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THE VISUAL FIELDS AND OCULAR
CONDITIONS IN ACCESSORY SINUS AFFECTIONS.

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Being a Thesis submitted
for the Degree of M.D. 1910.

BY

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SECTION I.

The determination of the subject.

The choice of this subject of investigation for my thesis was determined by two interesting cases of ocular affection resulting from accessory sinus disease, which occurred during my two years of residence at the Bristol Eye Hospital - the one being a case of bi-temporal hemianopsia due to acute sphenoidal sinus disease, and the other of secondary glaucoma lasting for a considerable period in which the temporal field of vision was contracted instead of the nasal which is usual in glaucoma, also the result of sinus disease.

As these were two unusual fields of vision, it occurred to me that this might be a profitable field of investigation if I could obtain a sufficient amount of clinical material to work upon, and more especially upon looking up some of the literature on the subject of ocular affections in nasal disease, I found little attention had been paid to this aspect, apart from mere statements to the effect that some observers had found visual fields contractions and that others had not.

Clinical material.

I have therefore, through the kindness of Dr Watson Williams, acted as Clinical assistant in his Ear, Throat and Nose department of the Bristol Royal

Infirmary, thus being enabled to investigate all the cases of accessory sinus disease which have occurred during a period of six months or so; and also those seen during a month at the Shrewsbury Eye, Ear, Nose and Throat Hospital, together with a few cases from the Bristol General Hospital. In an ophthalmic clinic, even at the present time, too little attention is paid to the important part that accessory sinus disease may play in ocular affections.

Accessory sinus affections are not common conditions, and my clinical material has not been as great as I could have desired, amounting in all to 32 cases, but they possess the advantage that it is a regular series of every case that occurred in the two clinics during the periods mentioned, and they are therefore representative, and in addition the diagnosis in each case has been confirmed by a rhinologist, and with a few exceptions by operation or after treatment. The question of diagnosis is of the utmost importance, because it is often of considerable difficulty even to a rhinologist, and in some of the reported cases, as I shall later point out, have been diagnosed on insufficient grounds.

Anatomical Investigations.

During these observations, I have found it necessary, to examine into the anatomy of the optic nerves and chiasma in relation to the base of the skull and accessory sinuses, as for example to

explain in case / page 53 why bi-temporal hemi-anopsia associated with sphenoidal sinusitis should be a rare condition, and sphenoidal sinusitis comparatively speaking not uncommon.

I think the ideas held by many clinicians and anatomists upon the anatomical relation of these parts are frequently erroneous, and the descriptions in the modern text-books but very meagre. And these investigations with accurate measurements - though only few in number - I have embodied in this thesis on pages 35-38, and I wish to acknowledge my indebtedness to Professor Walker Hall for permission to examine the cranial cavities of cadavera in the post-mortem room.

Attainments desired.

It was my hope that the visual fields observed might afford a means of aiding the diagnosis of accessory sinus affections, and to a certain extent this has proved to be the case, as will be seen later.

Anatomy of the Sinuses.

The anatomy of the sinuses I have dealt with at some length, and perhaps more fully than at first seems necessary, but as upon this depends very largely the diagnosis of accessory sinus affections, and the proper appreciation of the difficulties met with in forming the diagnosis, and the manner in which ocular affections arise, it is desirable

Pathology of Ocular Affections.

The pathology of these ocular affections is uncertain, and I cannot pretend to have enlightened it, because as none of these cases have terminated fatally I have been unable to observe any pathological changes post mortem, but I have given what I have considered to be the processes, as deduced from the clinical course of events.

Scope of Thesis.

Special stress has been laid upon the visual fields, but in all the cases I have noted any other ocular symptom or disease present. For the most part the diseases of the accessory sinuses in this series, with a few exceptions, have been chronic or only sub-acute, as the acute affections, though often giving rise to ocular symptoms, most frequently tend to spontaneous recovery of the sinus condition, and with this the subsidence of the ocular affection, and only those are seen, in nasal and ophthalmic clinics, in which the more serious symptoms persist.

History.

The close relationship of the nose and eyes has always been recognised in regard to such reflexes as irritation of the eyes causing sneezing, and irritation of the nasal cavity causing lachrymation, but the history of ocular affections depending upon nasal disease dates back only to the time of John Hunter, who observed that maxillary sinusitis sometimes

caused irritation of the eyes; for all practical purposes, however, nothing was known till Ziem published some excellent work in 1882, and later in the same decade cases were also published by Lennox Browne, Berger, Gluck, Jacobson, Knapp, Van Milligan and Tacquet, but these cases generally related to the frontal and maxillary sinuses, and very rarely to the ethmoid or sphenoid.

It was not, however, until late in the last decade of the preceding century that the literature of the subject became at all abundant, and even then only isolated cases so far as this country was concerned. At the present day there are a large number of reports of cases, and particularly by Jessop in this country, but very few collective accounts of the subject as a whole have been published in any country. In 1894, a then exhaustive paper was published by Laurens, and Birch-Herschfeld gives a good account in the *Archives fur Ophthalmologie* for 1907; and Fish at the British Medical Association meeting in 1907 gave a large series of cases of optic neuritis and glaucoma secondary to accessory sinus disease, but none so far as I have been able to discover have reported on the visual fields at any length.

Ophthalmology was in its infancy fifty years ago and rhinology was unborn, and it is therefore not surprising that so important a subject should have received so little attention until quite recently,

and this is well illustrated by two cases recorded in the Royal London Ophthalmic Hospital Reports for 1888 where there were orbital cellulitis and meningitis terminating fatally, which were attributed to orbital injury, though only slight in character; the post mortem revealed in the one case septic sinusitis of the frontal and ethmoidal cells, and in the second no sinus affection, and the remarks made were that "the sinuses had become infected in the one and not in the other" thus evidently confusing post and propter hoc.

Sections.

I have divided this thesis into the following sections:-

Section I.-The present section.

Section II.-The anatomy of the accessory sinuses and orbit, considered from a clinical and pathological standpoint, together with personal observations upon the chiasma and optic nerves and their relative positions to the sphenoid bone, and upon the length of the optic canals and the site of origin of the central artery of the retina.

Section III.-In brief the pathology, symptoms, diagnosis, and treatment of accessory sinus disease.

Section IV.--The series of 32 cases of accessory sinus disease with the fields of vision and other ocular conditions, together with skiagrams of the accessory sinuses.

Section V.--The pathology and etiology of the ocular affections with extracts from the literature bearing upon the subject.

Section VI.--Conclusions.

Section II.

The Anatomy of the Accessory Sinuses, Orbit, Optic Nerves, Chiasma, and Bony Parts, considered from a clinical and pathological standpoint.

The Anatomy of the Accessory Sinuses.

For this I have drawn largely from the works of Logan Turner (1) Lothrop(2) C.R.Holmes (3) and Onodi. (4)

The nose consists of two chambers, which open upon the face by the anterior nares, and posteriorly into the nasopharynx by the posterior nares or chiasma.

The septum divides the nasal cavities from each other in the middle line, and is formed anteriorly by cartilage and posteriorly by bone.

The nasal cavity has for descriptive and clinical purposes:-

A roof which is narrow and concave from before backwards, and in that order is formed by the nasal bone, and the nasal process of the frontal bone, in the middle by the cribriform plate and posteriorly by

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1. LOGAN TURNER. The Accessory Sinuses of the Nose. 1906
 2. LOTHROP. Annals of Surgery, 1899.
 3. C.R.HOLMES. Knapp's Archives of Ophthalmology, 1896
 4. ONODI. The Accessory Sinuses and Optic Nerves. 1910.

the anterior wall of the sphenoidal sinus and the body of the sphenoid bone.

And a floor forming the roof of the mouth, and the septal wall common to both chambers.

The Outer Wall is the most important because it is in relation to all the sinuses of the nose. In front it is composed of the nasal process of the superior maxilla and the lachrymal bone articulating with it. In the middle is the Lateral Mass of the Ethmoid above, and the nasal surface of the superior Maxilla below. Posteriorly, it is formed by portions of the palate and sphenoid bones.

The wall is very irregular owing to the projection downwards of the superior, middle and inferior turbinate bones.

The superior and middle turbinate bones, or turbinals, are merely portions of the lateral mass of the ethmoid bone hanging into the nasal cavity; but

the inferior turbinal is a separate bone articulating with the superior maxilla.

The Olfactory fissure is that part which lies between and above the middle turbinal, and the septum nasi - pus observed in this situation is suggestive of posterior ethmoidal or sphenoidal sinus affection.

The Meatūs are three in number and lie external to and below their corresponding turbinals, and are named superior, middle, and inferior.

The Superior Meatus is very shallow and lies in the posterior third of the upper part of the outer nasal wall.

The Middle Meatus is a deep and wide groove occupying the posterior and middle third of the middle part of the outer nasal wall, corresponding in length to the middle turbinal.

The Inferior Meatus is the largest of the three and extends from the anterior nares to the posterior nares.

The Nasal Mucous Membrane.

The nasal mucosa is continuous with that of the pharynx at the choanae, and with the conjunctiva through the nasal duct. It covers all the cavities of the nose, and over the whole area its deeper part is attached to the bone, and is periosteal in function, whilst the superficial part is either respiratory or olfactory in function.

In the respiratory portion and in the accessory sinuses it is lined by ciliated epithelium and contains many goblet cells and acinous glands.

The mucosa has a double nervous supply, it being mainly olfactory in the upper part of the nasal cavity, and ordinary sensation in the lower by the 5th cranial nerve, through which the ^{numerous} ~~mucous~~ reflex ocular symptoms arise in nasal disease.

The vascular supply is very rich, and over the inferior turbinates is cavernous in character. The arterial

supply is mainly from the inferior spheno-palatine artery, and the venous return is forwards into the facial vein, backwards into the spheno-palatine vein, and upwards into the ethmoid vein, which latter has numerous connections with the ophthalmic veins, and veins of the orbit and dura mater; and thus there is a ready path for infection from the nose to the orbit (vide page 32).

The accessory sinuses of the nose, as will be seen later, are in such close relationship to the orbit and its contents, that, as St Clair Thomson so aptly says when associating them causally with ocular diseases, it is more appropriate to regard them as accessory of the orbit than of the nose.”

Logan Turner divides the accessory sinuses into an anterior and a posterior group, because of their anatomical and clinical relations. The anterior group consists of Frontal, Anterior Ethmoid, and Maxillary sinuses, all of which lie anteriorly and have their ostia in the middle meatus; and the posterior group, consisting of the Posterior Ethmoid and Sphenoidal sinuses, which lie posteriorly and have their ostia in or above the superior meatus.

The Ostia of the Accessory Sinuses.

The anatomical position of the ostia, or natural openings of the accessory sinuses, determines the clinical situation of pus in diseases of the latter, which is an important aid in the diagnosis.

The middle turbinate bone having been removed, the Ethmoidal Bulla, Uncinate Process of the Ethmoid, and Infundibulum are seen.

The Ethmoidal Bulla is a prominence varying in size, and situated below the middle turbinal, usually containing ^{an} air cell.

The Uncinate Process is a ridge of bone parallel to the root of the middle turbinate bone, which extends downwards and backwards from the anterior end of the lateral mass of the ethmoid; between it and the bulla is the Infundibulum.

The Infundibulum is a passage between the root of the middle turbinate and uncinatè process, and in cross section triangular in shape with its base to the nasal wall, and opening at its apex by the Hiatus Semilunaris into the middle meatus. The infundibulum terminates anteriorly, with equal frequency, either by becoming directly continuous with the Fronto-nasal canal, or above that canal; where continuous with the fronto-nasal canal, a frontal sinusitis if present would drain backwards into the anterior ethmoidal and maxillary sinuses owing to their ostia being situated in the infundibulum, thus readily infecting them, and also under this condition the frontal sinus is difficult to catheterise.

The Ostium of the Maxillary Sinus. This lies within and concealed by the infundibulum. It varies in size and shape, an average being 2 mm. by 3 mm. and sometimes it takes the form of a long slit.

Frequently there are accessory ostia; further back and lower in position, through which a sinusitis drains well, the pus then going almost entirely into the throat, simulating a sphenoidal sinusitis.

The Ostia of the Anterior Ethmoidal cells are several in number and open into the infundibulum.

The Frontal Sinus Ostium - there is only one for each sinus - which opens either into the infundibulum or into the middle meatus by means of the fronto-nasal canal, which latter varies considerably in length, curve and calibre.

The Ostium of the Sphenoidal Sinus. Between the posterior wall of the nasal fissure, i.e. the anterior wall of the sphenoidal sinus, and the depression in the superior turbinal called the Triangularis Ethmoidalis is the Recessus Spheno-ethmoidalis into which opens the single ostium of the sphenoidal sinus. This ostium is clinically of importance because it is very small and opens near the roof of the cavity, so that the cavity does not drain well in sinusitis, and the ostium is readily blocked by swelling of the mucosa.

The Ostia of the Posterior Ethmoidal Cells are two or more in number which open under cover of the superior turbinate, they are large varying from 2 mm. to 4 mm. by 1 mm. to 3 mm.

The Maxillary Sinus.

Is a constantly present cavity in each superior maxilla which varies considerably in size. It is also known as the Antrum of Highmore.

It is present at birth as a tiny cavity and continues to develop up to the 25th year by a process of eccentric bony formation and absorption.

It is bounded by several walls, of which the Floor forms the roof of the mouth, an antero-external wall containing the canine fossa, and a Posterior wall. The nasal wall extends from the floor of the nose to the infundibulum above, and the inferior turbinate articulates with it. The roof is of the most importance because it is in relation to the orbit, forming its floor. This bony wall, though thin, is thicker than the other sinus walls which form part of the orbital walls. Through its substance runs the bony canal containing the superior maxillary division of the 5th cranial nerve.

The Ethmoid cells also project into this wall, forming etho-maxillary cells.

The roof of the sinus is separated from the globe by a considerable pad of fat, but more posteriorly the optic nerve is quite close.

The cavity varies greatly in size depending upon the amount of absorption which takes place, the alveolar process and malar bones being often hollowed out, and in which latter case the orbit would be almost entirely surrounded by sinuses. The greater the size the thinner are the walls.

Logan Turner gives the average dimensions as
Height: 3.5 cm. Breadth: 2.5 cm. Antero-posteriorly,
3.2 cm.

The cavity may be explored or treated by opening into it through the canine fossa, a tooth socket, or through the inferior meatus below the inferior turbinal.

THE FRONTAL SINUS.

There are two frontal sinuses lying between the two layers of the frontal bone, one on either side of the middle line.

It starts to develop between the first and second years as an upward growth of the ethmoidal cell mucosa, and is first seen as a frontal cavity between the 8th and 12th years, and is said to increase in size up to old age, but it probably does not do so after the 25th year.

It has three boundary walls. The Anterior is almost vertical, and is formed by the outer layer of the frontal bone, and is thick and strong, averaging 3 to 5 mm. in thickness, varying with the racial crania, and inversely with the size of the cavity. The Posterior wall varies from 0.5 mm. to 3 mm. in thickness, and is in contact with the frontal lobe of the brain. It is formed by the upper layers of the frontal bone and its orbital plate, the anterior portion being almost vertical and the posterior almost horizontal.

The Floor is formed by the lower plate of the orbital part of the frontal bone, which it joins at the orbital margin. It is very thin, the thinnest

of the three, and it is through this part that abscesses sometimes bursts from the frontal sinus into the orbit (case 12 , page 97)

To the inner side, the frontal sinus is only separated from the ethmoid cells by a very thin plate of bone, and in one of my post mortems the separation was by membrane with a little bone in it, so that we nearly always find some ethmoid cells affected in association with frontal sinusitis.

Posteriorly, superiorly, and externally the sinus is very variable in its extent, but inferiorly, it extends to the articulation between the nasal process of the superior maxilla and lachrymal with the frontal bone, and to the supra-orbital ridges; and internally it is separated from its fellow by the septum.

Lothrop, and Logan Turner in particular, have described a great many variations of the frontal sinuses, and some of which are of great importance because of the manner in which ^{these} variations may cause a sinusitis to involve the eyes. In one case, the septum was so oblique as to present the appearance of one mesially placed sinus, there was a second however in the form of a mere slit over the orbital margin, and the possibilities of such a sinus are obvious, e.g. the smaller might cause ocular symptoms, and yet at the operation be overlooked entirely.

The size also varies greatly, a large one being more liable to cause ocular symptoms, partly because it has thinner walls, and partly because it is more extensive.

Logan Turner considers an average sinus measures:
height: 31.6 mm., breadth: 25.8 mm., depth: 18.0 mm.
and the smallest and largest with median septa
smallest height 18.0 mm., breadth 13. mm., depth 5 mm.
largest " 45.0 mm. " 60 mm. " 25 mm.

And the same author has described a frontal sinus which extended backwards in the roof of the orbit as far as the optic canal; such a condition with sinusitis would readily involve the optic nerve. One sinus only may be present occupying a mesial position; and numerous other variations.

THE ETHMOIDAL CELLS.

Our anatomical knowledge of these and their variations is very complete thanks to Onodi's work.

The ethmoidal bone consists of the vertical mesial plate, forming part of the nasal septum, of the cribriform plate at right angles to this septum, and hanging at right angles to the cribriform plate is the lateral mass of the ethmoid bone containing the air cells.

The inner aspect of this lateral mass forms part of the outer wall of the nasal cavity, and the outer aspect forms the inner wall of the orbit in part and is known as the Os planum of the ethmoid or

Lamina papyracea , the latter name describes the extreme thinness of the bone in which numerous dehiscences are often present; between the inner and outer aspects are the ethmoid cells.

The cells are present at birth and continue developing up to about the 20th year. The cells are bounded or completed by the maxillary and frontal sinuses as before described, and posteriorly by the sphenoidal sinus, into all three of which the ethmoid cells may burrow, forming respectively ethmo-maxillary, fronto-ethmoidal and sphenoid-ethmoidal cells.

THE ANTERIOR CELLS.

The ethmoid bone is occupied in varying proportion by the anterior and posterior cells, and sometimes almost entirely by the one kind, either anterior or posterior.

There may be only one anterior cell, or as many as seven or eight, in which case there are numerous ostia; they never have any communication with the posterior group.

The cells usually lie all round the fronto-nasal canal.

The thinness of the lamina papyracea, and the frequent presence of dehiscence explains the frequency with which ethmoidal disease causes cellulitis of the orbit and sub periosteal abscess, and this latter not seldom tracks along and points behind the tear sac, and clinically resembles a dacryocystitis.

THE POSTERIOR ETHMOIDAL CELLS.

These may be entirely absent, their place being taken by sphenoidal and anterior ethmoidal cells, or the posterior cell may be very large and take the place of the sphenoidal sinus.

There may be a single cell or two or three, and usually when multiple they communicate and have but one ostium; they never communicate with the sphenoidal sinus normally. (1)

Onodi (2) has shown that there are thirty variations of the posterior ethmoidal cells, and sphenoidal sinus, and that the posterior ethmoidal cells may only be in relation to the optic nerves and chiasma and not the sphenoidal sinus; and also that one posterior ethmoid cell may be in relation to both optic nerves and chiasma; and thus optic neuritis does not necessarily mean sphenoidal sinus affection as is usually supposed.

In practice, if disease of the ethmoid cells be present it is usual for all to be affected, because the dividing walls are so thin; and because of their intimate relations to all the other sinuses it is theoretically possible for these cells to infect all the other sinuses on the same side.

(1) HOLMES. Loc.cit.

(2) ONODI. Loc.cit.

THE SPHENOIDAL SINUSES.

From the antero-superior surface of the sphenoid bone, the lesser wing of the sphenoid rises and projects horizontally to join up with the greater wing which arises from the lower antero-lateral aspect of the body, and they enclose between them the optic canal. The lateral aspect of the body of the sphenoid bone forms part of the inner wall of the orbit.

The sphenoidal sinuses are two in number, and are situated in the anterior part of the body of the bone, and they have a more constant and intimate relation to the optic nerves and chiasma than any other of the sinuses, and these relations I shall describe along with the optic nerves.

Symington ⁽¹⁾ says they are not present at birth, but start to develop at the age of 3 to 4 years as a backward growth from the posterior ethmoid mucosa - in a child aged 4 years which I examined, there was no trace of a developing sinus - and they increase in size by the absorption of the spongy bone which goes on into old age, so that they are often extremely large.

The Roof of the sinus is nearly horizontal, sloping slightly backwards and downwards. From before backwards there are on it the lesser wing of the sphenoid, the optic groove and the olivary eminence, and the sella turcica, whilst if the sinus extends very far back there is the dorsum sellae; and Logan Turner says "consequently it is in relation to the olfactory peduncle, the optic commissure, the pituitary body and the pons var olii."

The Floor forms the most posterior portion of the roof of the nasal cavity

The Anterior wall is very thin and forms also part of the roof of the nasal cavity. The ostium is in this wall as before mentioned, and it is the part removed in surgical procedures.

The Posterior wall is irregular in shape and varies with the amount of absorption that takes place in the bone; it is usually thick and rarely dehiscent.

The External wall in front forms part of the inner wall of the orbit, optic canal, and sphenoidal fissure (Page 28, Sect. II), and is in contact with the carotid and ophthalmic arteries and the cavernous sinus.

The Internal wall is formed by the septum between the two sinuses, which is usually thicker than the other walls and complete, so that it tends to limit infection to one side.

Some of the many variations of this septum

which have been described by Onodi and Turner are of importance. It may be so oblique in the vertical plane that one sinus may occupy the whole breadth of the bone, or from obliquity in the horizontal plane one may come to be superior and the other inferior, and in either case one sinus might come into relation to both optic nerves and chiasma, and a sinusitis under such conditions might cause more serious ocular symptoms on the side opposite to that to which the sinus belonged, and grave errors in diagnosis have resulted in reported cases under such conditions.

The size of the cavity varies with the amount of bony absorption, the size of the posterior ethmoid cells, and the position of the septum. Holmes gives the size as: antero-posteriorly 1 c.m. - 5 c.m. height 9 m.m. to 28 m.m. breadth 10 m.m. to 28 m.m. I myself observed in a very old man two enormous sinuses, the right being: antero-posteriorly 5 c.m., breadth 2.5 c.m., height 2.5 c.m., and the left only slightly less extensive.

The bony absorption may go on into the greater and lesser wings of the sphenoid, so that then the optic canal passes through the sinus (Onodi). If a sinusitis existed in such a condition the optic nerve would be readily infected, and if the sinus were operated upon the nerve might be curetted away.

The thickness of the bony walls of this sinus are of the highest importance from the readiness

with which toxins pass through, or with which bony expansion takes place in disease and presses upon important structures. Holmes (1) gives the measurements as:

Anterior wall near the Roof 0.15 m.m.-2 m.m.

" " " " Floor 0.25 .m.m-5 m.m.

Roof from dehiscence to 3 m.m. An average being 0.8 m.m. and dehiscence rare.

Outer wall in 28 examinations:

Once dehiscence.

10 times . . 0.1 m.m. - 0.25 m.m.

7 " . . 0.25 m.m. - 0.5 m.m.

10 " . . 0.5 m.m. - 2 m.m.

In one case I observed there was only one sinus, and one outer wall measured 7 m.m. and the other 3 m.m. in thickness.

THE ANATOMY OF THE ORBIT.

The orbit is a quadrilateral fossa, having its base on the face, and its apex at the optic canal.

It has four walls, of which the outer is strong and is composed of the temporal and malar bones, and a roof, floor, and inner wall, all of which latter are also boundaries of the accessory sinuses.

The Roof is formed by the orbital plate of the frontal bone and the lesser wing of the sphenoid bone; it forms the floor of the frontal sinus, and bounds some of the ethmoid cells.

(1) HOLMES. Loc. cit.

The Floor is mainly formed of the superior maxilla, and it roofs in the maxillary sinus.

The Inner Wall is composed from before backwards by the nasal process of the superior maxilla, the lamina papyracea and the body of the sphenoid bone. As before mentioned, the lamina papyracea separates the orbit from the anterior and posterior ethmoid cells, and the sphenoid bone the sphenoidal sinus from the orbit.

The thickness of the various walls have been described with the associated sinuses.

The Optic Canal.

It is ^avery important structure to the subject of this thesis.

It is formed by the greater and lesser wings of the sphenoid joining up to enclose it. Posteriorly, it opens into the cranial cavity by the optic foramen and anteriorly into the orbit, and it transmits the optic nerve, the ophthalmic artery and sometimes the central artery of the retina (page 31, sect. II), and it is just big enough for its contents.

It is usually thought to be little more than a foramen in length, but I have proved it to vary in length from practically only a foramen to 1.5 c.m. and that the average is 9 m.m., depending upon the amount of development of the wings of the sphenoid and the varying shape of the bony parts. In the case reported by Onodi, where the canal passed through the sinus, the canal must have been of even

greater length than any I have observed (table I, page 38a).

The walls of the optic canal (on the inner side and roof) are very variable in thickness. I have frequently found the roof membranous in half its extent, and in one case completely so, and although this membrane is strong, yet it would allow a certain amount of swelling of the structures within the canal without causing such severe strangulation as when it is completely bony.

