visual memory centre and enables it to attain more rapidly to the permanent retention of the visual memories, such as will enable the patient to regain the power of reading.

APPENDIX TO CHAPTER I

Report on the examination of the brain in case of word-blindness with right homonymous hemianopsia by Alexander R. Ferguson, M.D., late senior Assistant to Professor of Pathology, University of Glasgow, now Professor of Pathology, Government School of Medicine, Cairo, Egypt, and Alexander Macphail, M.B., C.M., late Professor of Anatomy, St. Mungo's College, Glasgow, now Lecturer on Anatomy, St. Bartholomew's Hospital and College, London, with remarks thereon by the author.

Post-mortem Appearances.—The examination of the head only was permitted. The head was large, and the calvarium irregular in thickness, areas of thinning being most marked on either side of the superior longitudinal sinus; the dura mater was of normal appearance, but bled very freely; the superior longitudinal sinus contained a large quantity of dark fluid blood; the pia mater was very closely applied, but not adherent to the convolutions, the outer surface of the membranes having a dry and rather glazed appearance. On dividing the tentorium the right cerebellar lobe was obscured by fresh blood, and the substance of the lobe was lacerated on its postero-lateral aspect. The medulla oblongata was surrounded by fluid and partially clotted blood of quite recent appearance. The cerebellar arteries were carefully examined for aneurysm or other gross lesion with negative result. The impression conveyed, however, was that of meningeal hæmorrhage which had mainly found its way into and largely destroyed the substance of the right lobe of the cerebellum, and had partly escaped into the sub-arachnoid space. Although a small quantity of blood was found in the fourth ventricle, the remaining portion of the ventricular cavities was free. There were no hæmorrhages into crura, pons, or medulla. The arteries of the base of the brain were very rigid from advanced atheromatous

degeneration, and scattered patches of atheroma were also present in many of the smaller branches. The immediate cause of death was obviously the extensive hæmorrhage from some of the superficial branches of the cerebellar arteries by which the greater part of the right cerebellar lobe had been destroyed. The lesion round which the chief interest of the case centres was revealed on the inferior aspect of the left occipital lobe (see fig. 1) as a triangular area of sunken atrophied appearance, over which the pia mater appeared to form the external wall of a cyst which completely masked the outline of the subjacent convolutions, and from which on puncture some 3 drachms of clear fluid escaped. There was no thickening or other morbid appearance of the pia over the area affected, and elsewhere this membrane presented a normal appearance.

Method of Preservation.—As the further detailed examination with measurements was carried out on the hardened brain, we consider it important to state here the method of preservation employed. After removal of the cerebellum, a quantity of warm gelatine was injected through the cystic membrane, the whole brain being afterwards immersed in a formalin and salt solution, and thoroughly injected with the same solution through the carotid arteries; after three weeks' treatment in this fluid the specimen was transferred to methylated spirit; this after prolonged immersion was thoroughly removed and replaced by Müller's fluid.

Anatomical Relations of Lesion.—The area affected is limited superiorly by the calcarine fissure, extending forward to a depression over the posterior part of the hippocampal gyrus, over which a strand of shrunken membranes stretches in the direction of the crura; shrinkage of the lower margin of the cuneus, not extending, however, to its mesial aspects, is also suggested. The posterior limit of the lesion just falls short of the occipital pole, being cut off from it by a somewhat deep crescentic fissure, corresponding to the posterior limit of the posterior



FIG. 1.—SHOWING ANATOMICAL RELATIONS OF LESION (DRAWN AFTER PRESERVATION).

A, hippocampal gyr. ; B, collateral fiss. ; C, fourth temporal gyr. ; D, anterior calcar. fiss. ; E, third temporal gyr. ; F, occipito-temp. gyr. ; G, posterior cerebral artery.

calcarine. Externally and inferiorly, the margin of the lesion coincides with the posterior part of the third temporal sulcus, this forming with the posterior part of the calcarine fissure a continuous depressed margin. Anteriorly and inferiorly, the margin runs obliquely across from the above point (posterior part of third temporal sulcus) towards the hippocampal gyrus, which is concealed, along with the upper part of the collateral sulcus, by the shrunken membranes. Over the area thus demarcated the cortex is notably shrunken and the pia is closely adherent to the altered surface, while a main branch of the posterior cerebral artery, as it runs across the affected area, stands out prominently on the surface of the membrane. Both Broca's convolution and the angular gyrus are intact, but comparison of the left angular gyrus with the right shows that its conformation is notably simpler on the left side, the right being more prominent and more highly convoluted than the left. On making a horizontal section of the left occipital lobe (fig. 2) the cavity of the left lateral ventricle is seen to be widely dilated, measuring at the junction of the posterior and descending horns $1\frac{1}{4}$ in.; while the posterior horn itself has assumed the appearance of a large cyst extending right back to the occipital pole, where, as well as in the inferior and mesial aspects, the surrounding cortex is reduced to a thin limiting wall. To this wall the pia is for the most part closely adherent, leaving here and there small oval or spherical spaces between the thinned cortex and the membrane. At the occipital pole the apex of the dilated posterior horn measures a little more than $\frac{1}{2}$ in. On making a vertical section, carried forwards through this area from the occipital pole, it is seen that practically the lower half of the occipital lobe is replaced by the dilated ventricle, which measures at its anterior part, from floor to roof, almost 1 in., and over the posterior two-thirds of its extent varying from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. At the lower margin of this section the thin rind of cortex which forms the floor of the dilated ventricle is at some points apparently absent,

the floor being thus formed in these situations by pia mater alone; while the roof of the dilated ventricle encroaches to a large extent on the white matter of the occipital lobe lying above. Further sections of the left hemisphere show that the central part and descending horn of the lateral ventricle are normal, and examination of all the corresponding parts on the right side reveals no abnormal condition beyond a slight degree of dilatation at the junction of descending and posterior horns of the lateral ventricle.

Etiology.—The lesion itself presents considerable difficulty as regards its pathogenesis; the loss of such a large tract of brain substance involves the hypothesis primarily of an acute softening consequent upon either embolism or thrombosis. Apart altogether from the comparative rarity of embolism of such a branch of the posterior cerebral artery as would cause acute necrosis with softening of the area described, there is no clinical evidence to furnish a source of embolus. On the other hand, the condition of marked arterial degeneration from atheroma indicates thrombosis as the more likely cause of the condition. It is highly probable that communication was established between the posterior horn of the lateral ventricle and the area of brain involved during the stage of acute softening; and that in the long interval which elapsed between the incidence of the lesion and death of the patient proliferative changes in the surrounding glia had caused the area in question to assume the form of a smooth-walled cyst, continuous with the posterior horn of the ventricle.

Conclusion.—The cortex thus destroyed may be summed up as a large triangular area limited by the calcarine fissure internally and by the third temporal gyrus externally, with its apex at the occipital pole; the cortex of the cuneus (above the posterior calcarine fissure and between it and the parieto-occipital fissure) appears altogether normal, though the fibres—in the roof of the posterior horn of the lateral ventricle—passing to and from the cuneus must necessarily have been encroached upon by the



FIG. 2.—HORIZONTAL SECTION OF LEFT OCCIPITAL LOBE SHOWING DILATED VENTRICLE AND ATROPHIED CORTEX (*a, a*); ALSO RELATION OF LESION TO ANGULAR GYRUS (*A.G.*).

great dilatation of that cavity, while this same cause must have interfered, to a large extent, with all the fibres connected to what remained of the occipital cortex (including the tract usually described as the optic radiation), and also with the fibres ascending to the left angular gyrus from the left and right primary visual centres at the calcarine fissures. When the clinical symptoms are taken in conjunction with the existence of a lesion completely destroying both the cortex and the fibres of the infracalcarine area (while the cuneus remained apparently normal), we must conclude that the greater part at least of the visual centre lay, in this case, distinctly below the level of the calcarine fissure.

Remarks by the Author.—It will be observed that, so far as the cortex is concerned, the cuneus was quite intact except at the calcarine fissure. The lesion involved the calcarine fissure, although the greater part of it was infracalcarine. This confirms to a certain extent the opinion which Henschen (^{16b}) expressed in his report on the cortical centres of vision to the International Medical Congress at Paris, that the primary visual centre is localised in the cortex of the calcarine fissure and its immediate neighbourhood.

The result of this pathological examination also confirms the views which Déjerine (¹⁰) and Sérieux (⁶) have expounded with regard to the two different classes of cases of word-blindness which are met with. The first class comprises the cases where the patient is word-blind and agraphic—that is, quite unable to write. In the second class, of which the case under consideration is an example, the patient is word-blind and can still write to dictation, although he cannot read a single word he has written. The angular gyrus on the left side of the brain is now generally accepted as the area in which are deposited the visual memories of words and letters. Word-blindness, as we have seen, results either from the destruction of the cortical centre itself or from its complete isolation by the

destruction of its communicating fibres. When the angular gyrus itself is destroyed, the patient—according to Déjerine and Sérieux—is both word-blind and agraphic. They contend that before an individual can write, he must be able to revive the visual memories of the words and letters. Hence destruction of the cortex of the angular gyrus will render it impossible to revive these images, and hence writing is impossible. In the second class of cases, of which the present case is an example, where the patient is completely word-blind but is still able to write to dictation, Déjerine and Sérieux have maintained that the angular gyrus will be found to be intact; but that a lesion will be found beneath the cortex in such a position as to divide the fibres which pass to the left angular gyrus from the calcarine fissures in both occipital lobes, that such a subcortical lesion almost necessarily involves the radiation of Gratiolet on the left side, and hence the patient has at the same time right homonymous hemianopsia. They have supported their views by a number of cases of a most convincing character. The pathological examination in the present case affords a beautiful demonstration of the correctness of their views, and Professor Wyllie (¹⁹), in his book on disorders of speech, gives another case strikingly similar to the present one. This clear distinction then between these two classes of cases of word-blindness with and without agraphia may be regarded as positively established.

The position of the lesion explains also the very frequent association of word-blindness and right homonymous hemianopsia. In my book on *Letter-, Word-, and Mind-Blindness* I quote from other authors nine cases of word-blindness associated with right homonymous hemianopsia, and in my own experience up to the present I have met with five cases of word-blindness associated with this symptom. Hence in every case of word-blindness the presence of hemianopsia should be carefully looked for, as its presence will render the localisation of the lesion more exact. The precise relationship of the word-blindness

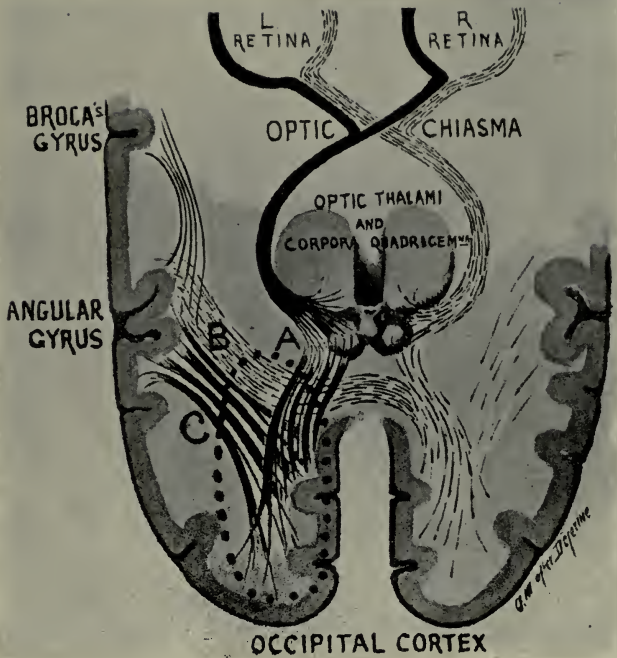


FIG. 3.—TO ILLUSTRATE THE CONNECTIONS BETWEEN THE OPTIC TRACTS, THE PRIMARY VISUAL CENTRES, AND THE LEFT ANGULAR GYRUS.

The left optic tract and its connections are represented in continuous dark lines; the right tract and its connections by broken lines. The dotted oval represents the area affected by the lesion, and includes: (A) Fibres passing from left thalamic region to left calcarine fissure; (B) fibres passing from right calcarine fissure to left angular gyrus; (C) fibres passing from left calcarine fissure to left angular gyrus. (Modified from Déjerine's diagram.)

Destruction of path A causes Right Homonymous Hemianopsia.
 Destruction of paths B and C causes Word-blindness.

and the right hemianopsia will be rendered at once apparent by a study of the diagram (fig. 3) showing the paths of the fibres to the left angular gyrus and their relationship to the lesion.

The post-mortem examination of the brain just recorded completely verified the localisation of the lesion, which I made eight years previously in the first published report of the case (^{3b}), and which was entirely based upon the knowledge of the work of Déjerine and Sérieux.

