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SUBJECTIVE SYMPTOMS IN EYE DISEASES.

BY

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SUBJECTIVE SYMPTOMS IN EYE DISEASES.

Since the introduction of the ophthalmoscope the objective examination of every part of the eye has reached a degree of perfection which has no parallel for any other organ of the body. It is not unnatural to find, therefore, the attention of medical men nowadays less directed towards the subjective symptoms which accompany any pathological change in the eye than was the case formerly, when the observation of the cause lay more frequently beyond their powers. But how extensive and accurate the knowledge, and how just the appreciation, of such symptoms was in the later preophthalmoscopic times must be evident to those who have looked into the works of such men as M'Kenzie, Travers, or V. Jæger. And when at last the new means of examination was put into their hands, there were men ready, trained in the old school, and with V. Græfe at their head, to reap all but to the full, and in an astonishingly short space of time, the advantages which must inevitably have sprung from a thorough combination of both objective and subjective examination.

Nowhere has an attempt to make *much* out of ophthalmoscopic examination alone been more evident than amongst physicians as an aid to the diagnosis and localization of disease elsewhere. There can be little doubt that the information to be gained by such examination alone has been very much exaggerated. When we except neuritis optica, the retinitis of Bright's disease, and the rare cases of tubercle of the choroid, which, however, as far as I am aware, does not make its appearance until long after there is good evidence of tuberculosis elsewhere, we have exhausted the list of cases in which the objective examination of the fundus may afford *per se* important aid in establishing or confirming a diagnosis. I have excluded from the list atrophy of the optic nerve, because it is only in well-marked and advanced cases that we are justified in diagnosing atrophy without ascertaining what may be the state of functional activity, or, in other words, without a thorough subjec-

tive examination. It is not by any means rare to hear appearances pronounced as partial or incipient atrophy which a proper subjective examination would show to belong to the category of physiological variations.

I. Limitation of the Field of Vision.

The examination of the field of vision is capable of affording indications of great importance from a diagnostic as well as prognostic point of view, and is worthy of more general attention than is yet accorded to it. The periphery of the retina, though not to the same extent as its centre, may receive three distinct impressions—those of light, colour, and form. The first is a quantitative, the second a qualitative impression, and the third may be looked upon as the relative appreciation of differences in either or both of the other two, affecting simultaneously (or at intervals of time sufficiently close not to cause too great a break in continuity) parts of the retina which are anatomically distinct.

The abnormalities of the light sense have not as yet received very much attention, partly because it is difficult to conceive a practical means of testing it which does not at the same time involve the sense of form, and partly because the physiology of the subject is still imperfectly known. Certain cases occur in which a marked improvement of vision takes place in subdued light, in which there is more or less day-blindness (nyctalopia). The toxic amblyopiæ exhibit this to a certain extent, generally inconsiderable, or at any rate to a degree more apparent than real; but it is the condition called *hyperæsthesia retinæ* in which it is a characteristic symptom. The condition is observed more in the tropics than elsewhere, and sometimes occurs epidemically, as in the case of our troops returning from the Crimea. In other cases, which have not as yet been sufficiently studied, there appears to be an abnormal relation between the visual acuity and the relative or absolute intensity of the light stimulus at different parts of the retina. An interesting case is recorded by Krenchel,[1] which shows the necessity which may sometimes arise for testing the light sense. Although I have elsewhere called attention to the case, it may be worth while glancing at its principal features in connexion with the present subject, as it is not improbable that the form of amblyopia there exhibited is of more frequent occurrence, although from the absence of reference to it in ophthalmological literature it has probably hitherto escaped detection. The patient, a seaman aged 33, had yellow fever in South America, during which he became blind. He slowly regained his sight, and when examined had $V=\frac{20}{20}$; field of vision slightly contracted (concentrically); colour sense normal; no definite atrophic appearance of the discs, though the vessels were perhaps somewhat smaller than normal. Although able to read the finest print, he declared that objects appeared to him to be

[1] *Klinische Monatsblätter f. Augenheilkunde*, Feb. 1880.

enveloped in such a dense mist that he hardly dared venture out in the street alone, even in broad daylight. Krenchel was at first inclined to disbelieve his statements; but after having been under observation for some time it became evident that he was really the subject of some obscure defect of vision. He was then tested with Masson's disc in order to determine his power of distinguishing between different degrees of intensity of light. The disc used produced on rotation seven rings (gray on white ground), the most distinct of which, compared with the background, corresponded to a difference in intensity of $\frac{1}{15}$, the least distinct to only $\frac{1}{120}$. All these rings could be seen by an individual with normal sight. The patient, however, was unable to see any one of them, and by means of a movable black sector on a white ground it was found that the least difference in intensity of which he was conscious was $\frac{1}{10}$. This, then, offered an explanation for the difficulty which he experienced in going about alone, as outward objects not differing greatly in intensity would lose their individuality for him, and appear more or less as they do in a faded photograph.

Abnormalities of the colour sense have received more attention, and will be considered further on.

Peripheral vision may be defective in continuity or in acuity. The continuity is subject to both regular and irregular interruptions.

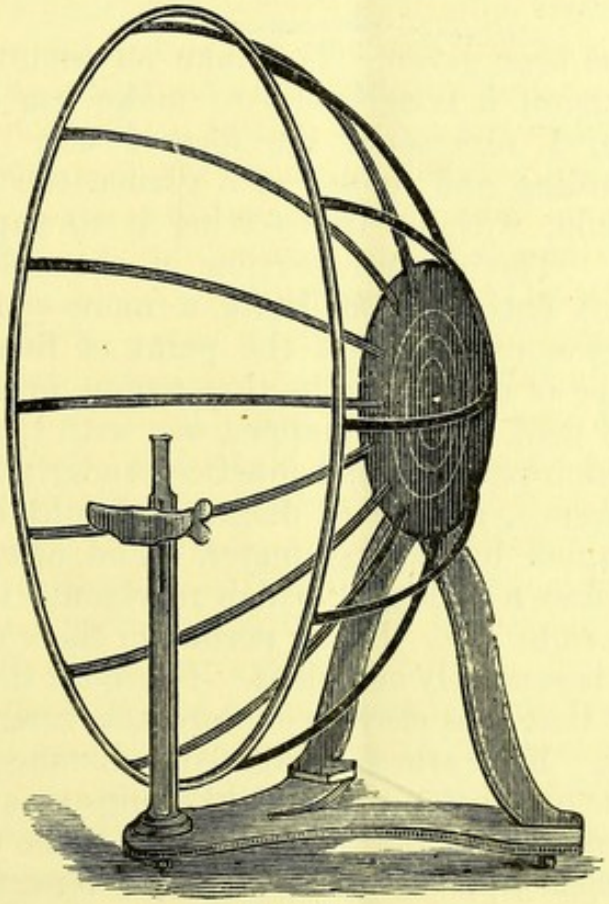

Fig. 1.