C.R.Holmes gives the thickness of the bone of the inner wall in sixteen examinations which he made - twice there was dehiscence, 14 times only 0.1 m.m. to 0.25 m.m.

In one of my cases, the bone was dehiscent throughout the length. In such cases, the optic nerve is only separated from the sphenoidal sinus by membrane.

The length of the canal is of importance, because a greater or less length of optic nerve is in close contact with the wall of the sphenoidal sinus, and more or less is enclosed in an unyielding canal, and the arteria centralis retinae may arise within it. (Page 31, Sect. II.)(Page 54, 63, Sect. IV)

The Periosteum.

The periosteum lining the orbit is continuous with the dura mater through the optic canal, and in the canal with the optic nerve sheath. Inflammatory oedema set up in the orbital periosteum far forwards, and though not in actual contact with the optic nerve,

may pass backwards to the optic canal and involve the nerve (page 149 Sect.V.)

The Orbital Contents.

The orbital contents are surrounded on three sides - roof, inner wall, and floor - by sinuses, and the optic canal may be entirely so surrounded.

They are: The eyeball

The optic nerve

Lachrymal apparatus

Lenticular and Ciliary Ganglion.

Orbital Fat

Vessels

Nerves and Muscles -,

3rd cranial nerve or oculo-motor supplying the following muscles:

- | | |
|----------------------------------|---------------------------|
| 1. Levator Palpebrae Superioris. | 4. Internal Rectus. |
| 2. Superior Rectus. | 5. Inferior Oblique |
| 3. Inferior Rectus. | 6. Iris & Ciliary Muscle. |

4th cranial nerve or trochlear supplying the superior Oblique Muscle.

6th cranial nerve or Abducent supplying the External Rectus Muscle.

Sensory nerves. The ophthalmic division of the 5th cranial nerve, and a branch of the 2nd division of the 5th.

Most of the orbital contents can be involved by accessory sinus disease, but some have more important relations, which I shall mention more fully.

The Ophthalmic Division of the 5th Cranial Nerve arises within the cranial cavity from the Gasserian ganglion and passes forwards through the cavernous sinus, and leaves the skull through the ^{inner} ~~maxillary~~ end of the sphenoidal fissure, where it divides into lachrymal, frontal, and nasal branches. At this point, it lies in close contact with the sphenoidal and ethmoidal sinuses.

The Lachrymal branch supplies the lachrymal gland: irritation of this branch is one of the causes of lachrymation in accessory sinus disease.

The Frontal branch passes forwards immediately in contact with the orbital roof to supply the skin of the face by its supra orbital and supra trochlear nerves. Neuralgia of these two branches is observed in almost every case of sinus affection, due to either contact or reflex irritation.

The Eyeball or Globe lies in the forepart of the orbit embedded in fat and suspended between the four walls by the septum orbitale. The anterior part of the eye when the lids are closed meets a straight edge placed upon the forehead and cheek, it is slightly in front in obesity and myopia, and behind in hypermetropia and thin people. The globe is situated nearer the inner and upper walls than the floor and outer wall.

The external muscles pass to the globe from their origins around the optic canal, where they are all in close relationship to the sphenoidal,

ethmoidal, and maxillary sinuses and sometimes to the frontal sinus too. The levator palpebrae superioris is in contact with the floor of the frontal sinus throughout its course, and the superior oblique is only separated by the former muscle from the same sinus; which explains why paralysis of the levator palpebrae superioris is often seen alone in sinus affections.

The Sphenoidal Fissure is situated just below the optic foramen, its inner end being formed by the outer wall of the sphenoidal sinus, and this wall is so thin that I have always been able to pass a surgical needle through with ease. The motor nerves of the orbital muscles and the ophthalmic division of the 5th cranial nerve, leave the cranium through the sphenoidal fissure in contact with the sinus wall, to gain the orbit.

The Optic Nerve.

This nerve runs a sinuous course from the posterior part of the globe to the optic foramen, and is surrounded by the external muscles and fat. Anteriorly it is widely separated from all the sinuses by a thick layer of fat, but posteriorly at the optic canal it is only separated by the origins of the muscles, and for some distance before the canal on the inner side it is very close to the posterior ethmoidal cells; below is the maxillary sinus, and above the nerve may be in actual relation to the frontal sinus, though not usual. The relations of

the optic nerve within the canal to the sphenoidal sinus are very important and have been already discussed.

The optic nerve has three Coverings or sheaths, derived from the three coverings of the brain; the innermost is the Pial Sheath, which is closely attached to the nerve substance sending in processes which divide it up into fasciculi.

The Arachnoid sheath is intermediate in position, and is attached by bands to both the pial and dural sheaths. The Outer Covering is continuous with the dura mater of the brain and within the optic canal with the periosteum of the bone, and anteriorly it fuses with the sclerotic coat of the globe; it is thick and strong and inexpandible. There are thus two potential spaces communicating with one another around the optic nerve and lined by endothelium, being in fact lymph spaces. From the inner space, Testut ⁽¹⁾ has demonstrated lymph spaces passing into the optic nerve and surrounding the bundles of nerve fibres, and branches passing in between the nerve fibres. Lymphatics also extend from the orbit into the nerve sheath. This anatomical relation of the lymphatics explains, I believe, the etiology of some of the visual field contractions in sinusitis (page /45 sect. v.)

The vascular supply to the optic nerve is by branches from the central artery of the retina, the ciliary arteries, and branches from the cerebral arteries within the cranial cavity.

Course of the Nerve Fibres within the Optic Nerve and Chiasma (after Testut)⁽¹⁾.

The optic nerve consists of three groups of bundles of nerve fibres - those on the outer side of the nerve being the direct fibres and correspond to the temporal half of the retina, on the inner side of the nerve are the crossed fibres, and are the nasal fibres in the retina, and a papillo-macular bundle. These latter fibres near the globe lie in the lower and outer part of the optic nerve and divide the direct fibres into two bundles.

Within the optic canal the macular fibres are central in position being surrounded by the crossed and uncrossed respectively on the inner ~~side~~ and outer sides. They retain this position as far as the chiasma when the central fibres from each eye meet and remain central side by side, and are surrounded above and below by the crossed fibres, and on the outer sides by the direct fibres (uncrossed).

There is ^a difference of opinion as to the position of the macular fibres in the chiasma, according to some authorities ⁽²⁾ they lie next to the brain, i.e. dorsal. There is also Gudden's commissure in

1. TESTUT. Loc. cit.

2. FISHER. Ophthalmological Anatomy. 1904.

the chiasma. The chiasma is the place of decussation of the visual fibres, the position and course of these fibres explain the visual fields (temporal contractions) in sinus affections (page /40, sect.V.)

The Ophthalmic Artery.

arises within the cranial cavity from the carotid artery and passes through the optic canal into the orbit, which it supplies together with its contents; its most important branch is the Central Artery of the Retina.

This artery, according to general clinical opinion and the anatomical text-books, is the first branch given off by the ophthalmic artery and arises from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch behind the globe.— Fuchs ⁽¹⁾, Berry⁽²⁾, Cunningham⁽³⁾ and others — that is from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in front of the optic canal, ^{and} entering the nerve on its outer side. In such a position the artery could not become blocked without the central vein, as occurred in case 1 pages 53 & 63: I was therefore led to investigate this point.

I think this artery, with all the other structures in this neighbourhood, is variable, and that it may occupy the usually described position, or be much

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1. FUCHS. Text book of Ophthalmology, 1907.
 2. BERRY. Regional Anatomy. vol. iii. 1902.
 3. CUNNINGHAM. Manual of Anatomy. 1906.

further back, and if the optic canal be long it may be within it. In the only injected body which I was enabled to examine, it arose from the ophthalmic artery just where the latter turns to gain the outer side of the nerve, at the anterior end of the optic canal (which was long) passing below the optic nerve and entering the latter on its inner side. I have frequently looked for it in the post-mortem room, but it is too small to find without being well injected. Testut (4) states that it arises 10 m.m. behind the sclerotic but in his very clear drawing he shows it just in front of the optic canal, and he goes on to say "Elle chemine d'abord quelque temps a la face profonde de la gainpiale etc." Professor Fawcett (Bristol) informs me that he teaches that this artery arises close to the optic canal and much further back than is generally supposed.

And it seems natural that so small a vessel should be given off from the ophthalmic, where it lies close to the nerve it is going to supply.

The Orbital Veins.

These have been recently thoroughly investigated by W.Krauss. (5) There are two main vessels, the

4. TESTUT. Loc. cit.

5. W. Krauss. Bericht der Ophthalmologischen Gesellschaft. 1902. Ophthalmoscope, 1907.

superior and inferior ophthalmic veins, that is, superior and inferior to the optic nerve. The superior starts on the face as the frontal vein and receives a large tributary - the lachrymal. The inferior runs along the floor of the orbit and joins the superior just before the latter terminates by passing through the sphenoidal fissure into the cavernous sinus.

None of the orbital veins have valves, and there is a free anastomosis between the main veins themselves and also their tributaries, and they form an anastomosing circle around the globe.

There is an anastomosis between the superior ophthalmic and the pterygoid venous plexus through the sphenomaxillary fissure, and with the veins of the accessory sinus and dura mater.

Krauss states that blood may flow almost as readily into the facial as into the cavernous sinus.

The central vein of the retina is supposed to terminate either in the venous circle around the globe, into the superior ophthalmic vein, or into the cavernous sinus directly through the sphenoidal fissure.

The Anatomy of the Base of the Skull in the Region of the Optic Chiasma and Nerves.

The carotid artery with the cavernous sinus lies on the lateral wall of the sphenoidal sinus and in the angle formed by the uncrossed fibres of the chiasma.

The relation of the optic nerves and chiasma to the sphenoidal bone and the relative size of all three is not well known. Most clinicians believe that the optic chiasma lies in the optic sulcus of the sphenoid bone, as will be seen in such works as Onodi,¹ Fuch's,² Watson Williams,³ and Fisher⁴; and though undoubtedly this position is sometimes correct, yet it is very unusual (see table I, page 38a).

T.W.P. Lawrence⁵ was the first to call attention to this in a few observations which he made in 1899 and expressed the opinion that the chiasma lay wholly behind the olivary eminence, and this was later confirmed by Zander⁶.

As, however, unless the optic chiasma varied in position, I could not explain the bi-temporal hemianopsia seen in case 1, pages 55 & 59a I made some investigations in the post-mortem room, and finding the parts varied considerably, I took careful measurements in the latter cases.

The description in Gray's Anatomy⁷

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1. ONODI. Loc. cit.
 2. FUCHS. Loc. cit.
 3. WATSON WILLIAMS. Diseases of Upper Respiratory Tract. 1910.
 4. FISHER. Loc. cit.
 5. LAWRENCE. Journal of Anatomy & Physiology, 1899.
 6. R.W.ZANDER. Anatomische Anzieger. Vol. xii.
 7. GRAY'S Anatomy. 1907.

of this part: "In the middle line from before backwards, is the optic groove behind which is the optic chiasma, the groove terminating on each side in the optic foramina; behind the optic groove is the olivary eminence, and laterally the anterior Clinoid processes, further back is a deep depression, the sella turcia, in which lodges the pituitary body.

The optic chiasma lies partly upon the olivary eminence, and partly on the diaphragmasellae."

The roof of the sphenoidal sinus is the thickest wall, measuring as we have seen 0.8 m.m. on an average, and the olivary eminence in the thickest part of the roof.

Post-Mortem Investigations and Measurements.

The measurements and position of the chiasma have only been noted in those cases where I have been able to remove the brain piecemeal to prevent disturbing the relationship, there being 10 examinations in all. The following measurements and observations were made:

1. Length of Optic canals on each side.
2. Length of the sphenoid bone between the olivary eminence posteriorly and the limbus sphenoidalis, i.e. the ridge of bone between the optic foramina anteriorly.
3. The antero-posterior width of the pituitary fossa from the posterior lip of the olivary eminence to the anterior lip of the dorsum sellae posteriorly.

4. Length of the intra-cranial portions of the optic nerves.
5. The diameter of the optic nerves.
6. The antero-posterior diameter of the optic chiasma.
7. The lateral diameter of the optic chiasma.
8. Position of the Chiasma.
9. Shape of junction of the optic nerves with the chiasma and the distance between the former.
10. Extent of sphenoidal sinus.
11. Presence or absence of sinus affection.

From the accompanying table it will be seen how great the variations are; as the examinations are too few for averaging, I give below the greatest and smallest measurements observed.

1. Optic Canals. Right and Left. 2.5 m.m. to 15 m.m.

and they are not always of equal length on the two sides.

2. Table of bone between the limbus and olivary eminence. 4.5 m.m. to 9 m.m.

3. Pituitary Fossa. 5.5 m.m. to 11 m.m.

When this is small the table of bone in front is large and vice versa.

4. Optic Nerves. Length from 7 m.m. to 12.5 m.m. Right
7.5 m.m. to 11.0 mm. left

5. Optic Nerve Diameter. Right & Left, 3.5 m.m. to
7.0 m.m.

This very large diameter of 7 m.m. was due to the nerves as well as the chiasma being very flat.

6. Chiasma. Anterior posteriorly. 7 m.m. to 11 m.m.
7. Laterally. 10 m.m. to 14 m.m.
8. Position of the Chiasma.

In only one case was the chiasma approaching to lying in the optic sulcus, and in this the anterior 5 m.m. lay on the table of bone and the posterior 4 m.m. lay over the pituitary fossa; and in this subject the sphenoidal sinus extended to the dorsum sellae - so had there been a sphenoidal sinusitis associated with a very thin roof (neither were present) a bi-temporal hemianopsia might have resulted. In one, the anterior edge of the chiasma just touched the olivary eminence, but in the other eight the anterior edge varied from 1 m.m. to 5 m.m. behind the olivary eminence.

Even in the case where slightly more than half of the chiasma lay on the table of bone, some part lay over the pituitary fossa, and as a rule the whole does, and even extending posterior to and covering up the top of the dorsum sellae. The stalk of the pituitary body is always behind the chiasma.

9. Shape of junction of the optic nerves with the chiasma. Sometimes the optic nerves join the chiasma in the form of a sharp "V", and this is when the nerves are long and the chiasma far back; sometimes as a "U", and in others as a broadened-out "U" - these latter are seen when the nerves are short and the chiasma far forward, particularly

the case in the broadened-out variety of "U".
The distance between the two nerves at their junction with the chiasma is from 0.5 m.m. to 2.5 m.m.

The belief exists that the length of the intracranial portions of the optic nerves depends on the amount pulled through from the orbits by the person removing the brain. The optic nerves are tightly bound within their sheaths which form the periosteum of the optic canals, and the nerve cannot be withdrawn in this manner.

Section III.

ETIOLOGY OF ACCESSORY SINUS AFFECTIONS.

The accessory sinuses are not rarely involved as is commonly supposed, and if the mild transient inflammations be included - which occur along with almost every ordinary acute nasal catarrh or coryza - it is an extremely common affection.

However, the chronic and acute inflammations which cause urgent and serious symptoms requiring special treatment are much more infrequent.

In the post-mortem room if the sinuses are systematically examined, it is common to find one or more of the sinuses (particularly the left sphenoidal) full of pus, which, during life, had caused no symptoms and had never been suspected; in 10 anatomical investigations in the post-mortem room I observed 2 cases of left sphenoidal sinusitis, one being in an old man, dead of pneumonia, and the other in a man dead of carcinoma of the liver.

Hanke, Pearce and Wolff, quoted by Fish (1) found sinusitis present in nearly all the autopsies of measles and scarlet fever. Weichselbaum (2) found it present in 12 out of

1. FISH. British Medical Journal, 1907.

2. WEICHSELBAUM. Wien. med. Wochenschr., 1890.

13 influenza autopsies, and Frankel (1) states it to be very common in the autopsies of pneumonia.

In almost every acute coryza we get a poly sinusitis as is evidenced by the frontal heaviness, headache, etc; diphtheria, typhoid, cerebro-spinal meningitis and smallpox are also sometimes complicated by sinusitis; syphilis is a very common cause according to most writers, as is to be expected considering the frequency with which that disease attacks the nose, but in the accompanying series of cases there was not positive evidence of its causal relation in one single case, and in only one was there a history of syphilis.

Neoplasms are indistinguishable in the early stages and gives rise to the same ocular and nasal symptoms as do the other inflammations.
Bacteria.

In both the acute and chronic empyema there is usually a mixed pyogenic coccal infection, but I have often noticed that in spite of the cavity being full of pus, only a very small growth takes place in culture. Sometimes the growth is pure, and is then pneumococcal.

1. FRANKEL. Virchow's Archiv, 1896.

Diphtheroid bacilli are nearly always present and commonly staphylo-, strepto- and pneumococci, and less commonly micrococcus catarrhalis, pneumo bacillus, and true Klebs-Loeffler.

Under the terms sinusitis and empyema are included the acute and chronic inflammations, and the accessory sinuses are also affected by mucocelles and malignant growths.

Mucocelles.

Mucocelles of the accessory sinuses are formed by the ostium of a cavity becoming closed, and the secretion of mucus continuing, leading to distention of the cavity, and atrophy of the mucosa, as a rule. They are sterile.

They are infrequent, and have only been noted in connection with the frontal and ethmoidal sinuses.

Empyema or Sinusitis.

The acute generally precedes the chronic because according to Lack¹ the causal agent has been sufficiently virulent to overcome the natural process of cure. For the same reason, excluding antral empyema, the chronic^{are} usually multiple.

Acute inflammation is also multiple in the

1. LACK. Diseases of the Upper Respiratory Tract.

early stages, excluding those due to strictly local causes; but as a rule when seen it has settled down into some one of the sinuses.

In the acute inflammation, the mucosa becomes reddened, swollen, and infiltrated with leucocytes; and because of the swelling, the ostium frequently becomes blocked and a closed sinusitis produced.

If the inflammation goes on and becomes chronic, either atrophy or polypoidal degeneration of the mucosa takes place, and the bony wall may become atrophic too; the ostium is seldom blocked in chronic cases because of the atrophy.

Polypi are rarely seen in acute cases.

Periostitis and abscess formation on the opposite side of the bone (orbit or cranium) not infrequently occurs in both acute and chronic.

Caries of the bony wall occurs with equal frequency in acute and chronic cases, but it is not common because the walls are thin and have periosteum on both sides. The orbital plate of the frontal sinus, the lamina papyracea, and ethmoid cells are usually the parts to be affected; caries of the antrum and sphenoid are very rare. Perforation of the hard palate occurred in case 16, page 106, and cases have been reported by Grunwald and Panzier.¹

¹Quoted by ONODI. Accessory Sinuses and Optic Nerve, 1910.

Frequency.

The maxillary antrum is the most commonly affected, next to which we find the sphenoid. Perhaps if disease of this sinus were more easily and certainly diagnosed as is disease of the antrum, it would be even more frequently recorded.

The anterior and posterior ethmoidal cells are usually involved along with respectively the frontal and sphenoidal sinuses.

Intra-Nasal Symptoms and Diagnosis of Empyema and Mucocele.

Mucocele.

The only sinuses affected by this condition are the frontal and ethmoid, and more commonly the latter.

From a mucocele per se the only symptom is obstruction in the nose. There is usually either swelling to the inner side of the eye - case // , page 96a, - or in the middle meatus of the nose. They are painless, and, as a rule, free from tenderness: and sometimes mucoid material can be forced into the nose by pressure.

The eye may be displaced. Forwards, downwards, and outwards, if from the frontal sinus (page 97 Case 12) and mostly outwards and downwards in ethmoidal empyema.

In the acute cases one commonly finds that the patient has, or has recently suffered from, either influenza or an acute coryza, which may or may not have been associated with nasal discharge. There is nearly always severe supra orbital pain, but the temperature does not rise more than one or two degrees unless intracranial complications set in.

In Maxillary Sinusitis the cheek may be oedematous, red, tender and painful, though the pain is generally referred to the supra orbital margin.

In Frontal sinusitis there is pain and tenderness on pressure. over the frontal bone and in particular the orbital roof. Not infrequently there is a great deal of redness and oedema, so that the lids cannot be opened.

The Ethmoidal Sinusitis gives rise to much the same symptoms as the frontal.

Acute Sphenoidal Empyema causes pain at the supra orbital margin, when it is often severe, at the back of the eyes, and occasionally at the external auditory meatus, simulating middle ear disease.

Anterior rhinoscopic examination may show the nasal cavity to be full of pus which must be removed before one can decide where it comes from, and before the condition of the

parts can be seen; or no pus may be present.

As a rule, the mucosa is reddened and swollen, particularly the inferior and middle turbinates.

Fish describes the appearance of the inferior turbinal in acute cases as having a "hot and dry" appearance, and this together with swelling he regards as presumptive evidence of acute sinusitis.

If pus is situated in the middle meatus, it can be derived from either the antrum, frontal or anterior ethmoid sinuses; and if above the middle turbinate from the posterior ethmoid or sphenoid sinuses.

(Closed sinuses always cause more severe symptoms than the open.)

Pus may be seen on the posterior pharyngeal wall.

Posterior rhinoscopy will show the mucosa and turbinates to be in the same condition as anteriorly; pus seen in the inferior meatus has no diagnostic value, but if seen lying upon the middle turbinal or on the roof of the choanae it is strongly presumptive evidence of posterior ethmoidal or sphenoidal disease.

Frankel's test is sometimes of service in antral suppuration; if no pus be present (and if present it is carefully removed) and the patient be directed to hold his head well down for a few minutes, and then the nose be re-examined, pus may be found present. If this be below the middle

turbinal it is very suggestive of antral suppuration, because this is the only sinus of the anterior group which drains well in this position.

When the ethmoidal cells are diseased it is very difficult to keep the nose free of pus for any length of time, because they drain continuously into the nose.

As a further aid to diagnosis, the antral and frontal sinuses can be washed out or transilluminated.

In the diagnosis of the two most difficult sinuses i.e. the posterior ethmoid and sphenoidal, it is a great help to exclude disease of the frontal and antral by washing out these latter two.

The antrum is most commonly washed out through a Lichwitz trochar and ⁿcanula passed through the sinus wall in the inferior meatus, and is readily performed; and the frontal through a frontal sinus ⁿcanula passed into the fronto-nasal canal.

If pus be obtained from either, it is pathognomonic. Transillumination is a valuable aid, especially in acute cases, but it is not absolutely reliable.

In health, the antrum should give a bright infra-orbital tache, and in most cases a pupillary reflex, in disease the latter is lost, and the infra orbital tache is very dull or absent. By frontal illumination we can in health map out the area of the sinuses, in disease there may be dulness.

The Skiagram is of great use, for it decides if the particular sinus be present, and gives its size, and it can be applied to all the sinuses. Kuttner¹ says, in the hands of expert sinus radiographers it is of real value in diagnosis, but only under those conditions.

Chronic Empyema.

In chronic sinusitis many of the signs and symptoms are the same as in the acute. There is usually the history of long-continued nasal discharge, which has perhaps folled^{ow} influenza or a cold. Often the complaint is of the feeling of constant cold in the head and obstruction in the nose, and that the symptoms are all worse when a nasal coryza supervenes.

Antrum.

There may be pain, but, as a rule, only when an acute or subacute attack supervenes resulting from coryza, and then is usually supra-orbital.

Characteristic of chronic antral suppuration is the patient complaining of the smell from the discharge - cacosmia. The discharge is usually more abundant^{up} to mid-day.

Frontal Sinus. There is usually some tenderness and constant headache localised to the corresponding brow.

1. Die entzündlichen Nebenhöhlenerkrankungen der Nase im Röntgenbild. Berlin. 1910.

Sphenoidal sinus. There is usually more or less severe constant headache, most frequently supra orbital, but also vertical, occipital and at the auditory meatus. Pain at the backs of the eyes is characteristic of sphenoidal disease.

The discharge tends to form in crusts about the septum and choanae.

Anterior and Posterior Rhinoscopic examinations show pus in the sites already mentioned. The mucosa is "boggy and sloppy" as it is termed, and frequently the nose is blocked by polypi.

Transillumination, washing-out, and skiagraphy are all employed in the same manner and for the same purposes as previously mentioned.

Orbital Cellulitis may result from disease of any of the sinuses whether acute or chronic, but most frequently from the frontal and ethmoidal. Proptosis may be the result of bony expansion or inflammatory oedema, and may occur in any sinus disease; that due to sphenoidal is generally straight forward; the other displacements have been mentioned on page 42 .

The diagnosis in both acute and chronic cases is difficult, particularly in the posterior group, and it must not be forgotten that more than one sinus may be involved and that the particular one diagnosed may not be the one causing the symptoms.

Fish¹, Mackay and Turner², St Clair Thomson³ and others all lay stress on the fact that because no pus is found in the nose the conclusion does not follow that there is no empyema; and Axenfeld⁴ states that because a surgeon operates and finds an apparently healthy sinus it does not necessarily mean that the sinus has never been diseased, and he instances a case where an orbital abscess resulted from a frontal sinusitis, and which he was able to trace to it, yet at the operation the frontal sinus was apparently healthy.