CHAPTER II

CONGENITAL WORD-BLINDNESS

By the term congenital word-blindness, we mean a congenital defect occurring in children with otherwise normal and undamaged brains characterised by a difficulty in learning to read so great that it is manifestly due to a pathological condition, and where the attempts to teach the child by the ordinary methods have completely failed. Such is the significance of the term as it was first employed by the early writers on this subject and as it is now employed by the author of this book. The recognition of this condition was the direct outcome and result of the previously acquired knowledge of those symptoms of cerebral disease which we have been studying in the first chapter. The complex processes involved in vision proceed smoothly and harmoniously during health in the region of unconscious cerebration, but when disease disturbs the delicate mechanism of the brain, there are revealed to us glimpses of its intimate workings, a knowledge of which we could not acquire otherwise. It is for this reason that we have studied at such length the symptoms of acquired word-blindness, the knowledge of which will enable us to interpret and explain the phenomena of the congenital form. An adequate knowledge of the former condition is an essential preliminary to the proper understanding of the latter. It is the absence

of this necessary and fundamental knowledge which has given rise to much of the ambiguity and vagueness which characterise many recent accounts of this condition. Congenital word-blindness is a subject of comparatively recent origin, and in *The British Medical Journal* of November 7th, 1896, Dr. W. Pringle Morgan made the first communication ⁽²⁰⁾ to be found in medical literature on this topic. It may interest my readers to know that Dr. Morgan, in sending me a copy of his paper, said in a letter enclosed with it: "It was your paper—may I call it your classical paper?—on word-blindness and visual memory published in *The Lancet* on December 21st, 1895, which first drew my attention to this subject, and my reason for publishing this case was that there was no reference anywhere, so far as I knew, to the possibility of the condition being congenital."

Dr. Morgan's patient was a boy, aged 14 years, bright, intelligent, and quick at games and in no way inferior to others of his own age, unless in his inability to learn to read. The greatest difficulty was experienced in teaching the boy his letters, and it was thought that he never would learn them. He had by constant application acquired a knowledge of the letters, but though at school and under tutors for seven years, and in spite of the most persistent efforts, he could only with difficulty spell out words of one syllable. Words written or printed seemed to convey no impression to his mind, and it was only after laboriously spelling them that he was able by the sound of the letters to discover their import. He read figures fluently, and could do simple sums correctly. The boy himself said that he was fond of arithmetic, and found no difficulty with it. The boy's schoolmaster, who had taught him for some years, said that he would be the smartest boy

in school, if the instruction were entirely oral. This first recorded case is thus a typical example of congenital word-blindness possessing the two essential characteristics of genuine cases, *viz.* gravity of the defect and purity of the symptoms. Dr. Morgan's communication was brief, and he made no attempt to analyse or explain the symptoms beyond the statement that in his opinion the case was one of word-blindness, "evidently congenital and due most probably to defective development of that region of the brain disease of which in adults produces practically the same symptom—that is, the left angular gyrus." My first communication (3^o) on this subject was a fortnight later to *The British Medical Journal* in the shape of a critical note explaining some of the symptoms in the case reported by Dr. Morgan in the light of our knowledge of the phenomena of acquired word-blindness. My second communication was to *The Lancet* on May 26th, 1900, when I reported two cases of congenital word-blindness. This paper was not confined to a simple record of the cases, but gave a detailed analysis and explanation of the symptoms. I claim for this paper that it is the first attempt in medical literature to analyse and explain in detail the symptoms met with in this condition, to establish the diagnosis on a scientific basis, and to show that the difficulties encountered in teaching children so affected to read could be overcome by patient and persistent training. The following are the concluding sentences of the paper:

"I have little doubt that these cases of congenital word-blindness are by no means so rare as the absence of recorded cases would lead us to infer. Their rarity is, I think, accounted for by the fact that when they do occur, they are not recognised. It is a matter of the highest importance to recognise the cause and

the true nature of this difficulty in learning to read which is experienced by these children, otherwise they may be harshly treated as imbeciles or incorrigibles, and either neglected or punished for a defect for which they are in no wise responsible. The recognition of the true character of the difficulty will lead the parents and teachers of these children to deal with them in the proper way, not by harsh and severe treatment, but by attempting to overcome the difficulty by patient and persistent training."

In *The Ophthalmic Review* for March 1901, Mr. E. Nettleship gave notes from his case-books of five cases of great difficulty or inability to learn to read which had come under his observation in the ordinary course of his practice, and which he now regarded as belonging to the class of cases which I had described in my *Lancet* article by the term congenital word-blindness. Mr. Nettleship said in his communication: "I think we are much indebted to Dr. Hinshelwood for drawing attention to the subject of congenital word-blindness. For though this condition seems to have attracted but little notice hitherto, it is, as he points out, not on that account necessarily, nor even probably, of rare occurrence; whilst if even moderately frequent, it has considerable importance. I have myself been familiar with the condition for years, thinking and speaking of it as congenital want of power to acquire knowledge by printed signs; but I have to thank Dr. Hinshelwood's publication for giving me a clear and accurate conception of its nature."

To *The Ophthalmic Review* for April 1902 I contributed another paper giving a report of two other cases which had come under my notice. In that paper the various points in the diagnosis of congenital word-blindness were discussed in detail, and especially the

treatment of the condition. In 1903, on the Continent, Lechner⁽²²⁾ and Wernicke⁽²³⁾ reported each a case. In 1904 Mr. Sydney Stephenson^(24a) made a communication on the subject to the Society for the Study of Disease in Children, and reported two new cases. Mr. Stephenson gave a short sketch of the history of our knowledge of the subject of congenital word-blindness and stated that "up to that date fourteen cases had been reported by six authors, and that to Dr. Hinshelwood undoubtedly belonged the credit of having been the first to describe the condition scientifically."

In July 1904, at the annual meeting of the British Medical Association at Oxford, I read a paper^(2j) on congenital word-blindness, in which a fifth case was reported, and the various points in the etiology, symptomatology, and treatment of the condition were discussed.

Such is the history of the pioneer efforts to diffuse a knowledge of congenital word-blindness. Since then numerous papers thereon have appeared in this country, on the Continent, and in America, but I think not much of real importance has been added to the knowledge of the subject which is to be found in these early communications. The condition being now generally recognised and acknowledged as one of the congenital defects of childhood, it now occupies a place in the pages of many recent books, as a subject of considerable interest and importance especially from the educational point of view.

I think it is well to begin the study of this defect with some records of actual cases, so as to familiarise the mind with the various types of the condition. I have selected for that purpose twelve cases from my case-books, and the five recorded in the present chapter

were the very earliest that came under my observation. These twelve examples will suffice to illustrate the various symptoms met with, and to convey to the mind of the reader a general picture of the condition.

CASE I.—In March 1900 a boy, aged 11 years, was brought to me at the Glasgow Eye Infirmary by his father, who gave the following history: This boy had been at school for four and a half years, but was finally sent away, because he could not be taught to read. His father informed me that he was a considerable time at school before his defect was noticed, as he had such an excellent memory that he learned his lessons by heart; in fact, his first little reading book he knew so well that whenever it came to his turn he could from memory repeat his lesson, although he could not read the words. His father also informed me that in every respect, unless in inability to read, the boy seemed quite as intelligent as any of his brothers or sisters. His auditory memory was excellent, and better than that of any of the other members of the family. When a passage was repeated to him aloud, he could commit it to memory very rapidly. When I first saw the boy and his father at the Eye Infirmary, I asked them to call at my house and I wrote down the address on an envelope. A few days thereafter the father could not find the envelope, but the boy at once told him my address correctly, having remembered it from hearing me state it once. When I examined the boy, he seemed a smart and intelligent lad for his years. He knew the alphabet by heart, repeating it rapidly and correctly. He could recognise by sight, however, only a very few letters, and these not with any degree of certainty, after being four and a half years at school. He could spell correctly most simple words of one syllable, such as "cat," "dog," "man," "boy," etc.,

but he could not recognise by sight even the simplest and commonest words such as "the," "of," "in," etc. He had no difficulty in recognising all other visual objects such as faces, places, and pictures. On each page of the little primer in which I tested him, there was a picture of some object, which was followed by some simple letterpress about it. He at once recognised and named the pictures, *e.g.* "a cat," "a dog." I would then ask him to spell the word, which he nearly always did correctly. On asking him to pick out the word "cat" on the page, he was unable to do it. I repeated this experiment with the same result on page after page of the little primer. On testing him with figures I found that he could repeat from memory fluently and correctly numbers up to a hundred. He could also perform mentally simple sums of addition. He could not, however, recognise all the figures by sight, but he knew them better than the letters, and recognised a greater number of them.

CASE II.—A boy, aged 10 years, was brought to me by his father in January 1900, to see if I could discover the reason of his great difficulty in learning to read. The boy had been at school for three years, and had got on well with every subject except reading. He was apparently a bright, and in every respect an intelligent boy. He had been learning music for a year, and had made good progress in it, his teacher expressing great satisfaction at the end of the year. In all departments of his studies where the instruction was oral he had made good progress, showing that his auditory memory was good. His father, a medical man, who had read my papers on word-blindness, thought that his son's great difficulty in learning to read might be due to some visual or cerebral defect, and therefore brought him to see me. It was soon evident, however,

on examination of the boy that the difficulty in learning to read was due not to any lowering of the visual acuity, but to some congenital deficiency of the visual memory of words. He knew and recognised by sight all the letters of the alphabet, but his stock of word-memories was very limited, so that he could not read by sight alone but required constantly to pause and spell out the words letter by letter. Such short familiar words as "the," "in," "on," "of," "to," etc., he recognised at once, but more uncommon words, even when of one syllable, such as "tub," "rug," he was unable to recognise by sight alone, until he had spelt them out aloud letter by letter, and so appealed to his auditory memory. His father has noted that the boy never reads for amusement. As his father expresses it, "it seems to take a great deal out of him." Figures he reads very fluently both in simple and in complex combinations. The boy himself says he reads figures much more easily and with less effort. He performs simple sums quite correctly, and his progress in arithmetic has been regarded as quite satisfactory. He has had no difficulty in learning to write. His visual acuity is good.

CASE III.—A girl aged 10 years, healthy-looking and well grown for her age, was brought to me at the Glasgow Eye Infirmary in April 1901. She had always enjoyed excellent health, with the exception of a severe illness six years previously when she suffered from measles complicated by whooping cough and pneumonia. She went to school four years ago, and has experienced the greatest difficulty in learning to read. After four years' laborious effort, she only reads now the book of the first standard, and that with the greatest difficulty. It took nine months of hard labour before she learned the letters of the alphabet, and even at the end of nine months she knew it only imperfectly. So great was her

difficulty in learning it, that at times it seemed an impossibility, and on several occasions her mother abandoned the task in despair. She, however, returned to it again and again, and after nine months' labour she learned, although imperfectly, the letters of the alphabet, and even yet she makes occasional mistakes in naming the letters. Since then she has not got beyond the book of the first standard, which she reads with difficulty, having to spell out most of the words except the very small familiar ones such as "the," "of," "in," "to," etc. These small common words are the only ones which she recognises by sight alone. The others she has to spell out either aloud or silently, in the former case appealing to her auditory memory, and in the latter to the memory of speech movements, or glosso-kinæsthetic memory as it has been called by Bastian⁽²⁵⁾. In her education, this difficulty in learning to read by sight has been the only one encountered. Her general intelligence is good and her memory good in all other respects. Her auditory memory is excellent, and she learns by heart passages rapidly and well. She spells well, and has no difficulty in spelling at once words which she cannot recognise by sight alone. She writes fairly, and there has been no difficulty in teaching her to write. She has had no difficulty in keeping up with the other children in her arithmetic, and no difficulty has been encountered in teaching her to read figures, which she does with fluency. She has learned addition and subtraction, and is at present working at multiplication. Her vision is good.

CASE IV.—A boy, aged 7 years, a healthy and in other respects intelligent child, has now been three years at school, but cannot be taught to read. At the request of the schoolmaster the boy was brought by his parents to the Glasgow Eye Infirmary in Sep-

tember 1901, to see if the difficulty in learning to read was due to any ocular defect. His vision was found to be normal and his eyes healthy. He does not even know all the letters of the alphabet, but if gently told when he is wrong and given time, as a rule he can name the letter correctly at last. He can repeat the alphabet rapidly by heart. He can scarcely read a word without spelling it out letter by letter. Even such short words as "on," "cat," "rat," must be spelt out aloud, letter by letter, before they are recognised. I observed repeatedly whilst examining him that after spelling out and naming a word, if he comes to the same word a line or two lower down, he does not recognise it. There has been no difficulty in teaching him orally, and his auditory memory seems excellent. He was pushed on for a time with the other children, because he successfully concealed the fact of his inability to read by learning his reading lesson by heart. His mother says that he is a smart, intelligent boy, even smarter and quicker in many respects than her other children, his one defect being that he cannot be taught to read. He can spell fairly. He can form all the written characters well. Figures he reads correctly and fluently up to twenty, but beyond that he is somewhat uncertain and makes mistakes.

