

# VISUAL FIELDS

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Duncan, Okla.

By

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The visual field indications from exogenous sources of intoxication, such as the various alkaloids, are a little more spectacular and dramatic in the third stage than that of the first two stages. Because of this, and, that it is a little more obvious due to its advance stage, this so-called degenerative, or amblyopic phase, is much better known to the average practitioner. It has been known for a long time past and is not new as we here present it. It has more often been called "toxic amblyopia". Lloyd says toxic amblyopia, retrobulbar neuritis and axial neuritis are interchangeable titles, and are usually lesions of the optic nerve.

The characteristic field indications of the degenerative stage are the formation of scotomatous areas, usually central. Green and red, according to Pressburger being colors of the nerve fibre, are first affected and may show blind spots while white perception is perfectly normal. As the condition advances white will also be affected. Cases usually show other symptoms such as ocular discomfort, reading disability, fading portions of a page, etc, in the latter stages only. Because of this few cases are encountered that show only a green scotoma. Patients don't seek professional help in this stage. Much more common is the appearance of the red scotoma, but many don't seek help until there is a definite white lesion.

Commonest among the alkaloids that may be responsible for toxic amblyopia are those found in tobacco and alcohol, either individually or in combination. Because of their commonness and marked characteristics they will be treated specially in another paper and so will be further considered here. Other alkaloids, common among agents responsible for visual disturbance will be treated independently also.

In addition to these alkaloids many drugs are known to produce amblyopia although their occurrence is much less frequent. They are (1) quinine, which acts as a vaso constrictor giving spasm to retinal vessels, and damages ganglia of the conduction system. The field phenomenon is one of scotoma for red and white and extreme peripheral contraction of form. Elimination of the quinine usually restores vision if not too long delayed. (2) Lead is one of the metallic poisons sometimes given as a therapeutic agent. It's affection is marked amblyopia and a central scotoma appears. Elimination of the lead usually restores vision. Cases have been noted where this poisoning is obtained by children eating flakes of leaded paint from furniture, etc. (3) Arsenic is another metallic poison often used for therapeutic purposes, especially in relation to skin diseases. The field indications themselves are not distinguishable from lead, (4) mercury, and other metallic poisons, but prompt reference of one of these cases to the proper practitioner may be the means of, preventing the loss of sight. Some cases of arsenic poisoning have been traced to corn plasters containing arsenic. Others have been from accidentally taking it internally with food. Certain types of hair dyes, face creams, nail polishes, clothing cleansing compounds, etc, have proved to contain some of the poisons which have produced blind spots, but more recently this source has been eliminated thru pure food and drug laws, etc.

In degenerative amblyopia one eye is always more advanced than the other. Usually one eye registers the effects of depressive intoxication while the other shows the central scotoma. The general size of the fields is depressed, especially in persons of more advanced years. Ophthalmoscopic examination is generally negative. If the cause is from exogenous intoxication this degenerative phase is the most advanced stage, having passed through the exhilarating effects of the stimulative stage and the depressive effects of the second.

Due to the central scotoma it is almost impossible to secure duccion findings. Recovery points will be especially low, and even erratic. Phorias will have to be obtained by Maddox rod streaks, etc, because it will be impossible for a patient so affected to read small letters. Even at best they will not be accurate and reliability is questionable except as an indication that may be compared with other phorias at other times and under different degrees of intoxication.

Clinical experience tells us that the eye that develops the symptoms first in the depressive stage will be the eye which will produce the more advanced scotoma. It will show first for green, then red, then blue before becoming absolute. The other eye will go through the same stimulative and depressive stages, but may or may not get to the degenerative stage. Visual acuity of resolution is from 20/80 to 20/200, and recovery is possible only after elimination of the causative agent. Field tests taken between 24 and 48 hours after elimination of the true toxic agent will show the disappearance of the functional derangement and the degenerative effects.

After the etiological factor is found the patient should invariably be referred to the family physician with a complete record of the visual analysis.

