Cases illustrating various types of scotoma in the visual field : portion of a lecture on "The visual field as a factor in diagnosis" delivered before the J. M. Da Costa Medical Society of the Jefferson Medical College / by G. E. De Schweinitz.

Cases Illustrating Various Types of Scotoma in the Visual Field.

PORTION OF A LECTURE ON "THE VISUAL FIELD AS A FACTOR IN DIAGNOSIS," DELIVERED BEFORE THE J. M. DA COSTA MEDICAL SOCIETY OF THE JEFFERSON MEDICAL COLLEGE.

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Ophthalmology.

CASES ILLUSTRATING VARIOUS TYPES OF SCOTOMA IN THE VISUAL FIELD.[1]

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GENTLEMEN,—The following cases illustrate several varieties of scotoma and demonstrate the value of careful perimetric examinations in the study of obscure ocular lesions. They differ widely from the ordinary oval areas of imperfect vision, found between the macula and the fixing point, in which the appreciation of colors is imperfect or lost, common to a group of cases which we are accustomed to describe as the toxic amblyopias. Although microscopic examinations of the optic nerves and of the visual tracts farther back, which is the only crucial test, so far as the localization of the morbid pathway is concerned, are wanting, the cases are not devoid of interest as clinical studies, and, therefore, are presented with this end in view.

SUB-ACUTE GLAUCOMA; SEMI-ANNULAR SCOTOMA; UPWARD IRIDECTOMY.

CASE I.—George S., American born, aged fifty, presented himself for treatment July 8, 1891, on account of failing vision in the right eye, the left eye having been removed four years previously, on account of an "inflammation" which caused blindness; probably glaucoma.

The patient complained of drawing pain in the right eyeball, frequent attacks of iridescent vision, and of an appearance resembling smoke in the horizon.

[1] Some of these cases have been presented to the Section of Ophthalmology in the College of Physicians of Philadelphia.

His vision, with + 1.25 c., axis V = $\frac{6}{9}$, T + 2; there was a faint haze in the cornea, which was anæsthetic; the anterior chamber was about normal in depth, the iris not atrophic, the pupillary reflex was prompt, and the ophthalmoscope revealed an oval, greenish optic disk cupped to the periphery, the bottom of the cup being — 4 D, sur-

FIG. 1.

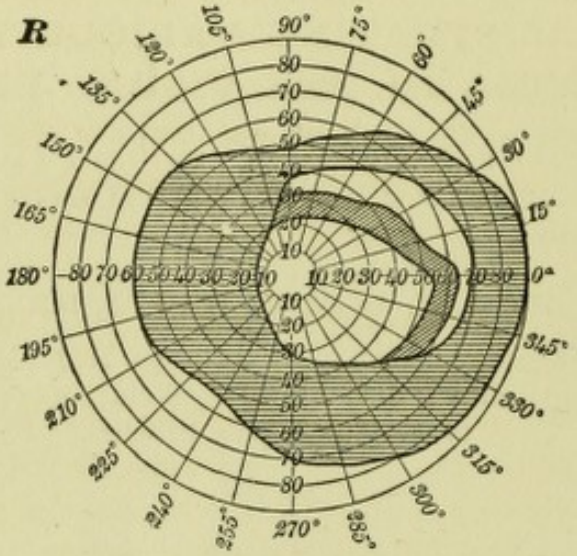

Diagram of the field of vision of Case I., illustrating concentric restriction, marked nasal contraction, and a crescent-shaped scotoma.

FIG. 2.

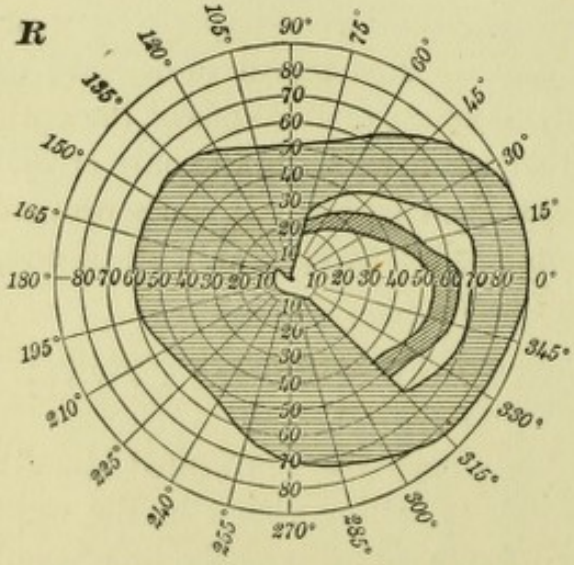

Diagram of the field of vision of Case I., after nine months' use of eserine. Compare with Fig. 1.