CASE V.—A boy, 12 years of age, was brought in March 1902 to the Glasgow Eye Infirmary by his mother, to see if there was anything wrong with his eyesight. The boy had been seven years at school, and there had been from the outset the greatest difficulty in teaching him to read. The boy should have been in Standard V, but was now, after seven years, only in Standard II, and he could not get out of it because of his reading. He had made no complaint whatever about his vision, but his mother had brought him to

the Eye Infirmary in order to discover if his eyesight had anything to do with his difficulty. His mother stated that he was in every other respect a sharp and intelligent boy. He had no difficulty with arithmetic, and could keep up with the other scholars easily in this department. He was now working at compound addition. His mother said that the other boys laughed at him in class, and that when he became excited his reading was worse than ever. He concealed his defect for a time by learning his lesson by heart, so that when it came to his turn and he got a few words at the beginning, he could repeat the lesson by heart. His auditory memory, therefore, was evidently very good. On examining him I found that his reading was very defective for a boy who had been seven years at school. He could rarely read by sight more than two or three consecutive words, but came to a standstill every second or third word, and was unable to proceed unless he were allowed to spell out the word aloud, thus appealing to his auditory memory, or to spell it silently with his lips, thus appealing to his memory of speech movements—glosso-kinæsthetic memory of Bastian⁽²⁵⁾. The words he stuck at were chiefly polysyllables, but this was not always the case, as he often failed to recognise by sight even simple monosyllabic words. He spelt very well, and when asked to spell the words which he had failed to recognise by sight, he nearly always did so without any difficulty. He read all combinations of figures with the greatest fluency up to millions. I made him do several sums up to compound addition. All of these he did smartly and correctly. His mother informed me that he had a splendid memory and could learn things by heart very easily. I wrote to his schoolmaster for information about the boy. He replied that the lad had experienced

throughout his whole career in the school the greatest difficulty in learning to read, which had kept him very much behind in his progress through the school. He was strong in arithmetic, good at spelling, and average in other subjects, including geography and history. "I have never," said his master, "seen a case similar to this one in my twenty-five years' experience as a teacher. There is another boy in his class who is quite as poor a reader, but this other boy is all-round poor, showing no sign of smartness in anything."

After reading the records of the cases in this and the following chapter, the first thing that will strike the reader is their strong similarity to the records of pure cases of acquired word-blindness given in Chapter I; in fact, the symptoms manifested in these two classes of cases are practically the same, *viz.* inability to recognise by sight printed and written characters but with all the other cerebral powers unaffected. The difference between the two classes of cases is that in acquired word-blindness the visual memories of words and letters, the result of years of past training and education, have been completely lost, whilst in the congenital form children with otherwise normal brains and intelligence are unable to acquire these visual memories of words and letters at least by the same process of education and training as other children. It was thus that Dr. Morgan, on meeting with the case of a child unable to read after seven years' training, but with intellectual powers otherwise unaffected, saw at once the striking similarity to the cases which he had read a year previously in my paper in *The Lancet* on word-blindness, and suggested that the inability of the child might be due to a congenital form of this condition. Thus the knowledge of the one condition led directly and naturally to the recognition of the other.

It will be observed that in all the cases recorded in this book there was no defect whatever in the general intelligence of the children nor in their powers of reasoning or observation. In some cases even the parents maintained that the child affected was the most intelligent member of their family. It was this fact particularly which puzzled both teachers and parents, that a child smart and intelligent in every other respect could not be taught to read like other children. The defect in these children is then a strictly specialised one, *viz.* a difficulty in acquiring and storing up in the brain the visual memories of words and letters. It may not extend beyond this special group of visual images. The power of retaining and storing up the visual memories of numbers and musical notes may be quite normal, though in some cases the defect may extend to these also. Such symptoms, although puzzling and inexplicable to those without a knowledge of word-blindness due to disease, become clear and explicable in the light of our knowledge regarding the latter. We have seen in Chapter I that the visual memories of words and letters, of numbers and of musical notes, must be stored up in distinct cerebral areas, as we find that each of these groups may be lost whilst the others are preserved, but since they are frequently lost simultaneously they are probably very close together and may even be contiguous. Hence we infer that in the case of these defective children their difficulties in learning to read can most readily be explained on the ground of some defect in the special area of the brain where are stored the visual memories of words and letters. There is now a general agreement, as we have seen in Chapter I, that this area is in the angular and supra-marginal gyri of the left side of the brain in right-handed people, and that

the more important part of the centre is situated in the angular gyrus. If there be any abnormality within this area due either to disease, to injury at birth, or to faulty development, it is easily conceivable how such a child should experience abnormal difficulty in learning to read. Any condition diminishing the number of cortical cells within this area or interfering with the blood supply would lower the functional activity of the centre, and hence would diminish the power of retention of the visual images of words and letters which is absolutely essential for the successful accomplishment of the act of reading. Varying degrees of damage to this cerebral centre would account for the varying degrees of defect manifested by the different cases.

Reading.—To understand clearly the nature of the defect in these children, we must analyse a little more precisely the cerebral visual processes concerned in the act of reading and consider the manner in which an individual learns to read. The following remarks, of course, apply to the old-fashioned method of learning to read. Of the twelve cases reported in this book, all had been trained in this way, unless Case XII, who was trained on the "look and say" system, regarding which we will make some remarks in the chapter on treatment. The first stage in the old method is to store up in the visual memory the individual letters of the alphabet. When we have stored in our visual memory the visual images of the letters of the alphabet, we can recall them into consciousness at will and see them as clearly as if printed on the pages of a book, even when the book is absent. It is by comparison with these permanent visual images of the letters and words stored in this cerebral centre that we are able to recognise the printed letters and words on the page of

the book. If this cerebral area is destroyed by disease, then the individual loses this power of recognition and becomes letter- and word-blind, as we have seen exemplified in Chapter I. Under normal circumstances this first stage is accomplished with comparative ease and rapidity, there being only twenty-six letters in our alphabet, or taking capital and small letters, fifty-two visual images in all to be acquired. The memory of words is first registered in our auditory memory centre, situated in the tempero-sphenoidal lobe, and of course intimately connected with the visual memory centre, as all the cerebral centres involved in language are connected with one another. We are able to spell the words before we are able to recognise them by sight. When the individual has stored up in the centre in his left angular gyrus the visual memories of the individual letters of the alphabet, and in his auditory centre the spelling of the words, he is then able to enter on the second stage of reading. He is now able to read words by spelling them out aloud letter by letter, and thus by appealing to his auditory memory, he gets the proper word; or sometimes he may simply be seen to move his lips, spelling silently each letter, and thus appealing to his memory of speech movements, or glosso-kinæsthetic memory as it has been called by Bastian (²⁵), or he may sometimes be seen tracing the letters with his fingers on the table and thus appealing to his writing centre. To reach the third or final stage in the art of reading is a much more formidable task, and requires for its accomplishment a much longer period of time. This third stage consists in the gradual acquirement and storage of the visual memories of words. When this is accomplished, the individual reads not by analysing each word into its individual letters, but by recognising each word as a separate picture.

The words then cease to be for such an individual simply a combination of letters. Each word is regarded rather as an ideogram, picture, or symbol which suggests a particular idea. The individual now recognises a word, just as he recognises a landscape or a familiar face, by its general outline and form without resolving it into its constituent details. He has now learned to read by sight alone. When he looks at the words on the printed page, he can now interpret them by comparison with the visual word memories stored in his angular gyrus, and there is no need for further appeal, as before, to his auditory memory or glosso-kinæsthetic or writing centres. He has now successfully attained the final stage in the art of reading, *viz.* the power of reading by sight alone. But even in those who have reached this stage, there are different degrees of proficiency. Many who have reached this stage of reading by sight can do so only very slowly and with some degree of effort, whilst others can skip over the pages of a book with great rapidity and ease. There are slow readers and quick readers. Very great differences are observed in this respect. No doubt the amount of practice is a most important factor in producing these differences, some people only reading very rarely, and others being engaged with books from morn till night ; but I think the degree of development of the visual memory centre is also a contributory factor. We are not all furnished at the start of life with visual memories of the same capacity, and this influences us more or less throughout our whole existence.

With this knowledge of the process involved in acquiring the art of reading by sight, our cases become quite clear and intelligible. In all of these the difficulties began even in the first stage, *viz.* in learning the letters of the alphabet. This at once reveals a very

grave defect in the visual memory centre, as the number of visual memories to be registered was only twenty-six, or taking both capital and small letters, fifty-two in all. The degree of difficulty varies, but in all it is very great, and in Case III the mother of the child told us that it took nine months' persevering effort to acquire the letters of the alphabet. Most of the cases recorded in this book, however, had acquired after a considerable effort the visual memories of the letters of the alphabet, and had reached stage two in the art of reading. They could read if allowed to spell out the words letter by letter and so make appeal to their auditory memory, which had already been furnished with the spelling of the words. In all, the auditory memory was good, and they were all able to spell well with one exception, Case XII, where the boy was educated on the "look and say" system, in which they are not taught to spell. In the two Cases V and VI, they were able to recognise many of the words if allowed to move their lips and spell them silently, thus appealing to their memory of speech movements, glosso-kinæsthetic centre. Although in all these cases the abnormal difficulties of the children were manifest in the very first stage, it was in their attempt to reach the third stage, *viz.* reading by sight alone, that their defect became conspicuously manifest. In order to accomplish this with any degree of proficiency, a very large number of visual memories of words has to be acquired. In all the cases recorded, the children, even after years of the ordinary training at school, had only managed to acquire at the most the visual memories of a few short familiar words, such as the, to, of, etc., and had been unable to get beyond the second stage, *viz.* reading words by spelling aloud and appealing to the auditory memory. There is thus manifest in these children

such a striking contrast between the capacity of the auditory and the visual memories that it at once reveals a condition which is so abnormal that it can only be regarded as pathological. It is thus in their failure to acquire the art of reading by sight alone and without appeal to any other cerebral centres than the visual that this defect becomes conspicuously manifest. They have been unable like the other children to furnish their visual memory centre with the visual memories of words, and it is the great and persevering efforts which are necessary to repair this failure and to remedy this defect which makes their educational career so different from that of the ordinary child.

Arithmetic.—Of the twelve cases recorded in this book, in three only, Cases I, IV, and XI, did the defect extend also to the recognition of figures. In the other nine cases no difficulties were experienced in learning to read figures, and the children were able to keep up with the others in the subject of arithmetic. In two, Cases V and X, the children were said to be good at arithmetic and markedly above the average. This was a feature in these cases which naturally puzzled very much the parents and schoolmasters. It does seem an extraordinary thing that a child manifesting such abnormal difficulties in the attempt to read words and letters should experience none in the reading of figures or in performing the various mental processes involved in arithmetic. Of these twelve children four had reached the compound rules, and as we have seen, two actually excelled in the subject. This facility in the reading and manipulation of figures manifested in the great majority of cases of congenital word-blindness excites no surprise, however, in those who are familiar with the symptoms manifested in acquired word-blindness which we studied in the first chapter. In the light

of the knowledge thus acquired the explanation is clear and simple. We saw that in acquired word-blindness the power of reading figures is preserved intact with great frequency. This was well exemplified by the fact there stated that out of eight cases of acquired word-blindness recorded by me at various periods, the power of reading figures was preserved intact in six cases. We also saw that the legitimate inference from the facts supplied by recorded cases of acquired word-blindness was that the visual memories of words and figures were deposited in distinct cerebral areas, but that these were probably close together and possibly contiguous. This affords a clear explanation of the facts observed in these twelve cases of congenital word-blindness. When the congenital defect of development was strictly limited to the word centre alone, the children possessed the power of reading figures, as was seen in nine out of our twelve cases, but when the defective development was more extensive and thus involved the figure area, then the inability to read included both words and figures, as was well exemplified in Cases I, IV, and XI.

It may be interesting to recall what I said on this subject in a communication to *The British Medical Journal* in November 1896, commenting on the symptoms of the first case of congenital word-blindness which had been recorded by Dr. Morgan. Amongst other remarks, I made the following on the topic of the reading of figures: "In a paper read by me at the Glasgow Medico-Chirurgical Society and subsequently published in *The Lancet* of December 21st, 1895, I discussed in detail a case in which the patient with normal visual acuity was unable to read any printed or written characters with which he was previously familiar, with the exception of Arabic numerals, which

he read fluently. I have there quoted five additional cases where with word-blindness the power of reading figures was preserved intact. Professor Gairdner, of Glasgow, has since informed me of a similar case occurring in his own experience. Dr. Morgan's case lends additional confirmation to the remarkable fact that the visual memory for words and letters is completely independent of that for figures. Clinical experience has already taught us that the one form of visual memory may be completely lost, whilst the other remains intact. Dr. Morgan's case supplies the additional fact that the visual memory for words may be congenitally defective, whilst that for numbers presents nothing abnormal. Experience further teaches that either form of visual memory may be developed to an abnormal degree without the other manifesting any corresponding development or even with the other remaining below normal. I think we are compelled to infer from such complete functional independence of these two groups of visual memories an anatomical independence. We can as yet only localise the visual memory of words and letters, but from the frequency with which the visual memories of words and numbers are simultaneously lost, we can infer that the areas affected, though not identical, are probably very close together. I wish to call particular attention to this little-known fact of clinical experience in the hope that a more widely diffused knowledge may increase the number of accurately observed cases of word-blindness."