It is important and must be remembered that visual field charts will not differentiate the various poisons. There is no specific type of field defect that indicates any specific type of toxic agent. Visual field derangements only indicate an abnormality of function at the time of the test. These indications, however, shout multitudinous warnings to the practitioner of wisdom. Finding sources of exogenous toxemia is not only a valued service to the patient but is a means of maintaining good will among those where it may otherwise be impossible. It is a very common thing to have patients become dissatisfied with their lens prescriptions when the cause of their visual discomfort or inefficiency is due to the disturbance of chemical imbalance of the organism. If these imbalances are found and the patients are advised to eliminate the sources, then, whether the advice is followed or not, the optometric practitioner is in the clear. His work in lens prescription is not subconsciously criticized by the patient because he knows that he was warned ahead of time that the toxic agent would disrupt normal function, and efficiency and comfort could not be expected as long as the toxic source persisted.

## ENDOGENOUS TOXINS

In lesson No. 10 a method was given to distinguish toxic sources being taken into the organism (exogenous) and toxic sources arising inside the body (endogenous). Emphasis has been placed on exogenous intoxication and we will continue to do so because they are much more in the working field of the Optometrist. Endogenous toxins are fully as important, however, and are sometimes more dangerous. For this reason it is very important that these cases be recognized and referred to the proper practitioner for care.

Endogenous toxemias go through the same stages and similar visual fields manifestations as do

exogenous. To differentiate them the terminology is primary, secondary and infectious. Primary endogenous toxic fields correspond to the stimulative phase of exogenous but differ in that there is no increase in general field size. The same color inversions appear, namely green overlapping red. The secondary corresponds to the depressive stage and these two are frequently confused if comparative test are not made morning and evening. The Exogenous type showing field defects substance during the day. The endogenous type will show the field defects morning and evening as the poisonous source is internal and productive during the night as well as day).

Endogenous and exogenous degenerative states can also be distinguished through morning and evening tests and by elimination of possible exogenous sources for retests.

## FOCI OF INFECTION

Among endogenous toxemias there are certain types of infections that create an excessive depression of all fields except that for motion. In this field phenomenon all colors and form fields will be exceedingly small, within 15 to 20 degrees, and both eyes will register the collapse even though one eye will be more advanced than the other. The condition will be manifested both morning and evening.

Such small fields if present at all hours of the day are indicative of foci of infection, that is, the infection is gathering into a focal spot, a localized region, and is not of a drainage nature. Very frequently there is formed a walled-off pus pocket, or abscess. This may be located anywhere in the body, but in 90 percent of the cases it is an oral infection. An abscess at the apex of a devitalized tooth, a residual infection in bone area after the removal of a tooth, closed pyorrheic pockets, are all common lesions responsible for this typically small field. Streptococci and a staphylococci bacteria are probably the most important organisms associated with these infections. Severe toxic effects may occur when virulent organisms associated with dental infection gain entrance to the tissues. It often results in a secondary infection elsewhere in the body.

The collapse of the fields is a positive indication of systemic poisoning from the source of localized infection. Cadaverine, a bi-product of the disintegration of body tissues, is one of the most poisonous substances known to man and is very frequently the responsible agent in cases of auto-intoxication.

Although dental infection, (which will be treated independently in a succeeding paper) is the most frequent of sources of focal infections as indicated in our visual field practices, it is by no means the only source. Cases have come to our attention of a focal infection producing the described field phenomena from a gathering in lung tissue that caused lower lobar pneumonia three days after the diagnosis of local infection was made; of appendicitis, though it more frequently registers the field indication of the depressive stage and of the drainage type of infection rather than the locked type under discussion; of an infection in the foot from chronic irritation from a nail projecting into a shoe; a locked infection in a knee join probably a secondary infection from a dental abscess, and of a locked infection in non-draining sinusitis, though it, like appendicitis, is more often of the drainage type.

Cases showing the typical focal infection fields will not respond to orthoptic treatment so rapidly, and although some improvement may be noted during the course of training it will not remain for long. Visual conditions will not show much improvement until the toxic sources has been eliminated. Experience has shown that the safest procedure is to give the best lens

correction and refer the patient for outside treatment. After the elimination of the toxic source another analysis of the visual condition should be made. An entirely changed situation may exist.