The regular manifest themselves by some limitation of the normal extent in a particular, or, it may be, in all directions. The irregular

breaches are more or less blind portions surrounded by normal or relatively normal portions of the field of vision. To these the name

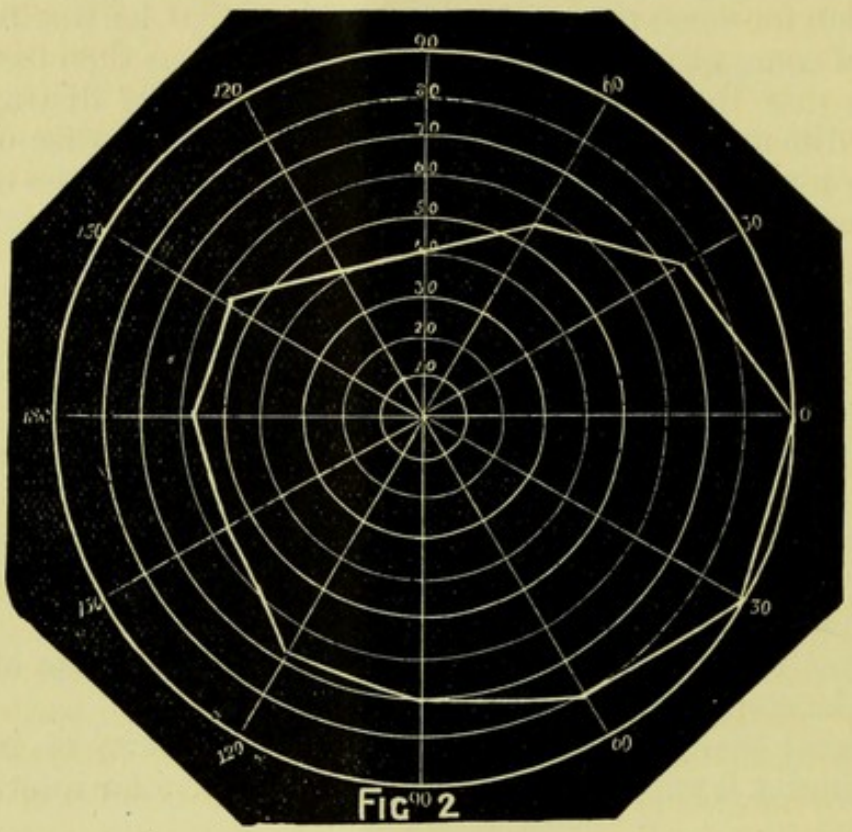

Fig. 2.

of scotomata has been given. To make an accurate examination of the field of vision it is necessary to make use of some sort of perimeter. Fig. 1 represents the form I use. It has the advantage of enabling one to see at a glance the dimensions and form of the field, without transferring it to paper, and can be worked faster. The central portion of the sphere up to 20° all round is left entire, to facilitate a more complete examination of the region round about the point of fixation. Thus the extent and shape of a scotoma in this region, or the contour of a very contracted field, may be mapped out with the utmost degree of exactness which patience and practice render possible. For the purpose of reference, a note or diagram should be taken of the field as determined by the perimeter. The usual way in which this is done is shown in Fig. 2, which represents the normal field of vision of the right eye. In my perimeter there are twelve arms, 30° apart: this is generally sufficient. Behind it the wall is painted a dull black, so that it is easy to explore the intermediate regions when necessary. Each arm is graduated to distances of 5°. In this way the angular dimension of the field along any arm can be determined without difficulty to a degree or so. Some German authors give elaborate measurements of the field to *minutes*—a degree of accuracy which, even if it be attainable, is certainly unnecessary. If there be any doubt as to the restriction of the field in any particular case, the examination is best made by artificial light the

intensity of which is a little greater than that which begins to tell on the normal field. This is a sort of compromise between the examination of the light and form senses which is of considerable practical importance. The white object used in the examination should not be larger than 10 mm. square. It is held in position and caused to travel as desired along any of the arms of the perimeter by means of a long and sufficiently flexible black rod. The observer must at the same time stand in such a position as to make sure of the patient constantly fixing the centre of the perimeter, at which point there is a little ivory knob.

The normal extent of the field of vision is subject to variation at the upper, and slightly also at the inner parts, owing to individual peculiarities in the size and shape of the eyebrows and nose. The physiological limits may be taken to be as follows:—Upwards, 45°; upwards and outwards, 50°–55°; outwards, 90° (often slightly more); outwards and downwards, 80°–85°; downwards, 70°; downwards and inwards, 60° (variable on account of the nose); inwards, 55°–60°; inwards and upwards, 55°. The extent of the field upwards and upwards and outwards is found to be 5°–15° greater when the point of fixation is situated 20° or 30° from the centre of the perimeter in the opposite direction. This has to be borne in mind when there is a doubt as to whether or not there is limitation in this region. Thus, should the exploration with the centre of the perimeter as point of fixation only give an angular dimension of 40° for the peripheral extent of the field upwards, we should not always be right in assuming a contraction in this direction unless *no increased measurement* resulted from testing with a lower point of fixation.

The determination of the limits of the field for different colours is a matter of much greater difficulty and uncertainty, as the results are influenced by the hue and shade of the colour used, by the size of the coloured objects, and by the quality and intensity of the light under which the examination is conducted. Practically, in examining any case, I find it useful to determine the extent of my own visual field in one or two directions under the same conditions, and then allow something for individual peculiarity beside. Another precaution that will be found useful in practice is to have the test object (which it is well to make 20 mm. square) differently coloured on either side. In this way we are provided with a check on the accuracy of the patient's statements. The most convenient colour to use is some hue of red, as it is for the reds and greens that pathological defects in the colour sense first manifest themselves. If the test colour chosen be examined carefully at the inner side of the field of vision, it will generally be found to change colour. Before becoming absolutely colourless, it will become yellowish, brownish, or bluish, according to the hue and shade selected, and it is this tint which may with advantage be selected for colouring the opposite side of the test object. When the red-green perception is entirely

abolished, the limits may be taken for blue or yellow, the vision for which is longer in disappearing, but the only necessity for this is to exclude the possibility of the more usual form of congenital colour-blindness, which we should have reason to suspect if the peripheral boundaries for yellow and blue were not restricted. But the determination of the limits of the field for quantitative and qualitative stimuli does not exhaust the examination of indirect vision: it is important to ascertain whether or not there is any break in the continuity of the field. Such interruptions, or scotomata, are usually divided into *positive* and *negative*, according as they give rise or not to a consciousness of the interruption. In the one case there is more or less perception of darkness, in the other an entire absence of any visual impression. The scotoma existing over the projection of the area of the optic nerve where it enters the eye is a familiar example of the negative variety, though it differs in some respects from those which arise pathologically (viz., in the manner in which the impression elicited by excitation of the retinal elements round about are mutually related).

The conditions in which some alteration or restriction of the field of vision occurs are optic neuritis and atrophy, the functional forms of amblyopia (under which group are included the various forms of amblyopia *sine causâ*, such as toxic amblyopia, amblyopia fugax, the various conditions connected with hysteria, etc.), retinitis, more especially retinitis pigmentosa, embolism of the central artery and thrombosis of the central vein of the retina, opaque nerve fibres, glaucoma, detached retina, intraocular tumours and foreign bodies, choroiditis, and coloboma.