FIG. 3.

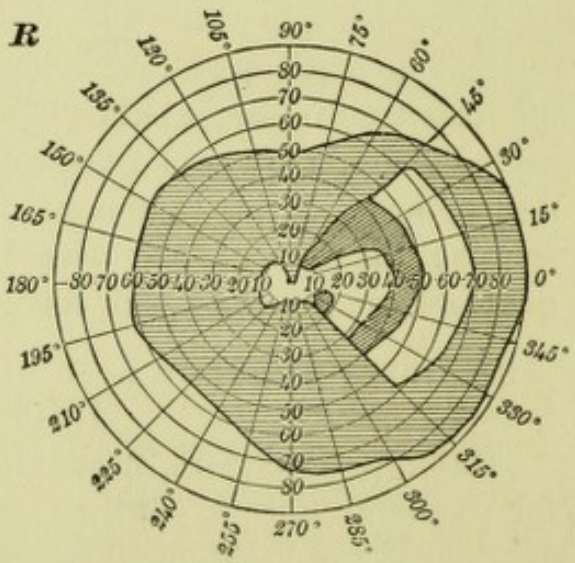

Diagram of the field of vision of Case I., eleven days after iridectomy.

rounded by a narrow halo, except down and in, where there was a faint pigment line with a crescent of choroiditis beyond it. The retinal vessels, both veins and arteries, pulsated strongly.

The field of vision is represented in Fig. 1. Iridectomy was ad-

vised but declined. Eserine locally and strychnine internally caused an improvement, so that the vision (July 24, 1891) rose to $\frac{6}{6}$; T + 1.

The patient was not seen again for nearly nine months,—namely, on the 27th of February, 1892. The vision was then barely $\frac{6}{20}$, the pupil semi-dilated and motionless, the arteries pulsating rapidly, and the tension + 3. This condition of affairs had occurred in spite of the continuous use of eserine, although how thoroughly applied it is impossible to judge. The visual field is represented in Fig. 2. Operation was again advised and again declined.

The next visit of the patient was on the 4th of March, 1892. There had been rapid failure of sight, counting of fingers being possible only within the area of the preserved field of vision. The serious nature of the case and the chances for and against iridectomy were explained, which, after a consultation with Drs. Randall and Jackson, was performed under ether without accident.

On the 15th of the same month the field shown in Fig. 3 was obtained; the coloboma was clear, the cornea not steamy; there was a slight opacity beginning to form in the lens and a small cystoid bulging of the inner end of the cicatrix was apparent; vision was $\frac{1}{24}$.

The patient has not again presented himself for treatment, although I have heard from him from time to time, and understand that there has been a steady increase of the blindness.

UNILATERAL RING SCOTOMA; INTERSTITIAL NEURITIS OF MODERATE DEGREE; ABUSE OF TOBACCO AND ALCOHOL; HISTORY OF RHEUMATISM AND MALARIA; SYPHILIS UNCERTAIN.

CASE II.—John Linch, aged fifty-three, born in Ireland, was admitted to the wards of the Philadelphia Hospital on the 15th of January, 1892, and gave the following history:

In March, 1891, he began to have a feeling of irritation in the right eye, followed by numerous photopsies in the form of flying stars. In three weeks his vision was very defective; he could read with the left eye only after shutting the right one, which watered readily.

His head was held in a very peculiar way, the face being turned toward the left shoulder, and the chin tipped upward. If the head was straightened, a strong tremor was produced, and the head gradually assumed the position just described by a series of jerks. The general functions of the body were normal, the urine was free from albumin and sugar, the heart-sounds were natural, the knee-jerks equal and normal, and the station was fair, only a slight posterior lateral sway being evident.

The patient had experienced three attacks of acute rheumatism, the last one a year ago. He had malaria in 1889, and also in 1876, while living in New Jersey, when he suffered for a long time with chills and fever every other day. There were no signs of lead poisoning and no positive symptoms of syphilis, although there was an uncertain history of lues in early life. He had smoked from boyhood about two ounces of tobacco per week, and had used liquor from early manhood, one-half pint of spirits per day.

With the right eye, vision = $\frac{6}{40}$ barely; unimproved by glasses. The direct pupillary reflex was slightly sluggish, the indirect action prompt. The optic disk was an irregular oval of dirty color, bounded on the temporal side by a black line, the nasal edges veiled. The retinal

FIG. 4.