These words, written more than twenty years ago in reference to the first reported case of congenital word-blindness, have been amply verified by all subsequent experience of the condition. The power of reading figures has been found to be preserved so frequently

that it is now regarded as a valuable aid to the diagnosis in cases of congenital word-blindness.

This conception of distinct cerebral areas involved for words and figures, which is clearly indicated from the study of disease, is also strengthened and confirmed by our knowledge of the mental phenomena observed in health. It is a common experience that a boy at school may display great proficiency in arithmetic and yet not excel in any of the other departments of his studies. We have seen that MM. Inaudi and Diamandi, who startled the scientific world many years ago by their great feats in mental arithmetic, exciting astonishment and admiration by their extraordinary memory for figures, did not possess any special gifts as regards other forms of memory—*e.g.* that for words—but that in some respects they were below normal. So Alfred Binet (^{5b}), who studied their cases very carefully, informs us. We see also the converse condition, boys who excel in their studies in other departments, but are the greatest “duffers” at arithmetic. Sydney Stephenson (^{24a}) mentions that he once saw a boy, 10 years of age, who experienced extraordinary difficulty in reading figures, without any corresponding difficulty as to letters and words. “Unfortunately,” he says, “I saw the patient once only, and have failed to trace him since.” In my student days one of my friends, who won the highest distinctions in his classical and philosophical studies, could not take the ordinary degree of M.A. because he was hopelessly defective at mathematics, and this deficiency extended to arithmetic also. I remember, as a student of the late Lord Kelvin, how that distinguished savant repeatedly made the most ludicrous mistakes in working out simple sums on the blackboard in the class-room which were gravely corrected by his assistant, much to the amusement of

the class. All these facts of experience thus clearly show that proficiency in figures or the reverse gives no indication as to the powers of the individual in other departments of study, and this is rendered quite intelligible by the inferences we have drawn from the study of acquired and congenital word-blindness as to the anatomical independence of the cerebral areas involved.

Writing.—All our cases learned to write. They learned to form correctly the written characters, and could copy a piece of writing which was put before them, but as a rule they failed when they were asked to write to dictation. It seems strange at first sight that a child knowing how to form the individual letters, and also knowing how to spell the words, is yet unable to write correctly to dictation. The explanation is to be found in our knowledge of the facts of acquired word-blindness, and I would refer to the discussion on this point to be found in my remarks on the post-mortem examination of the brain in the Appendix to Chapter I. We there saw that the graphic motor centre is not stimulated directly from the auditory, but requires the intervention of the visual memory centre, wherein are revived the visual images of the words. Hence in cases where the visual memory centre was destroyed by disease, the patient could no longer write to dictation, as he could no longer revive in his mind the visual memories of words which are necessary to stimulate the graphic motor centre. Our congenitally word-blind children are practically in the same condition. Although this visual memory centre is not destroyed, it is functionally in abeyance, as it has not yet been furnished with the visual memories of words, and hence stimulation of the graphic centre is impossible. It is only when we have furnished this visual memory centre with a fair supply of visual word memories, that

the child is able to accomplish anything satisfactory in the way of writing to dictation, and as its stock of visual word memories increases, so does its proficiency in writing to dictation.

Music.—In Case II the boy made good progress in music, his teacher expressing great satisfaction with his musical studies. This fact is in perfect harmony with our experience in cases of acquired word-blindness, which I have discussed in Chapter I. We have there given examples of acquired word-blindness where the patient, unable to read words and letters, retained intact the power of reading musical notes. We saw that the visual memory for musical notes is quite distinct from the visual memory of words, since the one form of memory may be entirely lost, whilst the other is not changed or modified in any way, and that this complete functional independence entitles us to infer an anatomical independence, just as in the case of figures. Hence when, as in Case II, the congenital defect was strictly limited to the word centre, there was nothing surprising in the fact that the boy made good progress in his music as well as in his arithmetic, both of which are dependent upon the functional activity of different areas of the brain. In one of the five cases recorded by Mr. E. Nettleship⁽²¹⁾, what puzzled the parents was the fact that whilst their child had the greatest difficulty in learning to read print, he could read music well.

Subjects Impaired by Oral Instruction.—We have seen that in all our cases the children possessed good auditory memories, a fact of the very greatest importance from the point of view of the prognosis and treatment, as we shall see later. In some of the cases, as in I, IV, V, and VIII, the auditory memory was exceptionally good, as was well shown by the incident mentioned in the history of these cases, that they concealed

their defect for some time by learning their reading book by heart from listening to others. Hence in all subjects where information could be imparted to them orally, their progress was quite satisfactory.

On analysing our cases, a final fact appears which is worthy of notice: the much greater frequency of this defect in boys as compared with girls. Out of the twelve cases recorded in this book, ten occurred in boys and only two in girls, *viz.* Cases III and X. Sydney Stephenson had noted this point in his first communication on the subject (24^a), and observed that of the sixteen cases reported up till then, thirteen—that is 81·25 per cent.—had been met with in males. This great difference in the incidence of this condition in the two sexes has been confirmed by the experience of all later observers, but no explanation has been suggested, so far as I am aware, to account for this striking frequency of congenital word-blindness in the male sex.

CHAPTER III

HEREDITARY CONGENITAL WORD-BLINDNESS

FOR the information regarding the educational history of the members of this family, I am greatly indebted to the headmaster of the school where the whole family, consisting of eleven children, had been educated and who personally brought the affected members to see me. Their schoolmaster informed me that there was no difficulty experienced in the education of the first seven members of the family, but that the eighth, ninth, tenth, and eleventh—all boys—experienced the greatest difficulties in learning to read. He also said that in his long experience as a teacher he had never before met with anything like the difficulties encountered in attempting to teach these four boys to read, and that he was greatly puzzled how to account for it, as in every other respect the boys seemed so intelligent. Dr. W. Lewis Thomson, Assistant Medical Officer of Health for Lanarkshire, to whom he had mentioned the case of the four boys, at once recognised the true nature of the difficulty. Dr. Thomson, being an old pupil of my own, was thoroughly conversant with the nature of congenital word-blindness, and at once recognising that the four boys were typical cases of this condition, arranged that the children should be sent to see me. I saw them in March 1907, accompanied by their mother and the schoolmaster, who gave me valuable information about their past history.

CASE VI.—S., 12 years of age, the youngest member of the family, had been at school for more than seven years, having joined it in January 1900. His mother stated that his general intelligence was good, and that he was quite as smart in every way as the other members of the family. The schoolmaster informed me that since going to school the greatest difficulty had been experienced in teaching him to read. The children at his school were taught reading in the old method, by learning first the letters of the alphabet. After seven years at school, this boy could not read by sight even a child's first primer. On examining him with the letters of the alphabet, I found he knew most of them, but not all. On testing his power of reading I found that he was quite unable to read by sight even a child's first primer composed of monosyllabic words, but was only able to pick out a word here and there. On a whole page of a child's first primer he could only recognise by sight five words—it, is, to, can, and not. He recognised nearly all the words if they were spelt out to him, and he recognised most of them if allowed to spell them out himself. But when I forbade him spelling them aloud or even spelling them silently, by forbidding him to move his lips, he could only recognise the five words given above, and was quite unable to read by sight alone any single sentence in this child's first primer. If allowed to spell out each word letter by letter, and thus appeal to his auditory memory, he could read the most of them; but if confined to the recognition of the words by sight, he could recognise only a very few of the simplest and most common words. His stock of visual word memories was thus extremely limited, and that after being over seven years at school. He has made much better progress in arithmetic. He reads fluently numbers up to hundreds

of thousands, and can do sums in addition, subtraction, and multiplication. He has thus made much greater progress with his arithmetic than with his reading, although even in this department his master informs me he is below the average. His auditory memory and general intelligence are good, and he can readily learn anything taught in the way of oral instruction. He repeated several verses from memory without a single mistake, which he had to learn by heart the week before as part of his school work. He recognises at once all kinds of objects and pictures shown to him. He has learned to write well. He cannot write to dictation, but copies correctly. His vision is practically normal and his general health is good.

CASE VII.—H., aged 14, has been at school for nine years. The greatest difficulty has been experienced all through these nine years in teaching him to read. He should now have passed all the standards and been in the supplementary class, but is only in Standard III. It has been his difficulty in learning to read which has kept him back, as otherwise he is a smart and intelligent boy. He gets on well with his arithmetic, and is at present doing the compound rules, which he does fairly well. His auditory memory is good, and he can learn by heart easily what is imparted to him by word of mouth. He writes well, and no difficulty was experienced in teaching him either arithmetic or writing. With regard to his learning to read, the schoolmaster informs me that the greatest difficulty with him was experienced during the first three years, during which so little progress was made that it seemed for a time that the difficulty would prove insuperable. During the last two years, however, he has made substantial progress, and is now learning to read. When I tested him with the reading book of Standard III, I found

that he could read slowly and laboriously, if I allowed him to spell out the words aloud. He knew all his letters, but very few of the words by sight, only some of the monosyllabic and most familiar ones. However, even in this respect he was improving and gradually increasing his stock of visual word memories, which was still limited, but much larger than that of his younger brother.

CASE VIII.—J., aged 18 years, was at school for seven years, and left when 14 years of age. He has now left school for four years, and has been working as a coal miner. His schoolmaster informs me that throughout his whole school career there seemed to be an insuperable difficulty in his learning to read, and at the end of seven years he left school without being able to read even the child's first primer. What struck the schoolmaster, however, as most extraordinary was that with regard to his arithmetic he made good progress and had no difficulty in keeping up with the other boys in this department, and before he left school had gone through all the compound rules, practice and simple proportion. His auditory memory was good, so much so that he learned his reading books by heart from hearing others go over them, so that when he got a start he could repeat considerable portions by heart. He learned to write quite easily, and could copy fairly well, but could not write to dictation. The most interesting point in J.'s career was that any progress made in reading had been accomplished during the last four years, after he had left school. He has thus practically taught himself. He is a great football enthusiast, and his mother informs me that since leaving school he has got the *Referee* every Monday and Friday, which gives detailed accounts of all the football matches. Every night, his mother states,

after his work he would spend a large part of the evening over this newspaper, attempting with the help of others to spell out the results of the matches in which he was interested. At first he could only do this very imperfectly and laboriously with the help of others, but now he can do this without help. On testing his power of reading with a child's first primer, I found that he could only read about one-half of the words without spelling them. The other half he could read if allowed to spell them out letter by letter, so that he could not read fluently even the child's primer. When I examined his power of reading with an ordinary book, I found that he recognised by sight very few words of more than one syllable, but had to spell them out letter by letter. Such common monosyllabic words as "the," "of," "to," "in," etc., he recognised at once. When I examined his ability to read football news, I found he could do this much better, as he could recognise by sight a much greater number of words. Such terms as "goal," "goalkeeper," "forwards," "backs," "runs," "dribbling," etc., and the names of the various clubs he could recognise by sight at once. By persistently attempting to read the football news for the last four years, he had acquired a comparatively good visual vocabulary of football terms, and hence he could always make something of the accounts of football matches, although still with difficulty and spelling out a considerable number of words.

CASE IX.—M., aged 16 years, was nine years at school, and left it one and a half years ago. He has since been working as a miner. I have not been able personally to interview him, as he refused to allow himself to be examined, so that I can speak of him only from the information supplied by the schoolmaster, his mother, and brothers. The schoolmaster informs

me that after nine years at school M. left it without being able to read. He practically made little progress beyond learning the letters of the alphabet. His general intelligence and auditory memory were good, and like his older brother J., he learned his reading-book by heart from hearing others repeat it, so that if he got a start, he could read off a good portion of the lesson from memory. He made fair progress in arithmetic, and when he left school was working at the compound rules. He learned to write quite easily, and copied well, but could not write to dictation. Since leaving school, his mother informs me, he has never made the slightest attempt to learn to read, and never looks either at a book or a newspaper. At present, she says, "he can read none."

Four years after examining these four brothers, in 1911, I had an opportunity of examining two members of the next generation of this family, *viz.* the children of the eldest daughter of the family. The two cases reported below are, therefore, the nephew and niece of the four boys whose cases I have just recorded. The mother of these two children never herself experienced any difficulty whatever in learning to read. She has six children, and the other four members of her family have learnt to read without any special difficulty.

