VISUAL FIELDS

 

By

Hugh F. Webb, Opt. D.

With the Technical Assistance of T. A. Brombach, OPT. **D.**

May – 1942 Vol. 2 No.8

To be at all satisfactory and accurate visual fields must be based upon proven and true principles of anatomy and physiology. If the basis is not sound then the whole concept of visual field interpretation is false and will not hold up under trial. Also the methods of obtaining the fields become the controls upon which the premises are established, and if results are to be compared the same controls must always be used.

The theories and principles used in finding sources of exogenous intoxication through color field analysis are extremely valuable to Optometry because they differentiate the abnormal field cases who need to be referred to other practitioners from those we can safely keep entirely within our own field.

To be of assistance to practitioners who are just beginning to use visual field studies an organized summarization of material given outlining various classifications of information has been arranged. Let us consider in order the functions of motion vision, form vision, relative field size, color outlines and scotomas, and see what each means.

MOTION

The extent of the motion field represents the extreme periphery of the retina which is capable of receiving sensation of motion without recognition of the contours and outlines of the moving object. For clinical purposes three classifications as to size are sufficient. They would be termed large, medium and small.

The upper and lower extents of the field are naturally more restricted than the lateral aspects due largely to anatomical limitations. Laterally the sizes may be classed as follows:

	nasal	temporal
large	beyond 50°	beyond 70°
medium	40° - 50°	50° - 70°
small	less than 40°	less than 50°

Let the letter "M" represent motion, and the figure “1” represent a large field. Thus M-l would be translated as “motion large." If we let the figure “2" represent a medium sized field then M-2 would be “motion medium,” and if the figure “3" represents a small field M-3 would be “motion small."

Large motion fields are to be expected in normal cases, but a rigid rule in degrees cannot be applied. Slightly smaller fields may be considered normal if control tests show no variance and other clinical data prove negative.

A medium motion field is indicative of pathology if control tests over a period of time have shown a decrease from a large state. In the absence of this control a medium motion field can only be classified as tentatively normal even when all other clinical data are negative.

Small motion fields are always indicative of a pathological condition. If the fundus examination shows lesions, etc, reference to an ophthalmologist is in order If the fundus is negative the case should be sent to a neurologist without delay.

Occasionally we find only one of the motion fields small. When the cause is not found in the fundus it is nearly always due to a lesion between the chiasm and the eyeball on the side affected. Disposition of the case should be the same whether one or both eyes are affected.

For the sake of classification the small left field for motion but with normal right field is specified by M-4, and M-5 will be when the right is small with a normal left.

Sector shaped defects may be classed as:

(a) vertical, to which has been assigned the figure "6"
(b) horizontally to which has been assigned to the figure “7”
(c) monocular, to which has been assigned the figure “8”

In the vertical shaped sector defects we have the hemianopsias, bi-temporal, bi-nasal and right and left homonomous hemianopsia. These have been adequately described in volume 1 number 5.

Horizontal sector shaped defects are altitudinal, and upper and lower homonomous hemianopsia, and quadrant anopsia. These likewise were discussed in volume 1 number 5.

Monocular sector defects are Roenne's nasal, step found in glaucoma, trauma, degeneration and sometimes from ethmoidal and sphenoidal sinus disorders.

Those defects that are irregular will be designated by the figure "9." Tabes dorsalis, a lesion of the spinal lumbal section, usually due to syphilletic infection, often produces one of the irregular fields, and usually it affects one eye before the other. Over a period of time a progressive irregular contraction will be evident, and along with this will be a gradual loss of central vision. Eventually there will be a complete amurosis this usually occurring from two to four years after infection. Occasionally the visual loss is slower and it begins as a sector loss rather than irregularly concentric.

Another common lesion causing irregular losses of motion is multiple sclerosis. The sclerosis may be affecting the nerves in the optic tract, chiasm or brain. In addition to irregular peripheral contractions scotomas will be manifest. Fundus examination is usually negative. Often these field defects are permanent even though a cure from the multiple sclerosis is affected.

When motion perception is lost entirely w*e* represent it with the figure "10." Motion may be entirely lost without affecting form or color vision. When this happens it is often associated with left or right anesthesia. Also we may maintain motion vision when form and color are lost, even though there be a retinal degeneration.