Let us now make mental note of the types of intoxications and infections that we frequently find through field studies.

1. Lesions  
These may be from trauma, disease, pressures, etc., and affect all, or certain portions of the visual field due to an interruption in the course of receiving and transmitting visual stimuli to brain.
2. Intoxication (Exogenous)
  - A. Stimulative  
Enlarged fields and green over red in evening.
  - B. Depressive  
Reduced fields and red over blue in evening.
  - C Degenerative  
at least one eye producing scotomatous areas in the evening. If only one eye shows scotoma the other will register the depressive type field.
3. Auto-intoxication (Endogenous)
  - A. Primary  
reduced fields with green over red morning and evening.
  - B Secondary  
reduced fields with red over blue morning and evening.
  - C Infections
    1. Locked type  
collapse of both fields morning and evening.
    2. Drainage type  
reduced fields with red over blue morning and evening (probably could also be classified under secondary auto-intoxications).

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In order to make visual field studies practical and usable in routine optometric practice, it is deemed advisable to illustrate actual case records where various toxic substances have proved through field studies to be responsible agents creating annoying and dangerous symptoms experienced by patients who request visual service. In other words demonstrating how some cases have been successfully handled is frequently of more assistance to us in practice than voluminous theoretical explanations.

We have seen from previous papers that exogenous sources of intoxication may produce field changes during the course of a few hours, and after the patient has been free from consumption of that intoxicant for several hours during the night the fields may appear perfectly normal. This is true in cases of tobacco intoxication.

Hilario G. Marquez. L..M., Ph. D., says, "there is from 27 percent to 36 percent nicotine absorption from tobacco smoke" (depending on whether it is inhaled deep into the alveola of the lungs or simply sucked into mouth and throat where there is less absorption area, (nicotine content in tobacco smoke may vary from 1 percent to 3 percent). "That makes from 27 to 36 milligrams per hour absorption into blood of free nicotine when cigarettes are smoked at the rate of two puffs per minute. The free nicotine will be completely excreted within 18 hours after absorption except that which is stored in body tissue and is not free. That which is stored will be later released into blood as free nicotine".

At this point let us refresh in our minds that individual tolerance varies greatly in relation to any toxic substance. For instance, some persons are found who exhibit the second and even third stages of intoxication after taking one two cigarettes daily. Others consume much large quantities without any demonstrable effect. The only acceptable answer to this is difference in individual susceptibility and resistance power. One person may have high resistance to affection from nicotine but his resistance to pyridine may be very low. Because there is pyridine in tobacco this may affect him greatly after relatively small consumption.

Although nicotine is the most abundant narcotic found in tobacco it is by no means the only one. Chemists consider nicotine (nicotine sulphate) among the most deadly poisons to the human organism. High also on their list is cyanide (hydrocyanic acid. Hydrocyanic is also found in tobacco, and so it too, though it's quantity is much less than nicotine, may be the actual agent responsible in some cases of tobacco poisoning. Some others are carbon monoxide, colodine, ammonium and the furfural bases.

Statistics agree in the phenomena, but vary as to the percentages in cases of amblyopia from retro-bulbar neuritis, which produces our degenerative stage in field taking. Figures vary from 12 percent to 33 percent of these amblyopic cases being due to tobacco alone,

and goes as high as 86 percent when tobacco and alcohol are jointly responsible. It is interesting to note that horses in Australia have been found to be blind from eating wild tobacco plant. In many cases they have showed marked improvement when taken in off the range and simply prevented from having access to the plant.

Tobacco is in such common usage today that many of us fail to recognize that it can be, and is, the agent responsible for many cases of visual disturbance. The effects of tobacco on other functions and parts of the body may be fully as important, and perhaps more phenomenal than the amblyopia and visual irritability that we find, but they are outside our field and will not be further considered here.