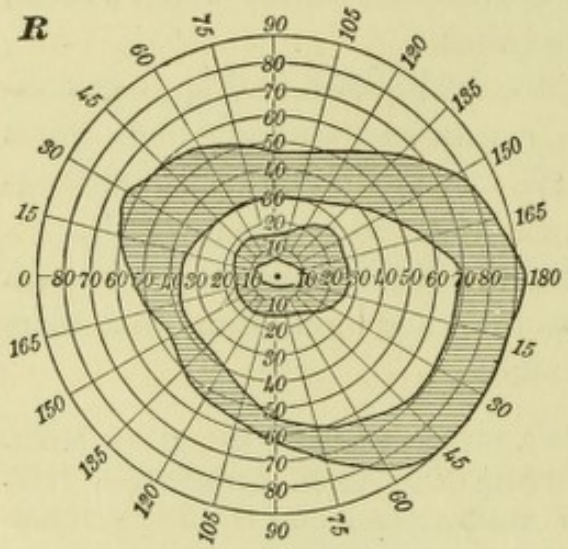

Diagram of the field of vision of Case IV., illustrating peripheral contraction and broad ring scotoma.

FIG. 5.

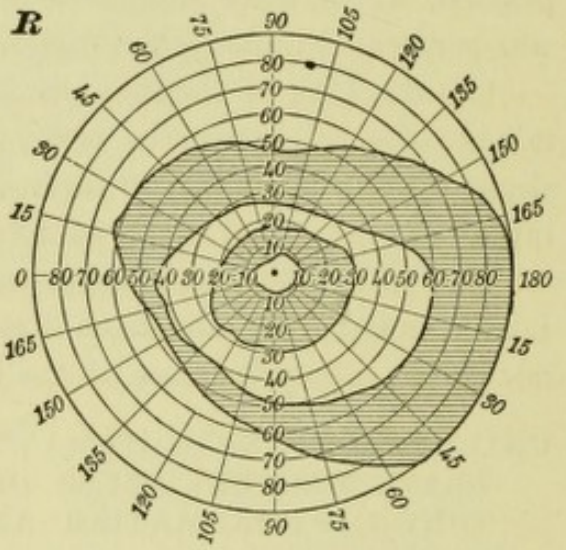

Diagram of field of vision of Case II. Compare with Fig. 4

veins were full, the arteries normal in size. There was general rarefaction of the choroid.

The pupillary reactions of the left eye were prompt, vision equalled $\frac{6}{6}$ after correcting a slight myopic astigmatism. The scleral ring was sharply cut all around a vertically oval disk, the outer half of which was slightly greenish in tint. The field of vision was normal.

The field of vision of the right eye presented the characters shown in Fig. 4,—namely, a very broad ring scotoma, which was absolute; also peripheral contraction, and achromatopsia.

No improvement took place under treatment, which consisted in stopping the tobacco and exhibiting ascending doses of iodide of potash.

The patient was not seen again until December 18, 1893, when the symptoms did not differ materially from those just recited. The vision,

as before, was $\frac{6}{40}$ barely. There had been more absorption of the pigmented epithelium, and between the disk and the macula a patch of superficial atrophy of the choroid had appeared, while in the periphery there was marked exposure of the deeper choroidal vessels, with dark, lozenge-shaped islands lying between them. The disk was a little more prominent, and the veiling of the nasal edges more marked. The field of vision was practically unchanged, save only increased peripheral contraction and some enlargement of the scotoma (see Fig. 5). The patient is now under treatment for a sarcocele, following an injury, probably sarcomatous in nature.

Remarks.—It is probable that careful testing of the visual field of cases of glaucoma would reveal the presence of scotomas more frequently than the ordinary descriptions of this disease would lead one to suppose. Bunge (quoted by Berry) found a central or paracentral scotoma four times in a hundred examinations, and when Bjerrum's method—*i.e.*, using small test objects at a distance of two metres—is employed, these defects are still more frequently discovered. To quote from Berry's[1] abstract of Bjerrum's article, "the glaucoma field, as taken by this method, shows an interference in the function of the retina, which, whatever be the part most affected, always starts from the papilla, and pretty clearly points out that, whether from pressure or otherwise, the defect is a result of a destruction of the fibres in the papilla at the margin or sides of the excavation."

In the case just described, the semi-annular defect becomes incorporated with the darkened area on the nasal side, and evidently represents a portion of a ring scotoma; indeed, in one map not here reproduced, and taken earlier in the history of the case, this ring character is more evident. The probable explanation of these ring scotomas is pressure upon the so-called intermediate fibres of the optic nerve-bundle.