FORM

Experimentation has established the fact that the recognition of white coincides so closely with the recognition of contours and outlines of an object that the extent of the form field is determined when the patient reports the perception of a white target. White will be seen very early as the white target approaches center from the periphery while in motion, but if the target is held stationary the white will fade away, and reappear when in

motion again. Obviously the first recognition of white while it is in motion is not a measure of the form field. The extent of the form field is determined when the patient can retain the perception of white in a stationary position.

In order to establish a collapse of the form field a 5 mm target at the distance of the ordinary arc perimeter, which is about 1/3 meter, is recommended. Naturally a smaller target will register a smaller field for a normal person.

Like with the motion field three general classifications as to size are sufficient. They are large, medium and small. Large form fields are to be expected in both eyes for all normal cases.

For clinical purposes the following will suffice:

	Nasal	temporal
large	40° - 48°	40° - 50°
medium	15° - 40°	20° - 40°
small	less than 15°	less than 20°

Medium form fields may be considered normal if they are in a direct relationship with motion fields. However, when motion fields are large and form fields show restrictions they must be considered as indicative of pathology; or, in some cases visual fatigue to the state of creating and exhaustion. (see vol.1 no.8).

Small form fields are positive indications of focal infections (locked infections) if no changes occur in comparative tests morning and evening, and the motion fields are unimpaired. Exhaustion may create a small field in the evening with a normal field in the morning. Exhaustion fields, however, usually affect one eye more than the other, and infrequently reach the state of collapse to inside 15 to 20 degrees, which is the limits of the small field for white.

Large, medium and small fields for motion are diagnosed by the figures 1, 2 and 3. In classifying fields we have the problem of indicating whether the fields were taken in the morning or evening. To solve this two figures are ascribed to each of the sizes, and the letter "F" represents "form." A large field in the morning will be called F-I and a large form field in the evening will be called F-6. Morning medium fields will be F-2 and evening medium form fields will be F-7. Small morning fields for form are F-3 and in the evening are F-8.

When two sets of visual fields are recorded, one morning and one evening, and the form fields are large at both times, it will be recorded as F-l6. If both sets of form fields are medium they will be classified as F-27, or small as F-38.

If form fields are large in the forenoon but small in the evening they will be represented by the symbol F-18.

In addition we may have an adequate right form field but a small one on the left. This is represented in the morning by F-4, and in the evening by F-9. If the reverse is found, that is, the left is adequate but with a small right, it is classified as F-5 in the morning and F-IO in the evening.

This latter group of small form fields in one eye only is usually a fatigue problem, especially when, it is found in the afternoon only. A symbol for this would be F-19, indication a large morning field but in the afternoon a collapse of the left form field. (see vol. l no.8 where this is described in both industrial correlation work and in relation to exhaustion in athletes).

It is important to note here that frequently these conditions cause a collapse of form field to inside the area

containing the normal blind spot. Certainly blind spot measurements will not be accurate if the form recognition is reduced so as not to include the area surrounding the nerve head.

(This analysis and analytical interpretation will be continued in the next paper).

VISUAL FIELDS

  Duncan, Okla.

By
Hugh F. Webb, Opt. D.
With the Technical Assistance of T. A. Brombach, OPT

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No. 9

In presenting an analytical interpretation of visual fields let us next consider the relative size of the color fields. The relative size is purely dependent on individual reaction of the patient. Although tables of average size color fields have been made by many investigators (see Vol. No.9) so much depends on the technique of the operator, patient reaction, development of the color sense in the patient, and controls such as instruments, targets, etc., that only comparative clinical significance can be claimed for this division of visual field measurements.

The same as was done in assigning numerals to the size of the field and the time of day to form field interpretation, we find the relative size of the color field designated in the same manner. The letter “R” represents “relative size.” Figures “1“ and “6" represent a large field in the morning and afternoon, R-l represents a large relative size of the field in the early part of the day, and R-6 represents a large relative size late in the day. R-2 and R-7 indicate medium relative size morning and evening, and R-3 and R-8 indicate small relative size morning and evening. Using these combinations we f1nd that R-26 indicates a medium relative size in the morning but a large relative size in the evening.