### STMULATIVE INTOXICATION

A young man 18 years of age was referred for visual service to enable him to enter the Naval Academy at Annapolis. Analysis showed him to be of the C-1, adductive fatigue, type, who was just beginning to enter into myopia. His near projection into minus was alarming. Eye comfort was almost a myth to him, No visual fields were obtained at this time.

Orthoptic reconditioning was instituted and was carried on in daily sessions of one half hour each from November 26th, 1940 till December 9th, 1940, with little or no accomplishment except to keep him in a constant state of irritation.

On December 9th visual fields were taken morning and evening. As figures 1 and 2 show there is no indication of any abnormality in the morning. At 4:45 P.M. fields showed a definite inversion of green over red, (figures 3 and 4). During the day three cigarettes and one cup of coffee had been consumed.

The possibility of toxic conditions arising from such sources was explained to the patient and he was told that if one of these agents were responsible, that elimination of it for a 24 hour period would cause the fields to show up normal. He was willing to make the observation and so the next afternoon fields were taken again. It was decided to test for tobacco alone and so the usual cup of coffee was taken at breakfast but tobacco was eliminated during this test period. As figures 5 and 6 show there is no indication of a stimulative effect at this time. He was advised to refrain from the use of tobacco in any form.

Immediately after discontinuing tobacco orthoptic work produced results and on December 29th he was dismissed as ready to pass all tests required for his admission to Naval Academy. In addition, the subjective at far showed .50 diopter of hyperopia, and at near the net was .75 diopter of hyperopia, with equilibrium findings in balance and all ductions adequate.

No lens was prescribed. Comfort was at a maximum and, four months later he reported the best four months he had ever spent so far as his eyes were concerned.

This illustrates a case where a state of stimulation from an exogenous toxin prevented visual efficiency, and even prevented reconditioning until the toxic source was eliminated.

### DEPRESSIVE INTOXICATION

A 39 year old landscape foreman and road engineer came December 29, 1939, complaining of

uncomfortable eyes, more when doing drafting or reading, but not free from it at any time. He had had his glasses changed frequently in the past three years but none of the changes had done any more for him than give a temporary "rested feeling".

Visual analysis found him to be of a C-1, adductive fatigue type with nets of  $+0.25 -0.75$  at both far and near. The equilibrium findings were typical of a C type beginning in presbyopia. Ductions were all low. Visual fields showed (figures 7 and 8) large motion and medium form with colors small and red interlacing with blue, typical of either a depressive state of exogenous intoxication or the secondary stage of auto-intoxication.

The man was a habitually early riser and on this day had arisen especially early to get some work done before coming to the office. The fields were taken about noon. At this time he had smoked ten cigarettes and consumed one cup of coffee. Since he had been up early and had been taking tobacco for over seven hours, these fields were interpreted as "afternoon" fields. In order to complete our set he was asked to come in the next morning for "morning" fields.

He was very interested in the field work and was discussing it that afternoon with a neighbor. The neighbor was a patient of another practitioner but who was familiar with field work and told him of how some toxins affect the fields. In his efforts "to be of help" he stopped smoking from 3 P.M. until the next morning when he told of his discontinuance so the field charts would show the "real" thing and not be influenced by his smoking. His appointment was postponed until noon and fields taken then. This was twenty one hours after stopping cigarettes. The fields were normal. (figures 9 and 10).

Three weeks later he returned having discontinued cigarettes and was completely free from the former depressive symptoms. No lens change would have been made but one lens was broken and so both of them were changed  $.25$  diopter in the cylinder.

Six months later visual comfort was reported.

#### DEGENERATIVE STAGE

A business executive, who naturally is good natured and jolly had not been feeling good for two to three years. His physician had advised him to quit smoking which advice was not heeded. His own depressed state worried him, chiefly because he feared its effect on business. A friend who knew field work had tried for some time to get him to submit to a visual field analysis for the express purpose of testing the results of his heavy cigar smoking which amounted to sometimes as much as 40 cigars per day. Finally he consented.

Visual fields showed a typical depressive state with a central scotoma for white night and morning in one eye. At that time 1 mm color targets were not available and so no charting was done for relative scotoma.