CASE X.—N., a girl, 12 years of age, has been at school for seven years. She has experienced the greatest difficulty in learning to read, and at present can only read very imperfectly, being able to recognise by sight only some of the commonest monosyllabic words. For several years she seemed to make very little progress, but has done much better during the last year. She knows all the letters of the alphabet, but was a very long time in learning them. She can recognise by sight most of the common words of one syllable, such as

“ the,” “ of,” “ in,” “ which,” etc., but most of the rarer monosyllabic words she cannot recognise by sight alone, although she recognises them nearly all when spelt out aloud to her. She has never had the slightest difficulty with arithmetic, and in fact has been rather good at it, and above the average. She is at present in the compound rules, and has no difficulty in keeping up with the rest of the class in this subject. She has no difficulty in committing things to memory which are repeated aloud to her, and this shows the possession of a good auditory memory. She seems a smart and intelligent girl in every other respect, apart from her difficulty in learning to read.

CASE XI.—D. is a boy aged 10 years and has been at school for four years. He has made very little progress in learning to read by sight. He does not know by sight even all the letters of the alphabet, although he can repeat them in sequence correctly. He can scarcely recognise any words by sight alone. Out of a whole page of a child's primer he recognised by sight only two words, “ to ” and “ go.” When I spelt out the words aloud to him, and appealed to his auditory memory, he recognised every word on the page. He can spell nearly all the small words, and can recognise them when they are spelt aloud to him, but he cannot recognise them by the sense of sight alone. Whilst the visual memory for words is so defective, the auditory memory seems good. He has therefore experienced no difficulty in committing things to memory which have been read aloud to him, such as pieces of poetry. With regard to arithmetic he has had the same difficulty as with regard to reading. He can repeat the figures in sequence up to one hundred, and can write them also. But if the figures are written down out of their order he can only recognise them by sight up to twenty

with any degree of certainty and very few combinations beyond that. In other respects than learning to read words and figures, he seems quite a smart and intelligent boy.

To Dr. C. J. Thomas (^{26a}) belongs the credit of first calling our attention to the probability of a hereditary tendency in congenital word-blindness. In a paper which appeared in *The Ophthalmic Review*, August 1905, Dr. Thomas first called special attention to the fact that congenital word-blindness may assume a family type, and that a hereditary tendency is probable. The above example of six members of the same family in two generations with congenital word-blindness is a striking confirmation of the correctness of Dr. Thomas's observations. In the discussion which followed the reading of my paper (^{3b}) on hereditary congenital word-blindness at the Exeter meeting of the British Medical Association in 1907, Mr. Sydney Stephenson narrated a striking example by giving details of six cases of congenital word-blindness affecting three generations of the same family. This he subsequently published in *The Ophthalmoscope* (^{24b}). In *The Ophthalmic Review*, Mr. F. Herbert Fisher (^{27a}) published a case of congenital word-blindness, and in this paper he called special attention to the fact that the uncle of the child affected had also experienced the greatest difficulty in learning to read. I have little doubt that in future, if observers in every case would make careful inquiries into the family history both of the present and previous generations, the evidence would rapidly increase as to the frequency of the hereditary tendency.

The fact that congenital word-blindness is sometimes hereditary, as is typically exemplified by these six cases occurring in two generations of the same family, is of considerable importance from the etiological

standpoint. We have seen that the difficulty in learning to read in cases of congenital word-blindness can most readily be explained by some defect in that special area of the brain, the left angular gyrus, where are stored the visual memories of words and letters. We have seen that the defect of this limited cerebral area might be due to disease, to injury at birth, or to faulty development. In these six cases of defect belonging to the same family it is evident that we may exclude such causal factors as disease and injury at birth. The abnormal condition of the visual memory centre for words and letters is doubtless both in these six cases, and in all such hereditary groups, due to defective development of this special cerebral area occurring in the early stages of embryonic growth. The first seven members of the family escaped this faulty development, but when it occurred in the eighth member, it repeated itself in the ninth, tenth, and eleventh.

If we analyse the symptoms manifested by these six cases, we are struck with their similarity. The symptoms of all six children were practically identical in kind, but only differed in degree. Their defect was strictly confined to their inability to recognise by sight, words and letters, with one exception, that of Case XI, where the inability extended to numbers also. In other respects these six children were quite as intelligent as the other members of the family. Their auditory memory was good and they made satisfactory progress in subjects where the instruction was oral. They all learned to spell and could read, if allowed to spell out aloud each word letter by letter, and thus appeal to the auditory memory. They could all recognise figures by sight, and learned to count fairly well with the exception of Case XI. They all learned to write easily, and could copy correctly, but not write to

dictation. It is evident, therefore, that the area of brain involved was exactly similar in each case except in Case XI, where the area involved was a little more extensive. This similarity of area involved occurring in six members of the same family excluded the idea of any other causal factor than defective development.

Although it is possible, as we have seen, that in isolated cases of congenital word-blindness the cause may be found in disease or injury at birth, I think it is probable that even in most of those isolated cases the condition is the result of defective development, just as in the hereditary form. This view derives considerable support from the fact that homonymous hemianopsia, which is so frequently associated with acquired word-blindness due to disease, has never, so far as I know, been met with in any case of congenital word-blindness. In the first chapter I have discussed the reason for the frequency of this combination of symptoms. Whilst I have never seen or heard of any case of congenital word-blindness associated with homonymous hemianopsia, I have met in my own experience with five cases of acquired word-blindness associated with this symptom. The fact that this association, so frequently observed in acquired word-blindness due to cerebral disease, has never yet been met with in the congenital form is, I think, most significant, and helps to confirm us in the opinion that defective development is the cause of congenital word-blindness in the vast majority of cases.

In this group of six cases, Case VIII is, I think, worthy of special notice, and is especially significant with regard to the question of treatment. Here we have the case of a boy who, after being seven years at school, left it without being able to read even a child's first primer. The ordinary routine instruction in class

had evidently been of no service to him, so far as learning to read was concerned, although he made good progress in arithmetic, in writing, and in subjects imparted by oral instruction. Yet he actually taught himself to read within four years after leaving school—the motive power which stimulated him to make the efforts with the necessary persistence and perseverance being his enthusiasm for football, which induced him night after night to try to read the newspaper accounts of the matches. This he did very laboriously at first, spelling the words out letter by letter, but by dint of keeping at it, he had gradually acquired a fair visual vocabulary of football terms such as enabled him to read the accounts of the matches in the newspapers. I think the history of this boy's case supplies us with the secret of successful treatment, *viz.* perseverance.

CHAPTER IV

DIAGNOSIS

I SAW in an article on the subject of congenital word-blindness the query, "Why were these cases, which we find so common, not recognised long before?" The answer to that query is very simple. Cases of this defect have existed ever since men began to read by the aid of the twenty-two letters of the alphabet invented by Phœnicians about 4,000 years ago, but the true nature of this defect could not possibly be recognised until they had become possessed of a knowledge of the facts of acquired word-blindness. This knowledge explained the phenomena which must have puzzled so many generations of medical men as something inexplicable, and therefore which met with little or no attention at their hands. Our knowledge of acquired word-blindness is only of about forty years' duration, dating from the days of Kussmaul and Broadbent. The subject was but little known to the bulk of the medical profession when I published in 1895 my first paper in the columns of *The Lancet*, the perusal of which enabled Dr. Morgan to recognise and to record the first case of congenital word-blindness. The papers subsequently published by myself and others during the next few years gradually spread the knowledge of the subject amongst the medical profession until the condition met with general recognition. That this

diffusion of knowledge was a very gradual process during the first few years is shown by the fact which Stephenson mentions in his communication (^{24a}) published in 1904, eight years after the publication of the first case, that up to that date only fourteen cases had been reported. In my first contribution on this subject I said: "I have little doubt that these cases of congenital word-blindness are by no means so rare as the absence of recorded cases would lead us to infer. Their rarity is, I think, accounted for by the fact that when they do occur they are not recognised." The truth of this forecast became evident from the increase in recorded cases and papers on the subject, when once the attention of the profession had been widely directed to the condition. In educational circles there was even a tendency before long to exaggerate the frequency with which these cases occurred in schools, and I find in an article (^{26b}) the statements "that these cases of congenital word-blindness are of very common occurrence," and that "one in every thousand of the children in our elementary schools at least shows this defect." Now I am quite sure that these are not cases of congenital word-blindness as I understand the term, and hence the great importance of setting forth clearly our principles of diagnosis.

Nothing has been more misleading in medicine than the use of statistics. Figures and percentages are worthless, unless we know precisely the basis on which they have been drawn up. The value of this statement that congenital word-blindness is found "in one in every thousand of the children in the elementary schools" will depend on what the writer means by the term congenital word-blindness. If we label as word-blind every case where some difficulty is experienced in teaching the child to read, then no doubt we may

find the condition quite as common as is indicated in the above quotation. But in my opinion this is an entirely erroneous conception of what the early writers on this subject meant by the term congenital word-blindness, and this lack of precision in diagnosis has been responsible for much of the confusion of ideas and inaccuracy which appears in many of the recent accounts of this condition. It will be observed that all the cases recorded in this book are marked by two important conditions: first, gravity of the defect, and second, purity of the symptoms. If the reader consults the records of the early cases, he will see that these are all of an exactly similar character. The first case reported by Dr. Morgan is an admirable example, and fulfils exactly the two conditions, *viz.* gravity of the defect and purity of the symptoms. In order to make the principles of the diagnosis perfectly clear, let us examine more carefully the significance of these two conditions, the presence of which I regard as essential, before we can describe a case as one of congenital word-blindness.

We have seen in our studies on acquired word-blindness that although every human being endowed with the sense of sight possesses the visual memory, yet it is possessed in very different degrees by different individuals. Francis Galton (²⁸) in his interesting work, *Inquiries into Human Faculty*, made a careful investigation into the powers of visual memory possessed by one hundred different individuals, and found the most astounding differences. Although no doubt the visual and other forms of memory can be developed and improved by continuous exercise, these great differences in capacity and proficiency of the visual memory are due chiefly to differences of congenital endowment. It is owing to these great variations in the degree of

development of the various cerebral centres that we find in children such great variations in their aptitude for the various subjects in their educational career. We have seen that the visual memory centre was complex, and that distinct cerebral areas are involved for figures, for musical notes, and for words and letters. We saw also that in the visual word centre, the visual memories of different languages are arranged in different groups so that the visual word memories of one language may be lost, whilst the others are preserved. A man may thus become word-blind to one language and not to another. Different degrees of development of these various cerebral areas render intelligible to us the great differences manifested in children in their scholastic career. Many children have the greatest difficulty in learning arithmetic and mathematics, whilst others master the most complicated problems of both with ease and rapidity. Some children learn music without much apparent effort, whilst others can only be taught with great perseverance and difficulty. Some experience such difficulty in learning to read foreign languages that they are practically word-blind so far as foreign languages are concerned, and others have no difficulty in acquiring several. This is well exemplified by the different degrees of aptitude shown at school by boys in the study of Latin and Greek. Here it is not a matter of speaking the languages, but simply of reading and writing them, so that their special aptitude or the reverse depends to a large extent on the degree of development of their visual memory centre. Some who experience great difficulty in learning to read a foreign language may have little or none in learning to speak it, and *vice versa*, as different cerebral centres are involved for these two processes.

Although in every department of study we thus find

these great differences in the degrees of aptitude exhibited by the children, we do not give any special name to those cases where some degree of difficulty has been encountered in the teaching of a given subject. We regard them as cases in which the cerebral areas involved have not been well developed. We do not regard them as pathological conditions, but simply as examples of physiological variations in the degree of development of the areas involved. In a precisely similar manner when teaching children to read, we find some who learn with ease and rapidity, and others attaining the same end but with varying degrees of difficulty which necessitate correspondingly greater efforts on the part both of teacher and pupil. Such cases as the latter ought not, in my opinion, to be described as suffering from congenital word-blindness, unless they exhibit such a marked degree of difficulty as renders it impossible for them to be taught by the ordinary school methods. Cases where children simply lag somewhat behind their fellows in acquiring the visual memories of letters and words, but where a little extra time and effort overcomes the difficulty, should not be described by this term. If it is thought advisable to describe by any special term such cases, where there is evidently some slight defective development of the visual memory centre, then in order to avoid confusion with the grave degrees of this defect, let them be described by another term. I would suggest for that purpose congenital dyslexia.