R-4 is ascribed to an adequate relative size in the right eye and small relative size in the left in the morning. The same condition in the afternoon is classed as R-9.

R-5 means adequate relative size in the left eye but small right in the fore noon. The evening symbol for this condition is R-10.

Unless other field phenomena indicate the presence of an exogenous toxic agent, the change during the day from an adequate relative field size to small, in one or both eyes, it usually is the result of exhaustion.

COLOR FIELDS

Much emphasis has been placed on the importance of color field interpretation and many case records have been shown to demonstrate their use and value. Of course, they must be properly interpreted or they are valueless.

Green is the color most drastically affected by chemical change in the organism._As a result of drugs and other activities the outline for green may interlace or overlap the outline for red, and in some cases extend beyond blue, to resume nom relationship with the other colors after the effect of the causative agent is eliminated. Then again, there may be drastic collapse for green without affecting the relative size for red and blue,

Red may interlace or overlap the blue outline with a restriction of the relative size of the entire color

field. This is indicative of a depressive state of exogenous intoxication when found in the evening only, or, of the secondary stage of auto-intoxication when present forenoon and afternoon. In certain types glandular dysfunction red may extend beyond the normal blue field with relative size large.

Blue, normally the largest of the colors is of value only to record the interlacing and overlapping affects with red and green or in the recording the exaggerated or reduced relative size of the entire color field,

Clinical value of this use of color fields is dependent upon strict adherence to the prescribed technique and standard illumination. (see Vol. 1 No.3). Daylight cannot be used due to its constant variation in light intensity.

All colors will be seen first while the target is in motion approaching center from the periphery. When the target is stopped and is stationary the color may then fade away. Comparative analysis for the findings as taught through this course is dependent upon color fields being recorded where the true saturated color can be maintained while the target is in a stationary position.

The letter “C” represents color, and the figures represent the normal relationship, or the overlapping or interlacing effects, and the hour of the day. Morning fields will be indicated by the following numerals:

1. Represents a normal color relationship.
2. “ green over red.
3. “ red “ blue.
4. “ red over blue with small green.
5. “ red over blue and green over red.

The first three are the three basic general phenomena. The latter two are more specific and probably indicate stages between the true stimulative and definite depression.

The figures 6, 7, 8, 9, and 10 have the same meaning as 1, 2, 3, 4, and 5, except that they indicate afternoon fields.

Any interlacing or overlapping effects of the characteristic color fields outlines is abnormal and apparently indicates an imbalanced condition of the chemistry of the organism.

Comparative tests are absolutely essential. Fields may at certain periods of the day, apparently, show nearly normal color fields due to effects of dual agents of an endogenous toxic depressant and the stimulative effects of an exogenous agent.

SCOTOMA

All defects of the visual field which do not extend to the periphery are properly designated as scotomas. They are insular like spaces of defective vision lying within and surrounded by more or less normal field.

Scotoma, like motion fields, are classified according to the kind of the defect, and no special designation is made as to the hour of the day. Most scotomas remain constant at different hours, except with some relative scotomas.

The letter "S” stands for scotoma, figures associated with the letter differentiate the kind and quality of scotoma.

S-1 means positive scotoma - the patient is aware of the loss.
S-2 means negative scotoma - the patient is unaware of the loss.
S-3 absolute scotoma - all perception of light wanting.
S-4 relative scotoma - light sense is subnormal and the color sense is usually defective for red and green. We may also have relative scotoma for blue.
S-5 central scotoma - includes- the point of fixation.
S-6 pericentral scotoma - the point of fixation is at or near the center of the defect.
S-7 para central scotoma - not including the point of fixation but being near it.
S-8 peripheral scotoma - located near the peripheral limits of the field.
S-9 bi-lateral scotoma - affecting both eyes.
S-10 uni-lateral scotoma – affecting one eye only.

It is obvious that one scotoma may be classed under several of the subdivisions. For instance we may have a scotoma S-2-4-7-10, which would be interpreted as a scotoma negative, relative, para central and uni-lateral.