The patient didn't want to discontinue his cigars and the fact that fields were the same night and morning was excuse enough for him to continue, arguing that smoking wasn't causing it.

About three months later he was convinced to try going without cigars for awhile. After he had done this for four days he made it known to his friend who insisted on getting another set of field charts made. The charts were not only normal in color relationship, but all colors were much

larger and the scotoma had disappeared. He expressed himself as feeling better than he had done for a long time.

It was finally discovered why the fields recorded scotomatous areas night and morning. As was mentioned he smoked as many as 40 cigars daily. This amounted to "chain smoking", or lighting one cigar from another. He seemed eager to get the least bit of stimulation to counteract his general depression. In his efforts to do this he frequently awoke four or five times during the night and smoked a cigar. Depression, with scotomas in the early morning, were the result.

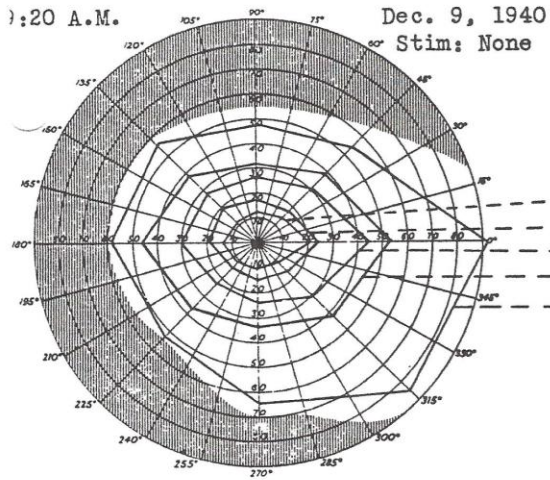
In this paper we have shown the three distinct stages of intoxication produced by tobacco smoking. Other forms of tobacco such as chewing plugs and snuff produce the same effects. It is not the form of the tobacco, although some forms yield more nicotine than others, and it is not the quantity, rather it depends on the idiosyncrasy of the individual, as one can resist far greater amounts than another person. Usually such quantities as 40 cigars daily if persisted in long enough will produce the degenerative stage. This is the long known, and frequently described, classical, tobacco amblyopia.

Diagnosing tobacco intoxication as such in earlier and less damaging stages of stimulation or depression is much more recent and of infinitely greater service to patients.



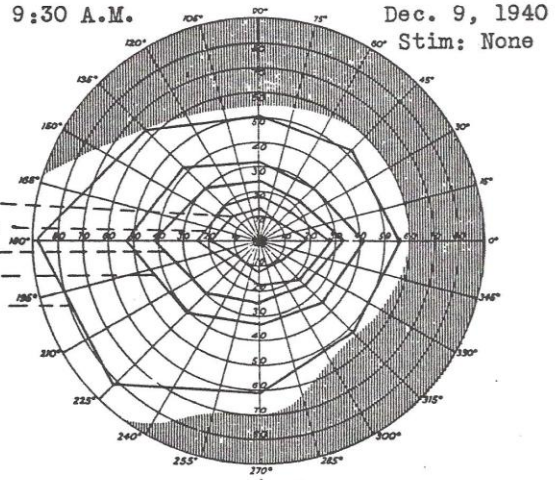
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8:20 A.M. Dec. 9, 1940  
Stim: None



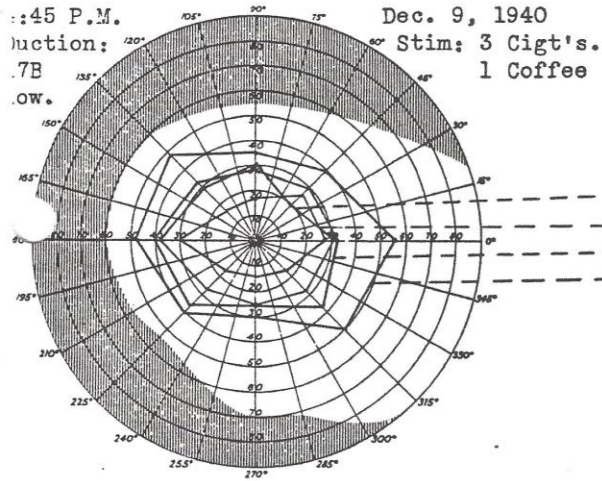
Right Figure #1.