The term dyslexia was introduced by Prof. Berlin, as we shall see later, to describe a special group of cases, where the patients experienced great difficulty in reading, and due to the development of cerebral disease. The prefix "congenital," however, would serve to obviate any confusion with those cases of acquired

dyslexia described by Prof. Berlin (²⁹). The term congenital word-blindness ought to be strictly reserved for those graver cases of defect where the difficulty in learning to read was so great and so unusual that it could be regarded without any exaggeration as an abnormal and pathological condition, and where the attempts to teach the child to read by the ordinary methods had completely failed. In forwarding me a report about Case V the schoolmaster at the head of a large board school said: "I have never seen a case similar to this one in my twenty-five years' experience as a teacher." With regard to the family whose history is recorded in Chapter III, the headmaster of the large board school at which they were educated said that "in his long experience as a teacher he had never before met with anything like the difficulties encountered in attempting to teach these four boys to read." It is quite evident that the cases referred to in such terms by the headmasters of large schools with long experience must belong to a very different category from those which we are told are exceedingly common, and are to be found in one in every thousand children attending our elementary schools.

Mr. Harman, in an article on congenital word-blindness in a recently published work (³⁰), tells us that "the defect as a congenital occurrence is rare." My own opinion is that the condition as recognised by myself and the earlier writers on the subject is best described by the term moderately rare. The truth is that this great divergence of opinion as to the frequency of the condition is simply due to the fact that some later writers have extended the term congenital word-blindness to include slight degrees of defect in the visual word centre, while the earlier writers had reserved it only for those grave cases which could be

regarded as pathological. It would simplify matters much if in future the term congenital word-blindness was reserved for those grave cases only such as are described in this book, and applying the term congenital dyslexia to describe those slighter degrees of defect which are said to be so common in the elementary schools.

In our diagnosis of a case of congenital word-blindness not only must we have regard to the gravity of the defect, but also to the purity of the symptoms. We restrict this term to cases of localised defect only, where we have one definite cerebral area affected in an otherwise undamaged and normal brain. Here also I think confusion has arisen by including under the term congenital word-blindness cases other than those of pure types of the defect. For example, a child was brought to me who after being two years at school did not know the letters of the alphabet, and it was therefore suspected there must be something wrong with its eyesight. On examination I found that this inability to learn to read the letters was not due to any defect of vision, but to a cerebral cause, and yet I did not regard it as belonging to that category which I have described as congenital word-blindness. On careful examination I found that all the forms of memory were defective. The child was not only unable to learn to read, but could not learn anything. His mother could not trust him to perform the simplest message correctly, thus evidencing very great defect of the auditory memory. Not only were all the forms of memory defective, but the child's general intelligence was defective also. The inability to learn to read was not in this case due to any local, but to a general failure of cerebral development. Hence it did not come under the class of cases described by the term congenital

word-blindness. Even the schoolmaster who wrote me regarding Case V recognised that such cases belong to quite a different category. "There is another boy," he said, "in his class, who is quite a poor reader, but this other boy is all-round poor, showing no signs of smartness in anything." These cases, where the inability to learn to read is only one symptom of a general cerebral defect, as evidenced by a general failure of intelligence, must not be classed with cases of congenital word-blindness which are due to a purely local defect in an otherwise normal and undamaged brain, and in which the prognosis is of a very different character, as we shall shortly see. A true case of congenital word-blindness is therefore marked not only by the gravity of the difficulty in learning to read, but also by its purity of type, *i.e.* it is uncomplicated by any other symptoms of cerebral defect. All the children whose cases I have recorded were bright intelligent children, whose powers of observation and reasoning were quite intact, and in many cases the parents said they were in other respects than in learning to read the most intelligent members of the family. If, then, we limit this name to cases of high degree of defect and of perfect purity of type, then I think it will be found that such cases are by no means common, but still occur with sufficient frequency as to be of the greatest importance to all who are engaged in the training and education of the young. I have seen thirty-one such cases in a period of fifteen years. This is a large number of cases to come under the observation of an ophthalmic surgeon in such a period of time, but my opportunity for seeing these cases was an exceptionally favourable one. Having always been greatly interested in the cerebral disorders of vision, from the very beginning of my career as a teacher of ophthalmology and with large classes of

students, I had delivered special lectures every year on this subject which included word-blindness both acquired and congenital. My students, being thus specially instructed, were able to recognise these cases when they met with them later in their practices. A large proportion of the cases seen by me were thus sent by former pupils from all parts of the country, and these thirty-one cases came therefore from a very wide area.

Not only are the general intelligence, powers of observation, and reasoning unaffected in true cases of congenital word-blindness, but the auditory memory is intact, and in many cases is exceptionally good. This is very well exemplified by the fact that out of the twelve cases recorded in this book, four of them for a time concealed their defect by learning their reading-book by heart, so that when it came to their turn they could from memory repeat their lesson, although they could not recognise the words by sight. They had, therefore, no difficulty in all the subjects which could be imparted to them orally. They all learned to spell well, they had no difficulty in committing to memory passages of poetry, etc., and made quite satisfactory progress in all subjects which they could acquire by oral instruction. In Case II the boy made good progress in music, and his teacher expressed great satisfaction with his progress in his musical studies. These children therefore, though manifesting the greatest difficulty in learning to read words and letters, may experience none in the reading of music. When such a difference is observed, it should help to the correct diagnosis of the true nature of the difficulty in learning to read print.

We have seen that out of the twelve recorded cases, the difficulty in reading extended to figures in three

cases only, so that in nine cases the children experienced no difficulty in reading figures or in learning their arithmetic, and so were able to keep abreast of the other children in this subject. In two of these twelve cases the children actually excelled in arithmetic. Now when this marked difference is present in the ability to read words and figures respectively, it is of the greatest value in diagnosis. When a child experiences difficulty in learning to read, the first cause which naturally suggests itself is that the difficulty may be due to some defect of vision, either to an error of refraction or to some diseased condition of the eye. When the difficulty, however, is found to be confined to learning to read words and letters, and does not extend to figures, it is at once made evident to the examiner that the difficulty is due not to an optical but to a cerebral defect. Hence in every suspected case the child must be carefully examined as to its power of reading figures as well as words and letters. Too much importance, however, in the diagnosis must not be attached to this point. Although experience teaches that in the great majority of cases of congenital word-blindness the defect extends to words and letters only, still genuine cases are met with, as in Cases I, IV, and XI, where the difficulty extends to both words and figures; nor is this to be wondered at, when we consider that distinct cerebral areas are utilised for the storage of the visual memories of figures, words, and letters, and that the cerebral areas involved are close together and probably contiguous. Whilst the retention of the power to read figures is most helpful in the diagnosis by making it at once clear that the inability to learn to read is due to a cerebral and not to an optical cause, yet it is to be remembered that the extension of the defect to the reading of figures

does not exclude the diagnosis of congenital word-blindness. In such cases, where the defect extends both to words and figures, careful consideration of the other symptoms will lead us to the correct diagnosis. We have found that in all our cases the children had no difficulty in learning to write, and were all able to copy. Some of them were good at drawing. They had also no difficulty in recognising and naming pictorial representations of objects, independently of the size of the pictures. These facts themselves would show that the difficulty in learning to read words and figures was not due to defective vision, as otherwise the difficulty would have extended to their learning to write, to copying, to drawing, and to the recognition of the pictures.

The first cause, as we have seen, which parents and teachers naturally think of when they observe the difficulties of the child in learning to read is defective vision, and that is why I saw most of my early cases at the Glasgow Eye Infirmary. A careful consideration of the history of the case will as a rule have made us conclude that the difficulty is cerebral and not optical, even before we examine the child's vision. In all cases, however, we must satisfy ourselves by careful examination that the eye is healthy and the visual acuity good, before we can pronounce with complete confidence the diagnosis of congenital word-blindness. The presence of some ocular defect, due either to disease or refractive error, does not, however, exclude the possibility of congenital word-blindness. There is no reason why these conditions should not co-exist with word-blindness, but the presence of ocular defect and diminished visual acuity would impart some uncertainty as to the relative importance of these different factors in contributing to the difficulty experienced by the child in learning

to read. This uncertainty would of course be cleared up in course of time after the ocular defect had been remedied by appropriate treatment or any refractive error corrected by the prescription of suitable glasses.

The diagnosis must, however, in the final resort be based upon the fact that the difficulty in learning to read is manifestly that of storing up and retaining the visual memories of words and letters. In the examination of these children this deficiency becomes most evident in the contrast afforded between their visual memory for words and letters, and their auditory memory for the same, which we have seen is preserved intact. In Cases I and XI, where the children recognised by sight only a few letters of the alphabet, they could by appeal to their auditory memory repeat them all correctly in sequence. In the other cases where they knew the letters, they could all read if allowed to spell out aloud the words letter by letter, and thus make appeal to their auditory memory, but when they were asked to recognise them by the sense of sight alone, their defect became manifest and their recognition by sight alone was confined to a few common monosyllabic words. Some could read even if allowed to spell silently with the lips, or copy the letters with their hand on the table, thus appealing to the glosso-kinæsthetic and writing centres respectively. Hence the importance in the examination of these children that no appeal be allowed to the other forms of memory than the visual, because in this way alone is the true character of the defect made manifest. My usual routine in the examination of the child is as follows: I use an ordinary first reading-book for this purpose, which of course has only small monosyllabic words and has a few pictures. I first point to a picture, say of a cat,

and ask the child what it is. I then ask the child to spell the word, which he probably does quite correctly. This shows me that he has a concrete knowledge of the object, and that he has the word registered in his auditory memory. I then take him to the alphabet and I see that he is able to recognise the individual letters c, a, t, although I do not ask them in that order, as he would then recognise the word from his auditory memory. When I have thus satisfied myself that he knows how to spell the word, and also that he recognises the individual letters of which the word is composed, I then ask him to look at the page and pick out the word by the aid of sight alone. I explain to him that he must not spell it out either aloud or even silently by moving his lips, and that he must not move his hands. In this way no appeal can be made to any other form of memory than the visual. It is here that he breaks down. When restricted to this appeal to the visual centre alone, it is found that he knows very few or perhaps none of the words which he can spell correctly, and even recognise when allowed to spell them out letter by letter, and thus appeal to his auditory memory. It is this startling contrast between the efficiency of the auditory memory and the poverty of the visual thus made evident which shows that the essential point in this child's case is the difficulty it experiences in registering in its brain the visual memories of words. As has been already pointed out, the receptivity of this visual memory centre and that of all the sensory centres varies a great deal in different individuals, owing to different degrees of development of the cerebral areas involved.

Hence it is found at school that the rapidity and ease with which children learn to read by sight vary a great deal. No doubt it is a comparatively common

thing to find some who lag considerably behind their fellows, because of their slowness and difficulty in acquiring their visual word memories, but I regard these slight defects as only physiological variations, and not to be regarded as pathological conditions. It becomes a source of confusion to apply to such cases as has been done of late the term congenital word-blindness, which should be reserved for the really grave degrees of this defect which manifestly are the result of a pathological condition of the visual memory centre, and which have proved refractory to all the ordinary methods of school instruction. In the twelve cases recorded in this book, the children had been at school for periods ranging from three to ten years, and yet had acquired practically no visual word memories when tested strictly in the manner I have described. In such cases the defect is so striking as to mark out the affected children as suffering from a pathological condition, and hence to justify us in describing their defect by the special term congenital word-blindness.

With the possession of a knowledge of the symptoms, there is little difficulty in the diagnosis of congenital word-blindness when the cases are met with, since the general picture of the condition stands out as clear-cut and distinct as that of any pathological condition in the whole range of medicine. This is very well exemplified by the history of the discovery of Case III. The father of this child informed me that one of my papers on congenital word-blindness having accidentally come into his hands and having read it, he, although without any medical knowledge whatever, at once concluded that his child's case belonged to this category. He accordingly sent the child to see me, and I confirmed his diagnosis. This was the third case

which had come under my observation, and on reporting (31) it I then remarked: "This incident alone shows the importance of a diffusion of knowledge regarding this subject, which has hitherto practically received little or no attention."

CHAPTER V

PROGNOSIS AND TREATMENT

I REGRET to observe that in some recent books in which the subject of congenital word-blindness is dealt with, a very gloomy view is taken of the prognosis of such cases, and the advice is given that time should not be wasted in attempting to teach them to read, but that these children should be put at once to tasks for which they have more natural capability or concentrate their attention on the development of their normal capacity. My long experience of congenital word-blindness has enabled me to give with confidence a much more hopeful prognosis, and to arrive at a very different conclusion regarding their treatment, *viz.* that in nearly all cases of congenital word-blindness, such as I have described and defined in the preceding chapters, the children so affected with proper treatment and great perseverance can be taught to read. If this be so, then I think it a great injustice to the child, no matter to what class of society it belongs, to be excluded for the remainder of its lifetime from all the great advantages and pleasures which the possession of the art of reading opens up to every individual. The reward of successful attainment is manifestly worthy of great efforts which should not be abandoned in any case until it is clear that further efforts are hopeless. I think that the tendency to give a gloomy

prognosis has arisen from the fact that the writers are not speaking from an experience of pure cases of congenital word-blindness. The reader will observe that I have always insisted on reserving the term congenital word-blindness for cases of absolutely pure type, where the inability to learn to read is clearly due to a purely local defect in an otherwise normal and undamaged brain. This simplifies enormously the outlook both as to prognosis and treatment, because such cases are the exact analogues of the conditions we have met with in acquired word-blindness due to disease. If in these latter cases, where the visual word centre has been destroyed, we have been able to re-educate such patients and enable them to regain the power of reading, then we have every reason to anticipate with confidence that in congenital cases, where the same centre is involved, a similar result will be accomplished by similar methods.