Field in detached Retina.—The portion of retina detached can be seen with the ophthalmoscope, but it is impossible in this way, even with careful drawing, always to form an idea of the extent of the lesion sufficiently exact to be of use in comparing the conditions met with on the first and subsequent examination of any case. The most trustworthy means of making such a comparison is by plotting out the field. It must be borne in mind, however, that the freshly detached retina retains its functions to a slight extent, so that it is always advisable to make the examination in subdued light, of course under as nearly as possible identical conditions each time. Were a conscientious examination always made in this manner, I cannot but think that cases of recovery from detached retina would very seldom be recorded. A few undoubted cases have occurred. The boundaries for peripheral colour vision are narrower than the line separating the undetached from the detached portion of the retina, so that an examination with pigments might be made instead of the ordinary one, which, however, is sufficiently accurate if the precaution of using a very subdued light be attended to. Treitel has found in six cases a remarkable confusion between blue and green. This was first observed by

Leber, and ascribed by him to absorption of the blue rays by the yellow sub-retinal fluid. Certain points in connexion with the form and method of extension of the detachment, as well as of the symptoms to which it gives rise, are sufficiently characteristic to engage attention. Thus the defect in the field of vision has most frequently a more or less indefinite, ill-defined, and irregular boundary. If the field be restricted below, an extension upwards is not unlikely to follow. This may pass to either or both sides of the point of fixation, though generally it does so to the inner alone, or it may involve the centre itself in its course. Such an extension is not so likely to be the case where the first restriction, as often happens, makes its appearance above. In almost all cases of simple detachment of the retina the central visual acuity is more or less diminished, indicating some participation in the disease which has led to the detachment elsewhere. Often the subjects of detached retina are conscious of a certain degree of distortion of the images which they receive, and it is not uncommon to hear them complain of seeing colours, green, black, etc. When the detachment is caused by tumour, the defect in the field is much more sharply defined, whilst the central vision remains unaffected. If, as is often the case, the tumour be peripheral, the subjective symptoms are, sharply defined peripheral limitation of field with good central vision. If the detachment occur in both eyes, it is rare to find any great degree of symmetry, such as is shown in Fig. 3, the field of vision in a case which occurred amongst Mr Tay's patients at Moorfields.

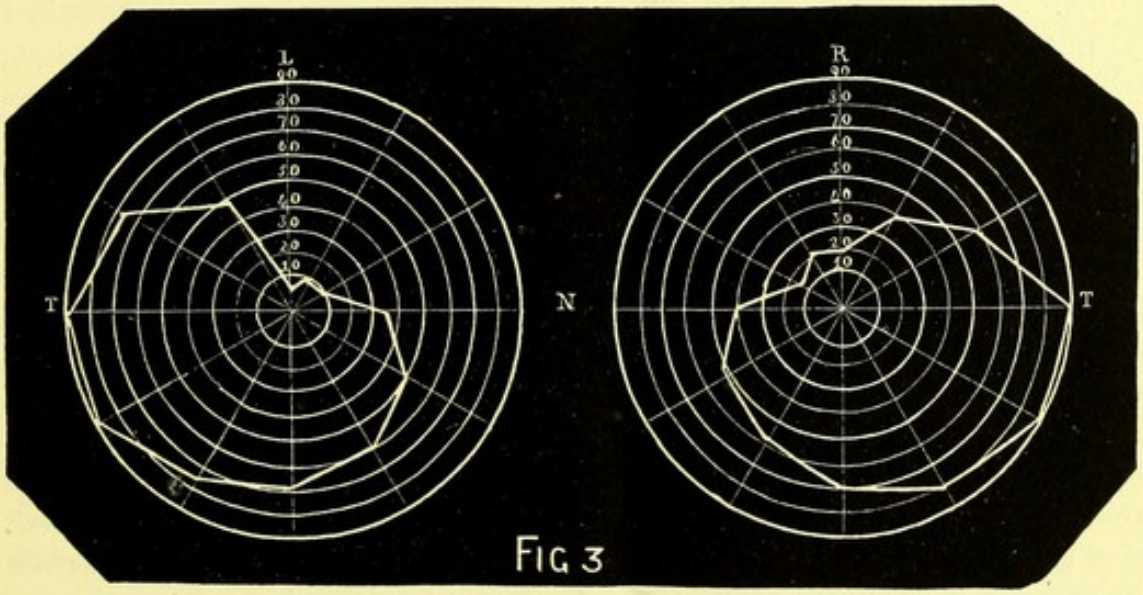

FIG 3

(H. H., a sailor, aged 28, four months' duration, V $\frac{6}{200}$ and $\frac{20}{200}$, slight H.)

Retinitis Pigmentosa.—The state of the peripheral vision in retinitis pigmentosa is so characteristic as to render an ophthalmoscopic examination almost superfluous. The peculiar features are marked concentric limitation combined with good central vision.

Usually the objective appearances are also sufficiently striking to leave no doubt as to the nature of the case. In some instances, however, where there is an entire or almost entire absence of pigment, the subjective examination is of value in confirming

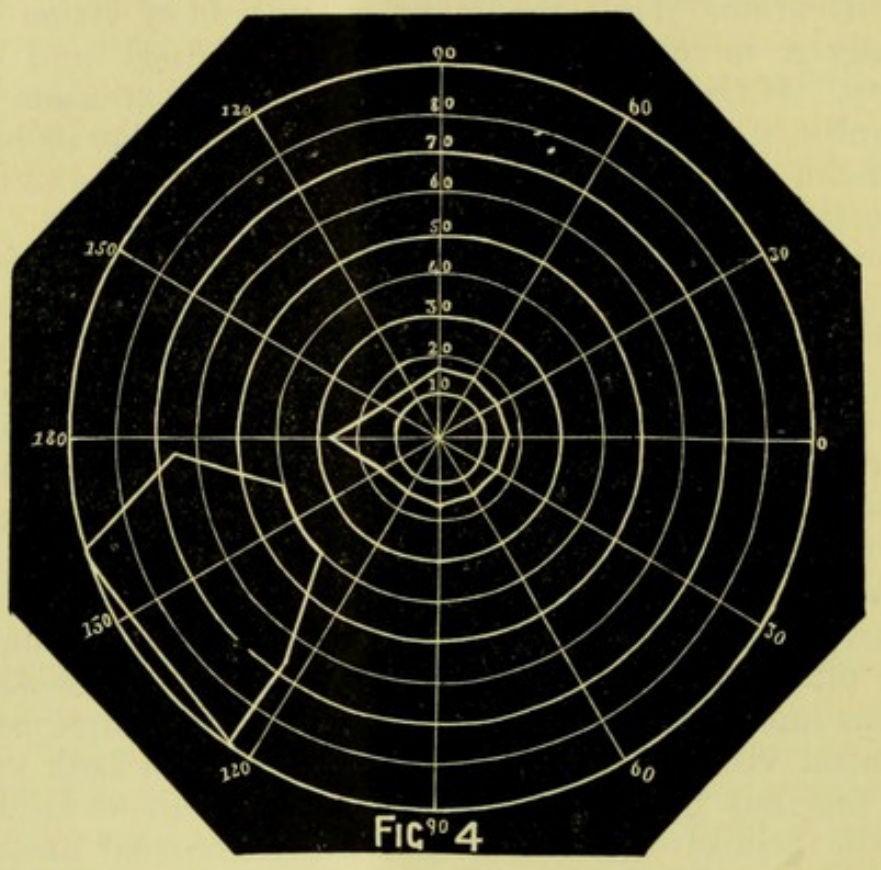

FIG. 4

the diagnosis. The extreme periphery of the retina does not appear to be subject in the same degree to the degenerative changes which constitute this disease, and we consequently find that, whilst the function of the greater part of the retina is lost, a zone or belt, or it may be only a small temporal portion, retains a part of its light. Fig. 4 represents the field of the left eye in a case which had existed from early childhood in probably pretty much the same condition. V $\frac{20}{40}$; J. 1 at 6″; M 3, 0.