Although the scotoma is a large one, it may readily be understood, from an examination of the charts, that it could easily be overlooked if the visual field was investigated by one method only,—viz., by passing the test-object along each meridian from without inward, and noting the point at which it was recognized. No map is complete until the area within the boundaries of the visual field is searched with small test-objects for defects of this character, and, according to Berry, the method of Bjerrum (unfortunately not tried in this case) is more exact than the ordinary procedure.

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[1] Ophthalmic Review, April, 1890.

In Case II. the scotoma is a typically annular one, and, taken into consideration with the ophthalmoscopic appearances of the disk, may be explained by an interstitial neuritis affecting the intermediate fibres of the nerve, without seriously encroaching upon the peripheral and macular bundles.

Swan M. Burnett,[1] in an interesting article on ring scotoma, directs attention to Bunge's assertion that the papillo-macular bundles supply the central area of the retina for an oval space 20 degrees in the horizontal direction and 10 degrees in the vertical, an area which in one of his cases approximately remained intact, being a counterpart of the central scotoma in circumscribed retro-bulbar neuritis. It will be noted that the same space, not greatly differing from Bunge's description, is unaffected in my case, and, therefore, the theory as to the probable localization of the lesion, already recorded, receives support. This line of reasoning is also utilized by Burnett, to explain the scotoma in his patient's visual field.

The ordinary explanation of ring scotoma, viz., choroidal lesion or degenerative retinal disease, is not suited to the present instance. Altogether, the symptoms point to optic nerve-lesion, although the peculiar head-tremor is suggestive of central disease. At present, however, our knowledge is too defective to speculate upon the nature and situation of an affection which would bear an etiological relation to an association of these two phenomena.

HOMONYMOUS LEFT LOWER QUADRANT SCOTOMA; LATER RIGHT LATERAL HEMIANOPSIA; STILL LATER RESTORATION OF UPPER RIGHT QUADRANT; AND, FINALLY, RESTORATION OF FIELDS, BUT DEVELOPMENT OF LARGE RING SCOTOMA.

Case III.—L. J., aged sixty-four, born in America, came for treatment April 11, 1888, complaining of inability to read accurately, of a bluish-black spot in each field of vision, and of attacks of subjective vertigo. His health had usually been sound, though he was subject to bilious attacks. Venereal infection denied; family history good; mental faculties normal; no anæsthesia; K. J. minus; urine negative.

Vision in each eye with proper correction, $\frac{5}{V}$; no paresis of ocular muscles; pupillary reflexes normal. The field of vision is depicted in Figs. 6 and 7,—viz., an absolute scotoma in left lower quadrant of each eye; in the remainder of the quadrant there was loss of color-sense, but preservation of faint form-sense; color perception was normal in the preserved areas.

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[1] Transactions American Ophthalmology Society, 1887.

Each optic disk was a small vertical oval, gray in its deeper layers, with the scleral ring all around and a small shelving cup. No change in retinal circulation, and no macular or retino-choroidal disease.

FIG. 6.

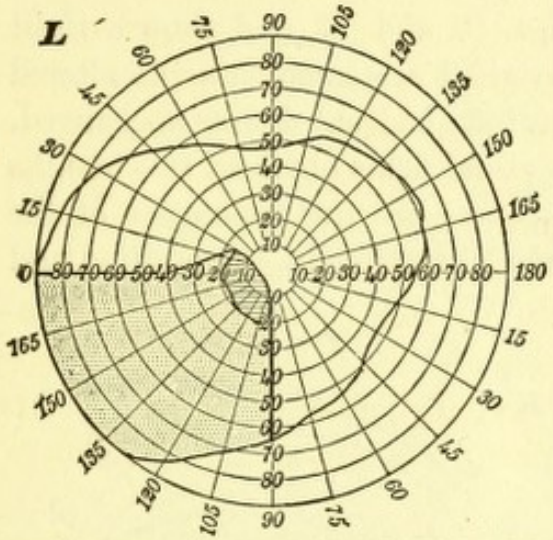
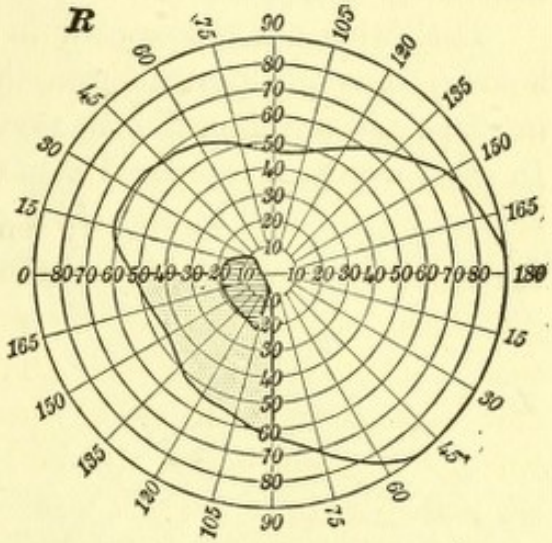


FIG. 7.