9:30 A.M. Dec. 9, 1940  
Stim: None



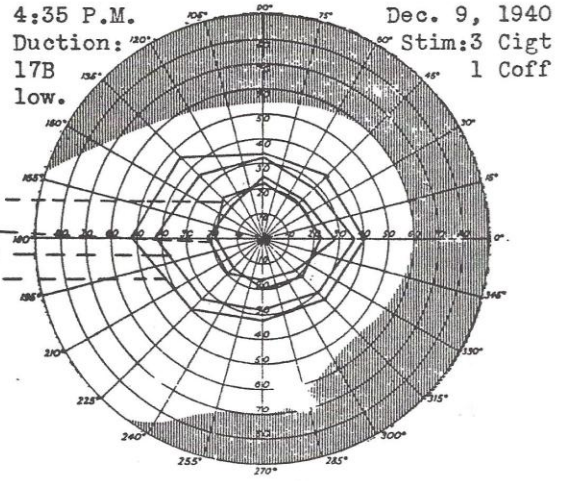
Left Figure #2.

3:45 P.M. Dec. 9, 1940  
Duction: Stim: 3 Cigt's.  
17B 1 Coffee  
low.



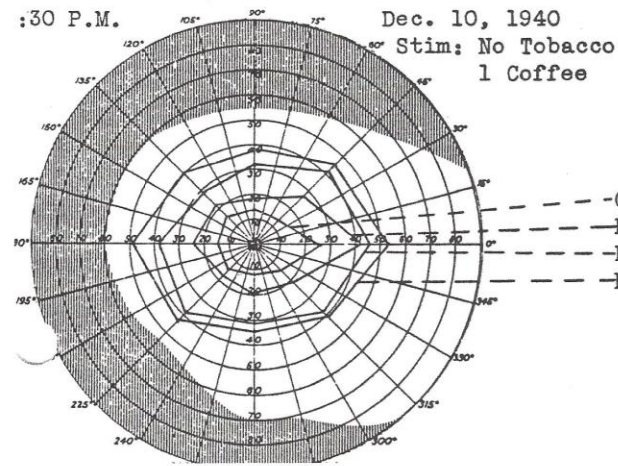
Right Figure #3.

4:35 P.M. Dec. 9, 1940  
Duction: Stim: 3 Cigt  
17B 1 Coff  
low.