Total loss of the color sense in the visual field is rare. When this form of color impairment is present the patient may recognize different degrees of brightness in the test objects. If the loss follows normal color perception it is extremely difficult, if not impossible, to obtain a color field charting. This would be dependent on the cause of the loss. If the person is afflicted with achromatopsia so he has been totally color blind all his life we have much more hope. These persons can usually differentiate their colors by their intensity of apparent grey to them. If they are shown the differences in the apparent shade of grey they will be able to tell when that shade of grey is reached, the same as a person with normal color vision can tell when the saturation of a color is reached. Many persons with achromatopsia can have visual color fields measured, and diagnosis is just as accurate from such an analysis as if the person possessed normal color perception. The same is true with partially the color blind, and some persons having dyschromatopsia.

This, and the immediate proceeding paper, present in a very condensed form the summary of analysis and classification of abnormal visual fields. The analysis is, of course, the most important part of the entire procedure. This does not imply that fields inaccurately measured can be compensated for by interpretation. Precise work under definite controls must be exercised, but following that there must be an orderly interpretation. Like all biological tests, mathematical precision in results is not to be expected. At best, visual field measurement is a subjective test that records the reaction of the patient to the manner in which the stimuli was offered.

In presenting this method of analyzing the various field phenomena6 the upmost care has been taken to remain within conservative limits. Therefore the analytical chart to follow must be utilized only as a guide for a logical interpretation of various measurements of visual fields, and must not be considered as a substitute for other diagnosis of pathology.

The analytical chart has been divided into five principle sections. The subdivisions classify the various types of standard observations. The final analysis of these various findings can be reduced to a formula by recording with letters and figures the visual field indications in morning and evening tests.

The following formulas are results of 25 years of investigation covering over 30,000 case records which permits their clinical acceptance as a guide to a logical interpretation of visual field measurements.

ANALYTICAL CHART

Plate No. 1

MOTION

M

1. O.U. Large
2. O.U. Medium
3. O.U. Small
4. O.D. Large - O.S. Small
5. O.D. Small - O.S. Large
6. O.U. Vertical Sector Defects
7. O.U. Horizontal Sector Defects
8. Monocular Sector Shaped Defects
9. Irregular Sector Shaped Defects
10. O.U. Motion Perception Lost

FORM

F

A.M.

1. O.U. Large
2. O.U. Medium
3. O.U. Small
4. O.D. Large O.S. Small
5. O.D. Small O.S. Large

P.M.

6. O.U. Large
7. O.U. Medium
8. O. U. Small
9. O.D. Large - O.S. Small
10. O.D. Small - O.S. Large

RELATIVE SIZE

R

A.M.

1. O.U. Large
2. O.U. Medium
3. O.U. Small
4. O.D. Medium - O.S. Small
5. O.D. Small - O.S. Medium

P.M.

6. O.U. Large
7. O.U. Medium
8. O.U. Small
9. O.D. Medium – O.S. Small
10. O.D. Small – O. S. Medium

COLOR FIELDS

C

A.M.

1. O.U. Normal
2. O.U. Green over red
3. O.U. Red over blue
4. O.U. Small green –Red over blue
5. O.U. Red over blue

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6. O.U. Normal

P.M.

7. O.U. Green over red
8. O.U. Red over blue
9. O.U. Small green - Red over blue
10. O.D. Red over blue - O.S, Green over red

1. Positive
2. Negative
3. Absolute
4. Relative
5. Central
6. Pericentral
7. Para Central
8. Peripheral
9. Bilateral
10. Unilateral

TYPICAL CASE INDICATIONS Plate No. 2

1. NORMAL	(M 1)	(F 16)	(R 16)	(C 16)	
2. NORMAL	(M 1)	(F 27)	(R 27)	(C 16)	
3. EXOGENOUS (Stimulative Stage)	(M 1)	(F 16)	(R 16)	(C 17)	
4. EXOGENOUS TOXEMIA (Depressive State)	(M 1)	(F16)	(R 27)	(C 18)	
5. EXOGENOUS TOXEMIA	(M 1)	(F 16)	(R 27)	(C 18)	(S 2-4-10)
6. ENDOGENOUS TOXEMIA	(M 1)	(F 27)	(R 27)	(C 27)	
7. ENDOGENOUS TOXEMIA	(M 1)	(F27)	(R 27)	(C 38)	
8. ENDOGEOUS TOXEMIA (Focal infection)	(M 1)	(F 38)	(R 38)	(C 38)	
9. GLANDULAR DYSFUNCTION	(M 1)	(F 16)	(R16)	(C 27)	
10. GLANDULAR DYSFUNCTION	(M 1)	(F 16)	(R 27)	(C 38)	
11. EXHAUSTION	(M 1)	(F 19)	(R 1-10)	(C 18)	
12. EXHAUSTION	(M 1)	(F 1-10)	(R 1-10)	(C 18)	
13. LESION OF VISUAL PATHWAY	(M 3),	(M 4),	(M 5),	(M 6),	(M 7), (M 9) or (M 10
14. PRESSURE OR LESIONS	(M 9)				