TREATMENT AND PROGNOSIS OF ACCESSORY SINUS DISEASE.

Acute Sinusitis.

Acute accessory sinus disease shows a great tendency to self-cure, and only very few require more than medical or very simple surgical treatment, and unless there be some serious complications this should be the line pursued; and such complications would be for example cavernous thrombosis, violent optic neuritis, orbital cellulitis and meningitis. Optic neuritis which is not of a very violent character does not require immediate surgical interference, because as will be seen in section V. (cases 1 and 2 pages 53 & 64 which are severe examples) these cases may rapidly clear up under medicinal treatment, and when this fails recourse may be had to surgery, for even though in the interval vision has been considerably impaired, experience shows it is not usually permanent.

Hot fomentations applied to the forehead or cheek have a beneficial effect upon the pain and the congestion. Spraying the nasal cavities occasionally with a weak solution of cocaine and adrenalin may by contracting the mucosa around the ostia permit of a more free escape of pus. Frequent douching with mild antiseptics is always to be a routine practice, such as ^{the} ~~see~~ page 49.

Hempel⁵ has had good results from the use of potassium iodide administered internally in 5 gr. doses over a prolonged period; he says it liquifies pus and contracts the mucosa.

Mercury in the form of inunctions pressed to the point of salivation is useful in controlling the inflammation, and particularly in the complication of optic neuritis (see cases 1 & 2 page 53 & 64)

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1. FISH. British Medical Journal, 1908.
 2. MACKAY & TURNER. Ibid.
 3. STCLAIR THOMSON. Ophthalmoscope, 1908.
 4. AXENFELD. British Medical Journal, 1908.
 5. HEMPEL. Berlin. klin. Woch., 1909

Free diaphoresis is of great advantage in some cases, probably by relieving the congestion of the mucosa, as was seen in case *id.*, sect iv page 64. It may be obtained by hot air baths, pilocarpine injections. Guaiacol dissolved in oil and used as an inunction is very efficacious, and less depressing than most others.

The diagnostic processes of washing out the frontal and antral sinuses is often sufficient to start the process of recovery, and they may be repeated if necessary, in which case the antrum is approached through a tooth socket.

Chronic Sinusitis.

In chronic empyemata undoubtedly too many operations are performed, particularly on the frontal, ethmoidal and sphenoidal sinuses, and medicinal means are not given a sufficient and systematic trial, and this particularly so in view of the very unsatisfactory results following the so-called radical operations, but there are of course many cases in which some more or less serious operation is called for.

The Antrum of Highmore is much more amenable to treatment and satisfactory in prognosis.

The first essential in all cases of sinusitis whether acute or chronic, is to keep the nasal cavity clean by a mildly stimulating lotion. The following recipe is that recommended by Dobell:

R. Sodii Bicarbonatis
Sodii Salicylatis a.a.gr.xv.
Olei Mentholis
Olei Thymolis a.a.gr.ss
Glycerini m xl
Aquae ad ʒi

Fiat et Misce.

Sig.-One part of lotion to two parts of warm water frequently used as a douche.

Any polypi present must be removed. If the turbinates are very enlarged and impede free drainage portions must be removed.

The frontal and antral sinuses may be washed out daily. If these means prove unsuccessful operative treatment may be considered.

Radical Antral Operations.

consist in trephining through from the inferior meatus, canine fossa or both, into the antral cavity, subsequently the cavity is daily washed out. The proceeding is quite satisfactory.

Frontal Sinus.

There are many modifications, but Killian's new operation, consisting of removing the anterior wall and orbital roof but leaving a bridge of bone is perhaps the best. There are also osteo-plastic methods, whereby flaps of bone are turned down and the whole cavity well exposed, such as in Watson Williams's operation.

The Ethmoidal Cells.

are curretted or nibbled away with forceps after preliminary turbinectomy has been performed.

The Sphenoidal Sinus.

The middle turbinate must here also be removed, and then the anterior wall of the sinus is nibbled away with bone-cutting forceps.

In chronic cases only too often one sinus after another is found diseased, and one after another is opened up until they have all been operated upon.

Mucoceles

are treated by simply opening and draining either into the nose or on to the face, care being taken not to infect them.

Malignant Disease.

is treated upon the same surgical principles as in other parts of the body.

SECTION IV.

The NORMAL VISUAL FIELDS and the METHOD OF TAKING ADOPTED in this SERIES OF CASES.

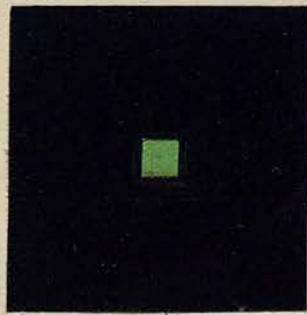
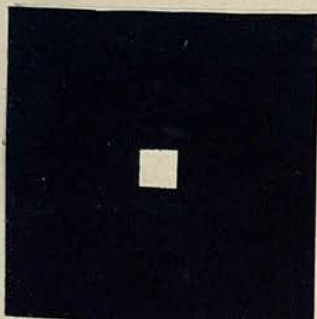
I used the Priestley-Smith perimeter with test objects mounted on 4 c.m. black square cards. The test objects being 5 m.m. squares of white, red and green in most of the cases, but finding that green showed any contraction present better than red, in some of the later cases I have only used white and green.

Previous experience has shown that 5 m.m. square test objects are the best for general use. I have used this size in every case throughout where it has been possible.

For purposes of comparison it would be ideal to have the visual fields examinations made in a dark room with a definite artificial light, but as this has been impossible, I have recorded the daylight conditions as far as possible in each case.

Another important point is the use of always the same colours, as different colours may possess very different values of Luminosity.

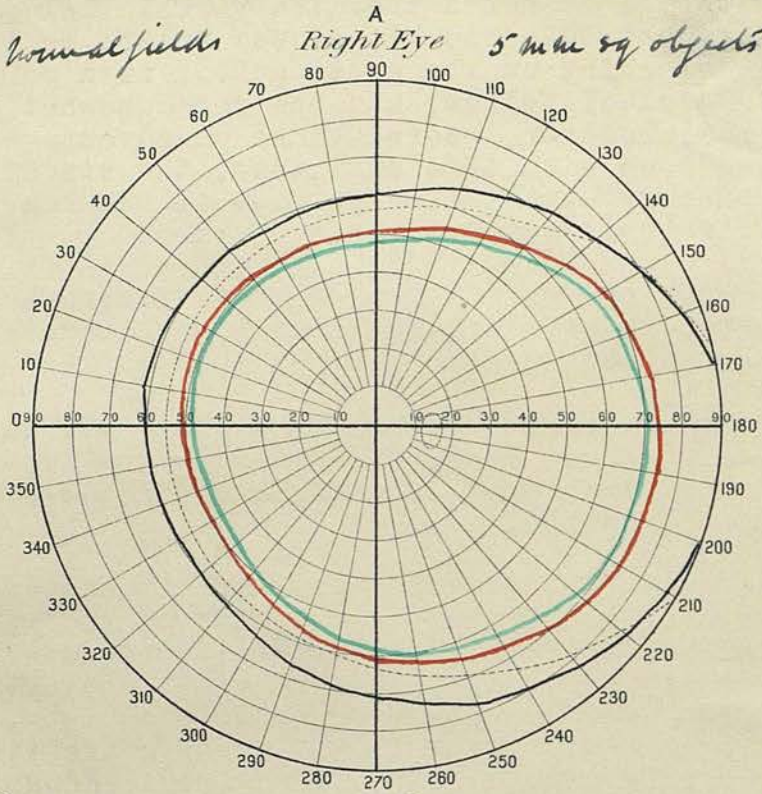
The fields of vision which I give below as the normal are the averaged obtained, with a good light and 5 m.m. square test objects, from six healthy men and women, and in them there was a good deal of variation in the visual extent for the colours red and green, and we may consider a field full if it be within 5° on the outer side and 10° on the inner side of the average line



Normal fields

Right Eye

5 mm sq objects



Name

Date

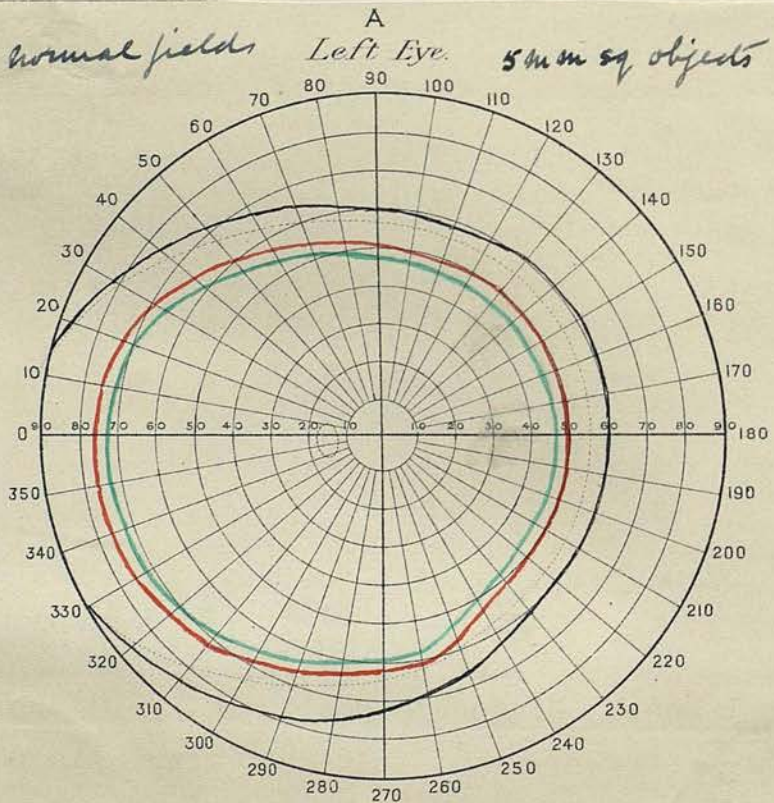
Priestley Smith's Perimeter.

Curry & Paxton.

Normal fields

Left Eye

5 mm sq objects



Name

Date

Priestley Smith's Perimeter.

Curry & Paxton.

It will be noted that the visual field for green is charted somewhat closer to the red than usual depending on the green colour used contained a good deal of yellow, and the red somewhat dull. This has, however, proved to be an advantage, because even with this advantage, the visual field for green has been in most of the cases much more affected than the red.

The average visual fields for 5 m.m. square objects have been marked upon all the charts whatever sized test object was used in testing the patient.

Scotomata have been examined for by 1 m.m. square red and green objects, and larger objects where the scotoma was so large as to permit of their being shown.

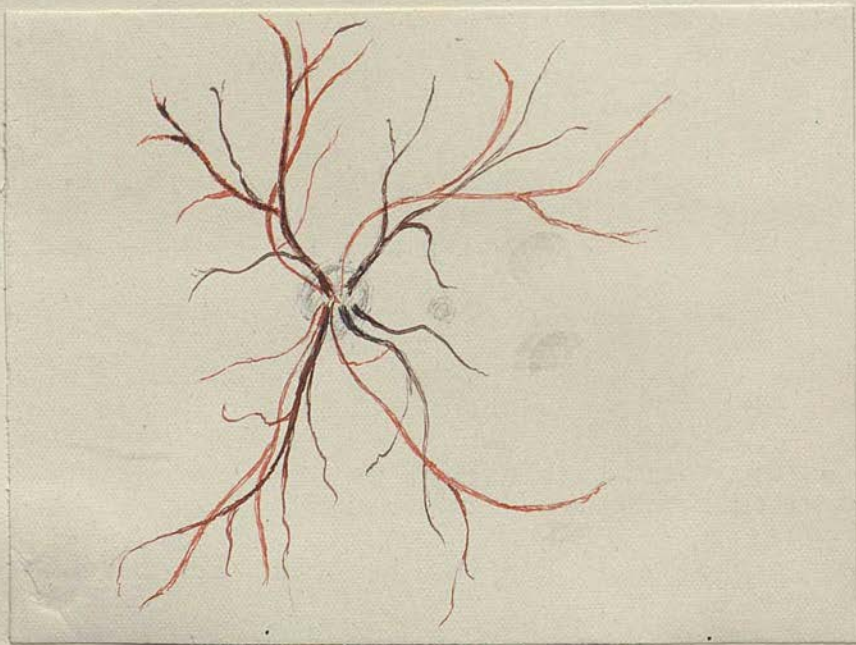
As the charting of each visual field between every 15° and 20° takes a very long time and is fatiguing to the patient, I gave frequent and considerable periods of rest, and also alternated the eyes.

Where possible, I have avoided taking the visual fields in female patients during their menstrual periods, because, according to Parsons¹, this may cause contraction, and in all patients before any nasal procedure such as douching or cathetering^{s1} the sinuses, lest it might also cause temporary contracture of the visual fields.

In a few cases, I have used the direct method of testing the visual fields, either because the patient was in bed, or as a confirmatory test. By the direct method I mean where the patient fixes his vision upon the observer's eye, immediately opposite, and the observer brings his hand or other large test object into view from the periphery and compares the patient's vision with his own

The series consists of 30 cases as follows:

- a. Sphenoidal and Posterior Ethmoidal Sinusitis
10 cases. Diagnosis positive in 6.
probable in 4.
 - b. Anterior Ethmoidal Sinusitis.
1 case. Diagnosis positive.
 - c. Frontal sinusitis. 3 cases. Diagnosis positive in 3.
 - d. Antral Sinusitis. 7 cases. Diagnosis positive in 7.
 - e. Polysinusitis. 9 cases. Diagnosis positive in 5
probable in 4.
-
1. PARSONS. Pathology of the Eye, vol.iv., 1907.



Ophthalmoscopic appearance of right eye to show the whole fundus (Indirect image semi-diagrammatic)

a. SPHENOIDAL AND POSTERIOR ETHMOIDAL SINUSITIS.

Case 1. Acute Bilateral Sphenoidal Sinusitis.
Prolonged blindness right and left. Optic neuritis,
blocked central artery, collateral circulation,
bi-temporal hemianopsia. Recovery.

Mrs F.K., aet. 25. Farmer's wife.
Came to the Bristol Eye Hospital on 1st October, 1908,
complaining that the right eye had recently become
blind.

The History was that fourteen days previous to this,
the first attendance, she noticed that the sight of
the right eye was growing dim, and two days later,
she could only see the halves of objects looked at,
and the portion seen was to her left hand side, and
since then the sight has rapidly failed to blindness.

She has had since the commencement of the trouble
violent pain over the forehead, but no sickness nor
giddiness.

Ocular conditions. 1st Oct., 1908.

She has no headache now, nor pain or tenderness in
the eyes.

Externally both eyes look healthy, corneae, irides,
and conjunctivae.

There is no obvious squint.

The pupils react to light and accommodation.

Vision Right = No perception of light.

Left = $\frac{6}{5}$ J $\frac{1}{12}$ inches.

Ophthalmoscopically.

Right. The Media are clear and healthy. The Fundus
Oculi presents a curious appearance of which the
accompanying drawing gives a good idea. The
Arteries are very attenuated at the disc and extremely
so at the point of emergence upon the disc, but as
they pass onwards towards the periphery they grad-
ually widen out to regain a very fair calibre at
the periphery. The veins by comparison are slightly
engorged, but are probably normal. There are no
cilio-retinal arteries, and no haemorrhages. The
disc is slightly blurred, but the retina is not
oedematous and shows no change.

Left. The Media and Fundus oculi are normal in
every way.

At this stage the condition was thought to be inflammatory blocking of the right central artery of the retina, and a bad prognosis given for the sight of that eye, and a favourable prognosis so far as the left eye was concerned.

October 6th, 1908. She was again seen independently and the same condition of the fundus noted.

Continued History.

She attended again four days later, i.e. Oct. 10th, 1908, (when she was admitted as an in-patient) because she noted two days previously, i.e. Oct. 8th, the sight of the left eye beginning to fail.

On the evening of Oct 8th, the sight was getting dim, but she could see her bed quite well; the following morning, however, she could only see the halves of objects, and the portion seen was on the right hand side. The headache returned, and has been severe for the last two days, and situated over the forehead. She has not been sick nor giddy.

There is no history of any similar attack before this October.

Present Condition.

She is a strong, well-developed, ruddy complexioned healthy young woman, the wife of a farmer, and recently married.

Cardio Vascular System, healthy.

Pulmonary System. healthy.

Urine. No albumen nor sugar.

Genital. Menstruation normal. She is not pregnant.

Nervous system. Excepting for the headache, there is nothing abnormal to note. Superficial and deep reflexes present, and sensation normal. No sickness and no giddiness.

Previous Health. Has never had any illnesses.

There are no signs of syphilis, tuberculosis, gout or rheumatism.

Nose. She does not complain of any nasal discharge, and unfortunately a thorough examination was not made at this date.

Ocular Conditions.

Both eyes look healthy, together with the surrounding parts, and there is no tenderness of the forehead nor cheek.

There is no proptosis.

Muscles. The movements are good and painless and there is no squint.

There is some tenderness on pressure of the globes backwards.

Pupils. The right appears to react to direct stimulation sluggishly and slightly, and the left reacts to light sluggishly.

Tension. Right and Left normal (and throughout the affection).

Vision. Right = No perception of light.
Left = Counts fingers at 9 inches.

Ophthalmoscopically.

Right. The media are clear and the fundus oculi presents no changes from those described previously.

Left. The media are clear and the fundus oculi appears healthy in every way.

Treatment and Progress.

Oct 10, 1908. Having been put to bed, she was freely purged with salines and calomel, and given Hydrargyri cum creta grs.ii. ter in die.

Oct 13. The Left disc appears to be slightly pallid, but otherwise there was no changes in the right or left fundi. She was ordered to have hypodermic injections of Pilocarpine Nitrate gr. $\frac{1}{6}$ ter in die and in addition to the mercury by the mouth inunctions twice daily of unguentum hydrargyri.

Oct 16. She feels much better, the headache being only slight. The pilocarpine has caused free diaphoresis and is to be discontinued. The pupils are two-thirds dilated and both react sluggishly to light.

Vision. Right = Hand movements.

Left = $\frac{6}{36}$

Oct 21. Still improving, and is free from headache.

Vision. Right = counts figures in the nasal field.

Left = $\frac{6}{20}$

Ophthalmoscopically there are no changes in either eye.

Oct 24. The frontal headache has returned and she feels ill and sick, but she has not vomited (she is having a great deal of mercury and has just started menstruating, which is normal). Temperature 98.4.

Vision. Right = counts fingers in the nasal field.

Left = Hand movements in the nasal field.

There is now a decided and definite Bi-temporal Hemianopsia.

Ophthalmoscopically.

The right optic discs shows increasing pallor, but otherwise no change in either the right or left.

As she was beginning to be salivated the mercury was discontinued.

Nov 1. She has still severe frontal headache and feels ill; she has not slept for several nights owing to the pain, which has not been relieved by morphia injections.

Vision. Right = counts fingers in the nasal field.
Left = Nil

Ophthalmoscopically.

The right optic disc shows a good deal of atrophy, and the vessels still present much the same appearance as when first seen.

The Left fundus oculi has greatly changed. There is a well marked neuro-retinitis - the centre of the disc being seen with +5. D above the rest of the fundus, and there is much streaking of the surrounding swollen oedematous retina. The veins are very engorged and there are numerous retinal haemorrhages near the disc, and there is exudate covering the vessels in parts. The arteries appear about normal.

Nov 5th. The headache is slightly better.
Vision. Right = counts fingers in nasal field.
Left = nil

Ophthalmoscopically. The left optic disc is now only swollen +2 D, and the right remains in statu quo.

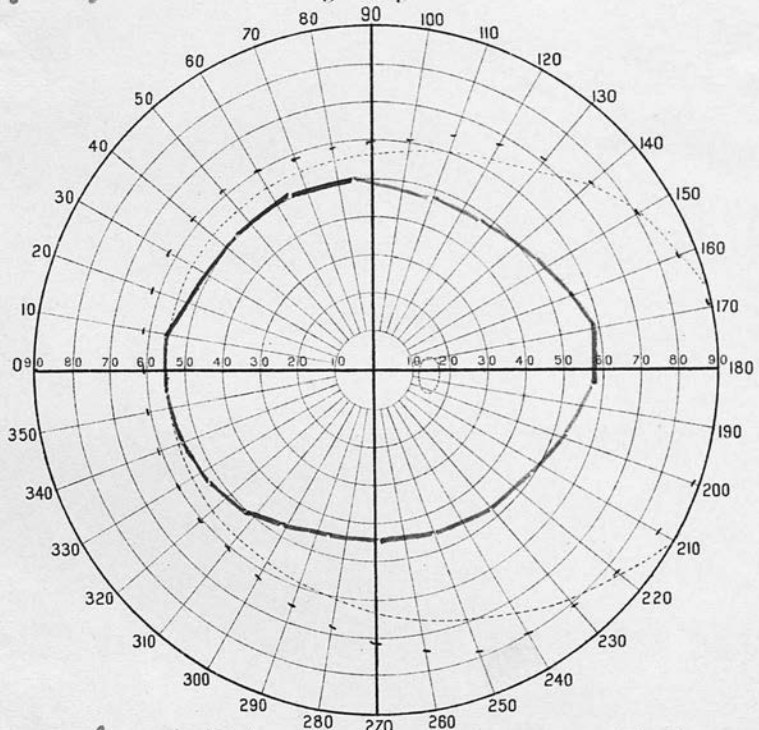
Nov 8th. The headache is now very much less severe.

Vision. Right = $1\frac{1}{2}$
 = $\frac{60}{60}$
Left = nil

Nov 12th. Has now no headache, and feels very much better. The vision has improved but is still very defective in the temporal fields.

Right = good

A
Right Eye Field white = 9 mm sq



Name Mrs. J. King
Priestley Smith's Perimeter.

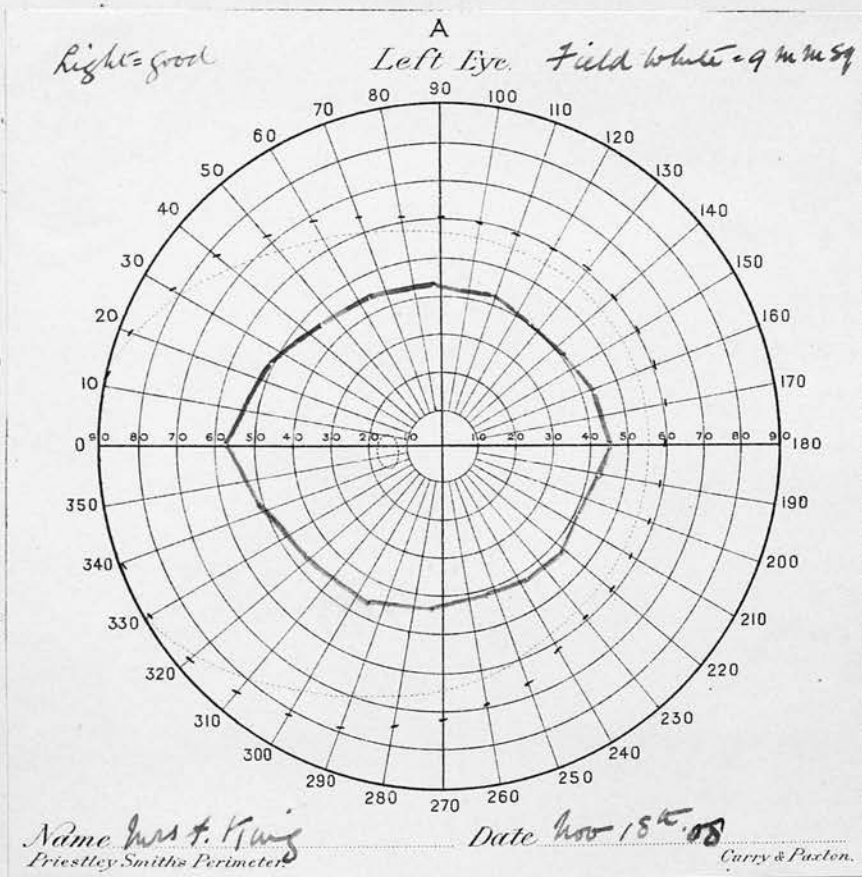
Date Nov 15th 05

Curry & Paxton.

Vision Right $\frac{1\frac{1}{2}}{60}$ Left $\frac{1}{2}$
 $\frac{1\frac{1}{2}}{60}$ $\frac{1}{60}$

Ophthalmoscopically, the neuro retinitis in the left eye has to a large extent cleared up, and there are only a few haemorrhages. The right fundus remains unchanged. Mercury inunctions were again administered.

Nov 18. Visual fields taken with 9 m.m. square white test objects. The visual fields are markedly contracted for white and particularly on the temporal side. No mention is made of whether or no scotoma were present.



She remained an in-patient till Dec. 1st, during which time she had no retrogressions and the vision gradually improved.