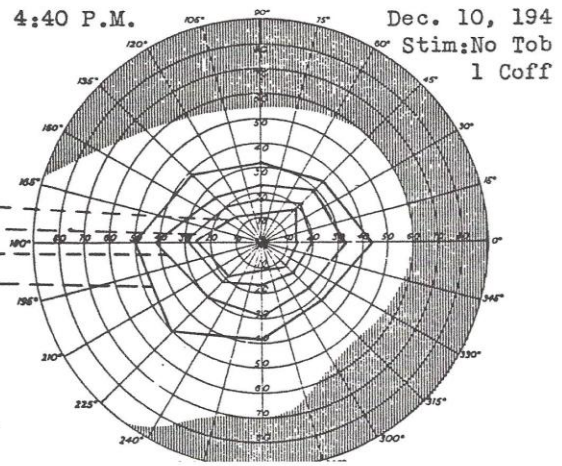


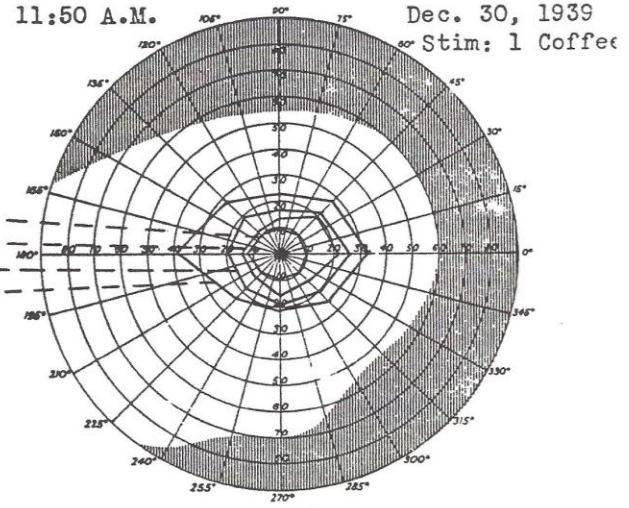
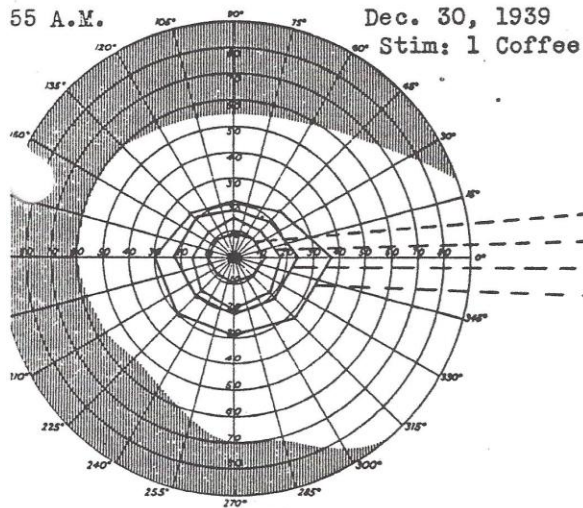
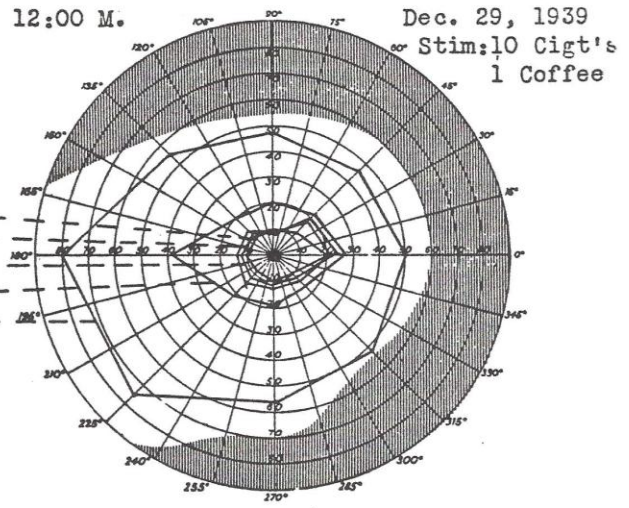
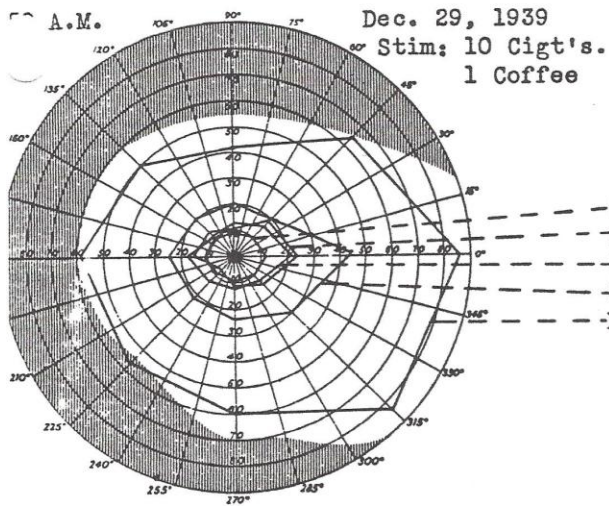
Left Figure #4.

3:30 P.M. Dec. 10, 1940  
Stim: No Tobacco  
1 Coffee



4:40 P.M. Dec. 10, 1940  
Stim: No Tob  
1 Coff





ht Figure #7.

Left Figure #8.

ht Figure #9.

Left Figure #10.