In clinical practice variations will be recorded. Activities of dual toxic agents may at first make it impossible to analyze field indications according to the formulas suggested for clinical interpretation.

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By
Hugh F. Webb, Opt. D.
With the Technical Assistance of T. A. Brombach, OPT

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With the principles of the Analytical Chart firmly established in our minds let us make practical use of the information in the manner which will become routine with us in practice. In order to do this, procedure will be altered slightly from preceding papers. Rather than describe the disorder and then show results on the visual fields, fields will be shown first and we will then try to find a possible answer before we read the completed discussion on the case.

Figures 1 and 2 show case "A" fields early in the morning and in the afternoon. History of the ocular disturbance is a gradual increase in headache after visual concentration. It is accompanied by a nausea, always worse in the afternoon, and seems to be present no matter what kind *of* use he has made *of* his eyes during the day. He had no oral infections, and had two dentures. A physical examination by the company physician made five weeks before was negative. His age was 38, and he was employed as a lineman for an electric power company.

Before going farther get out your analytical charts and tables from the last two month's papers. Take a blank piece *of* paper and make a place for your field analysis formula, ie, (M)(F)(R)(C)(S). As motion, form, relative size, color fields and scotoma are discussed fill in the numerals according to your own interpretation. When you have your material ready continue reading, but not until.

In analyzing the charts we find that motion will fall into one of the classifications *of* large, medium or small. Place in YOUR formula, following the letter M the numeral you feel best represents the motion field shown in chart 1. You will find a table in the May paper (Vol.2 No.8) showing what constitutes large, medium and small motion fields. In plate No.1 of the June paper (Vol. 2 No.9) you will find the numeral to apply to that field size.

Next let us consider the form field. Again referring to the May paper you will find a table *of* sizes for the form field that will enable you to determine the size classification for form. In plate No.1 of the June paper is given the numeral that indicates the size. Find the numeral which in your judgement best describes the size of the form field in the morning (figure 1) and record it in the space following the letter F. Next find and record the numeral that best describes the form field in the afternoon (figure 2).

Follow the same procedure in building the formula as to the relative size of the color fields and record the numerals following the letter R.

Next comes the important phase of interpreting the color fields themselves. Find the numerals that are symbols *of* the conditions shown, and record them following the letter C. Be sure the morning numeral is first, followed by the afternoon numeral in all cases.

If you haven't followed in detail the exercises go back right now and build your own formula before proceding further. Write it out.

If you have followed instructions properly your formula will correspond to the formula recorded under "Case A" at the end of the paper. Let's see why! The table in the May paper says that in order to be classed as large the motion field must extend beyond 70 degrees temporally and beyond 50 degrees nasally. This we do have, without sector defects, etc. and so the field is considered large (M-1).

To have the form field classified as large it would necessarily be larger than 40 degrees nasally and temporally. This is not the case here, and so we look at the next classification which is medium. To be classed here it would have to be not less than 15 degrees nasally and not less than 20 degrees temporally, and also less than the requirements for a large field. This seems to be the case both morning and afternoon, therefore the morning symbol of 2 and the afternoon symbol of 7 would complete the form field recording, (F-27).

The same reasoning holds true in analyzing the color field. True the green and red are very small, but not ALL of the colors are small Therefore the medium classification will suffice (Rc27).

C is the letter symbol for color. Following down the analytical chart we find the normal color relationship in the morning is represented by the figure 1, and the red over blue phenomena, encountered in the afternoon only, is represented by the numeral 8. Thus the proper symbol for the condition shown would be (C-18).