Diagrams of the visual fields of Case III., illustrating in the parallel-lined areas homonymous scotomata and relative quadrant defect in the dotted area. The peripheral boundaries of the form fields are normal.

The patient was seen at irregular intervals without material change until July 2, 1892, when he came, stating that in February of that year he had experienced a severe illness, chiefly characterized by paroxysms

FIG. 8.

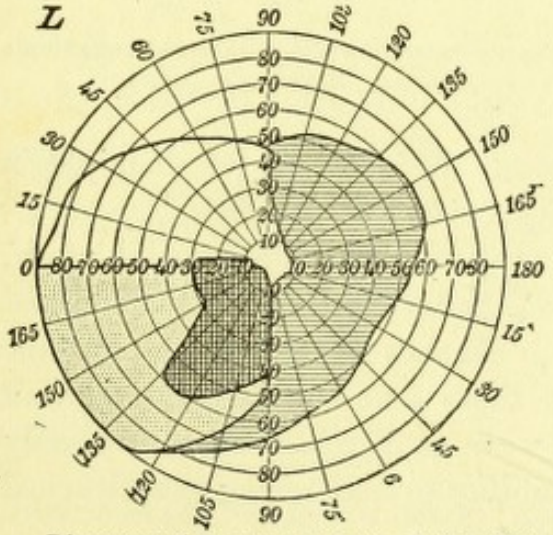
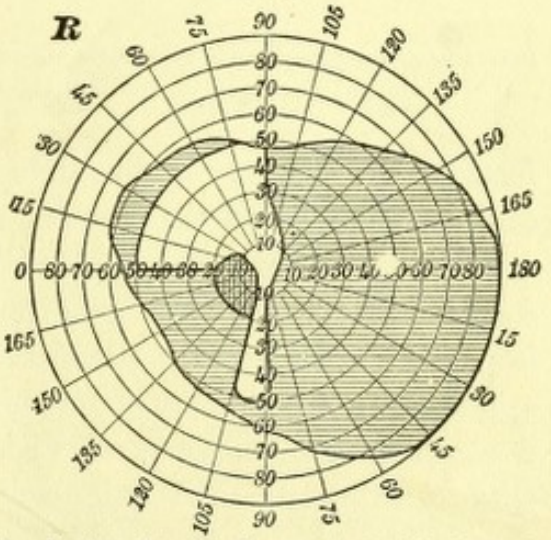


FIG. 9.



Diagrams of the visual fields of Case III., obtained after the development of right lateral hemianopia. The parallel lines represent the darkened fields, the cross-hatching the scotoma, and the dots the relative defect, which on the right side has become absolute.

resembling angina pectoris, and that three days previously he had awakened with much clouding of vision.

There were no ophthalmoscopic changes, but the visual fields, in

addition to previous lesions, now more exaggerated, showed right lateral hemianopsia. (See Figs. 8 and 9.)

The patient was not seen again until September 16, 1892, when he returned, stating that on July 19 of that year there had been temporary left hemiplegia, which was not then evident.

The fields are represented in Figs. 10 and 11, and show a right homonymous quadrant anopsia, the original scotomatous areas altered in shape and position, and the previous left quadrant defects unchanged. In other words, as compared with the visual fields obtained two months before (Figs. 8 and 9), the chief differences are the restoration of the upper right quadrant of each, and the alteration in the position and

FIG. 10.