Curiously enough, this patient was completely colour-blind for red and green. There can be little doubt that this was congenital, as in other cases I have invariably found the colour vision normal. If the exploration of the field in retinitis pigmentosa be merely undertaken with reference to its continuity and extent, whilst the relative activity in the functions of different parts is disregarded, it will be found that there is a great want of correspondence between the results arrived at at different times, unless great care be taken that the conditions are as nearly as possible similar at each examination. The state of the peripheral vision is very markedly dependent on the intensity of light, a fact which is well known in connexion with the most prominent symptom of the disease, viz., night-blindness (hemeralopia).

Embolism.—A loss of half the field or a sector-shaped defect in

it, *limited, however, to the one eye*, occurs in embolism of one of the principal branches of the central artery of the retina. The defect is generally in the upper or lower half of the field. This condition is not infrequently wrongly called hemianopsia superior or inferior. After embolism of the main artery a small peripheral portion of the temporal side of the field retains often more or less completely its function, a fact which it is well to bear in mind, as the ophthalmoscopic appearances, after a certain time has elapsed, are often slight and undecided; and this condition occurring on the one side, especially in a subject the state of whose circulatory system would render embolism possible, is strongly suggestive of the blindness being due to this cause.

Scotomata occur either in connexion with lesions of the retinal elements or independently of gross anatomical alterations, generally owing to some functional intra-cranial or cerebral disorder. The first may be of traumatic, inflammatory, or vasomotor origin, or be due to malformation. The cause is generally evident on ophthalmoscopic examination. The affected regions give rise to positive scotomata, of which the patient is most conscious when the centre is affected. This form is found in the different kinds of choroiditis, traumata, and hæmorrhages of the retina and choroid, opaque nerve fibres, coloboma, retinitis, etc. In diffuse retinitis a zonular or ring-shaped scotoma may often be found, either complete or interrupted at intervals, without any corresponding ophthalmoscopic changes. A form of choroiditis occurs in old people which is limited to the region of the macula lutea, and is often not very easily detected owing to the exudation, or senile changes of the basal membrane, differing only slightly in colour from the rest of the fundus. It gives rise to very different degrees of blindness, generally sufficient, however, to render the reading of newspaper type impossible. Owing to the limitation of the pathological change to the centre, complete blindness never results from it. Large or small insular scotomata not implicating the centre or extending to the periphery, for which no objective reason can be detected, are occasionally met with. The origin of these is obscure. The prognosis is good as far as blindness goes if the function of the surrounding portions of the retina remains normal, but the scotomata are not likely to disappear. Fig. 5 is the field of the left eye of a lady aged 40, in whom there were no ophthalmoscopic appearances or any history of exposure to strong light. The condition remained unaltered for several months, after which I did not see her again. The right eye was normal.

Glaucoma.—In this disease Von Græfe showed long ago that the condition of the field afforded an indication of primary diagnostic importance. The limitation which takes place is usually most marked to the nasal side (inwards and downwards).[1] Frequently this

[1] On this point Mauthner holds a different view. See his recent work on glaucoma.

part of the field is destroyed to close up to the point of fixation when the rest remains as yet but slightly constricted and the vision of

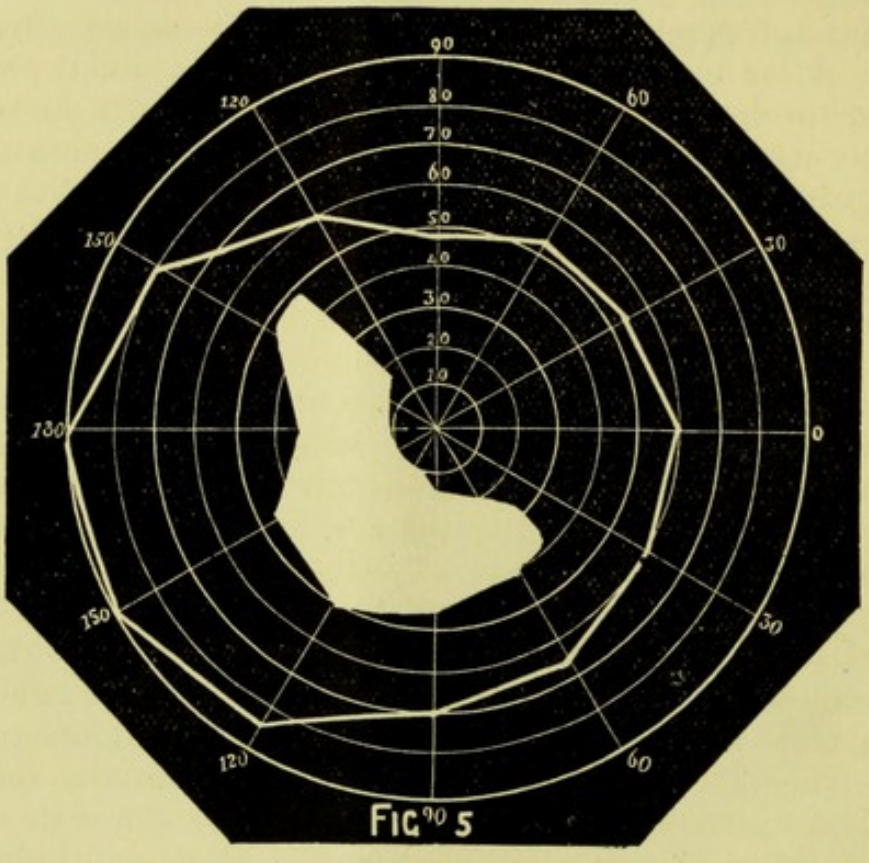

FIG 5

the centre tolerably good. It is interesting to observe the effect of iridectomy on the glaucoma field of vision. If the disease has been acute, the operation is generally followed by widening, sometimes to a very considerable extent. This is also in some degree the case in chronic cases when the measurement of the field before operation has been made at a time when there has been considerable increase of tension, under which condition part of the limitation may be due more to a temporary abolition than to an irretrievable destruction of the local functional activity. In most chronic cases, however, and always in the true glaucoma simplex, there is cause for congratulation if the extent and acuity of the eccentric vision remains unaltered. Often the restriction becomes slightly greater, a result generally unimportant when compared to the chance of arresting the progress of destruction, but which occasionally—viz., when the restriction has at one part been close up to the point of fixation—may, by involving the centre, make all the difference between tolerably useful sight and an amount which is barely sufficient to enable the patient to move about without assistance. According to Treitel, the boundaries of the eccentric colour vision are restricted only to the same relative extent as for black and white. Undoubtedly such is often the case, and, as will be seen further on, this is entirely different from the condition in optic atrophy, so that if it be constant it would obviously afford an indication of some diagnostic importance in that class of cases in

which the diagnosis between glaucoma simplex and atrophy is not without difficulty.