Dec 1. Vision Right $\frac{5}{60}$ J $\frac{14}{12}$ inches.
Left $\frac{1}{60}$ J $\frac{20}{12}$ in.

Ophthalmoscopy. The right disc is very pale. There are a few haemorrhages in the left fundus still unabsorbed, but the optic disc is now only slightly blurred. She was given pills to take twice daily, containing $\frac{1}{32}$ gr. of strychnine

hydrochloride which she has taken at intervals for the past year.

Jan 21, 1909. The central and indirect vision have greatly improved in each eye.

Pupils. Both the right and left are two-thirds dilated and show very marked hippus.

Vision Right = $\frac{6}{12}$ Left = $\frac{6}{36}$

Ophthalmoscopically. The right disc is pallid and the vessels are generally attenuated. They have lost the inverse direction of calibre.

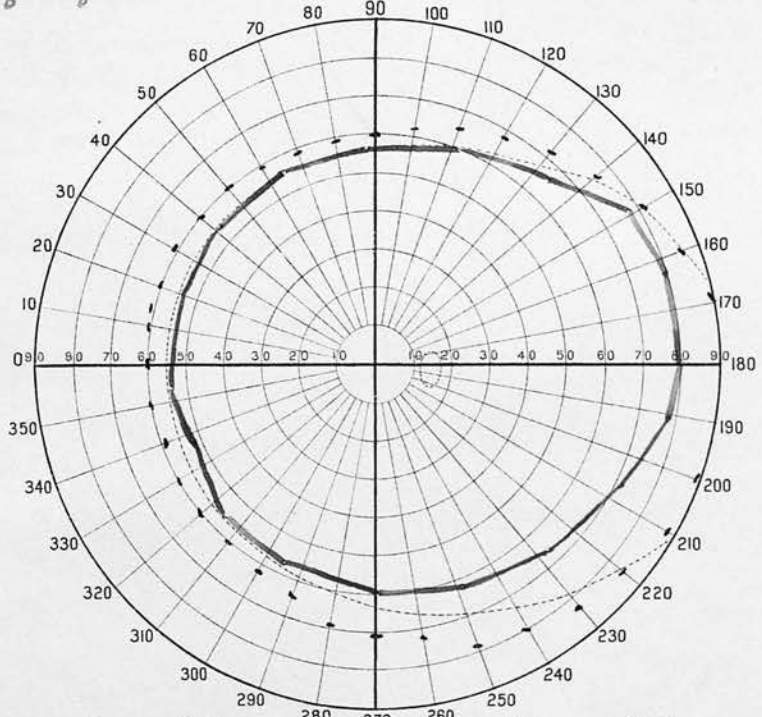
The left disc is pale. but the neuritic exudate and haemorrhages have been absorbed.

The visual fields show slight general contraction, more marked in each temporal field. Vide p. 58a.

Right = good.

A
Right Eye

Field white 10 m. m. sq



Name Mrs. F. King.
Priestley Smith's Perimeter.

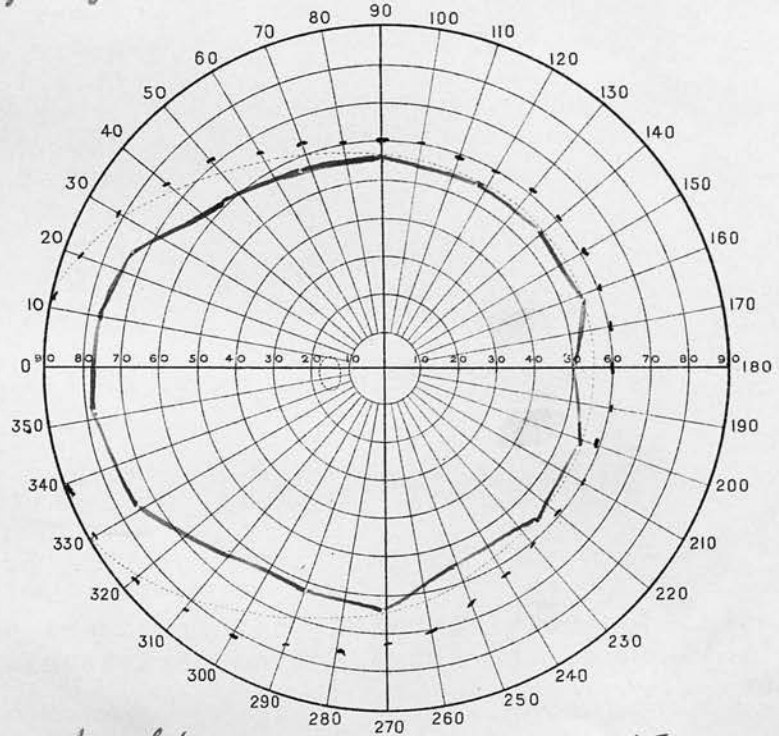
Date Jan 21st 1909

Curry & Paxton.

Right = good

A
Left Eye

Field white 10 m. m. sq



Name Mrs. F. King.
Priestley Smith's Perimeter.

Date Jan 21st 1909

Curry & Paxton.

N.B. Visual fields tested with 9 m.m. object and compared with the 5 m.m. field of vision.

Nov. 18, 1909. She looks well, and has had good health during the past year.

There are no signs of syphilis, nor acromegaly at the present date.

Ocular Conditions.

Externally, both eyes appear healthy - corneae irides and conjunctivae.

The Muscular Movements are good and painless, and Maddox rod shows no squint. There is no tenderness on pressure over the globes, nor of the frontal and cheek regions.

Pupils. They react to light and convergence, but hippus is very marked.

Tension. Right and left normal.

Vision. Right = $\frac{6}{9}$ (3) J $\frac{1}{12}$ inches.
Left = $\frac{6}{18}$ (3) J $\frac{6}{10}$ inches.

Ophthalmoscopically. The media are clear and healthy in both eyes. Right: The vessels are of fair size, and the arteries show no alteration in the calibre in the reverse order as when previously described. The arterial coats are not thickened, and there are no perivascular lines.

The optic disc is very white, and its edges are perhaps a little irregular, as though there had been some neuritis, but it is not very definite; there is atrophic cupping.

There are apparently no cilio-retinal vessels and the fundus is otherwise normal.

LEFT. The disc is very pale, its edges are irregular and part of the lamina cribosa is seen.

The vessels are attenuated, but the coats are not thickened, and there are no perivascular lines.

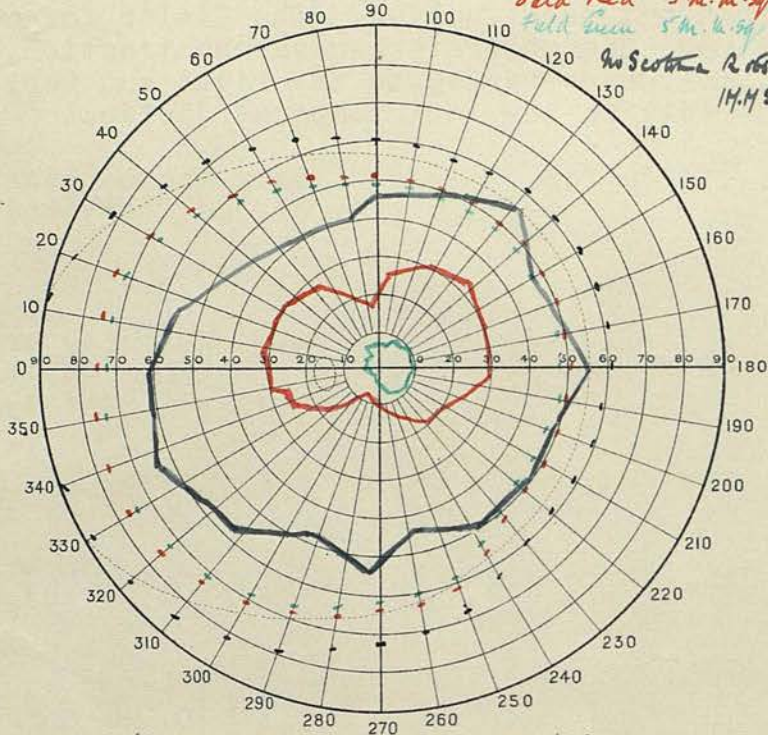
The retina is striated around the disc, but there is no swelling and the haemorrhages and exudate have been entirely absorbed.

There is post neuritic atrophy.

Right's pair

A
Left Eye

Field White 5 M. M. Sq
Field Red 5 M. M. Sq
Field Green 5 M. M. Sq
No Scotoma R. or B.
14.14 Sq



Name Mrs Florence King
Priestley Smith's Perimeter.

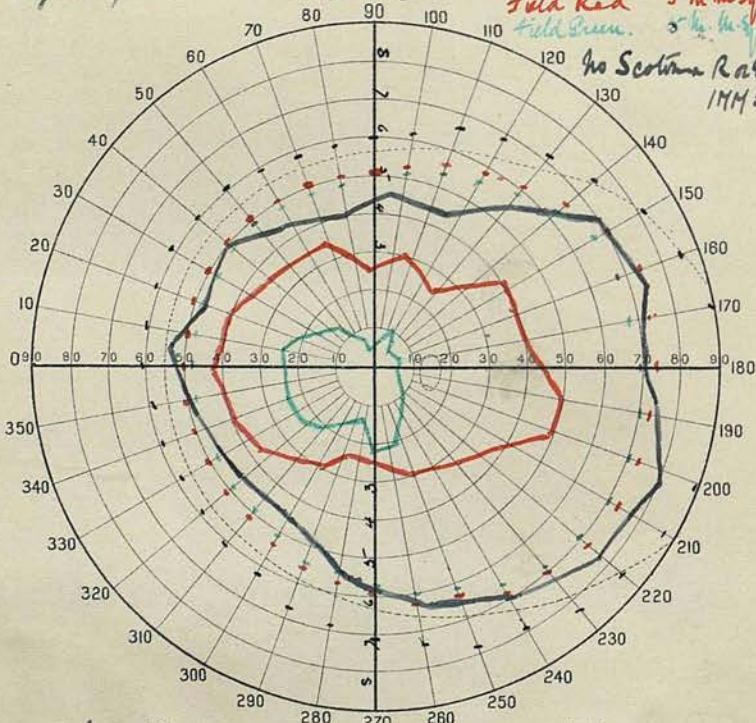
Date 15th Nov. 09

Curry & Paxton.

Right's pair.

A
Right Eye

Field White 5 M. M. Sq
Field Red 5 M. M. Sq
Field Green 5 M. M. Sq
No Scotoma R. or B.
14.14 Sq



Name Mrs Florence King
Priestley Smith's Perimeter.

Date 15th Nov. 09

Curry & Paxton.

The visual fields. page 59a.

Patient not menstruating. The fields for white and red show moderate general contraction, slightly more marked in the right and very considerably in the left temporal fields.

The fields for green show very marked general contraction, particularly in the left, and even at this date there is almost a Bi-temporal Hemianopsia. There are no scotomata.

N.B. Fields of Vision taken previously are with 9 m.m. square objects, and the above for 5 m.m. square objects; the former being almost $3\frac{1}{2}$ times as large.

Nasal Conditions. Nov 18th, 1909.

On careful enquiry, she is positive she has no discharge from her nose now, and that she has never had any.

Anterior Rhinoscopy.

The parts all appear healthy and there is no pus. The Septum is deviated a little to the left.

Nasopharynx. The posterior pharyngeal wall is greyish, and granular, and presents the appearance as if it had been associated with the passage of pus over it for some time.

Posterior Rhinoscopy. This examination was readily performed without troublesome palatal reflexes, and as Edward Woakes pointed out many years ago, is always found in patients who have suffered from post-nasal discharge.

There is a fair amount of pus in the post-nares, and high up upon the left middle turbinal there is a very definite film of pus.

The situation of this pus points strongly to its origin, either from the sphenoidal sinus, or the posterior ethmoidal cells.

Transillumination. The frontal and antral cavities on each side illuminate well.

DIAGNOSIS.

The diagnosis in this case was one of great difficulty. As it first presented itself, it appeared to be a blocking of the central artery of the right retina, and from the gradual onset either the result of an embolus causing at first only partial blockage, and later completion by thrombosis; or to an inflammatory condition far back upon the nerve setting up an endarteritis or thrombosis and blockage of the circulation.

Spasmodic contraction of the artery was excluded owing to the length of time that the condition lasted - 4 to 5 weeks.

From the result, and later history, the blockage of the central artery was evidently due to an inflammatory oedema of the vessel coats. The bad vision, however, was due to the retrobulbar neuritis, for the collateral circulation was very considerable.

The very definite history of the patient, that in each eye halves of objects in the temporal field had disappeared consecutively was somewhat lost sight of, until the condition presented again at a later date, because when first seen the right was blind with a blocked central artery, and the vision of the left so greatly reduced that it did not show any particular field, other than general contraction of the field.

Mercury was administered, not with the idea of its being of a syphilitic nature, but to combat inflammation.

None of the usual causes could be found for what appeared to be an ordinary bi-lateral retrobulbar neuritis in a particularly healthy woman - albuminuria, diabetes, influenza were all excluded; and it was not until three weeks after she was first seen that a definite bi-temporal hemianopsia developed, which at once localised the lesion in the region of the optic chiasma.

Acromegaly is the commonest cause of bi-temporal hemianopsia, and Swanzy (1) mentions gumma and chronic periostitis in this region as other causes.

Acromegaly was excluded, as there was no enlargement of the jaw, face, feet or hands. the skin

(1) SWANZY & WERNER. Handbook of Diseases of the Eye.



F.K. Case 1. Lateral.

Both sphenoidal sinuses are large, and posteriorly one extends to the dorsum sellae and the other not quite so far; and anteriorly, both extend well into the ethmoid region, one somewhat further than the other. The table of bone between the limbus sphenoidalis and the pituitary fossa is no thicker than the average, and is large, because the pituitary fossa is small. There is no sign of a tumour.

Other intracranial tumours were excluded because of the entire absence of all cerebral symptoms excepting headache, which, however, was unassociated with sickness.

A Tumour sufficiently large to involve both optic nerves and chiasma would almost certainly have affected the 3rd, 4th, and 6th cranial nerves, and these were unaffected.

The lesion or lesions must be capable of affecting the right optic nerve and right half of the chiasma, and then at a later date the left optic nerve and chiasma, and such could result from a sinusitis of the posterior ethmoidal cells or sphenoidal sinus, first on the right side and then on the left, under certain conditions, which are -

The Chiasma must be far forward in relation to the optic sulcus of the sphenoid bone, and the walls of the sinus sufficiently thin or dehiscant as to allow toxins and inflammatory matter to pass through and involve the optic nerves and chiasma; vide the anatomy of the optic nerves and chiasma and central artery of the retina, page 31 et seq.

From the nasal conditions as observed a year later, and the symptoms, there can be no doubt that this train of ocular symptoms resulted from one or other of the aforementioned sinuses, and from the length of time between the two eyes being affected that it was a sinusitis of the right sphenoidal, and later of the left.

The skiagram shows well developed sphenoidal sinuses with a roof of no more than average thickness.

I explain the intense neuritis on the left side and the absence on the right, by supposing that the anatomical conditions of the left sinus and optic nerve were more suitable for the passage of toxins, etc., to the nerve, and perhaps further forward on the left optic nerve.

A point of great interest in this case is the blockage of the central artery without involvement of the vein; a fact which goes to prove that the central artery of the retina arises from the ophthalmic far back in the orbit, as I have shown on page 31 sect. 2

There was also almost complete collateral circulation within the globe. (vide page 54 sect. 5)

Case 2.

Right and Left Chronic Sphenoidal Sinusitis.

Bi-lateral choked discs persisting over a prolonged period and vision reduced to P.L. and $\frac{6}{12}$ in the left and right respectively, and recovery to $\frac{6}{12}$ and $\frac{6}{5}$ in left and right.

Miss A. H. Aet. 29. Dressmaker.

History of ocular affection, taken Jan 19th, 1910.

Two years ago this January she accidentally covered the right eye and was surprised to find she could not see to read the newspaper, and on further testing the left, she found she could not read the large letters on the railway trucks some fifty yards distant, which she could very easily do with the right. During the next six months - up to summer, 1908 - the left eye went "blind" so that she could barely tell light from dark. Towards the end of the summer, 1908, the sight of the left eye slightly improved, so that she was able to see her fingers, but not well enough to count them.

The sight in the right eye was good up to September 1908. In September, 1908, all the teeth were extracted with the exception of the canines two and four incisors in the lower jaw, because they were thought to be the cause - though sound - of the severe headache which she had at that time, (vide later); and a week after this the eye became suddenly bad - she could see all right the night before on going to bed, but the following morning she could not see herself in the mirror. The headache was still severe.

For the next three weeks she was unable to tell the time and then the sight suddenly returned in the right eye during the night, so that she could see much better in the morning.

The sight in the right eye remained good and improved during the next fortnight and she was able to read a paper. She had had no treatment during this time.

At the end of this fortnight, the sight of the right eye rapidly failed, and, as before, it was mostly noticeable on waking in the morning, and during the following fortnight or thereabouts the sight was so bad that she had the greatest difficulty in getting about her own home.

Then about the end of the first week in November, 1908, the sight in the right eye again began to improve, and towards the middle of the same month the headache almost suddenly ceased.

In the summer of 1906 (patient, aet.22) she was suddenly seized with severe headache, which was frontal in character, generally over both eyebrows but sometimes only over the right, and this headache lasted without one day's intermission (she is particular about this) until the middle of November, 1908, when it practically suddenly ceased. At times the pain was so severe, that she had to go to bed, and in spite of treatment by her local doctors nothing relieved it.

There was no cause so far as she knew; it had no relation to the menstrual periods, and she had not had a cold nor influenza previously; and when in 1907 she had influenza it had no effect upon the pain one way or the other, nor was the eyesight worse as far as she remembers.

She says she has never had any nasal discharge, and that she has none now.

From November 1908 to September 1909 the vision in the right eye was very misty, and everything appeared nearer than it really was; that of the left remained much about the same, though during the last few months she has seen better to the extreme left than when an object has been directly in front of the left eye; the sight in the left eye was not sufficient to recognise objects, however.

She was seen at the Shrewsbury Eye, Ear, Nose and Throat Hospital on September 25th, 1909 and was found to have double optic neuritis.

She was admitted an in-patient to the same institution on November 10th, 1909, and the eye condition noted was Bi-lateral optic neuritis.

Vision Right = $\frac{6}{9}$ lenses no help.

Left = Hand movements.

Treatment. Inunctions of mercury ointment for a few days, and Burnham treatment for twelve days. This latter consists of rubbing into the abdomen

R Guaicolis
Olei Olivae a.a.
Fiat et Solve

Signature: $\bar{3}$ ii daily.
and the administration of the two following:

R Tincturae Nucis Vomicae ʒi
Acidi Nitro-hydrochlorici diluti ʒii
Aquae Chloroformi ʒvi
Fiat et Misce.

Sig.-One tablespoonful thrice daily.

R Hydrargyri cum creta grs ii
Pulvis Ipecacuanhae Compositi grs iiii
Glycerini Tragacanthae q.s.
Fiat Pilulae

Sig.-One three times daily.

The object of this treatment is to cause free diaphoresis, and it is less depressing than that obtained by hot air baths or pilocarpine. The strychnine also helps in preventing depression.

The diaphoresis lessens the congestion of the mucosa, and if the sinusitis be a "closed" one may convert it into an "open" one, and promotes the drainage of the cavity. Mercury is exhibited for the beneficial effect upon inflammation.

She was discharged at the end of twelve days, when the vision was
Right = $\frac{6}{6}$
Left = $\frac{6}{36}$.

There was no note made of the ophthalmoscopic appearance.

She remained perfectly well for the next fortnight, and then the severe frontal headache returned and lasted for a fortnight constantly, and then suddenly ceased.

The headache has never during the whole time been associated with sickness.

She does not remember if the eyes were ever tender, nor was there any swelling or redness of the forehead.

Previous health. Has never had any serious illness
Mild influenza in 1907.

She has not suffered from rheumatism nor syphilis.

Family history. Father died of consumption, her mother is alive and well. The family consisted of three, including the patient - one brother alive and well, and one sister who died of kidney trouble.

Present Condition. She is a robust, healthy-looking young woman. Heart and lungs are healthy
Genito-Urinary system. Menstruation normal, no dysmenorrhoea nor metrorrhagia.

Urine: No 1030. Faintly alkaline, no albumin nor sugar.

Haemopoietic System. The spleen is normal in size and position, and the liver is not enlarged.

Cytology. Red corpuscles 4800000, whites 7000. There is bi-lateral enlargement of the thyroid gland (she comes from a goiterous district, and it causes no symptoms.)

There are no signs of lead poisoning.

Nervous System. The headaches previously described are unassociated with nausea and sickness.

Reflexes. Superficial are present.

Deep. Knee and wrist jerks healthy, No ankle clonus. The right plantar is flexor, and the left is probably so, but is not very definite.

Sensations. To touch, heat, pain and cold are healthy.

No Rombergism and no tremulousness.

There are no paralyses or paresis.

Ocular Conditions.

Externally both eyes appear healthy, corneae, irides and conjunctivae.

Muscles. The left eye diverges slightly, but the movements are good and concomitant in all directions. Convergence is good.

There is no proptosis; and no oedema of the face conjunctivae nor eyelids.

The lachrymal apparatus is healthy.

There is slight tenderness on pressing the globes backwards.

Pupils. They are equal in size and react to light and convergence actively. Hippus is not present.

If the right be covered and uncovered, the left pupil actively dilates and contracts respectively, and when the left is covered and uncovered the right only reacts very sluggishly and slightly.

On illuminating the temporal half of the left eye, i.e. the blind portion, the right and left pupils scarcely react, but on illuminating the nasal half of the left both the left and right pupils react actively.

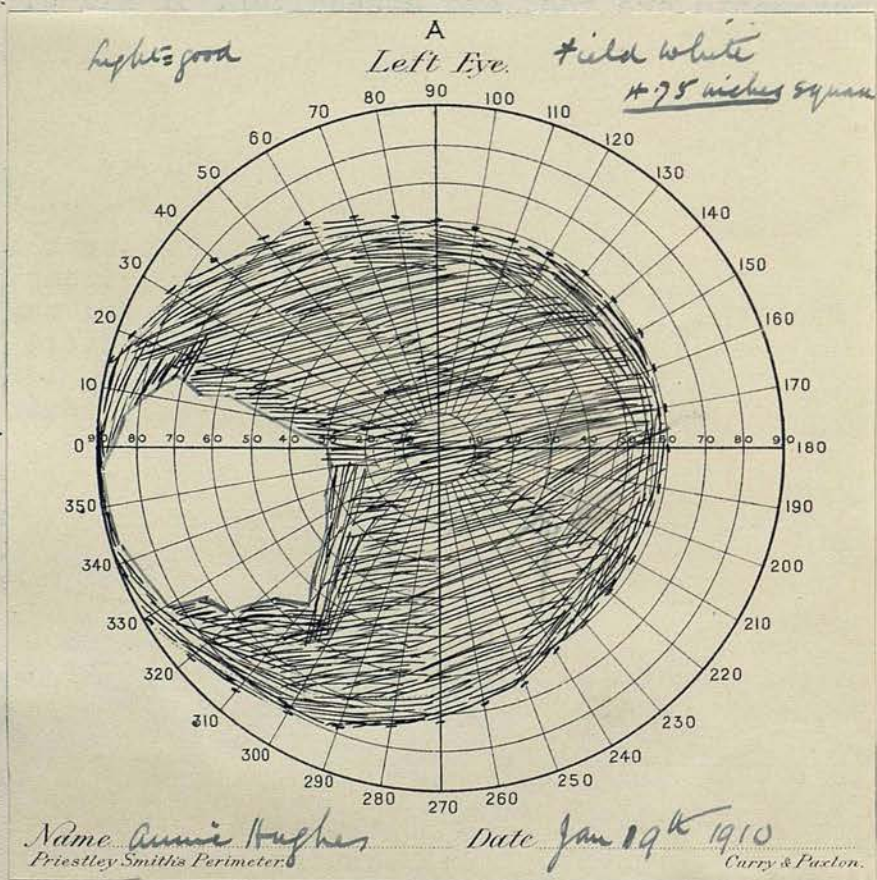
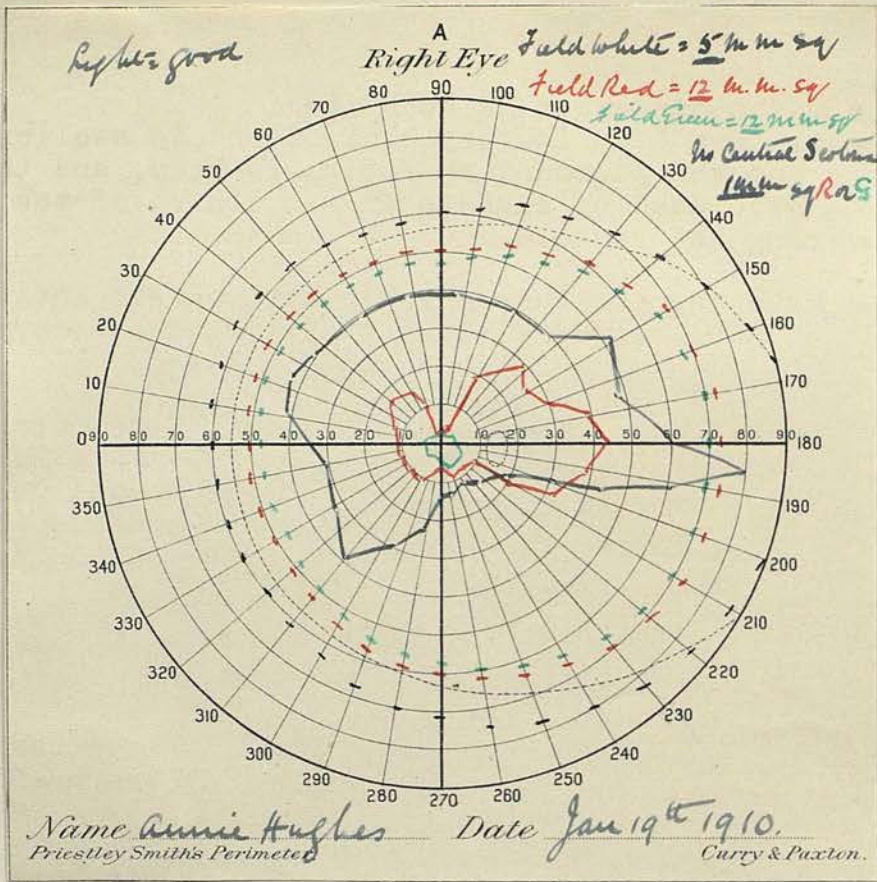
This test was very easily performed accurately, and as the field of vision of the left eye, may, I think, be called a hemianopsia, this is Wernick's Hemianopic Pupillary reaction, and means that the lesion is situated either in or below the left optic tract.