Experience has amply justified the correctness of this reasoning. In nearly all the cases of congenital word-blindness with which I have had to deal, where the treatment has been carried out with patience and perseverance, the children have been taught to read. The rate of progress and the difficulties encountered have varied, but progress has always been continuous. We know from experience of acquired word-blindness due to disease that though the re-education of the patient can be accomplished, it is only with much greater perseverance and much greater difficulty than is experienced in teaching a person with an undamaged brain to read. I think that the difficulty in these cases arises partly at least from the fact that all the centres involved in speech are on the same side of the brain, and that when one of them is destroyed, the education of a corresponding area on the opposite side can only

be accomplished by considerable effort, as the area in question does not usually discharge the function which it is now called upon to discharge. Similarly in these cases of congenital word-blindness, whilst the other centres concerned in language are performing their functions normally on the left side of the brain, it is highly probable that the left visual memory centre is so defective that the visual memories of words and letters can be stored up only in the corresponding centre on the right side, and hence the increased difficulty encountered in teaching these children to read. We have seen in Chapter I that when the speech centres on both sides were destroyed by disease, the aphasia was permanent and irremediable, so in congenital word-blindness it is evident that if the centres on both sides are defective, the difficulties in teaching the child to read may be insuperable. In cases of pure type such an experience is so rare that I think we are justified in assuming that in these cases the defective development is strictly unilateral. But in cases where the difficulty in learning to read is combined with other cerebral symptoms evidencing defects in other cerebral centres, or where it is combined with a general failure of the intellectual powers, then I think it is highly probable that in such cases the failure of development or pathological condition has extended to both angular gyri and hence the insuperable difficulties experienced in attempting to teach such children to read. It was such considerations which led me to infer at a very early period that it was a hopeless task to attempt to teach general mental defectives to read. Hence when such cases were sent to me as cases of congenital word-blindness, I pointed out the distinction and did not advise any attempts to this end.

Mrs. Hume Pincent at the conference of the National Special Schools Union in Birmingham in 1910, in a paper on "The Result of Special School Education," said in regard to the mentally defective children therein instructed: "It is quite exceptional for any of them to reach a higher educational position than that attained in Standard II. This means that at 16 the best of them will be able to read and calculate to about the same extent as a normal child of 8 or 9. The number who attain to Standard II are variously stated by witnesses as from 40 to 58 per cent., at the best only about half the total number. If it is a question of pleasure or profit to be obtained from reading, I am afraid we cannot flatter ourselves that special school teaching confers this benefit on the mentally defective, for to read for pleasure after school age a far greater ease and fluency must be obtained than is represented by Standard II. Only about half get even as far as this."

I think it is the confusion consequent on mixing up cases of this latter class with the pure types of defect such as have been described in this book which has led to the gloomy prognosis and to the discouraging advice as regards treatment which have been referred to at the beginning of this chapter. When I see it stated that congenital word-blindness may be combined with any amount of other mental defects from mere dulness to low-grade mental defect, imbecility, or idiocy, I can understand how confusion has arisen from the loose application of the term congenital word-blindness to all conditions in which there is defective development of the visual memory centre, quite independently of any consideration as to whether it is a strictly local defect or only a symptom of a general cerebral degeneration. It is a great injustice to the children affected

with the pure type of congenital word-blindness, a strictly local affection, to be placed in the same category as others suffering from generalised cerebral defects, as the former can be successfully dealt with, whilst the latter are practically irremediable. This source of confusion would be obviated if the term congenital word-blindness was reserved exclusively for pure types of defect occurring in brains otherwise undamaged. If the inability to learn to read seen in these general mental defectives must be described by a special term, then I would suggest the employment of the term congenital alexia, which hitherto has been used in a somewhat vague way. The subject being of comparatively recent growth, it is not surprising that the nomenclature is defective and imperfect. Hence the use of a single term to describe very different conditions has been responsible for many of the confused and contradictory statements which are to be found in recent writers on this subject. They are all using the term congenital word-blindness, but with very different meanings attached to it. Precision of nomenclature will be a very great help to increased accuracy and clearness of ideas on this subject. I would suggest, therefore, the use of the three terms congenital word-blindness, congenital dyslexia, and congenital alexia in order to describe the three groups of cases, which are perfectly distinct from one another both as to their diagnosis, prognosis, and treatment. In this way all future confusion would be obviated, as we would know the precise significance attached to each term, and thus we would avoid that pregnant source of error arising from men using the same word but with different meanings attached to it. Let us therefore employ the three terms as follows: *viz.* congenital word blindness to be reserved exclusively for those pure and grave

cases of defect such as form the subject of this book, and which constitute a very definite and well-defined group; congenital dyslexia to be reserved for those slighter degrees of defect, which are much more frequently met with, characterised by a much greater difficulty in learning to read than is experienced by the average child, but not sufficiently grave to be regarded as pathological; congenital alexia to be reserved for those cases where the defect in the visual memory centre is only a part of a general cerebral deterioration.

In our first five cases it looked rather hopeless to undertake teaching children to read who had been at school for periods ranging from three to seven years without making much progress towards the acquirement of the art. Not one of these cases could read by sight a child's first primer, and two of them could not recognise all the letters of the alphabet. It was the knowledge of what could be done in acquired word-blindness which encouraged me to hope that a similar result could be accomplished in these congenital cases. Further, on making careful inquiry, it was evident that systematic instruction in reading had not been carried out during the whole period of their stay at school, and therefore that the outlook was not so gloomy as it appeared to be at first sight. Four of these children were educated at crowded board schools, and in these cases it was a considerable time before their defect was observed, as they managed to conceal it by learning their reading book by heart, and being able thus to repeat their part of the lesson when it came to their turn. Even when it was observed that the children could not keep abreast with the others, there were no adequate means at that time of dealing with such defective children, and they were allowed to

drift through the school, learning what they could, arithmetic, writing, drawing, etc., but without learning to read. All these first five cases recorded in Chapter III learned to read by following out the instructions which I laid down for their further training. This experience gave us a solid basis to work upon, and enabled us in later cases to give a hopeful prognosis with a much greater degree of confidence, and thus inspire all those concerned with the determination and perseverance which are so necessary for the successful education of children with congenital word-blindness.

Now let us see what experience has taught us as to the best methods in dealing with these children. First and foremost I advise that they should receive personal instruction. They should be taught alone and not in class. I have insisted on this from my earliest experience, and subsequent experience has only confirmed and strengthened the teachings of my earliest communications on the subject.

In a paper published in *The Ophthalmic Review* in April 1902, I said: "There is no use of attempting to teach such children reading in a class along with other children with normally developed brains. The contrast between their difficulty and the facility of the others will only discourage them. Such children must be taught by special methods adapted to help them to overcome their difficulties. Nor must the teacher be easily discouraged. When it is found that these children cannot learn to read with the same rapidity as others, there is a temptation to abandon the task of teaching them as hopeless. But experience has taught us that persistent and persevering attempts will often overcome difficulties which at first sight seem insuperable. With the children of the well-to-do, when such a defect is observed, there will be no difficulty in carry-

ing out the education of the child, but what is the lot of such a child attending one of our crowded infant elementary schools? It may be years before the true nature of its defect may be observed, and even when it is observed that the child cannot keep abreast with the others, there is no adequate means of dealing with such defective children. The result is that the most valuable years are lost for training purposes, those precious early years when the brain is most plastic, when it is most receptive of impressions and most capable of further development. Hence the importance in our educational scheme of special provision for dealing with the education of backward and defective children on a scientific basis. Those backward and defective children ought to be examined by those capable of differentiating the various defects and arranging them into groups, a proceeding which would greatly simplify their further training."

These words were written fifteen years ago, and we are now living in different times from the educational point of view. Recent legislation has at last supplied that for which I pleaded in my earlier communications, and provision is now made for the systematic examination of all backward and defective children by medical examiners. This is a great step in the right direction, as by this systematic medical examination those cases of congenital word-blindness will no longer be allowed to drift through the schools for years without recognition as in former days, but will be recognised at a comparatively early stage. "Those precious early years" when the brain is most receptive will no longer be lost. The word-blind child will begin its special training under more favourable conditions than in the past, and therefore with an even better prospect of accomplishing successfully its difficult task of learning to read.

The five cases recorded in Chapter III were all taught to read by their parents. I saw them individually, explained to them clearly the nature of the condition and the exact lines upon which I wished them to proceed in the teaching of the child. It is only a parent or some one intensely interested in the welfare of the children who will have the requisite patience to teach them. I found that even in the case of the children of a higher social class they frequently did better when the father or mother taught them than when placed under the care of a tutor or governess.

In a recent discussion at the Royal Society of Medicine ⁽³¹⁾, one of the speakers made the following remarks regarding the treatment of congenital word-blindness: "Where individual attention has been given, I have seen these children learn to read slowly but surely. I am speaking more especially of the children of the better social class, who are able to spend a good deal of time at school, and have a nice home in which the school results are reinforced. I have known children of that class (where time can be spared to bring about kinæsthetic associations with words) read and write very fairly at the end of a few years' persevering instruction. In the case of elementary school children, where such attention is impracticable in large classes, I think it would be wise where word-blindness has been ascertained to let the reading go. Let them get on with their sums and copying which they can usually do, and more especially with manual occupations and industries likely to be of service in after life. I do not think a knowledge of reading is indispensable in lower-class education. I know some people who have got on well in the world who were very bad readers."

I have quoted this opinion because the speaker expresses in clear language views which in my opinion

are too prevalent in scholastic circles, and against which I wish to make an emphatic protest. In the first place I consider that it is just as important for the children of the lower classes to learn to read as for those of the upper. The child of the rich man in most cases is spared the struggle for existence, and is provided for by his parents, but the child of the poor man has to earn his bread and push his own way in the world. To ask him to begin his career in life as an illiterate without being able to read is surely to handicap him very heavily throughout his whole existence, no matter what career he may choose. There is more to be considered than simply "getting on well in the world." Every man, rich and poor, has an intellectual side to his existence, and life would be to many a very poor thing without this. To condemn an individual to lifelong illiteracy is to condemn him to intellectual starvation, and to cut him off for ever from the enjoyment of one of life's purest and greatest pleasures. I regard it, therefore, as a gross injustice to any child, no matter what his position in life may be, not to be taught to read, if it is possible to do so even at the cost of great trouble to all concerned. Now I quite agree with the opinion just quoted that it is not possible to teach such children in ordinary elementary schools, and I go further and say it cannot be done in classes even in the best private schools. The first condition of successful instruction in such cases, as I have already said, is that the child must have personal instruction and be taught alone. The most of my cases have been amongst the children of working-class people, whom I have seen at the Glasgow Eye Infirmary. I have had no difficulty in getting the parents to undertake the personal instruction of their children, when the nature of the condition was carefully explained, and also the

fact that on their personal efforts depended the future welfare of their child. They fully appreciated the importance of the task, and did not shrink from undertaking it. It has been my good fortune to have had to deal with people who, though poor, were intelligent. No doubt there are parents who would refuse to take any trouble in the matter, but these form only a very small percentage.

I always advocate, especially in the early stages, a number of short reading lessons every day, which must be carefully graduated in each case, so as never to produce anything approaching to cerebral exhaustion. This I think is a most important point in the treatment of these cases, and can be best carried out at home under parental guidance. In these cases of congenital word-blindness, the effort of trying to store up the visual memories seems to require a much greater degree of mental exertion than in children with normal visual centres. In teaching them to read it was observed that in a very short time the children became confused, and no progress could be made until they had rested for a time, and then resumed the effort. The visual impressions, too, must be very frequently repeated before they remain permanently in the brains of these patients. Hence experience taught us that the proper method of instruction was by short and frequent lessons during the day without anything leading to exhaustion. In some cases the rapid exhaustion produced by the effort in learning to read was so marked that they reminded me of the group of cases first described by Prof. Berlin (²⁹) under the term dyslexia, and which I have discussed in Chapter III of my book on *Letter-, Word-, and Mind-Blindness*. In these cases the patients could read for a short time and then were quite unable to proceed, although the words and letters were still

seen distinctly by the patient. There was no pain or discomfort in or about the eyes, but simply a sense of great mental effort, and no ocular defects could be discovered on the most careful examination. Prof. Berlin gave to this condition the name dyslexia, and he regarded it as a special form of word-blindness due to an interruption in the conductivity of the connecting fibres of the visual centre in the lower parietal lobe of the left hemisphere, which includes the supra-marginal and angular convolutions. This view has been borne out by post-mortem examination. He accounted for the phenomena observed by the hypothesis that the interruption of the connecting fibres is only partial, that the capacity for conduction is reduced to a minimum, and that the slight power of conductivity remaining is rapidly exhausted. This seemed a plausible and probable explanation of the rapid failure of the powers of reading and the sense of great mental effort observed in these patients. It suggested to me the possibility that in the cases of congenital word-blindness where the sense of cerebral exhaustion is specially manifested after very short attempts at learning to read, not only is the centre itself defective, but the communicating fibres may also be affected, as in these cases of dyslexia. Account for it as we may, the important practical point is to know that even in such cases, as the lessons are continued, it is found that the children are able gradually to make more prolonged efforts, so that the time of the reading lesson can be gradually increased. It is this necessity for the method of instruction being adapted to the needs and peculiarities of each individual case that makes it certain that much better results will be attained, as experience has long shown me, when the child is taught alone. No uniform method can be laid down. The length and frequency of the

lessons can only be adequately gauged by those engaged in the instruction of the child.