Hemianopsia.[1]—Symmetrical defects in the field suggest lesion in the optic nerve tracts or centres. If the defects lie to the same side in both eyes—that is, inwards in one and outwards in the other—we have the condition for which the term *hemianopsia homonyma* is now generally restricted. The hemianopsia may be to the right or left (hem. homon. dextra v. sinistra) and partial or complete, just as we have complete and partial right or left hemiplegia. It may or may not be associated with hemiplegia. In the cases I have seen it has more often existed alone, but it is probable that the cases in which the visual paralysis forms but a part of the whole lesion will be more frequently met with in general hospitals. Of 29 cases given by Schweigger,[2] hemiplegia was absent in 16 and present in 13, though in most of these it was only slight and transitory. If the case be recent and uncomplicated, there is no appearance of atrophy of the nerves. The boundary separating the blind and seeing portions of the field is usually sharp and regular; when the hemianopsia is complete it is a line coinciding (for the peripheral portions of the field, at any rate) nearly, if not exactly, with the vertical through the point of fixation. Whether or not it also passes vertically through this point, indicating an interruption in the functional activity of exactly half the macula lutea, is still a disputed point. Possibly in some cases it does so, and in others not. I have invariably found the immediate neighbourhood of the point of fixation (from 2°–5°) apparently

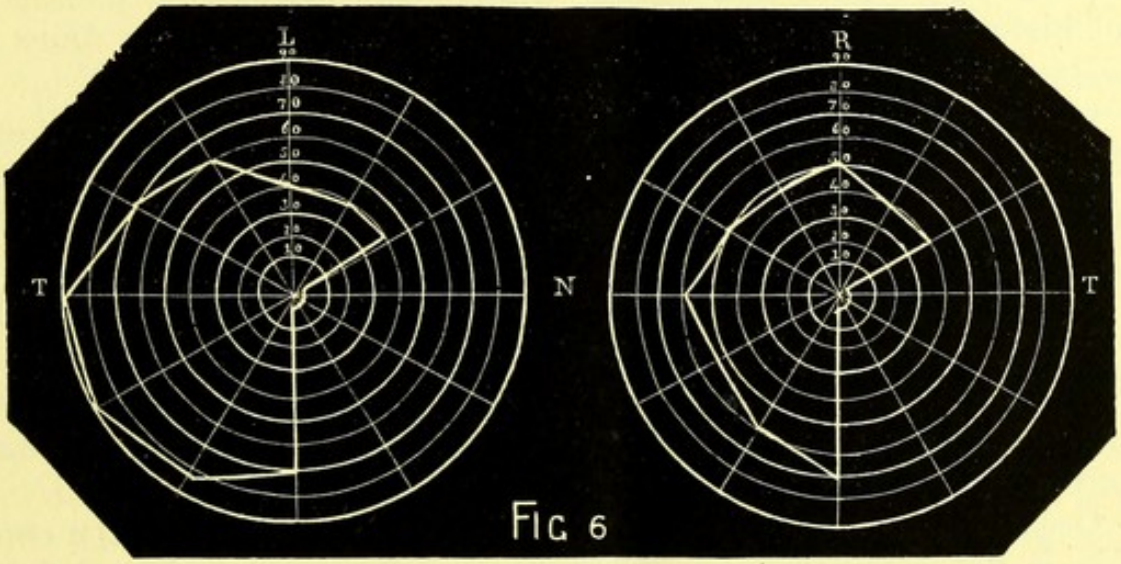

FIG 6

not implicated, but this may possibly be owing to the difficulty of securing accurate fixation, as some have suggested.[3] Yet I am

[1] The term hemianopsia (ἡμι, ἀ, ὤψ), first suggested by Hirschberg, and now adopted by most writers, is obviously more consistent with the general terminology of nervous affections than the original hemiopia.

[2] Græfe's *Archiv*, xxii. part 3.

[3] On this point see Mauthner, *Hirn und Auge*, No. 5 of his excellent series of lectures on ophthalmological subjects.

inclined to think that the two cases actually do exist, more especially as the lesion causing the hemianopsia may have, theoretically, three situations, viz., the optic tract, the optic thalamus and its neighbourhood, and the cortex cerebri somewhere behind the fissure of Rolando (the angular gyrus, according to Ferrier[1]). Lesions occupying the two former sites, and giving rise to hemianopsia, have been actually demonstrated.[2]

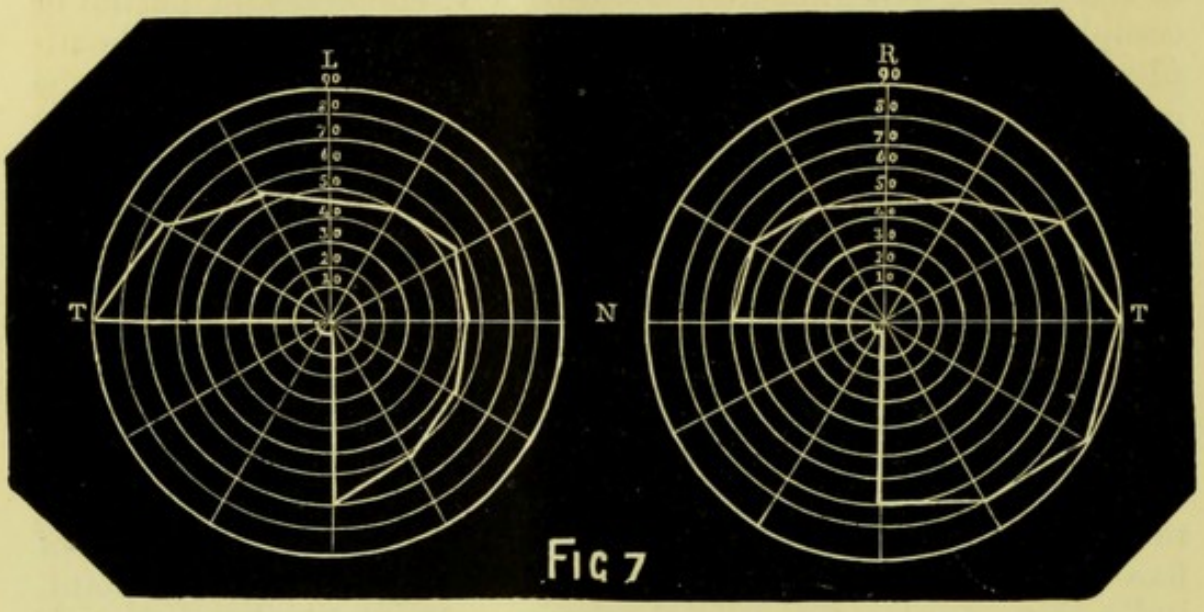

FIG 7

When the hemianopsia is partial, the defect is generally, though not always, of equal extent in both eyes. Fig. 6 is the field in the case of Wm. C., aged 37, under Mr Tay's care at Moorfields (1st July 1880). Duration, according to his own statement, 5 months, but history of partial hemiplegia $1\frac{1}{2}$ years ago. Right leg drags; tendon reflex normal; V fully $\frac{20}{20}$; colour perception normal.

Fig. 7 is from a case under the care of Dr Barlow at the London Hospital, in which the defect was limited exactly to the left lower quadrant. There was defective smell, $V=\frac{30}{20}$, and red-green blindness (in all probability congenital).