Tension. Right and left normal.

Vision. Right = $\frac{6}{9}$

Left = Perception of light in the temporal field.

67a.



Ophthalmoscopically.

The media are clear in both eyes.

Right. The disc is very blurred and is swollen +3 D and the surrounding retina is hazy, and there is a good deal of exudate in the centre of the disc covering the vessels.

The arteries are considerably attenuated. but there are no peri-vascular lines. The veins are very engorged, but there are no haemorrhages.

Left. The disc is choked and dome-shaped, standing out boldly from the rest of the retina + 4 D. The whole retina is slightly oedematous and hazy, and both the disc and the surrounding retina is very streaked. There is some exudate in the centre of the disc concealing the vessels.

The arteries both upon the disc and in the retina are extremely attenuated and appear threadlike.

The veins are engorged and appear enormous beside the threadlike arteries, but there are no haemorrhages.

The veins are extremely dark in colour in both eyes - more markedly so than is usually observed.

There is nothing locally in the fundus to explain the visual field of the left eye.

The Visual Fields. page 67a.

Right. The field for white shows considerable contraction in the superior field and extreme contraction inferiorly. The fields of red and green were too contracted to accurately chart by 5 m.m. test objects, and even with 12 m.m. test objects the field for green is extremely contracted. There is marked general contraction for red, but in particular superiorly and inferiorly.

In spite of the marked contraction, there are no scotomata centrally for red and green 1 m.m. square objects.

Left. A small island of vision is only preserved in the temporal field.

NASAL CONDITIONS.

There is some obstruction to breathing, which is relieved by the cocaine spray.

Anterior Rhinoscopy. The septum is slightly deviated. On the right side, the mucosa is engorged, and more so on the middle and inferior turbinals,

and on the left side the inferior turbinal fills up the nasal cavity and is very engorged, the middle turbinal is slightly engorged.

There is no pus anteriorly.

Posterior Rhinoscopy (after cocaine^{is}ing).
There is engorgement of the left inferior turbinate, and a very definite film of pus upon the left middle turbinate.

The right side appears to be healthy.
Transillumination, the frontal and antral sinuses illuminate well on both sides, the latter giving a pupil reflex.

Diagnosis.

The ocular symptoms date back eighteen months in the right eye, and nearly two years in the left, and although it is impossible to say definitely that gross optic neuritis has been present in both eyes all those periods respectively, yet it is very possible, the only fact mitigating against it being the absence of any atrophy, though this does not necessarily negative it, as I have seen even a syphilitic optic neuritis last four months without showing signs of atrophy, and at any rate it has been present in both eyes during the four months that she has been under observation.

The presence of bi-lateral optic neuritis with a history of recent severe localised headache suggest at once an intra cranial cause, either tumour, or abscess, but the entire absence of any other nervous symptoms almost excluded this.

The right visual field - altitudinal hemianopsia - suggests the site of the lesion to be in the region of the chiasma; and Wernick's Hemianopic Pupillary reaction also proves it to be either below or involving the left optic tract.

An intra cranial tumour or abscess in this region would very probably cause paralysis of the ocular muscles by involvement of the 3rd, 4th or 6th nerves, and this did not happen.

General toxic causes - diabetes, Bright's disease, lead-poisoning and leucaemia were readily excluded.

I therefore concluded, from the nasal signs, and the points given below, that this was a sphenoidal sinus causing oedema in the optic canals, which the after-treatment proved to be correct.

1. The headache was localised constantly to the frontal region, and the suddenness of onset and subsidence.

2. The rapid loss and return of vision on several occasions.

3. The length of time the condition has lasted - any intra-cranial tumour would have either subsided, e.g. tuberculous nodule, or have killed the patient.

4. The general health was so good, which would not have been the case with a general toxæmia or cerebral tumour.

5. Under diaphoretic treatment, the vision of the left eye improved from light perception to $\frac{6}{36}$ in twelve days (the diaphoretics relieved the congestion of the mucosa of the ostium and allowed the contents to escape.)

Treatment.

Burnham treatment was again administered, and on the second day pus was seen by anterior rhinoscopy in the right superior meatus.

A few days later, the middle turbinates were removed on both sides, preliminary to sphenoidal sinus operations. After this for ten days, the temperature remained up to 100° , and further operation was delayed.

A fortnight later, both sphenoidal sinuses were opened, and were found to contain muco-pus, which was evacuated, and sixteen days later

Vision Right = $\frac{6}{6}$
 Left = $\frac{6}{12}$

Case 3.

Chronic Right and Left Sphenoidal Sinusitis with acute Exacerbation.

Double optic neuritis, hippus, contracted fields, and scotoma; recovery.

J. O., aet. 22. Hebrew. Oxford University Student.

He went to the Bristol Eye Hospital 30th Dec, 1909, because his sight was failing. He was found to have a double optic neuritis.

Vision, Right = $\frac{6}{12}$ J $\frac{1}{6}$ inches, with +.75 sph. + .75 cyl. 70° down out = $\frac{6}{12}$

Left = $\frac{3}{6}$ J $\frac{1}{10}$ inches, with -3 sph. = $\frac{6}{6}$ pt.

Fields of vision, vide page 75.

He was transferred to the Ear, Nose and Throat department as it was thought to be a sinus affection.

Nasal Condition. Jan. 14th, 1910.

Complaint. During the last six years he has suffered from severe headache, which is always localised to the forehead and in particular over the left eye. For the last three months he has been unable to do any reading, because of the severity of the pain; and during the last few months has had pain at the back of the eyes.

He denies ever having any discharge from his nose, but careful enquiry elicits that for a long time crusts have formed in his nose which he has to remove with his fingers and water; that his nose always feels blocked up, and that in the morning he feels choked by matter at the back of the throat, hawking frequently before he can cough it up, and that it reforms several times during the morning.

Objectively, there is no swelling over the forehead nor cheeks.

Anterior Rhinoscopy. The septum is thickened and so deviated to the right anteriorly, and the left posteriorly that it is impossible to obtain a good view of the parts, but there is a good deal of pus in the middle and superior meatus on each side.

There is no pus in the naso-pharynx.

Posterior Rhinoscopy. There is a good deal of pus on the roof of the choanae and upon the middle turbinals on each side.

Transillumination. The frontal sinuses illuminate well, but both antrum very poorly.

General health and Present Condition.

He has had no serious illnesses, and he is temperate in his habits.
All the organs are healthy.
Urine. No albumin nor sugar.

Nervous System.

The headache has never been associated with sickness, nausea or fainting attacks.

Reflexes. The superficial and deep are normal, and the plantar is flexor. There is no ankle clonus.

The sensations to heat and cold, pain and touch are normal, and there are no abnormal sensations. There is no nystagmus.

Operation. He was advised to have a submucous resection performed in order to straighten the septum, preliminary to opening the sphenoidal sinuses, as there was little doubt of the optic neuritis being due to sphenoidal sinusitis.

Jan 27th, 1910. Ocular Conditions.

During the past three months he has had pain at the back of his eyes, which has been so severe lately that he feels that he can hardly keep from tearing them out. The sight has been getting worse lately, and he has not been able to read.

There is no proptosis.

The lachrymal apparatus is healthy.

There is considerable conjunctival injection, but the corneae and irides are healthy.

Muscles. The movements are good in all directions, but not sustained, because to do so causes severe pain. The right eye squints outwards 10° and although he can fix with his right, he prefers to do so with his left - it is a concomitant external strabismus; convergence with the right eye is only up to the middle line.

The eyes are so tender that he will hardly allow them to be touched.

Pupils. React to light and accommodation, and hippus is moderately marked.

Tension. Right and left normal.

Vision. Right with correction = $\frac{6}{12}$
 Left with correction = $\frac{6}{9}$

Fields of Vision.

Scotoma was only examined for. There is a relative negative central scotoma for red and green 1 m.m. square in the right and left eyes.

Ophthalmoscopically.

The media in both eyes are healthy

Right fundus. The disc is very hazy at the edge and slightly swollen. The arteries are small and the veins are engorged and very tortuous, but there are no haemorrhages. The superior vessels are covered in exudate near the disc.

Left fundus oculi. The disc is considerably swollen +3 D above the rest of the fundus, but its edges are well defined in a pale pinkish-red ring. The centre of the disc is very hazy, and the vessels are not well seen as they emerge. The arteries are small, but the veins are engorged and tortuous; there are no haemorrhages, but there is some exudate on the inferior retinal vessels.

Jan 28th, 1910. A Sub-mucous resection was performed upon the nasal septum with cocaine anaesthesia.

Jan 31st. His nose is very swollen externally, and there is now a constant discharge of muco-pus from the anterior nares.

He had a great deal of pain at the backs of the eyes during the night, which necessitated a hypodermic injection of morphine.

The headache is particularly severe to-day, and his eyes are exquisitely tender to touch.

Pupils react in the manner previously described.

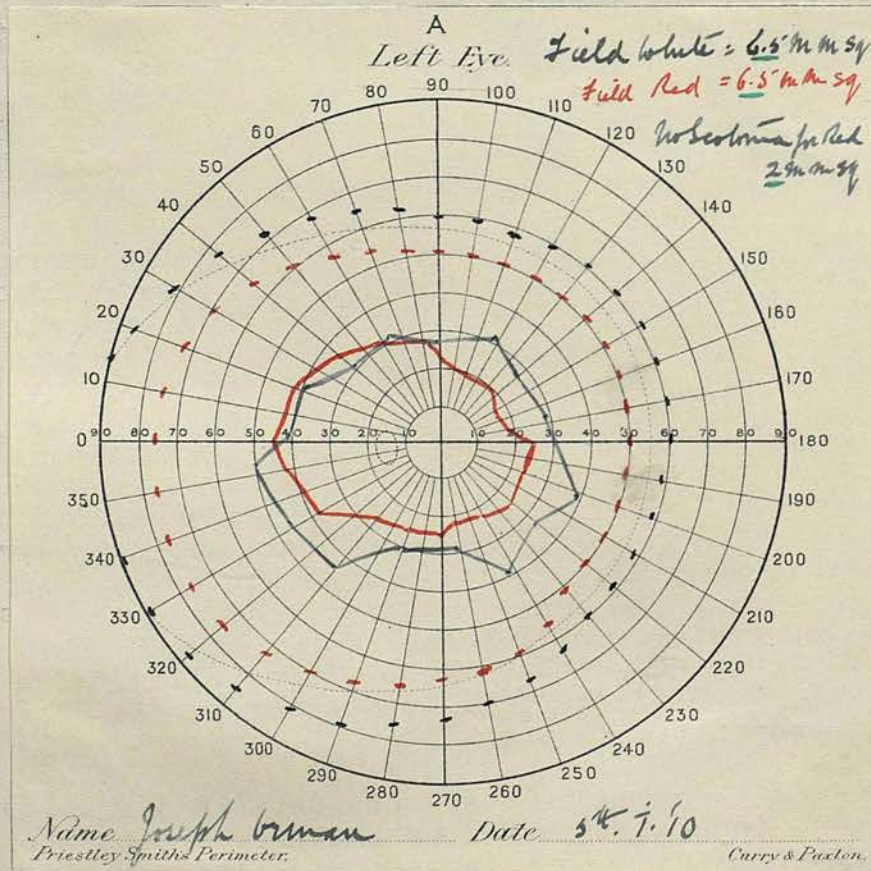
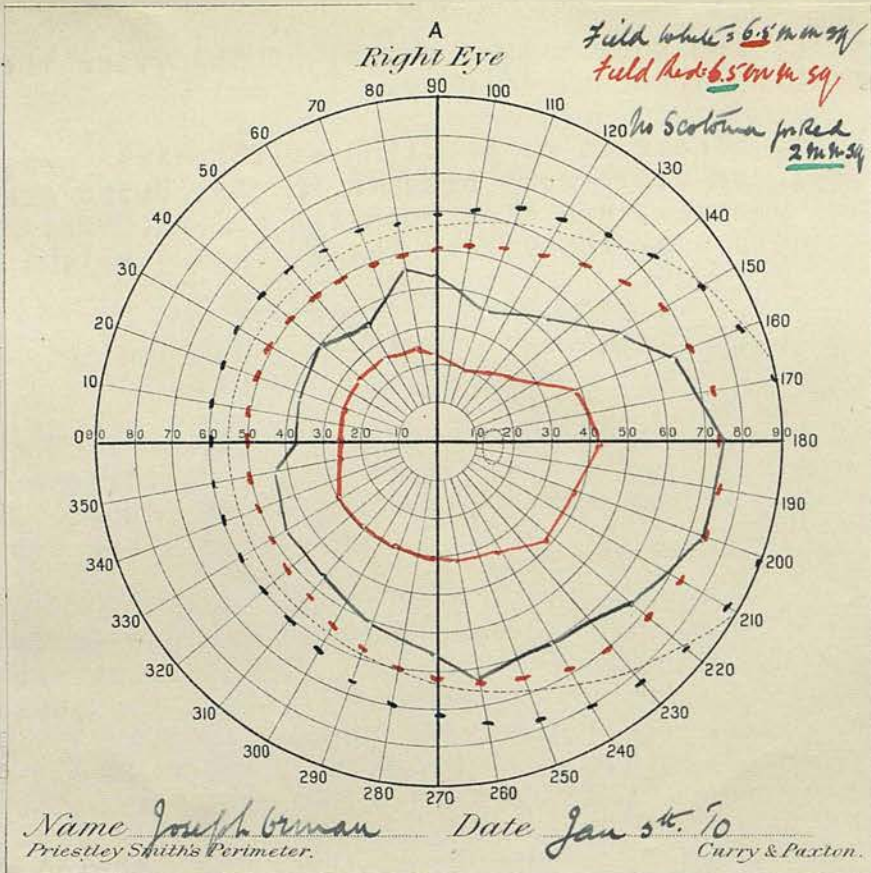
The Fundi present no fresh change.

The Visual Fields tested by the direct method are very markedly contracted, and the scotoma in the left is almost absolute.

He has developed a typical follicular tonsillitis with temperature 104.4°. Aspirin gr. x was administered four-hourly, and an ichthyol spray for the throat.

Feb 2nd. The throat is now much better and the temperature is 98.4.

74a



disc, and slight engorgement of the veins there is nothing abnormal to note.

Left. There is no swelling of the disc now, but there is still some exudate in the centre obscuring the vessels, and also upon the inferior retinal vessels near the disc. There is some slight venous engorgement.

There are no haemorrhages in either eye.

Fields of Vision.

Jan 5th, 1910. There is marked concentric contraction for both red and white in each eye. Scotoma was only tested for by 2 m.m. objects and was not present. *page 74a.*

Feb 15th. Both right and left show a good deal of general contraction for white; it is most marked in the temporal fields, especially the superior quadrants.

Red and green show mostly general contraction, particularly the latter colour. At this date, there are no scotoma in either eye as tested for by 1 m.m. square objects. *page 75a.*

There is, allowing for much smaller test objects, marked improvements in the visual fields from those of January 5th.

Diagnosis.

Although the sphenoidal sinuses were not operated upon - because of the subsidence of the symptoms and the ocular inflammatory processes, and also the bacteriological report - there can be no doubt that these ocular signs and symptoms were due to subacute bi-lateral sphenoidal sinusitis lasting some weeks, owing probably to the sinus becoming almost "closed." The operation to straighten the septum relieved the congestion of the mucosa, and was immediately followed by a profuse nasal discharge, with rapid relief of all ocular symptoms.

Of the ocular symptoms --

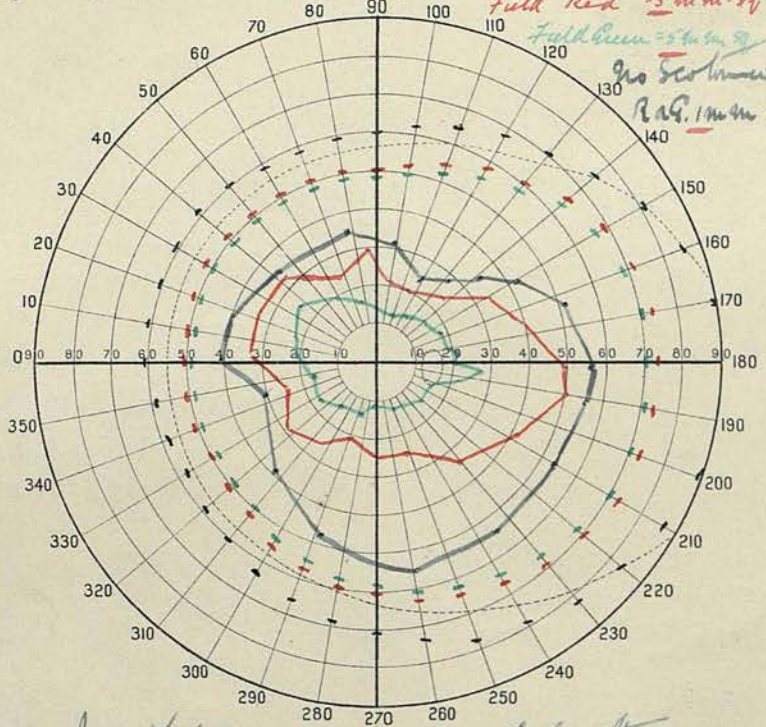
There was bi-lateral optic neuritis, with involvement of the papillo-macular bundle of fibres and associated scotoma.

Evidently there was also considerable inflammation of the orbital tissues, as shown by the pain on muscular movements and tenderness on palpating the globe, although no proptosis was present.

light = good

Right Eye

Field White = 5 m. m. sq.
Field Red = 5 m. m. sq.
Field Green = 5 m. m. sq.
No Scotomas
RAG. 1 m. m. sq.



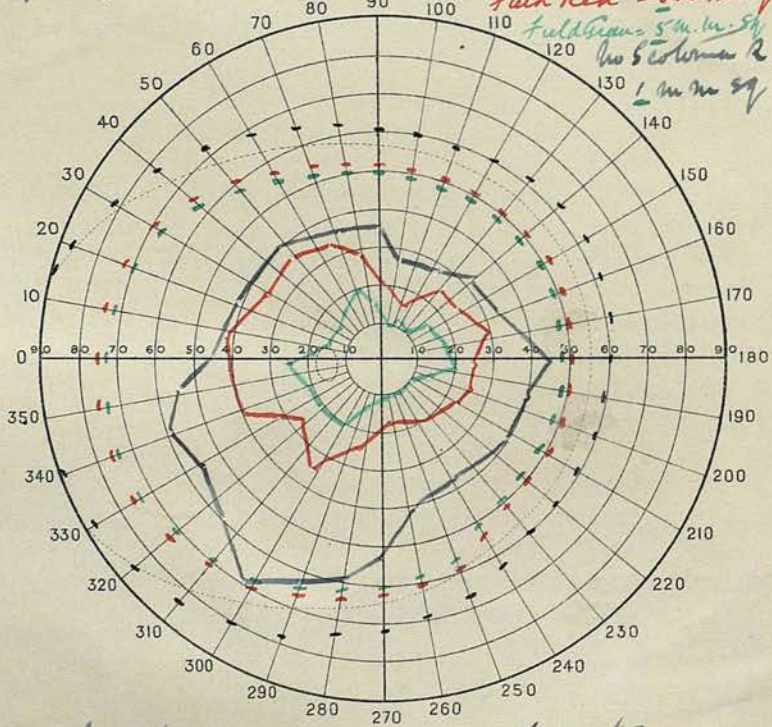
Name Joseph Gorman
Priestley Smith's Perimeter.

Date Feb 15th 1910
Curry & Paxton.

light = good

Left Eye

Field White = 5 m. m. sq.
Field Red = 5 m. m. sq.
Field Green = 5 m. m. sq.
No Scotomas
L. m. m. sq.



Name Joseph Gorman
Priestley Smith's Perimeter.

Date Feb 15th 1910
Curry & Paxton.

The strabismus was due to the existing latent strabismus, being developed into actual, owing to the blurring of central vision from the presence of central relative scotoma.

Case 4.

Probable Right and Left Sphenoidal and Posterior
Ethmoidal Sinusitis.

Macular guttate chorioiditis; extractions of
fields and central scotoma.

J. H., male, single, aet. 22. Farm labourer.

Came to the Shrewsbury Eye, Nose and Throat
Hospital complaining of bad sight.

History. For almost two years the sight has been
getting worse, but he has not sought advise
previously.

Ocular conditions, Jan. 17th, 1910.

There is no oedema of the forehead, orbit nor lids.
There is no proptosis.
The lachrymal apparatus is healthy; and externally
the eyes appear healthy - conjunctivae, corneae,
and irides.

Muscles. The movements and convergence are good,
and painless, and the muscular balance perfect.

There is no tenderness of the orbit, nor upon
palpating the globes.