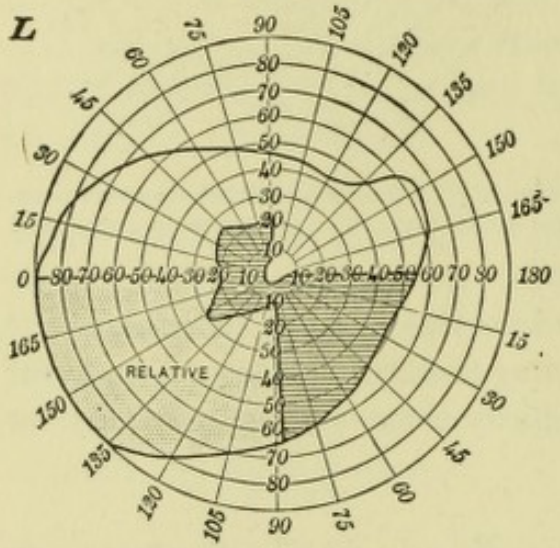
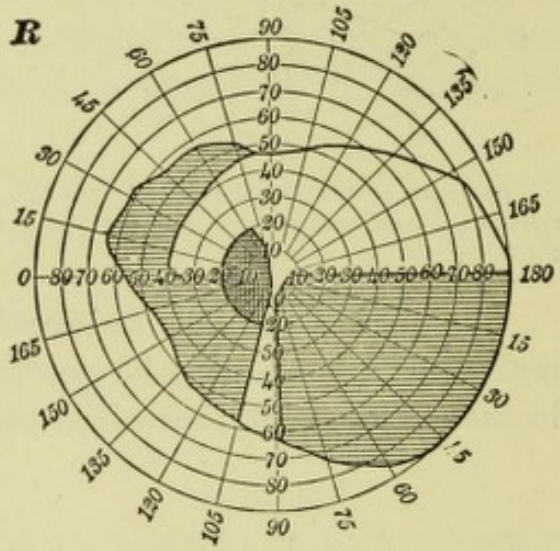


FIG. 11.



Diagrams of the visual fields of Case III., illustrating the restoration of the upper right quadrants and the change in the position and size of the scotoma. Markings as before.

form of the primary scotomatous areas. Evidently a left hemiplegia could not have been the cause of a right visual field defect.

Almost a year elapsed before the patient again presented himself, stating that his general condition was better, and that his vision had improved. There were practically no changes in the ophthalmoscopic appearances, which closely resembled those found at his original visit five years ago, and central vision with proper correction was only slightly subnormal. Vertigo and inability to read, owing to a darkened area on the page, were his chief complaints.

The visual fields obtained at this time are represented in Figs. 12 and 13,—viz., some peripheral contraction and a curiously-shaped ring scotoma.

Six months later (November 15, 1893) the patient again reported, and the maps shown in Figs. 14 and 15 were secured,—viz., less

marked peripheral contraction and ring scotomas, on one side partially relative, differing considerably in shape from those which existed half a year before.

FIG. 12.

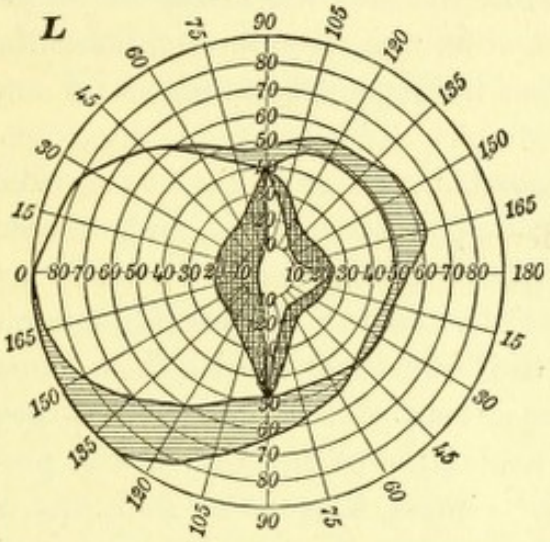
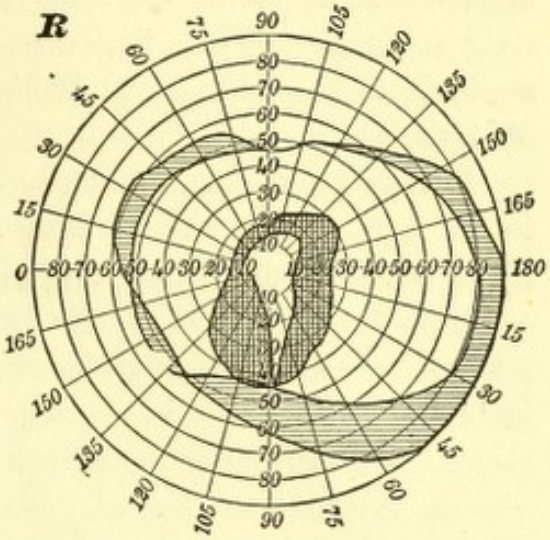


FIG. 13.



Diagrams of the visual fields of Case III., illustrating large ring scotomas.