In Fig. 8 the hemianopsia is not quite symmetrical. The field is from the case of a soldier, aged 32, under Mr Couper's care at Moorfields (9th May 1880). Duration $1\frac{1}{2}$ years; came on with right hemiplegia, which had disappeared; $V>\frac{20}{20}$; colour vision normal.

Occasionally the vision of the one side, or of a portion of the one side, is not completely abolished, but merely more or less defective. It is probable that such abortive forms of hemianopsia may exist in all degrees of incompleteness, and would be found to be much more frequent than is usually supposed if perimetric explorations of the field of vision were more generally made amongst the

[1] *Functions of the Brain*, p. 164.

[2] Hirschberg, Virchow's *Archiv*, vol. lxv. p. 118; and Forster, Græfe-Saemisch, vol. vii. chap. 13, p. 118.

"nervous cases" in general hospitals and asylums. The following case was accidentally discovered amongst the patients in Hansen's

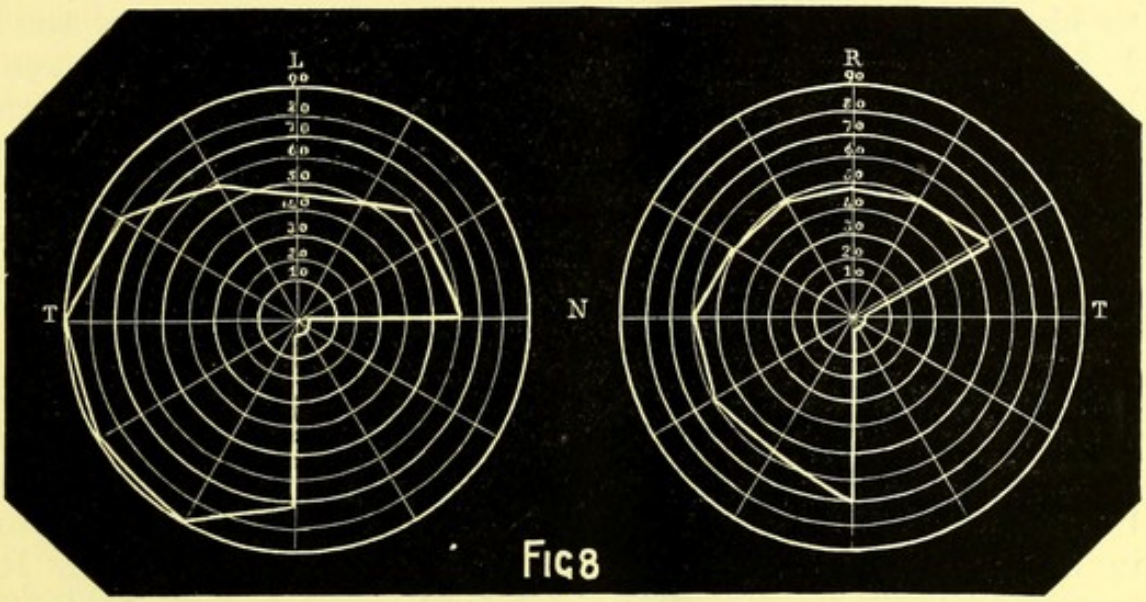

FIG 8

clinic, and is described by Bjerrum:[1]—The case was one of *acquired complete colour-blindness for all colours occurring in a typical left hemianopic form.* The central vision and remaining portion of the field were altogether normal. Excentric vision did not appear to have suffered to an appreciable extent. The white object used for testing appeared only very slightly duller to the left side. Fingers were counted excentrically just as well on the left as on the right side. The patient remarked spontaneously, after the examination, "That is curious; I seem to have got a sort of colour-blindness,"—showing clearly how slight the excentric amblyopia must have been.

Hemianopsia remains, as a rule, stationary, even although the subjective symptoms become in many cases, after some time, associated with more or less visible changes in the discs. According to Mauthner, the most marked atrophic discoloration is found in the eye of the side to which the field is restricted. This point requires, however, further confirmation.

Hemianopsia may, on the other hand, be complicated with complete optic atrophy of the one eye. The following case (Fig. 9) was probably of that nature:—Henry C., aged 19, has distinct atrophy of the right optic nerve, with complete blindness. The vision of the left $= \frac{20}{70}$ and J. 1 at 5″–6″. Field as in Fig., *i.e.*, vision entirely absent to the outer side; colour vision not defective; pupils respond well to light falling on the left eye; ophthalmoscopically considerable paleness, but no apparent diminution in the arteries or veins. *General Condition.* — Complains of great sleepiness and headache. Is subject to vomiting in the morning. Sometimes feels as if "going silly." Tendon reflex normal. This patient first attended at Moorfields in

[1] *Hospitals Tidende*, R. 2, Bd. 8, p. 41.

February 1879. At that time he believed his vision to have been failing for six months. Unfortunately, there is no further record on his paper than that the V was J. 16. According to his own statement, the left was also affected at the time. I first saw him on 10th June 1880, and last on 2nd September of the same year, during which time absolutely no change whatever took place in the vision of the left eye. This length of time is, of course, too short to justify the conclusion that the condition would probably remain permanently stationary; but as the patient has changed his address and could not be heard of, I have been unable to ascertain the present state.

A very unusual form of hemianopsia is described by Forster in his chapter on the relation of ocular and visual disorders to general disease, which forms one of the most interesting and novel features of the well-known Græfe-Sæmisch *Handbuch* (vol. vii. chap. 13). In this form the defect is limited to corresponding insular portions in the homonymous halves of the two visual fields. Fig. 10 represents the field in one of Forster's cases, a man aged 58. The condition was found to be the same a year after the first examination.