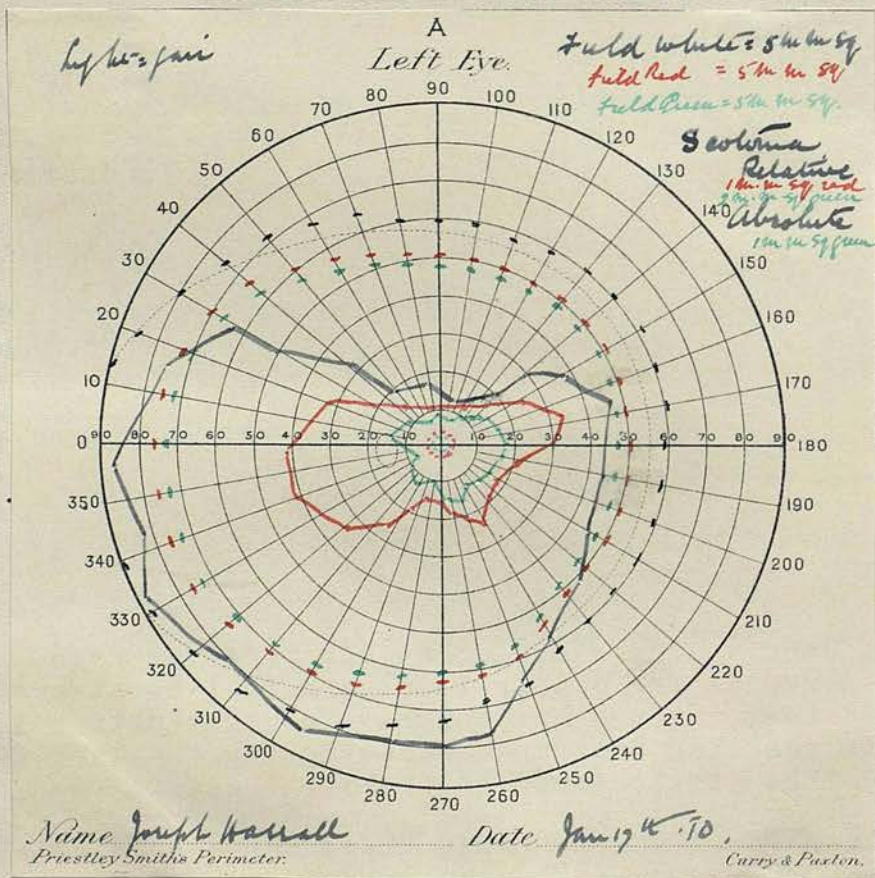
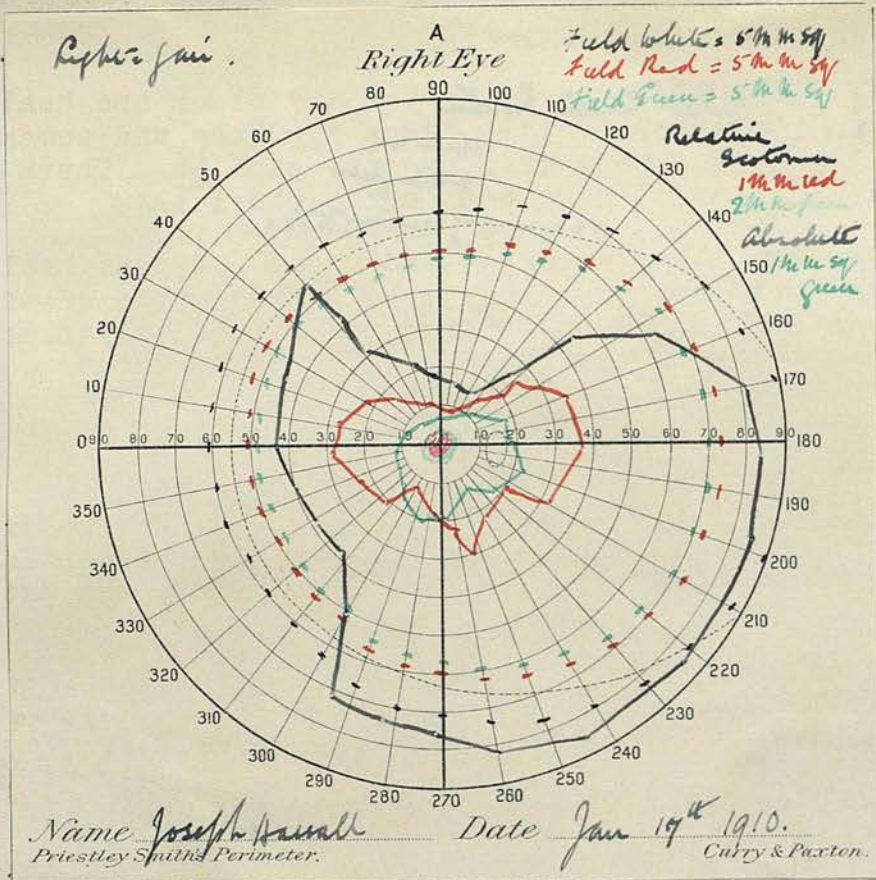
Pupils. React to light, convergence and consen-
sually actively, and hippus is not present.

Tension. Right and left normal.

Vision Right $\frac{6}{36}$ J $\frac{6}{8}$ inches.

Left $\frac{6}{36}$ J $\frac{6}{8}$ inches.

Lenses no help in either eyes.



J.H. Has not overhanging brows.

Ophthalmoscopically.

The media in both eyes are clear and healthy. Fundi Oculorum. The discs are hazy and somewhat ill-defined, but they are not swollen. There may, at some time, have been optic neuritis.

The vessels - arteries and veins - appear healthy. There is symmetrical guttate chorioiditis of each macular region, consisting of irregularly-placed non-radiating milkish-white spots, without pigmented edges.

Fields of Vision. page 76a

The fields for white show a marked loss superiorly, slightly more marked in the left, and excepting a slight nasal contraction in the right, the extent of the rest of the field is very full.

The fields for red and green show considerable general contraction, but the contraction is very much more marked superiorly and inferiorly.

It will be noted that the field for green is much more contracted than is the red.

Scotomata. There are central relative scotomata in each eye for 1 m.m. square red, and 2 m.m. square green, and absolute central scotomata for 1 m.m. square green in each eye.

2 m.m. red and 3 m.m. green can just be distinguished as such centrally.

General Health.

He has had no serious illnesses, and lives an outdoor life.

The organs are all healthy, and there are no signs of syphilis nor tuberculosis.

Urine. No albumin nor sugar.

Nasal Conditions.

On enquiry, he states that his nose has been obstructed for a long time, and that he always breathes through his mouth. The obstruction in his nose has been much worse during the last four months, particularly on the right side.

For several months past, there has been a slight discharge from his right nostril only, but for a very much longer time - he cannot remember the exact time - there has been a great deal of matter



E.B. Case 5. Antero-posterior.

The frontal sinuses are well developed and healthy, and the septum is slightly deviated to the right.



E.B. Case 5. Lateral.

The sphenoidal sinuses are well seen and are large, extending posteriorly to the dorsum sellae. The frontal sinus is well developed and has a thick wall.

to be full of pus and polypi, which were curretted away.

In spite of prolonged after-treatment, the headache and nasal discharge has persisted. The frontal sinus was repeatedly washed out through a frontal sinus canula, but without obtaining pus or giving relief.

Previous Health and Present Condition.

Other than an attack of influenza four years ago, she has had no illness.

She is always getting colds in the head

Menstruation healthy

Urine. No albumin nor sugar.

She has had no head injuries, does not smoke, and is teetotal.

Ocular Conditions.

She has never noticed anything the matter with the sight in her eyes.

There is no oedema of the lids nor conjunctivae.

Proptosis is not present.

The Lachrymal apparatus is healthy, as are also the conjunctivae, corneae, and irides.

Muscles. The movements and convergence are full and painless, and Maddox rod develops no latent strabismus.

Pupils. React actively to light, convergence, and consensually, and hippus is not present.

There is no tenderness on pressing the globes backwards.

Tension. Right and left healthy.

Ophthalmoscopically.

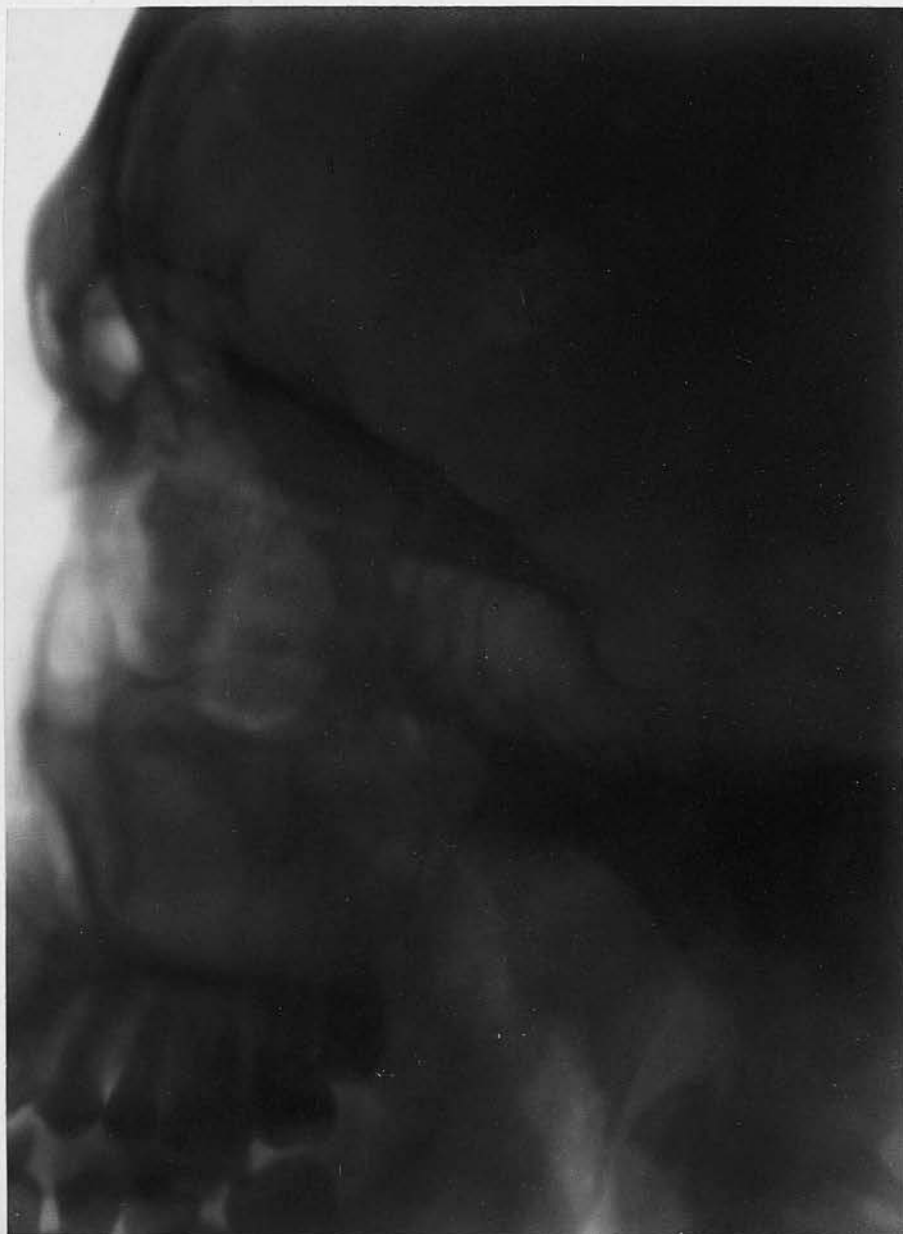
The media of each eye are healthy.

Fundi Oculorum. Both of the discs show considerable atrophic cupping and are quite white, particularly the papillo-macular bundles. The vessels are of fairly good calibre.

The changes are slightly more marked in the left, in which there is also a Fuch's coloboma.

There is slight but very definite atrophy in both optic nerves.

Fields of vision, vide page 80a.



E.J. Case 6. Lateral.

The sphenoidal sinuses are large and extend well under the pituitary fossa. Three of the posterior ethmoid cells are well seen. The anterior wall of the frontal sinus is bowed outwards.



E.J. Case 6. Antero-posterior.

The frontal sinuses are small, mesial and symmetrical, and are healthy.

very roomy owing to the deviation of the septum to the right. There is a great deal of pus in the left cavity which comes from the middle and superior meatus.

There is no pus in the right cavity.

The mucosa is oedematous, particularly the left inferior and middle turbinals.

There is a large mass of muco-pus in the nasopharynx, which quickly reforms on removal.

By posterior rhinoscopy, pus is seen very high up near the roof of the choanae and upon the middle turbinates on either side.

Transillumination. The frontal sinuses illuminate fairly well on both sides, but the antra very badly.

General Health. He is a healthy looking ruddy complexioned young man.

He has had no illnesses and no injuries to his head; and there are no signs of syphilis or tuberculosis.

Urine. No albumin nor sugar.

He is temperate in his habits, is teetotal and only smokes $1\frac{1}{2}$ ounces of tobacco per week.

Ocular conditions.

He does not complain of his sight, and he has no headaches.

There is no proptosis, and externally the eyes appear healthy in every way.

Muscles. The movements and convergence are good, and Maddox rod develops no squint. The Pupils react to light, convergence and consensually, and hippus is not present.

There is no tenderness on pressing the globes backwards.

Vision. Right $\frac{6}{5}$ J $\frac{1}{12}$ inches.
 Left $\frac{6}{5}$ J $\frac{1}{12}$ inches.

Ophthalmoscopically.

The media in each eye are healthy.

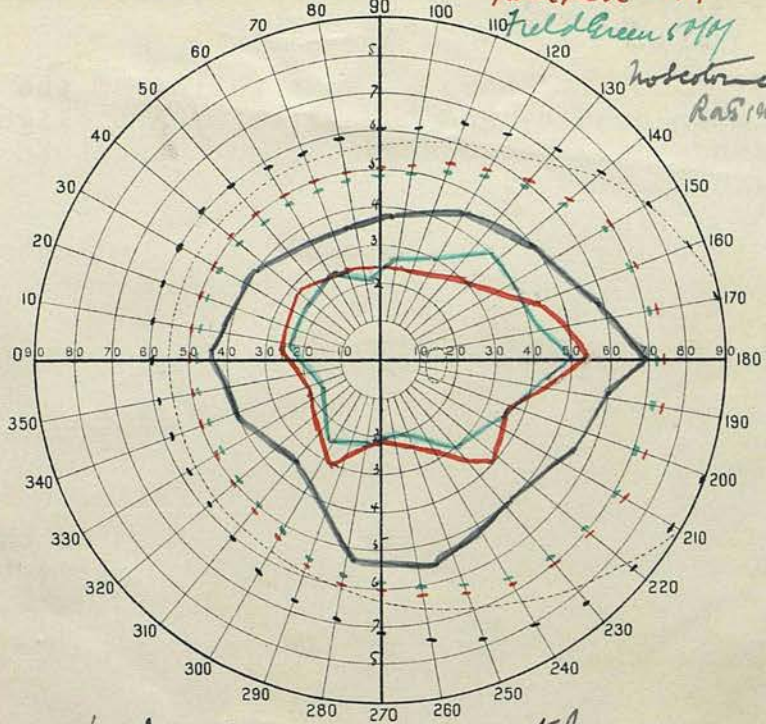
Right Fundus. The disc is very pallid, and the

Right eye good

A
Right Eye

field white 5MM
field Red 5MM
field Green 5MM

Isotoma
R.A.P.



Name *Wm Jennings*
Priestley Smith's Perimeter.

Date *pt. Nov 09*

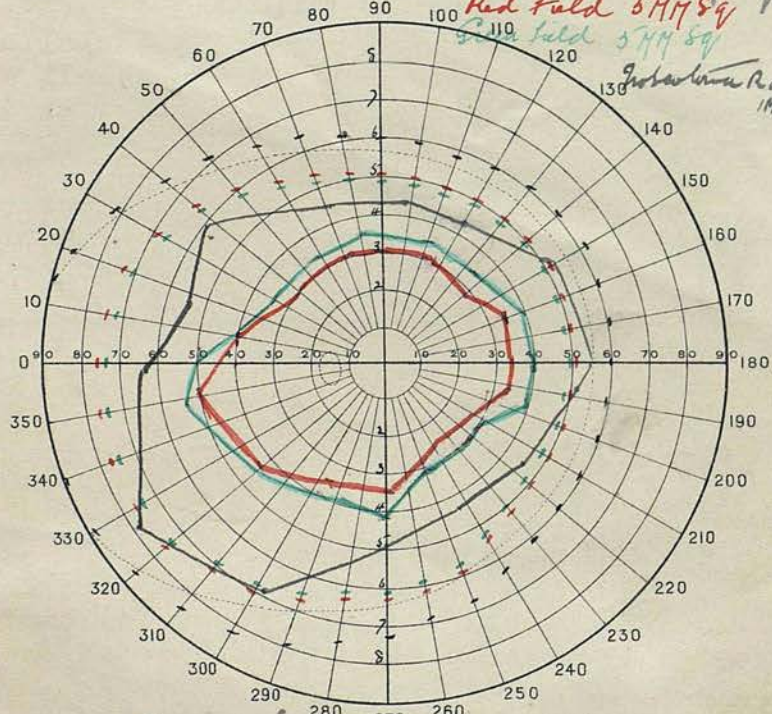
Curry & Paxton.

Right eye good.

A
Left Eye

field white 5MM sq
Red field 5MM sq
field Green 5MM sq

Isotoma R.A.P.
11/11/09



Name *Wm Jennings*
Priestley Smith's Perimeter.

Date *pt. Nov 09*

Curry & Paxton.

arteries are very attenuated, beside which the veins appear engorged but are normal. There is a definite slight optic atrophy.

Left Fundus. There is some pallor of the papillo-macular bundle, and the arteries are slightly attenuated. The changes do not amount to a definite atrophy.

There are no other ophthalmoscopic changes in either eye.

The Visual Fields. page 82a

In the right and left there is general contraction for all colours, but in particular the temporal fields.

There is partial reversal of colours in the left, the field for green being more extensive than for red.

There are no scotomata.

Operation. Nov 17th, 1909.

The middle turbinates were removed on each side, and then the anterior walls of each sphenoidal sinus.

The Right sphenoidal sinus was very shallow, being only $\frac{1}{8}$ of an inch in depth, but the left was shoe-shaped, the upper part measuring $\frac{6}{8}$ of an inch, and the lower part much more.

There was very severe haemorrhage obscuring all the parts during the operation. The maxillary antra were explored by Lichwitz's trochar and canulâ, but no pus was found.

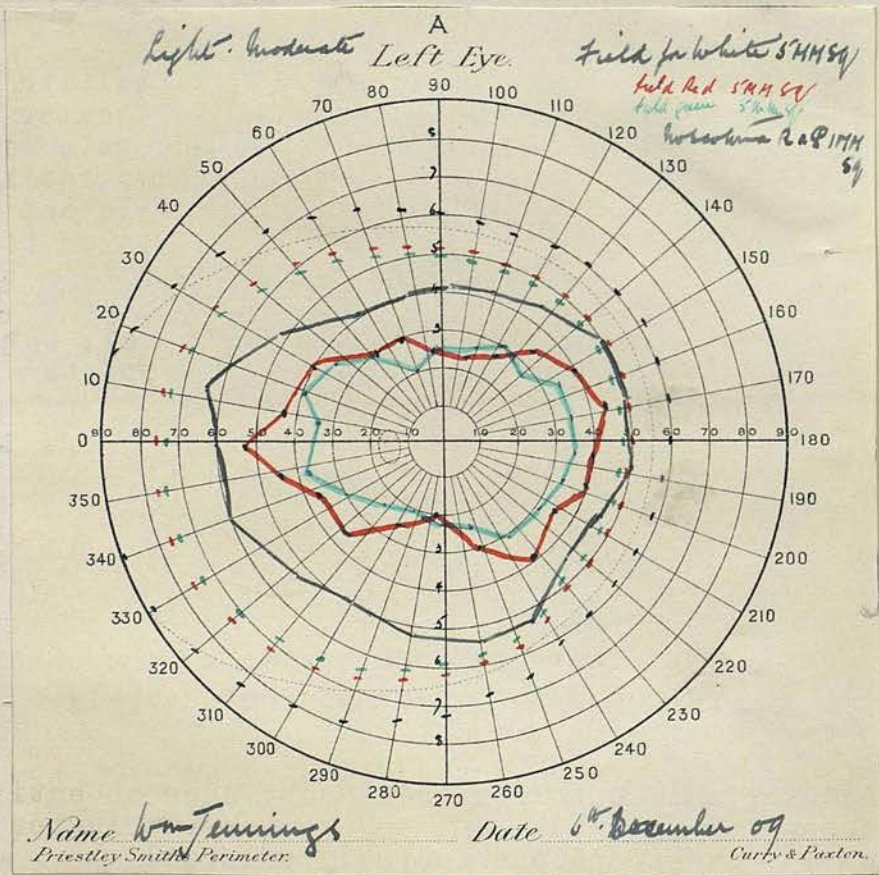
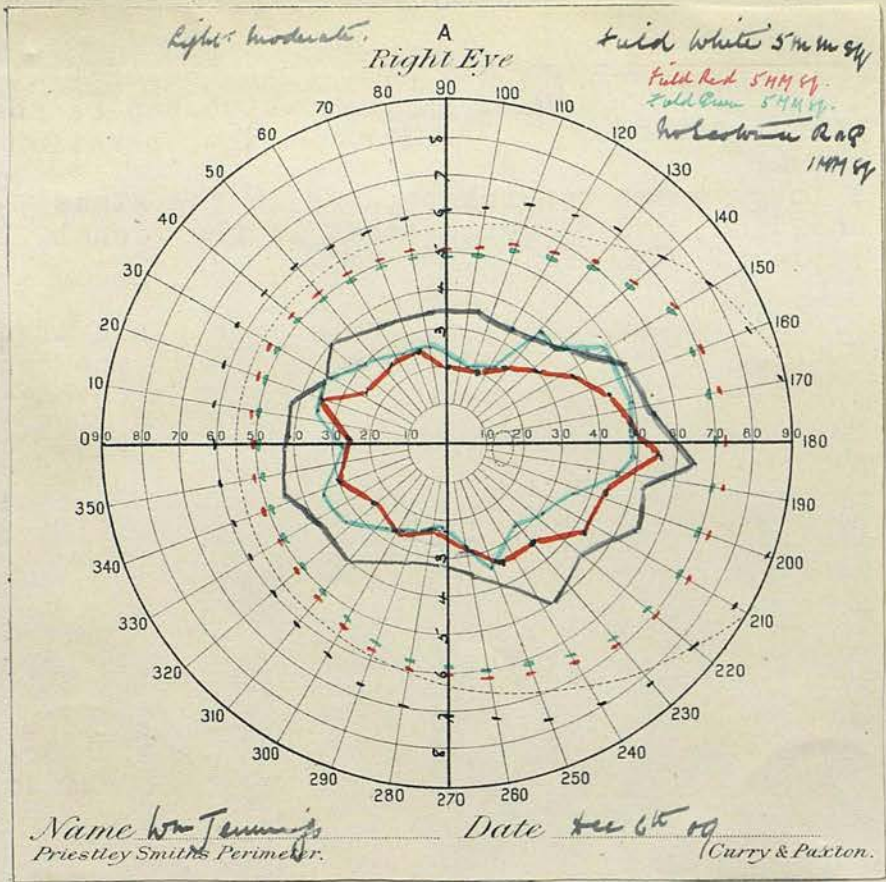
Dec 6th. There is still a good deal of pus in the superior meatus, but he can now breathe through his left nostril.

The Vision. Right = $\frac{6}{5}$
Left = $\frac{6}{5}$

Pupils. They both react to light and convergence, but there is slight hippus.

Fundi Oculorum. There are no changes.

Visual Fields. There is practically no change in character or extent; and there are no scotomata.



Mar 10th. There is still a lot of pus in the sphenoidal sinuses which can be seen coming Inter relation. through the operation openings.

No improvement has taken place in the sinus condition, and no improvement in the visual fields.

No other cause can be found for the optic atrophy and in the left eye there is pallor of the central bundle in the nerve, which points to a toxic origin.

Case 7.

Probable Right Sphenoidal Sinusitis.

Asthenopia, slight neuritis and contracted fields. Cure of the neuritis and improvement in the fields.

Miss M. P. aet 18. Governess.

History. First complained of very sensitive teeth in the upper jaw two years ago, in particular on the right side. Six months later, the pain was localised to just below the right orbit, radiating down the side of the superior maxilla and on the outer side of the right eye, but not on to the scalp; it was very severe.

She was treated by her doctor and dentist, but without any relief, and she was then sent to consult Dr Watson Williams.

There has never been more than the ordinary nasal secretion.

She frequently gets pain at the back of the right eye.

Objectively. There is no swelling of the cheek nor forehead, and no tenderness nor neuralgic spots.

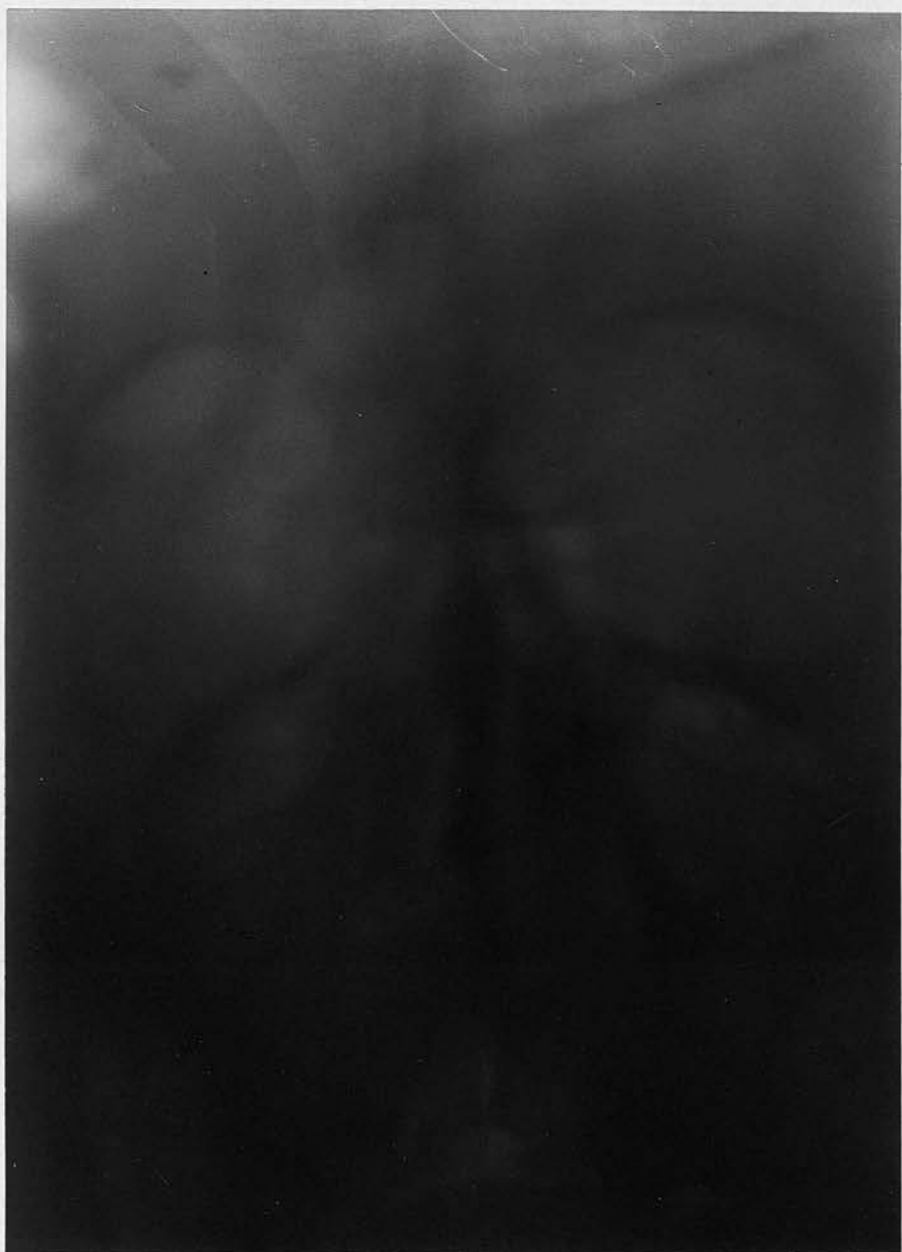
Anterior and Posterior Rhinoscopy show an entire absence of pus, but the inferior turbinates on both sides are considerably enlarged.