Remarks.—The visual fields presented in this case represent studies made at irregular intervals during five years. Naturally, on account of their peculiar character, a suspicion may be entertained that the maps

FIG. 14.

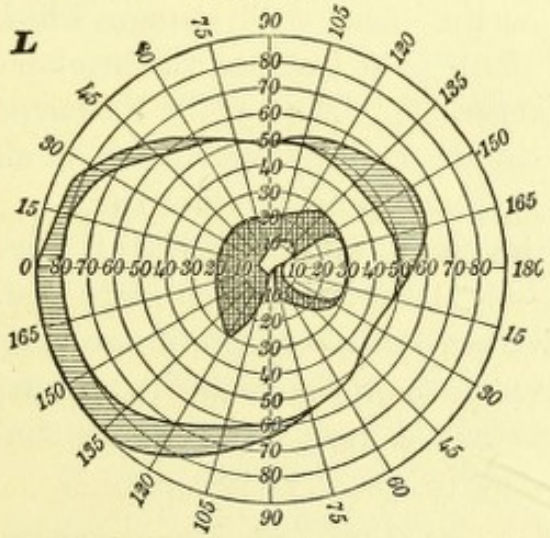
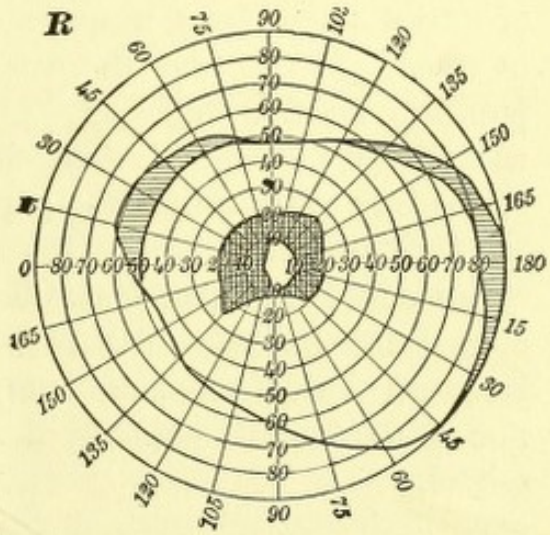


FIG. 15.



Diagrams of the visual fields of Case III., illustrating the final shape which the ring scotoma assumed.

are inaccurate, because any one who has had much experience in examining the visual field readily understands that exactness in finding the limits of scotomata, or the precise position of a dividing line between a darkened and preserved area, is a matter of extreme diffi-

culty. Hence it is not without interest to remark that the later fields in this case—namely, Figs. 10 to 15—were verified by independent observers, particularly by my former assistant, Dr. William Bruner, who studied the case with me at the time of the disappearance, or apparent disappearance, of the hemianopsia and the formation of the ring scotoma. While this does not eliminate error, it establishes the accuracy of the fields more firmly than if they were the results of one observer alone.

It may be assumed that the original disease or lesion was situated in the right cuneus; that a later lesion upon the opposite side caused right lateral hemianopsia, and that the resulting ring scotoma is not explainable in the light of our present knowledge. If these hemianopic phenomena were correctly observed, the lesions that caused them must have been temporary in character, or at least of such nature that they cleared up sufficiently to permit a restoration of function in the previously affected portions of the visual centres, because we find, first, a reappearance of the right upper quadrants, and, finally, a restoration of the entire field, except where the ring scotomas appeared.

In the final figures (14 and 15) the areas of preserved vision within the ring scotomas give somewhat the impression of hemianopic fields, particularly upon the right side, the dividing line so passing as to leave central vision intact. In one of Burnett's cases (*loc. cit.*) a somewhat similar condition was observed, and he refers to the possibility of a tract lesion being responsible for the visual field changes which he noted. If this were the case in the present instance, the hemiopic pupillary inaction ought to be demonstrable. Now, while I have no note that it was carefully sought for in the earlier observations, in all of the later examinations the pupillary phenomena were normal.

At some future time, when further study of this case shall have been made, I trust that I may bring the matter before you again with more definite information than I have been able to express this evening, because I could do no more than speculate upon the probable localization of the lesions, especially in so far as the ring scotomata are concerned.

UNILATERAL CENTRAL SCOTOMA; NORMAL FUNDUS OCULI; TRANSIENT ALBUMINURIA; POSSIBLE INFLUENCE OF HYSTERIA.