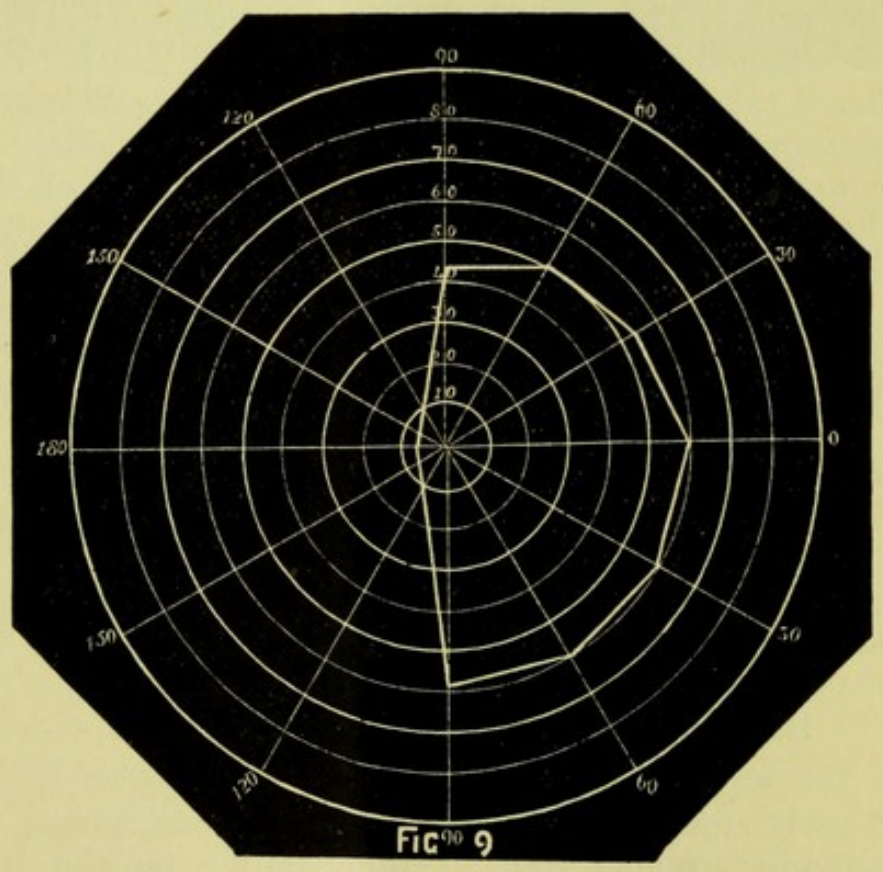

FIG. 9

Two other forms of hemianopsia have been observed, viz., temporal and nasal hemianopsia. In the former the outer and in the latter the inner half of each field of vision is deficient. They are both exceedingly rare. All the cases to be found in ophthalmological literature (23 temporal and 11 nasal), some of which there is good reason to regard as doubtful, have been

recently referred to by Mauthner.[1] Since then two more have been added to the list of temporal hemianopsias.[2]

Optic Atrophy.—Except where there is marked diminution in the size of the vessels of the retina, it would be rash to come to

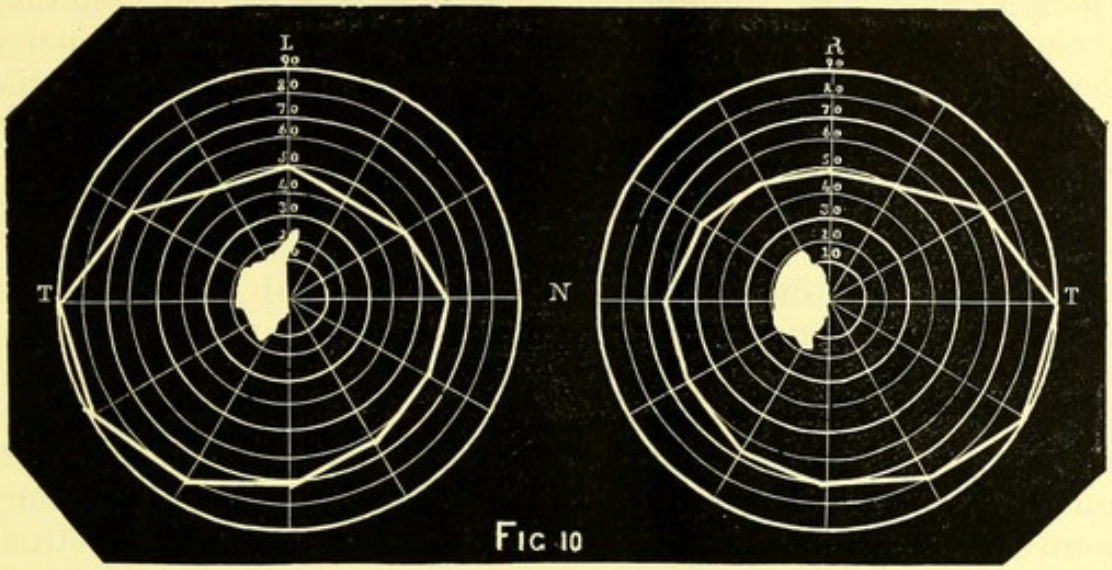

FIG 10

any conclusion as to the existence of optic atrophy from the mere ophthalmoscopic appearance of the papilla, as the physiological limits of colour and excavation are extremely wide. Along with a low degree of central visual acuity, an excessive paleness of the nerve is certainly suspicious; but there are many circumstances under which those two conditions exist, either mutually dependent or not, unconnected altogether with atrophy,—for instance, all those which give rise to a central negative scotoma. For a safe diagnostic as well as prognostic criterion we are thrown back upon the determination of the state of the field of vision. Our knowledge on this subject was first clearly formulated by V. Græfe,[3] and, indeed, so thoroughly was this subject investigated by him, that, with the exception of the slight refinement which has been introduced by the examination of the peripheral colour vision, little or no advance has since been made. One of the most important points which resulted from his observations was, that however much the central vision might be diminished, no fear of progressive atrophy, and therefore eventual total blindness, need be entertained if the boundaries of the field of vision remain normal. In progressive atrophy there is *invariably* a limitation of the field. The limitation often takes place all round (concentric limitation), but in other cases the field in one direction is more restricted than in the rest. The restriction which is taking place can frequently be most easily demonstrated for colours. This is, very probably, simply because, if the examination be made in ordinary daylight, the

[1] *Loc. cit.*

[2] Treitel, Græfe's *Archiv*, vol. xxv.; Gowers, in a communication to a recent meeting of the Ophthalmological Society.

[3] *Klinische Monatsbl. f. Augenh.*, 1865, and *Archiv*, vol. ii.

corresponding failure of the light and form senses may, if slight, more readily escape detection. There does not appear to be any reason for supposing that the failure of the colour perception is unconnected with that of the other functions of the visual apparatus. Though, considering the number of possible seats as well as natures of the lesions which would disturb the functions of the optic nerve, the possibility of such an independence should be borne in mind. Before, however, we are able to form correct conclusions on the nature of the colour failure in cases of optic atrophy, it would be necessary to have more ample data of the normal relations connecting the three senses of light, form, and colour. It is certain that they are all different functions of the special sense of vision, but in how far mutually dependent remains to be shown by future investigation. Although it is most common to find, in cases of optic atrophy, that the failure of the functions of the central and peripheral portions of the retina advance hand in hand, still cases are met with in which the peripheral functions have suffered much more severely than the central. The long time which sometimes elapses between the beginning of atrophy and complete blindness renders it difficult to give a favourable prognosis based on an apparent arrest in the progress of the amblyopia; but if the condition of the field of vision remain absolutely stationary for several months, the prognosis is certainly hopeful, and all the more so if the cause of the atrophy appears to be at an end. Cases occur in which, after the disease has produced a considerable amount of amblyopia along with great limitation of the field, it ceases, and the patient retains what is left.

It is impossible from the functional examination to determine whether the atrophy is connected with spinal or cerebral disease, or due to some other cause (hæmorrhage, primary sclerosis of the optic nerve, etc.), but there are other circumstances which render one or other cause the most probable in any case. In the great majority of cases of spinal atrophy some ataxic symptoms are already present when the amblyopia begins, whereas it is otherwise with the atrophy of cerebral origin, which is seldom preceded, though often followed, by mental disturbances. In cases of atrophy there is generally a considerable difference in the amblyopia of the two eyes. It is not uncommon to find the one far advanced towards amaurosis whilst the vision is still very fair in the other. The mode of development of the amblyopia is, nevertheless, generally much the same in both. Thus, if any particular portion of the field is most restricted in the one, the first symptoms may be looked for in the corresponding part of the field of the other eye.