Now carrying this formula for "case A" to plate No.2 in the June paper we find that it fits into one of the typical case indications. Find it before going on. ****

The fourth one down matches it, and so we can safely tell this patient that his findings are indicative of a condition of exogenous intoxication, that is, something being taken into his organism during the day is poisonous to him. Since only two known possible agents are being used, coffee and tobacco, it is logical to suspect one of them first. We can safely say "if one of these agents is responsible for this intoxication, it's elimination for a 24 hour period will produce normal visual fields at the end of that period." Then a control test can be made 24 hours later, or any longer period of time during which none of the agent under suspicion is taken. This very thing was done for this patient, "Case A.".

He returned 48 hours later having taken ne1ther coffee nor tobacco for that period. The fields were normal as recorded in figure 3. (right eye only shown). He was dismissed with the advice that the non-use of coffee and tobacco would aid materially in his adaptation to his visual needs sphere of .25 diopter more than he'd been wearing was given to eliminate his B-1 symptoms. The 21 day progress report proved the value, both in the findings and in the complete disappearance of all symptoms.

If desired this case could be carried further and by the elimination of one agent one at a time, but using the other, the offending agent could be singled out by noting the effects on the fields.

Another case wherein the visual field formula proved to be the making of the case is the following, "Case *B.*" An office receptionist, age 24, complained of continual headache and lack of energy. She had been taking vitamin B complex, carefully watching her diet and exercise and even nine hours sleep nightly didn't seem enough. A *B-2* problem was corrected by increasing the plus three-quarters of a diopter and to be worn for near only. Figures 4 and 5 are fields taken in the morning and late afternoon.

Draw another formula (M)(F)(R)(C)(S) and fill it out according to the field charts. AFTER you have made YOUR OWN formula compare it with that of "Case B" at the end of the paper.

When you have written out your interpretation of the field, read further, but not until you have worked it out for yourself.

We find the motion field to exceed the requirements to be classed as large, therefore we can ascribe the numeral 1 after the letter M, (M-1).

The form field exceeds 40 degrees temporally and nasally both morning and evening and so we can class it as large both times, (F-16).

The relative size of the color field is not excessively large, nor small compared with that of form, and so we class it as of medium size at both times, (R-27).

The color fields show red and blue interlacing both morning and evening and so we ascribe figures 3 and 8 to them (C-38).

There are no scotoma.

According to plate 2 of the June paper

the formula we find in "Case B" is listed as No. 10, glandular dysfunction.

The 21 day progress report showed no improvement, in fact the near nets had dropped to less plus acceptable than in the original examination, and it was telling in the symptoms of distress. Nothing had been done about the recommendation to have a physical examination. An insistance was made however, at this time, to have a basic metabolic test run. It showed a thyroid problem. Iodine in an inert base in tablet form was prescribed. Two weeks later the visual fields were taken and were normal as shown in figure 6, conclusively proving the validity of the diagnosis of glandular dysfunction as taken from that analytical chart.

Not all cases will be such clear cut and typical ones as the two shown. Not all formulas will conincide exactly with those of typical case indications of plate No.2 in' the June paper. From these basic formulas, however, we will be able to properly analyze many other formulas that do not type "to the letter." In addition many cases will of necessity be marked "etiology unknown."

Many more typical and atypical cases could be shown but it would only serve to prolong the material without contributing information. By now every practitioner should have ample case material to practice making formulas and analyzing them.

Case A (M-I)(F-27)(R-27)(C-I8)
Case B (M-I)(F-16)(R-27)(C-38)

Note:

Many questions have been sent in regarding details of interpretation. Many of these have been answered by direct correspondence. It is planned that a series in these papers be devoted to answering questions, clearing up any possible confusion and emphasizing important points. Also there will be a series of definitions. This series will probably begin with volumn 3 number 6 and continue to volumn 3 number 12. In order that we may know what are the most pressing problems, compile your questions in concise form and sent them to the O.E.P. office in Duncan, Oklahoma.