CASE IV.—Lizzie M., aged twenty-one, born in Ireland, presented herself for treatment, at the request of Dr. Edward Martin, October 21, 1893, with the statement that three days previously her vision had suddenly become misty before the left eye, the difficulty of sight,

preceded by slight pain, having been noted soon after rising in the morning.

The patient had been in this country for four years, had always enjoyed good health, never had rheumatism, malaria, nor were there signs of syphilis or any toxæmia. Menstruation was regular, and attended with only slight pain before establishment of the flow.

The patient was a slender girl, with good habits, her work as chambermaid being light and her surroundings exceedingly comfortable. There were no hysterical stigmata, and no signs of functional nervous disturbance except those furnished by the eyes.

The vision and accommodation of the right eye were normal. The visual field, both for form and for colors, was natural in extent, save perhaps slight contraction of the red and green lines and a coincidence

FIG. 16.

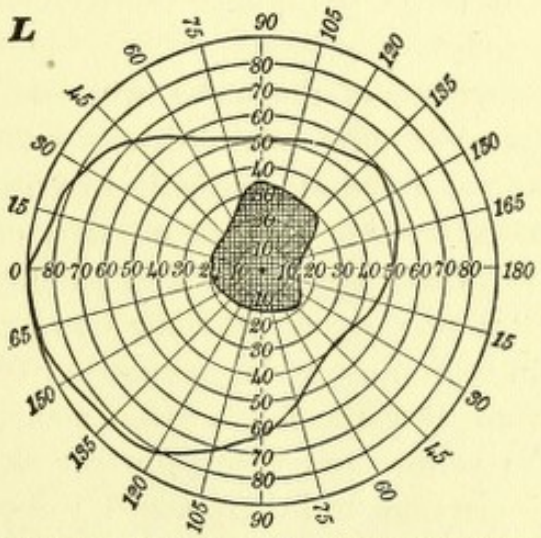


Diagram of the visual field of Case IV., illustrating large central scotoma.

of the red and blue lines, above and below, on the vertical meridian. The optic disk was nearly round, of good color, the scleral ring well marked, the veins full, and the arteries slightly tortuous.

Central vision of the left eye amounted to light perception, and the movements of the hand were detected in the periphery of the field.

A more careful examination of the field on the perimeter exhibited the conditions represented in Fig. 16—namely, a practically normal peripheral field, a large central scotoma which is absolute, and complete achromatopsia.

The ophthalmoscope fails to reveal any gross lesion in the fundus oculi, the disk being a vertical oval, of good color, the macula normal, the arteries full and rather tortuous, the veins slightly distended and moderately wavy.

The pupillary reactions of the right eye were normal; the direct reflex of the left pupil was nearly absent, although, by concentrating carefully a strong beam of light upon the retina, a faint reaction was visible. The indirect action was prompt and exact.

The urine in twenty-four hours was about normal in quantity, of lemon-yellow color, acid reaction; it possessed a specific gravity of 1018, and contained a large quantity of albumin and numerous oxalate of lime crystals. Sugar was absent, and tube-casts could never be detected.

The patient was placed in bed, the left temple blistered, and she was freely sweated by means of hypodermatic injections of hydrochlorate of pilocarpine. Nitromuriatic acid and compound tincture of gentian were administered until the oxalate of lime crystals disappeared, when this remedy was substituted with Basham's mixture and small doses of bichloride of mercury. For a few days in the early part of her attack she took iodide of potash.

Numerous examinations of the urine between the 21st of October and the 5th of November were made, always with the same result, although the amount of albumin gradually lessened. On the 6th of November it was not detectable with the ordinary chemical tests.

Vision began to improve after the first pilocarpine sweat, and by the first of November was $\frac{6}{15}$, the scotoma was practically gone, and color perception was beginning to be acknowledged. Red was called yellow or purplish all over the field; green, sometimes greenish and sometimes blackish; yellow and blue were correctly named. Three days later the achromatopsia had disappeared, the visual field both for form and colors was restored, and there was not the slightest trace of scotoma, the vision being $\frac{6}{7.5}$. On numerous occasions the usual tests for detecting malingerers were applied, but always without success.

If it is sought to explain this case as an hysterical phenomenon, it must be an exceedingly unusual one, although a few instances of scotoma attributed to this cause are upon record. In other respects the phenomena of the visual field were not unlike those seen in hysteric cases. On the other hand, it is not impossible that this was a case of postocular neuritis due to albuminuria, uncommon in type, particularly on account of its monolateral character. In this connection, the practical absence of the direct pupillary reflex indicating interference with the effect of light stimulus on the afferent pathway should not be forgotten.