At present there are in use several methods of learning children to read, and hence it is important to decide which is the best method to adopt for teaching the congenitally word-blind children to read. I have no hesitation in saying that in pure cases of congenital word-blindness with good auditory memory and other cerebral centres unaffected, such as we have discussed in this book, the best and quickest method is the old-fashioned method which I have described in detail in Chapter II. We there saw it had three stages: first, that of acquiring the visual memories of the letters of the alphabet so as to recognise them by sight; second, learning to read words by spelling them out aloud letter by letter, and so appealing to the auditory memory; and finally that of acquiring the visual memory of words and so learning to read by appeal to the visual memory centre alone. All my cases both of acquired and congenital word-blindness have been taught to read by this old-fashioned method. This is a point, however, on which there is a difference of opinion. Mr. Herbert Fisher^(27b), in a communication to the Ophthalmological Society on congenital word-blindness, quotes a case of his own where the patient was successfully taught to read on the "look and say" method—"a system," he says, "in which the word or at most the syllable is made the unit for visual memory instead of the individual letter." He advocated this method of teaching such children as being *a priori* that which might be expected to be the most ready way of practically meeting the difficulty.

Mr. Bishop Harman⁽³⁰⁾, in a recent article on congenital word-blindness, also takes the same view. He says: "These children must be taught on the plan of the Chinese. The Chinese script is a sign script: each

word or idea has its own symbol. The idea is not conveyed by a string of letters in combination, but by one particular sign. A certain mark conveys to the taught child the idea of a house, just as does a picture or as the symbol 1 the idea of unity or one. To teach these children we must fall back on this plan. The word 'cat' must be taken as a whole, not as c, a, t = cat, but the whole thing is the sign for cat. This method is known as 'the look and say' plan, and when carried out by a teacher of intelligence and with great patience it is possible to teach the child to read. In such cases it is obvious that individual teaching is necessary to secure any effective progress."

We have thus a difference of opinion with regard to the best method of instruction in teaching these word-blind children to read. I met with a case in my own experience where both methods—"the look and say" and the old-fashioned method—were tried successively, and which proved to my satisfaction the great superiority of the old-fashioned to the "look and say" method in teaching the congenitally word-blind to read. I reported this case at the Liverpool meeting of the British Medical Association in 1912 when I read a paper (3rd) on the treatment of congenital word-blindness.

CASE XII.—In March 1911, a boy, 13½ years of age, was brought to me with the history that he could not be taught to read. He had been seven years at school. He had made good progress in writing, and copied very well with a beautiful hand. He was good at drawing, and fair at arithmetic. He had been taught to read entirely on the "look and say" principle, and had not been taught to spell. When I examined him I found that he knew most but not all of the letters of the alphabet, and could recognise by sight many small words of one syllable, but this was all he could accom-

plish after seven years' training on the "look and say" system. I found that the boy had a good auditory memory, and I advised that he should be taught on the old method, beginning with the letters of the alphabet, and as he already knew most of these, he would probably not be long in learning them all. I then advised that he should be taught to spell, and then to read the simple words in a child's first primer, spelling them out letter by letter, and so appealing to his auditory memory, which was good. In this way the auditory and visual centres would be trained simultaneously. I saw the boy in the following April, and found that his progress had been continuous and rapid, much to the surprise of his parents. He was now reading fairly well words of two and three syllables, and had made more progress in the last thirteen months than he had made in the preceding seven years when taught on the "look and say" principle.

The superiority of the old method of instruction over the "look and say" system was thus strikingly manifested by the superiority of the results obtained by it in dealing with this typical case of congenital word-blindness. In the "look and say" method, as we have seen, the child is taught at once to recognise printed words as a whole, as a series of pictures just like Chinese symbols or Egyptian hieroglyphics, and not to recognise the words at first by a process of analysis and spelling them out letter by letter as in the old method. The appeal is made directly to the visual memory alone for the registration of the visual memories of words without the preliminary stages of learning the letters of the alphabet and the spelling of the words. Hence it is claimed that a child learns to read much more rapidly in this way. Now while this may possibly be true of a child with normal visual memory, it is

to be remembered that the conditions are entirely changed in cases of congenital word-blindness. There we are dealing with defect of the visual memory, which is frequently so grave that the child is practically in the same condition as if the centre had been destroyed, so that education of the corresponding centre on the opposite side of the brain has to be accomplished just as in cases of acquired word-blindness. Thus the arguments which were applicable in the acquired cases apply exactly to those congenital cases. We saw that all the cerebral centres concerned in language are intimately connected with one another, and that experience has taught that the impressions made on one cerebral centre are deepened and strengthened by being associated with the impressions made on other centres.

Hence in the cases where we have a defective visual centre but the other cerebral centres intact, that method of instruction will, in my opinion, be the best in which a simultaneous appeal is made to other centres besides the visual. This condition is fulfilled by the old-fashioned method of learning to read, in which simultaneous appeal is made to visual centre, auditory centre, and the centre for the memory of speech movements. A familiar example of the advantages of the application of this principle is afforded by the fact that most people, if called upon to commit to memory any passage of poetry or prose, will do so much more rapidly if they are allowed to read it aloud than if they are compelled to learn it silently by movement of the lips only. In the former case there is a simultaneous appeal to three centres—the auditory, speech movements, and the visual—whilst in the latter to two only, speech movements and the visual. If they are not allowed even to move the lips, they will take longer still, as they are

now restricted to the visual centre alone. It was consideration of these principles and the teachings of past experience in the re-education of cases of acquired word-blindness which led me to adopt the old-fashioned method of instruction in teaching the congenitally word-blind to read. The registering in the visual memory of the letters of the alphabet is a comparatively easy task, as there are only fifty-two in all, including both capital and small letters. But even here at the very outset of our task we may sometimes encounter great difficulties in the acquirement of these fifty-two letters.

In Case III we have seen that it took the child nine months' hard labour. The mother informed us that so great was the child's difficulty in learning the letters that at first it seemed an impossibility. By persevering, however, for a period of nine months, the difficulties were ultimately overcome. At this stage I have often found very great assistance from the use of block letters (*i.e.* letters cut out in wood) in teaching these children the letters of the alphabet. This was a further application of the method of simultaneous appeal to as many cerebral centres as possible. By the constant handling of these block letters the visual impressions were strengthened by the simultaneous associations with the tactile ones. Even at a later stage, when the letters were mastered, I have continued the use of the block letters, making the children form the words with them, and thus continue to get the benefit of the tactile impressions as long as it seemed to be helpful. The auditory memory being unimpaired and sometimes even exceptionally good, these children have no difficulty in rapidly learning to spell, and are able to spell words long before they have learned to recognise them by sight. The auditory memory having been furnished

with the spelling of the words, and the letters of the alphabet having been permanently registered in the visual memory centre, the task of learning to read is now greatly simplified, and the second stage is entered upon. The child has simply to recognise by sight the individual letters, and can now read words by spelling them aloud, and thus appealing to its auditory memory. In this way the child with defective visual and good auditory memory has the visual impressions of the words deepened and strengthened by the constant association with the impressions already made in its auditory centre. It thus attains more easily and more rapidly to the permanent acquirement of the visual memories of the words than if the appeal were made to the visual memory centre alone. When this centre is fully furnished with the word memories, then the child has reached the final stage in the acquirement of the art of reading. It is now able to read by sight alone.

No amount of argument can decide the question as to the best method of instruction in these cases. The test of experience alone can definitely settle this point. Increasing experience has only confirmed me more strongly in the opinion which I expressed in my first paper published seventeen years ago, and founded on my previous studies on acquired word-blindness, that in pure cases of congenital word-blindness the best method of instruction was the old-fashioned method of learning to read as I have just described it. The only circumstances in which I can conceive of any advantage from the adoption of the "look and say" system is in an impure case where the word-blindness is associated with a defective auditory memory. In such a case attempting to teach the child to spell would only be increasing the difficulties of the task, as we

would be attempting to educate two defective memory centres instead of concentrating our attention upon one. In such a case I think it is possible that the best results might be obtained by the "look and say" system, but I would be very doubtful where other cerebral centres were involved of attaining a satisfactory result by any system whatever. The cases we have been considering in this book are pure cases of congenital word-blindness, where the defect is confined to the visual memory centre only, in an otherwise normal and healthy brain, and it is to those cases that my remarks apply both as regards prognosis and treatment.

Such are the methods of instruction which I have advised in the education of those suffering from congenital word-blindness, and long experience of these cases has convinced me of their efficacy for the successful accomplishment of the task of teaching these children to read. No methods, however, are of much avail in this condition unless the task is undertaken with a determination to carry out these instructions with a patience and perseverance which will not be discouraged by the slowness of the progress which may be frequently experienced, especially at the outset. As instruction advances, it will be found as a rule that the rate of progress gradually becomes accelerated, and obstacles, which at first seemed insuperable, are gradually overcome.

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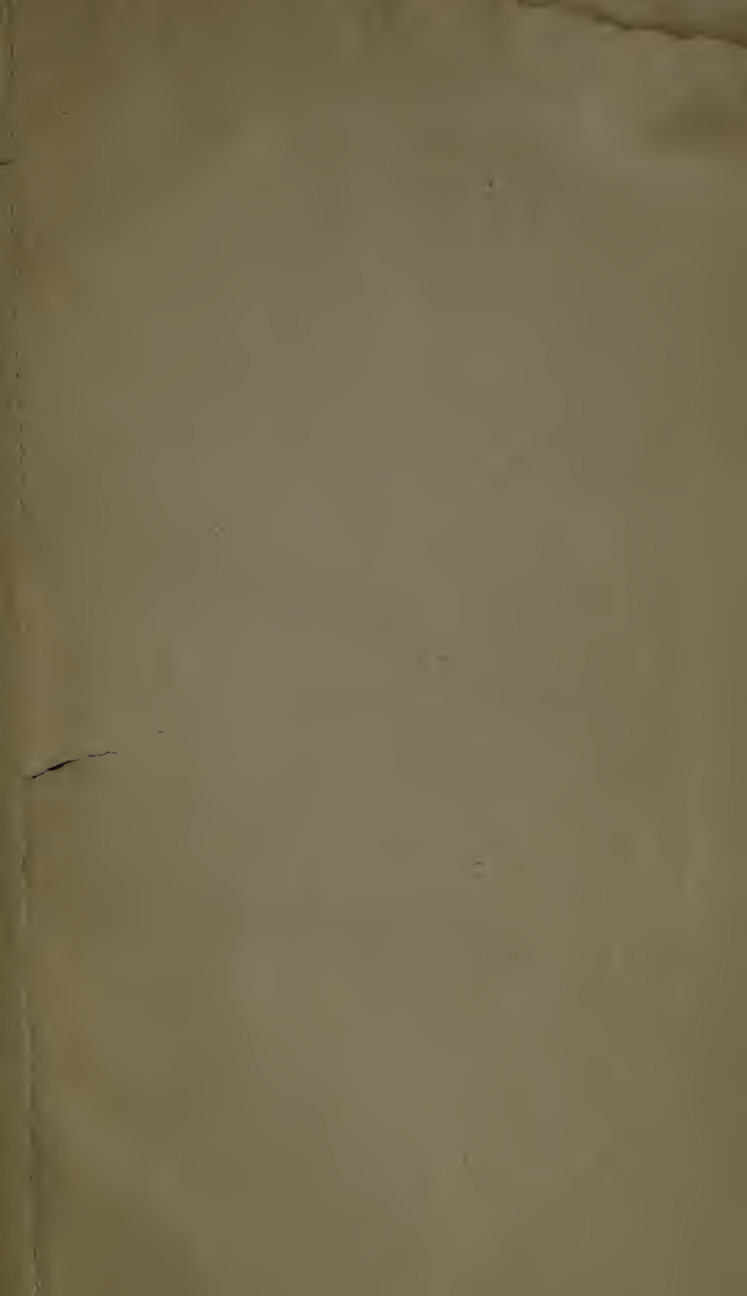
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