The characteristic subjective symptoms of optic atrophy are, then, more or less concentric limitation of the field of vision, which is greatly more pronounced for colour, with a simultaneous diminution of the central visual acuity. There is no constant relation

between the amount of failure of peripheral and central vision, although a large proportion of cases present pretty much the same conditions. Schweigger, Treitel, and others have described a few cases in which the central vision remained for a long period tolerably normal although the restriction of the field was extreme. Such small fields with good central vision are, as we have seen, more characteristic of retinitis pigmentosa, but the possibility of their occurring in progressive atrophy should be remembered. A case which was met with at Moorfields, for the notes on which I am indebted to Dr Charnley, appears to belong to this category, though there are points about it which render another explanation possible. R. B., aged 37, farmer, has for twelve months suffered from giddiness and tremors. V $\frac{20}{30}$ R, $\frac{20}{70}$ L. Field of vision of both eyes restricted to such an extent that there appears to be hardly anything but central vision left. Colour vision normal; eyeballs in constant motion. The present condition appears to have come on pretty suddenly, and has lasted for six months. Ophthalmoscopically the fundus appeared perfectly normal.

Owing to the short duration of this condition, and from the fact that the colour vision remained normal, and that the visual acuity was found several months after to be unaltered, it seems to me not impossible that this case may be one of double hemianopsia, in which the centre has each time escaped.

Central negative scotomata are met with in a class of cases which are almost always, though probably not exclusively, of toxic origin. The scotoma, which may be so slight as only to be readily demonstrated for colours, takes the form of a horizontal oval, stretching from the portion of the field corresponding to the position of entrance of the optic nerve to slightly beyond the point of fixation. The condition is accompanied by a diminution of central visual

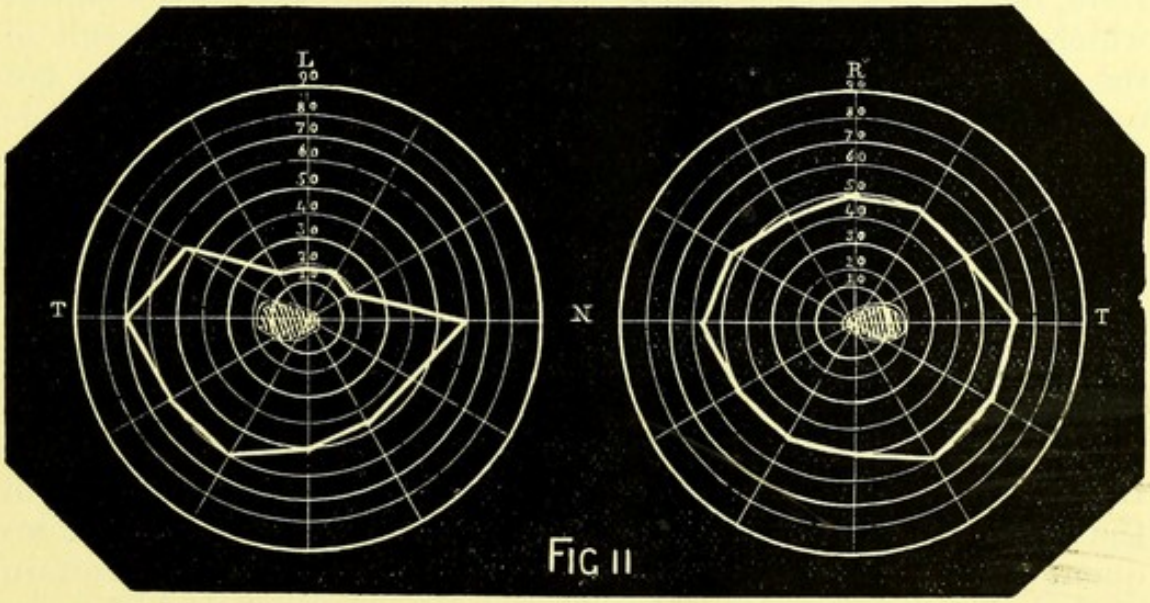

FIG 11

acuity of very varying amount. In by far the greatest number of cases—and in such the prognosis is extremely favourable if the

cause of the amblyopia be removed—no other defect of the field of vision exists, but a typical central negative scotoma may be complicated in rare cases by other limitations. In these it is doubtful whether complete recovery is ever possible, and, indeed, it is not impossible that they may ultimately lead to complete blindness. Fig. 11 gives the field in a case of the complicated form.

The vision of the right eye in this case improved during treatment from $\frac{15}{200}$ to $\frac{10}{100}$; that of the left remained stationary at $\frac{8}{200}$. The ophthalmoscopic changes were slight.

From the preceding short sketch of the state of peripheral vision in different diseases it is evident that there are many points of diagnostic importance to be gathered from an examination of the field. This, in the case of the diagnosis between intra-ocular and extra-ocular cause, which, so far as our present knowledge goes, is the direction in which the observed differences are most pronounced, is not so necessary, as there are, as a rule, objective signs which lead us to the same conclusions. But there can be little doubt that in the thorough examination of the relative as well as absolute functional activity of all parts of the retina we possess a means which, when further developed, will prove of immense power in the localization of intra-cranial disease. When we have been able to bring together the results of post-mortem examination with the variations observed during life in the exact nature of the defect for light, colour, and form, it would be strange indeed if such an examination were not more productive of diagnostic refinement than the objective examination of a neuritis or atrophy of the optic nerve taken alone. But it is not merely as a method of diagnosis that this examination deserves attention; in many cases it affords the most delicate means of ascertaining the course taken by any disease, especially when of intra-cranial origin. Here, however, it is necessary to bear in mind the circumstances which have been already mentioned as influencing the result of the examination, viz., intensity of light, practice, etc., so as not to ascribe without good cause slight or sometimes even considerable alterations in these results to progress of the disease either in the direction of recovery or blindness.

The prognostic importance attaching to the state of the field has been alluded to under the different affections, but it may be well to recall a few points here. The prognosis is good if there be diminution of central vision without any limitation of the field, or if the limitation takes the form of hemianopsia in which the portions affected are *sharply* separated from those in which the function is retained. If, on the other hand, there be limitation of the field, even without any apparent cause, the probability of subsequent atrophy and blindness is very great, and this is all but certain if there be a previous atrophy of one eye. A good deal of prognostic significance, however, attaches to the time which elapses for the production of a defect in the field. Generally speaking, the

limitations which come on suddenly are not so liable to end in atrophy as those of slow, gradual invasion; but here again we must keep in view the known or probable nature of the central cause, as it is evident, for example, that any sudden alteration appearing after a lesion of traumatic, apoplectic, or even embolic origin would necessitate a more serious prognosis than a similar change owing its existence probably to vasomotor, hysterical, reflex, or other more or less obscure functional disorders.

In conclusion, I need haruly say that it has not been my intention in the preceding pages to enter into an exhaustive discussion of the pathological changes which occur in peripheral vision, but merely to point out to many who are engaged in general practice, and more especially to those who have so eagerly embraced the ophthalmoscope as an aid to diagnosis, that they have besides, in the subjective examination of the field of vision, a means which has not only been productive of great results already, but is capable of much further development. I am indebted to Dr Edmund Hansen of Copenhagen for calling my attention to many points in connexion with this subject, and I would take this opportunity of thanking him for the uniform kindness with which he has always placed the results of his extensive experience at my disposal.

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