Transillumination. Both the frontal and antral sinuses illuminate well, the latter giving a



M.P. Case 7. Lateral.

The sphenoidal sinuses are small and are not well seen.
The frontal sinuses are larger by the lateral skiagram.



M.P. Case 7. Antero-posterior.

Both frontal sinuses are small, particularly the left.

pupillary reflex.

General Health.

She is a plump, healthy girl of bright disposition, and she has always enjoyed good health.

All the organs are healthy.

Menstruation and urine are normal.

Nervous System.

The headache and pain are unassociated with sickness, and are not worse during menstruation.

The superficial reflexes are present, and the knee-jerks are normal, and there is no ankle clonus.

The planter reflex is flexor.

The sensations of touch, heat, cold, and pain are normal, and there are no areas of anaesthesia nor hyperanaesthesia.

The muscular power is not impaired.

Ocular Conditions.

She complains that her eyes ache after fine work and in bright light, and at times she gets pain at the backs of the eyes.

There is no proptosis, and externally the eyes are healthy in every way.

Muscular movements and convergence are good; there is slight heterophoria corrected by 1° prism base upwards in the right.

The Lachrymal Apparatus is healthy.

There is no tenderness on pressing the globes backwards.

The Pupils react to light, convergence, and consensually, and hippus is not present.

Vision: Right = $\frac{6}{9}$ J 1 with +.75 sph. = $\frac{6}{6}$
 Left = $\frac{6}{9}$ J 1 " " " = $\frac{6}{6}$

Ophthalmoscopically.

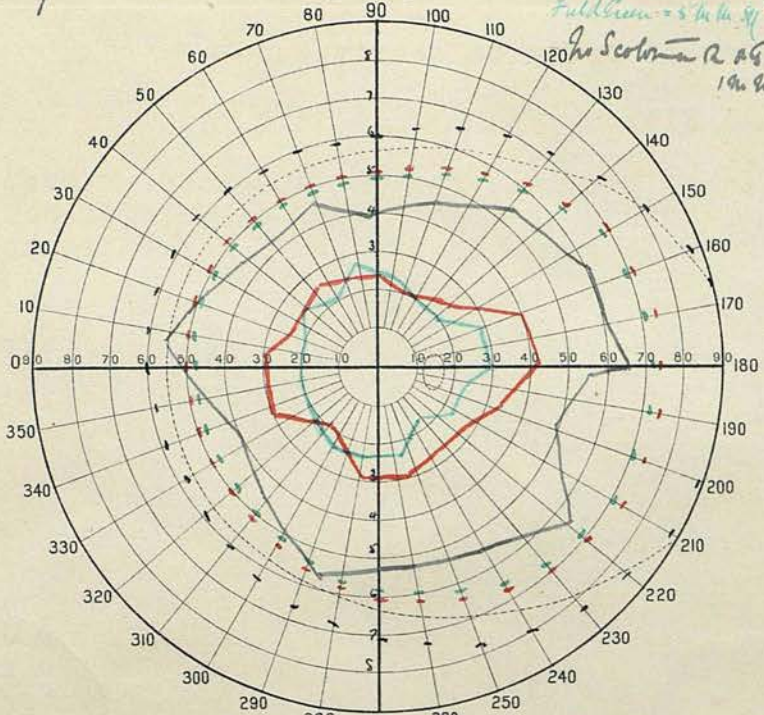
The media are clear and healthy in both eyes. Right Fundus. There is slight blurring of the edges of the disc, and the veins are tortuous. It is a slight fine neuritis.

Left Fundus. The disc is rather more blurred than the right, and there is some exudate on

Light = sunlight

A
Right Eye

Field White = 8 M. M. sq
Field Red = 5 M. M. sq
Field Green = 5 M. M. sq
No Scotoma R. A. P.
1 M. M. sq



Name *May Philpotts*
Priestley Smith's Perimeter.

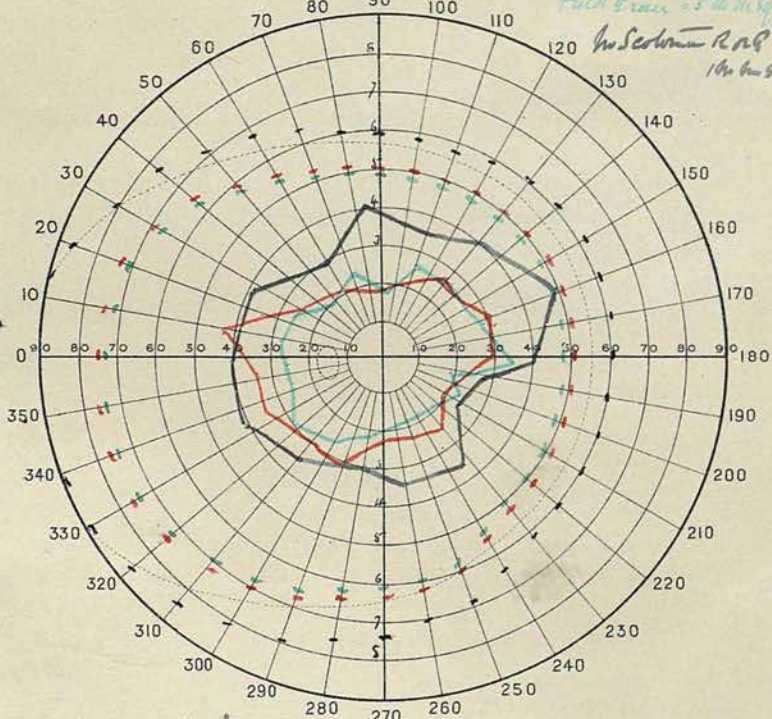
Date *10th Nov 09*

Curry & Paxton.

Sunlight

A
Left Eye

Field White = 8 M. M. sq
Field Red = 5 M. M. sq
Field Green = 5 M. M. sq
No Scotoma R. A. P.
1 M. M. sq



Name *May Philpotts*
Priestley Smith's Perimeter.

Date *10th Nov 09*

Curry & Paxton.

the inferior retinal vessels near the disc.

Slight but definite neuritis.

Visual Fields.

Patient not menstruating and nose untouched. Right. There is a good deal of general contraction, especially for colours. There are no scotomata.

Left. The contraction is general, and very marked especially on the temporal side.

The Diagnosis of the cause of this patient's trouble was very uncertain.

As the pain and headache was so severe that she had not been able to earn her living of late, and as there were certain symptoms suggestive of sphenoidal sinusitis trouble - enlarged inferior turbinates, pain at the backs of the eyes, contracted visual fields and slight neuritis, it was suggested that operation upon these sinuses might cure the condition, & she readily consented.

Operation. Nov 10th, 1909. The sphenoidal sinuses were explored and found to be apparently healthy. They were very small, the right only measuring antero-posteriorly $\frac{1}{8}$ th of an inch, and the left $\frac{1}{4}$.

The middle turbinates were also removed.

Nov 12th. Has had very severe headaches since the operation; there is a little watery discharge from the right side.

Nov 26. Has been entirely free from pain during the last seven days.

Nov 29. She now feels quite comfortable and is free of headache. There is no nasal discharge.

Ocular Conditions. Nov 29th.

She has no pain at the backs of the eyes now, can see better, and read without being tired.

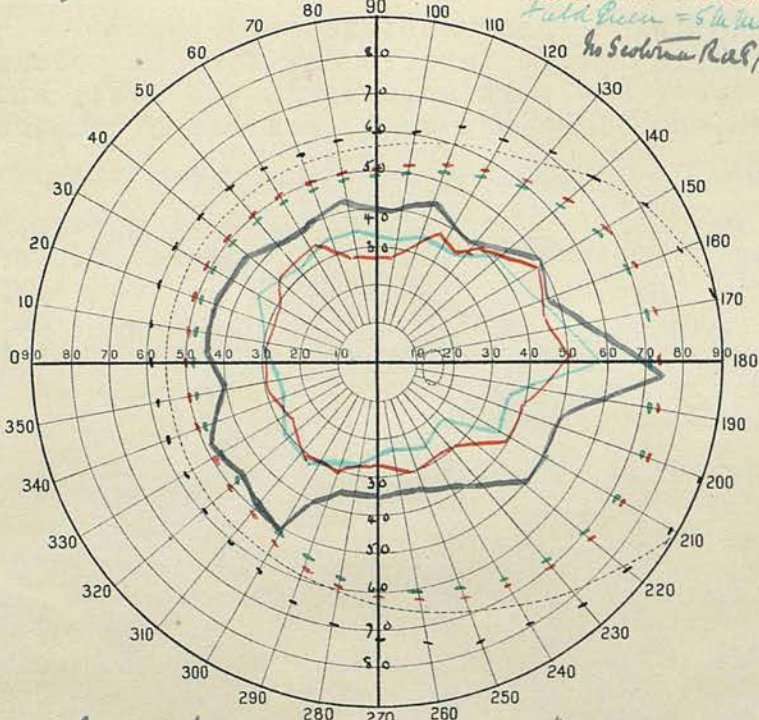
Vision: Right with correction = $\frac{6}{5}$ J 1
Left " " = $\frac{6}{5}$ J 1

Fundi Oculorum. The right and left discs are now quite clear, and the exudate on the left inferior retinal vessels has been absorbed, and the vessels appear normal; this agrees with the improved

Light = dull.

A
Right Eye

Field white = 5 Mcsq
Field Red = 5 Mcsq
Field Green = 5 Mcsq
No Scotoma RAB, Mcsq.



Name May Philpotts
Priestley Smith's Perimeter.

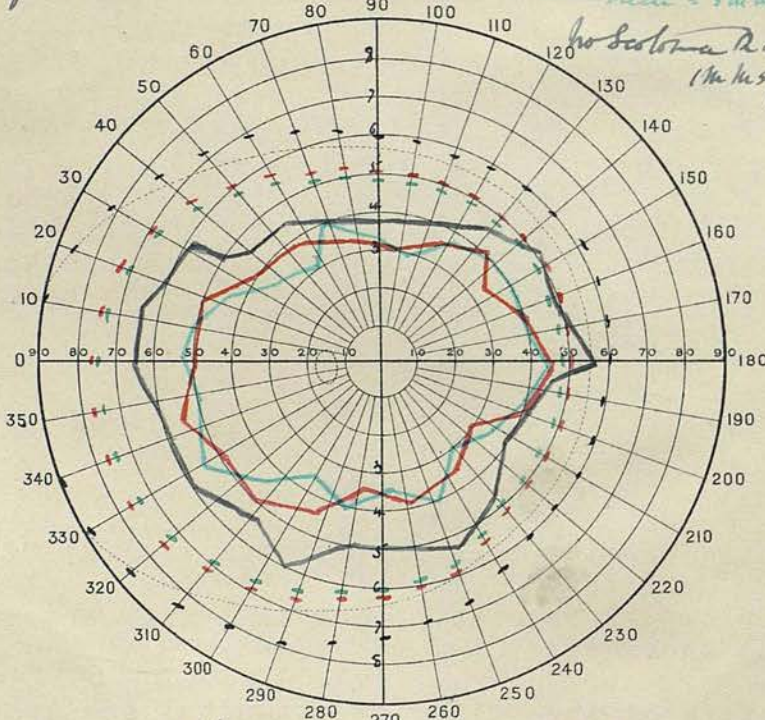
Date 29th Nov 09

Curry & Paxton.

Light = dull

A
Left Eye.

Field white = 5 Mcsq
Field Red = 5 Mcsq
Field Green = 5 Mcsq
No Scotoma RAB
1 Mcsq.



Name May Philpotts
Priestley Smith's Perimeter.

Date 29th Nov 09

Curry & Paxton.

vision and visual fields.

Visual fields (not menstruating). page 86a.

There is marked improvement for all colours in both eyes, and particularly in the left, and this though the light was dull, and bright on the former occasion.

This general and ocular improvement occurring so rapidly after sphenoidal sinus operation, and when medical treatment extended over two years had failed is very suggestive that the cause was in the sphenoidal sinus, in spite of the fact that there was so little evidence of disease in these sinuses.

Case 8.

Right and Left Sphenoidal and Ethmoidal Sinusitis.

Syphilitic Chorioido-retinitis.

Mrs M.D. Aet 42.

came to the Nose and Throat department complaining of headache and nasal discharge.

For several years past, she has suffered from headaches mainly over the left eyebrow, and which is worse in the morning. There has been discharge from the nose for about the same period, which is constant, but is always worse in damp weather and when she has a cold; and she frequently has to hawk matter up from the throat.

Objectively.

The left frontal region, and particularly the supra-orbital notch, is tender to slight pressure.

By anterior rhinoscopy, the mucosa is pallid and there is pus far back in both superior meatūs.

Posterior rhinoscopy. There is pus in the roof of the choanae.

Sinusitis of the posterior ethmoidal and sphenoidal sinuses was diagnosed.

October, 1909. The sphenoidal sinuses and posterior ethmoidal sinuses were explored and polypoidal tissue removed. There was however not very much pus.

General Health. 6th Nov., 1909.

She looks well and has no complaint, excepting the ^eheadaches.

All the organs appear healthy.

There is a definite history of syphilis; she suffered from a prolonged sore throat during the fourth pregnancy, and there are some twenty scars upon the legs, some of which are probably the result of syphilitic ulcerations, and others due to varicose ulceration.

Family History.

1st child is healthy, aet. 10.

2nd child. died aet 3 weeks, full term. no cause known.

3rd child. aet. 7.

4th child. aet. 6, both apparently healthy.

5th child. Miscarriage.

6th. Dead born.

7th. Dead born.

8th. Female. 20 months old, suffering from marasmus, and an enlarged liver.

Menstruation and urine healthy.

Ocular Conditions. Nov 6th, 1909.

She complains that she still has headache over the left eyebrow.

She can see all right during the day, but at night the sight is so bad that she blunders into things.

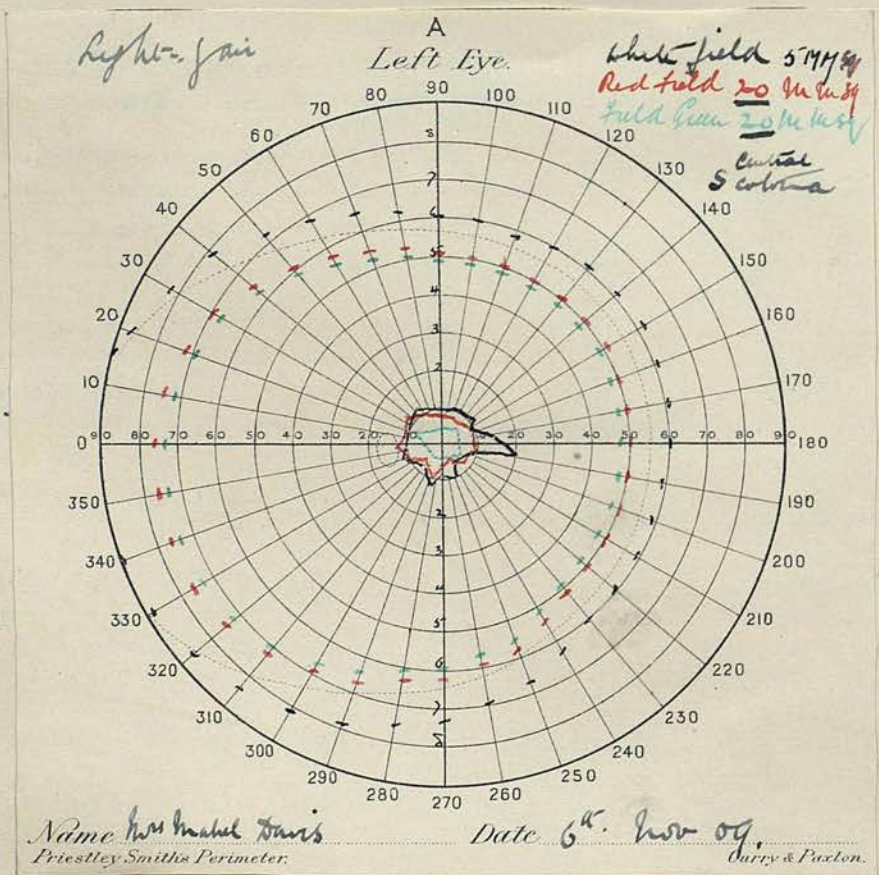
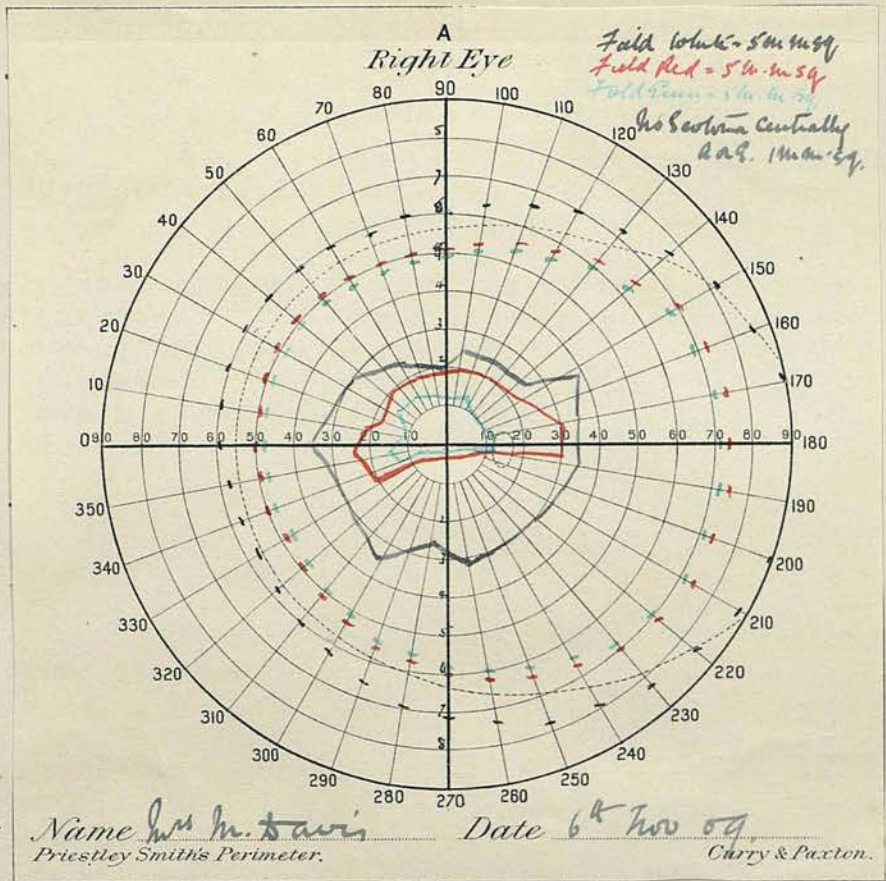
There is no protosis.

The Lachrymal apparatus is healthy, as are also the corneae, conjunctivae, and irides. There are no signs of old iritis in either eye.

The pupils react very sluggishly to light, convergence and consensually.

Muscles. She has pain when she looks downwards and in and out, but the movements are good; but convergence is weak and Maddox rod reveals a slight external strabismus.

There is no tenderness on pressing the globes backwards.



Vision: Right $\frac{6}{18}$ lenses no improvement.
Left $\frac{6}{36}$ " " "

Ophthalmoscopically.

The media in each eye are healthy and there are no synchisis in the vitreous.

Fundi Oculorum. There is much diffuse chorioido-retinitis in both eyes, and in the right there is a large patch of chorioidal atrophy just above the macula extending from the disc outwards measuring about two-and-a-half discs's diameter long by about two wide. The inflammatory changes are not active.

The vessels are slightly attenuated, but the discs are apparently healthy.

Visual Fields (taken after operation)

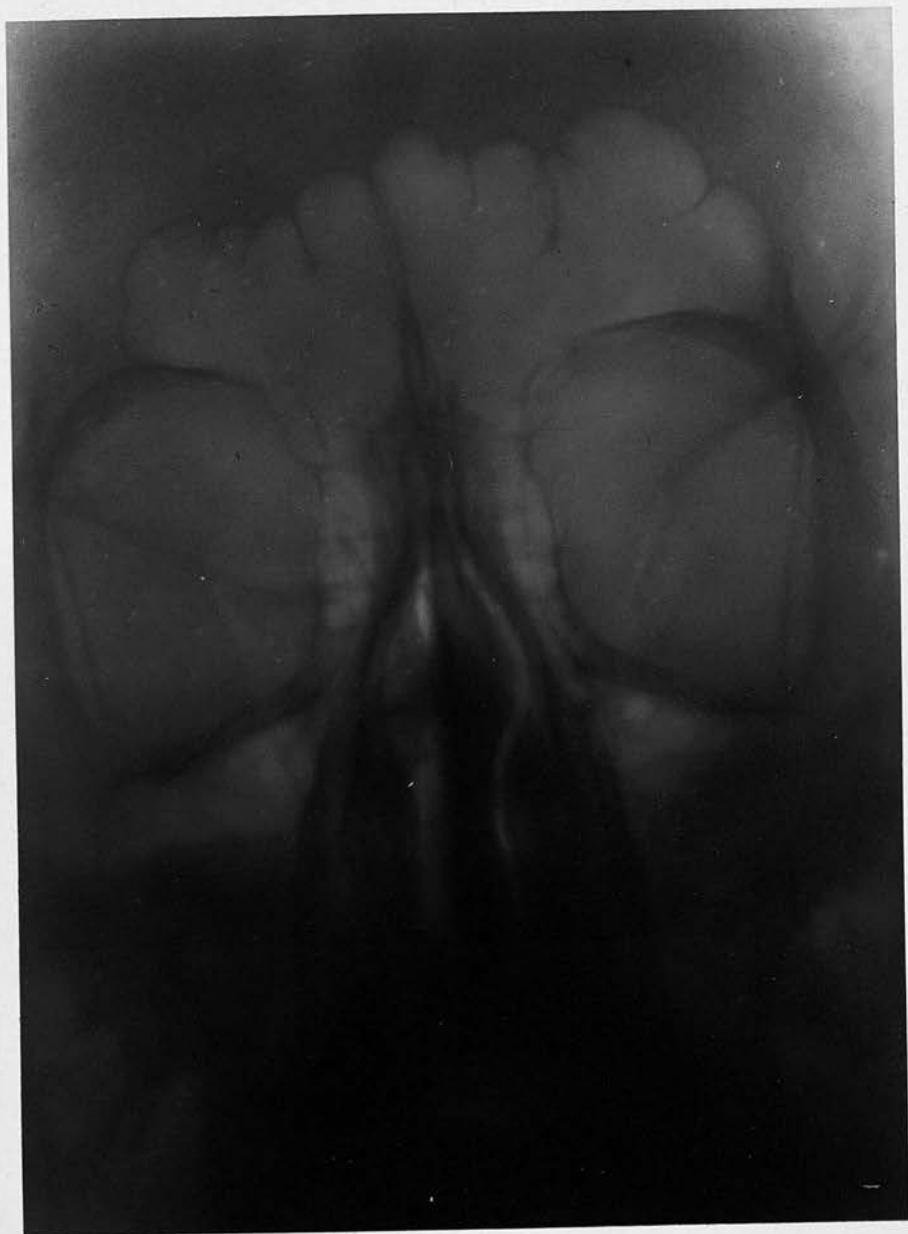
Patient not menstruating, and there is very little discharge from the nose.

Right. There is marked general contraction for white, and also for red and green, but the inferior part of the field for the two latter is almost hemianopic. This loss of the inferior field corresponds to the large area of atrophy described.

There is no scotoma centrally for 1 m.m. square objects, but there are peripheral scotomata.

Left. There is extreme general contraction for all colours, and there is an absolute central scotoma for 1 m.m. green and a relative for 1 m.m. red. 5 m.m. square red and green can be distinguished as such centrally, but the fields for red and green could only be charted for 20 m.m. objects.