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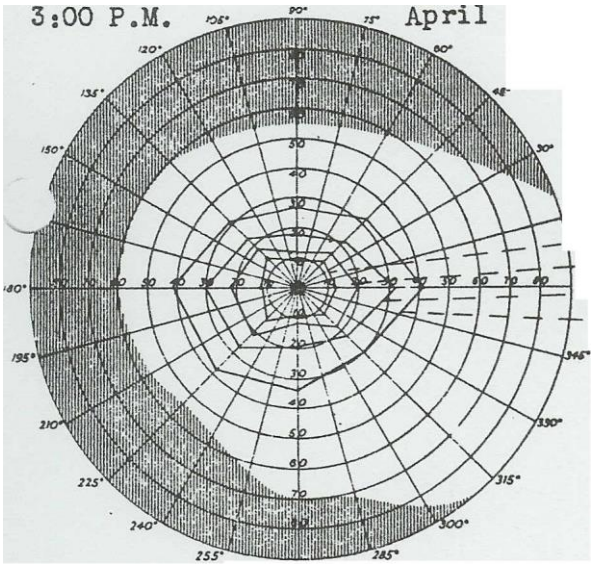

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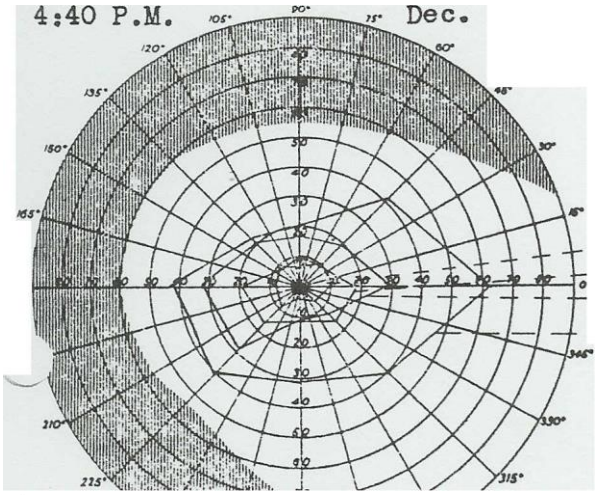

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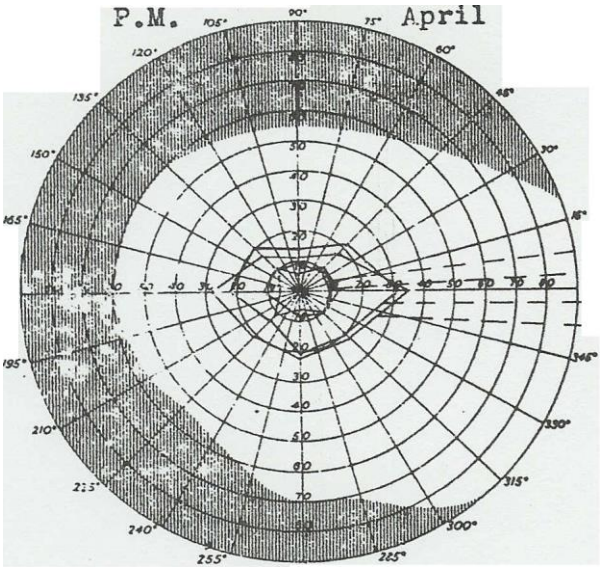

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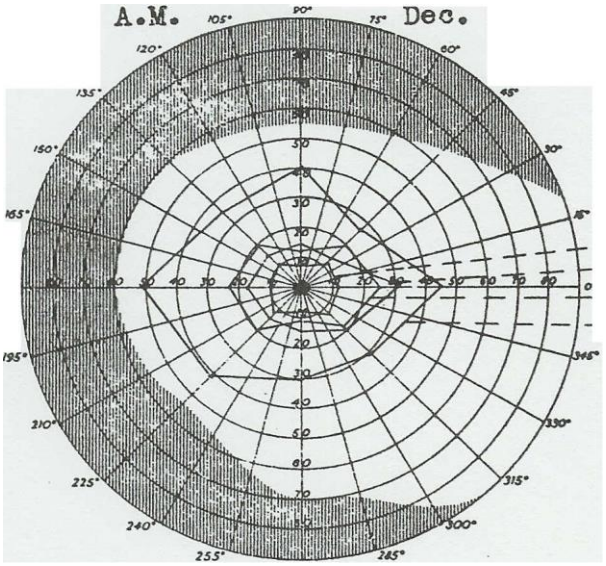

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