The visual fields are dependent upon the retinal changes, which are due to syphilis, which is also very probably the cause of the sinusitis.



M.D. Case 8. Antero-posterior.

The frontal sinuses are very extensive on both sides, particularly the left, and the septum is mesial.

They are healthy.

The anterior ethmoid cells are well seen on either side of the nasal bones.



T.S. Case 9. Antero-posterior.

The frontal sinuses are healthy and well developed, the left being slightly the larger. The septum is mesial.

A metopic suture is well seen.

Case 9.

Chronic Right and Left Sphenoidal Sinusitis.

Contracted visual fields worse
after operation.

Miss T.S., aet. 28. Seamstress.

Nasal Conditions.

She complains of headache and nasal discharge.

History. During the past eight years she has been unable to breathe through her nose. During all this time there has been a constant discharge from both nostrils and into the back of the throat, and severe headaches.

The headache has practically been constant and situated either in the brows or at the back of the head.

She came to the Ear, Nose and Throat department in April, 1909, and Anterior rhinoscopy at this date showed a great deal of pus, together with polypi, in the left nasal cavity, and some pus in the right.

The polypi were removed and the nose was douched out with alkaline lotions for some months, but without improvement.

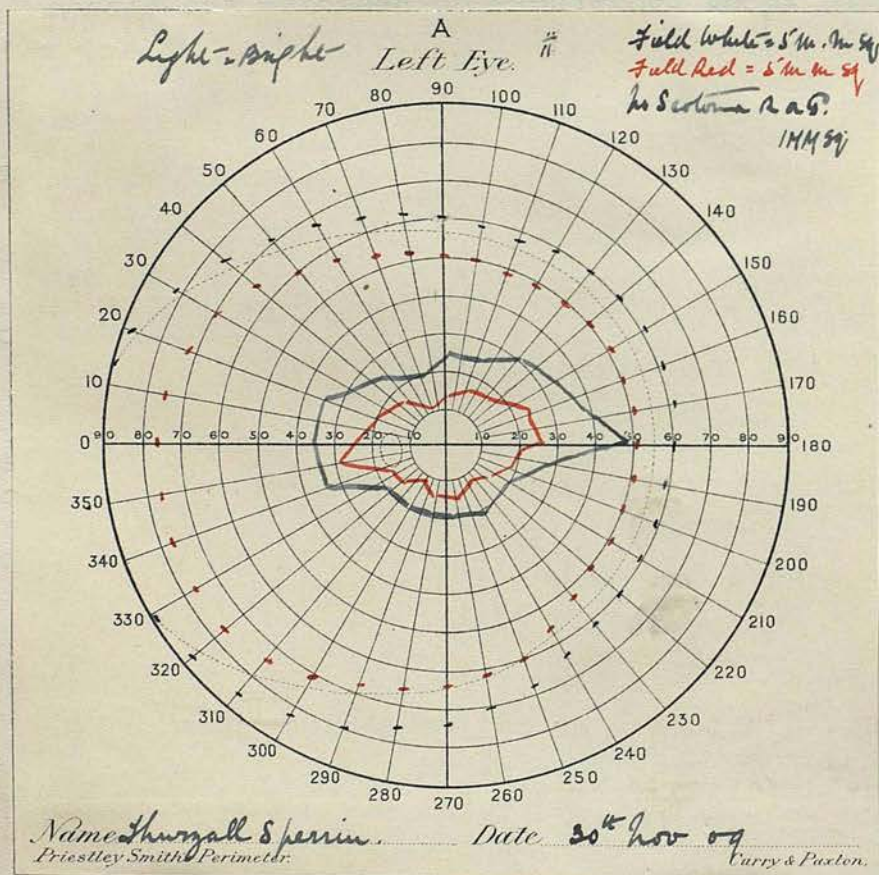
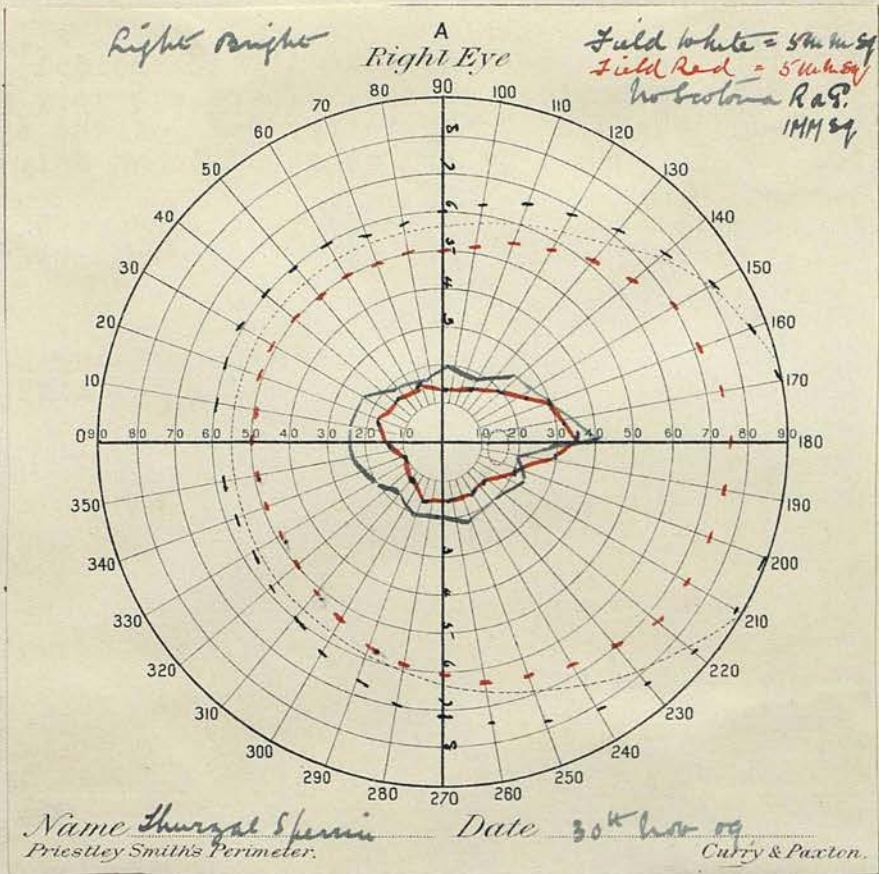
October, 1909. There is rather more discharge from the nose and the headache is as bad as ever.

Anterior rhinoscopy. The middle turbinates are very engorged and oedematous, and there are a few polypi in the left nasal cavity. There is a good deal of pus in both cavities, but it is impossible to see where it comes from.

There is a lot of pus on the posterior pharyngeal wall.

Posterior Rhinoscopy. The inferior turbinates are oedematous and pale, and there is much pus in the roof of the choanae.

Transillumination. The frontal and antral sinuses on both sides illuminate well.



inferior meatus, and no pus was found.

The middle turbinate bones and the sphenoidal sinuses on both sides opened. There was very profuse haemorrhage, and the latter part of the operation was performed by the sense of touch only.

After-treatment. The sphenoidal sinuses were washed out daily, and they contained much offensive pus.

Nov 26th. There is still much foul-smelling pus washed out of the right sinus, but only a little from the left.

Vision. Right = $\frac{6}{6}$
Left = $\frac{6}{9}$ with correction in each eye.

Fundi. In both eyes the discs are slightly hazy, but there is no swelling, and no engorgement of the veins.

Visual fields. page 91a

(Patient not menstruating and the sinuses have not been syringed out.)

The fields for white in both eyes are very markedly contracted compared to those of Oct 27th, but the fields for red are much about the same, and there are no scotomata.

There has been slight falling-off in the central vision, marked contraction of the fields, and some haziness of both discs since the operation.

Dec 28th, 1909. There is still pus in the posterior nares; and very little improvement in the headaches.

The opening in the sinuses were still further enlarged to-day.

Feb 20th, 1910. There is now no nasal discharge, and she is free of headache.

Vision Right = $\frac{6}{5}$ J 1
Left = $\frac{6}{9}$ J 1

Fundi. There are no active changes now.

Visual Fields. page 92a.

There is practically no change, and they are still

92a

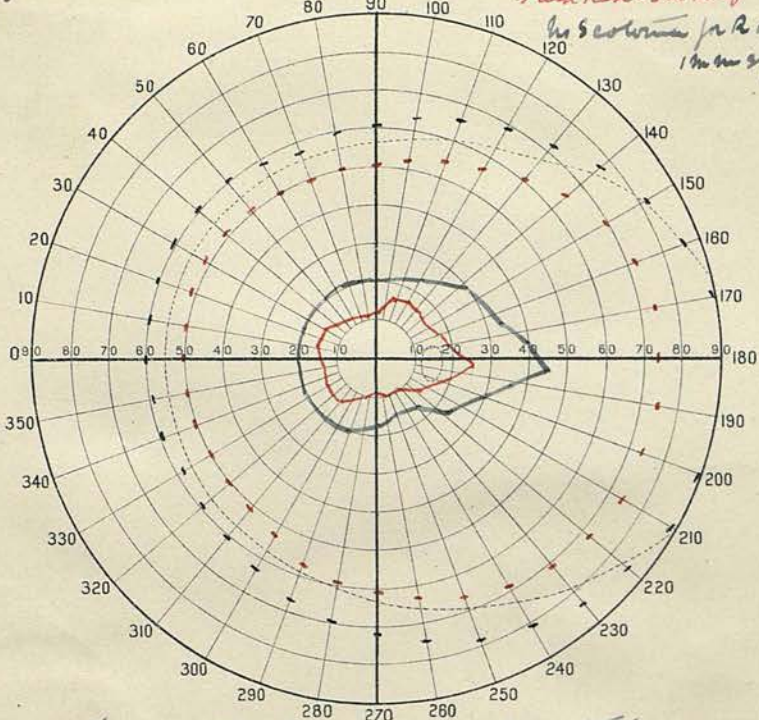
Light fair

A #
Right Eye

Field white = 5 m on sq

Field Red = 5 m on sq

No Scotoma in R or L
1 m on sq



Name *Thurgate Perrin*
Priestley Smith's Perimeter.

Date *Feb 19th 10*

Curry & Paxton.

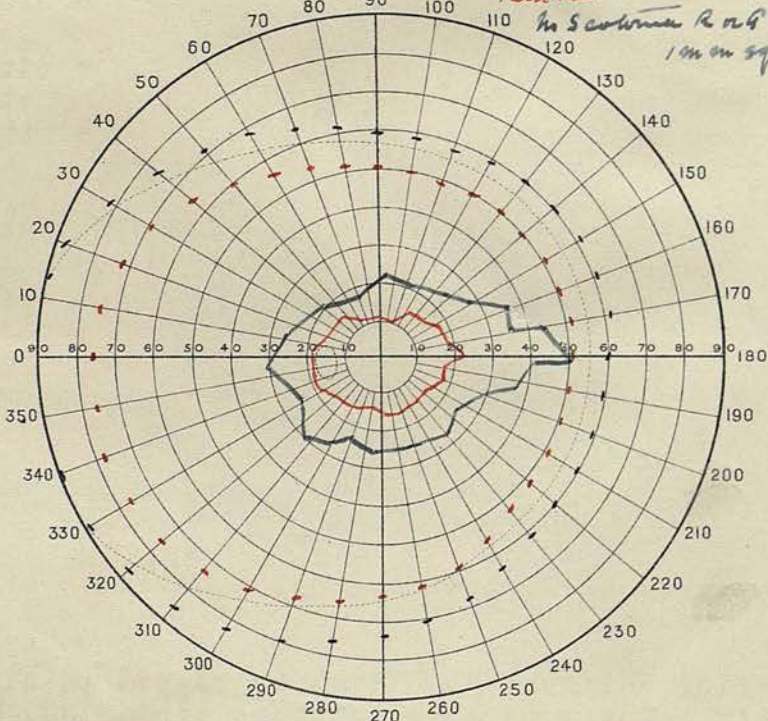
Light fair

A #
Left Eye

Field white = 5 m on sq

Field Red = 5 m on sq

No Scotoma R or L
1 m on sq



Name *Thurgate Perrin*
Priestley Smith's Perimeter.

Date *Feb 19th 1910*

Curry & Paxton.

very contracted. Doubtless some of this contraction is due to debility resulting from the operations, but when rapidly tested by the direct method with a 3-inch square of white paper there is very marked contraction, especially on the temporal side, showing that it cannot be due to fatigue entirely.

Case 10.

Probable Chronic Right and Left Sphenoidal and
Posterior Ethmoidal Sinusitis.

Mrs A.M.S., aet. 33, Housewife.

Complaint and History, March 4th, 1910.

She came to the Ear, Nose and Throat department because for the past ten years she has suffered from severe headache and nasal discharge. The headache has always been frontal in situation and constant, but is worse during the menstrual periods, and there is frequently pain at the backs of the eyes.

The discharge comes from both nostrils, but a good deal goes backwards into the throat, and it is often like "congealed blood," and she has found that by steaming the face the discharge is increased and the headache becomes less severe.

Both the discharge and headache started without any known cause, and the headache is so severe that it makes her life a misery.

Objectively.

There is no swelling nor tenderness of the face nor forehead.

Anterior Rhinoscopy. There is no pus in either cavity. The mucosa is somewhat atrophied, and the posterior pharyngeal wall can be seen - there are no crusts nor ozoena.



A.M.S. Case 10. Lateral.

The sphenoidal sinuses extend under the pituitary fossa.



A.M.S. Case 10. Antero-posterior.

The septum is mesial, and both frontal sinuses are small and healthy.

The antra are large.

There is a large mass of yellowish muco-pus on the posterior pharyngeal wall, and a smaller portion of chocolate-brown mucoid material.

Posterior Rhinoscopy. There is a good deal of pus upon the roof of the choanae and upon both middle turbinates.

Transillumination. The frontal and antral sinuses all illuminate well.

Diagnosis. Considering the symptoms, the nasal findings and the visual field contractions, sinusitis of the sphenoidal or posterior ethmoidal sinuses was practically certain.

Previous Health and Present Condition.

Her first child was dead born six years ago, at which time she suffered from albuminuria and fits, and since then she has had passing attacks of albuminuria.

Second pregnancy, 4 years ago, was an ectopic gestation and the left ovary was removed.

Has slight dysmenorrhoea.

Urine: Spc. G. 1015. No albumin nor sugar.

She has never had influenza, and does not suffer from recurrent colds.

There are no signs of syphilis nor tuberculosis. Her health is pretty good, but she always feels tired.

Ocular Conditions. March 5th, 1910.

She often has pain at the backs of the eyes, and she cannot see to sew or read for any length of time together. Externally, the eyes appear healthy - corneae, conjunctivae and irides, and also the lachrymal apparatus.

Muscles. The movements and convergence are good and painless, but Maddox rod develops a latent hyperphoria, which is corrected by a 10° prism base down in the right.

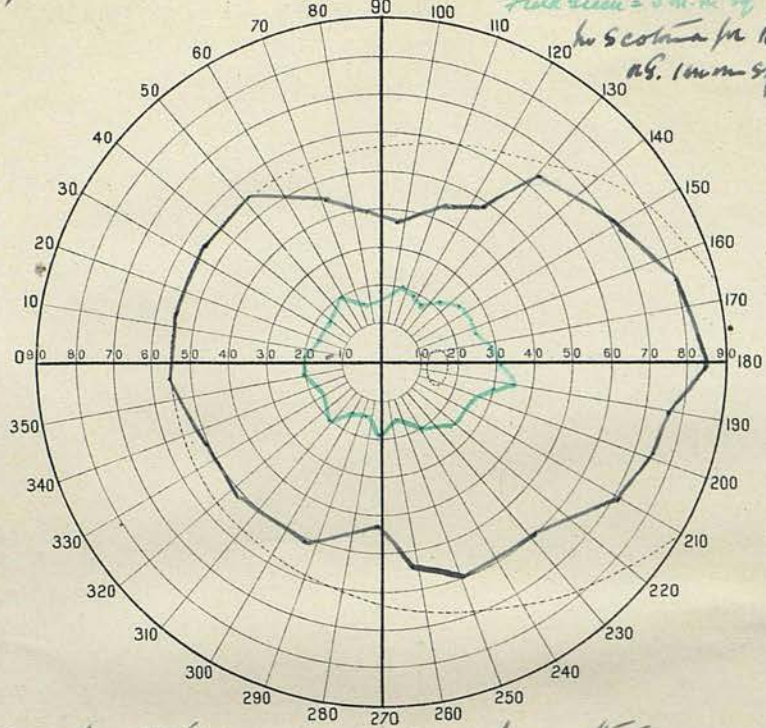
There is no tenderness on pressing the globes backwards.

Pupils: react to light, convergence and consensually, and hippus is not present.

highly sunlight

A
Right Eye

Field white = 5 m. sq
Field Green = 5 m. sq
No Scotoma for R
R.G. 1 m. sq



Name Mrs. Stuckley
Priestley Smith's Perimeter.

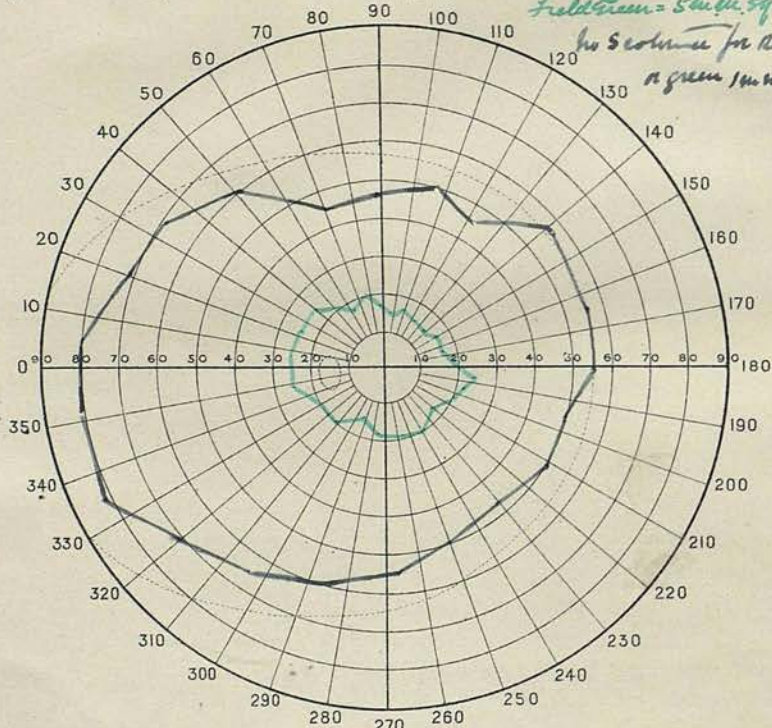
Date Mar 5th. 10.

Curry & Paxton.

highly sunlight

A
Left Eye

Field white = 5 m. sq
Field Green = 5 m. sq
No Scotoma for L
R. green 1 m. sq



Name Mrs. Stuckley
Priestley Smith's Perimeter.

Date Mar 5th. 10.

Curry & Paxton.

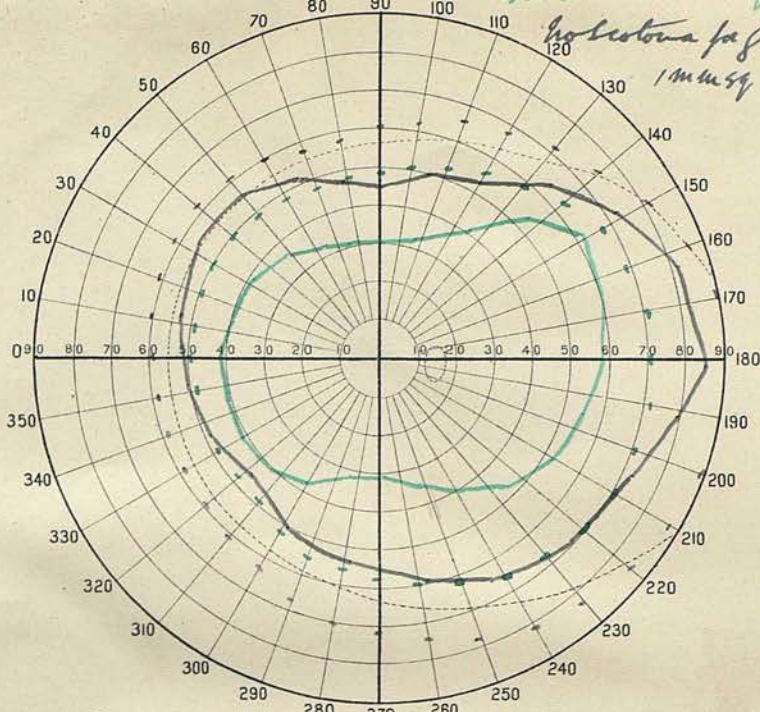
Light = dull

A
Right Eye

Field white = 5' in the sq

Field Green = 5' in the sq

No Scotoma for green
1 m in sq



Name Mrs Stuckley
Priestley Smith's Perimeter.

Date April 12. 10

Curry & Paxton

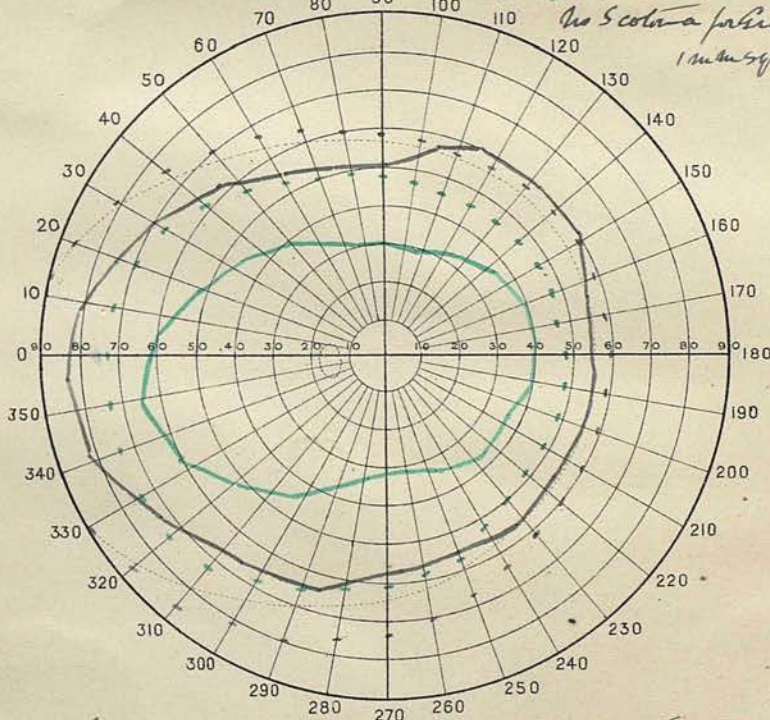
Light = dull

A
Left Eye

Field white = 5' in the sq

Field Green = 5' in the sq

No Scotoma for green
1 m in sq



Name Mrs Stuckley
Priestley Smith's Perimeter.

Date April 12. 10

Curry & Paxton

April 12th, 1910. She is now quite free of all symptoms and there is no nasal discharge.

N.B. The great extension of the fields for green in spite of the dull light.

Ophthalmoscopically the eyes are normal.

Vision: Right = $\frac{6}{5}$ J 1
Left = $\frac{6}{5}$ J 1

Visual Fields, page 95a.

The right and left fields for white show slight concentric contraction, which is much more marked in the field for green.

There are no scotomata.

Operation. March 6th, 1910.

The antra were explored by Lichwitz cannula passed into the cavities and found to be healthy. The middle turbinates were removed and the sphenoidal sinuses opened, and were apparently healthy.

March 17th. She feels much better and has no headache nor obstruction in the nose and less discharge.

There is no pus by anterior or posterior rhinoscopy now,

G R O U P B.

Case 11.

Left Anterior Ethmoidal Mucocele.

Epiphora; slight optic atrophy;
visual fields full.

John T., aet. 54. Blacksmith.

History and Complaint.

He came to the Bristol General Hospital in January, 1910, because of swelling on his nose. Thirty-one years ago his nose was struck with a sledge hammer, since when it has always been very crooked, but caused no trouble - no obstruction to breathing and no discharge.

During the last four or five months a swelling has gradually formed upon the left side of his nose, and apart from watering of the left eye, has caused no trouble, and is quite painless.



Nasal Conditions.

The nose is so bent over to the left, that the bridge, which is very flattened, rises sharply on the left side at right angles to the inner canthus.

The swelling complained of extends outwards from the left side of the bridge to almost the inner corneal margin, and is almost in contact with the conjunctiva, and upwards as far as the naso-orbital angle, and downwards to the lower edge of the nasal bone, whilst anteriorly it is on a level with the bridge of the nose.

a

It is a semi-tense and elastic swelling, without egg-shell crackling and about the size of the terminal phalanx of an average thumb, and is dark-red in colour from chronic venous congestion.

The mucosa is a little congested, but there is no discharge of any kind seen by anterior rhinoscopy, but the septum is so twisted that no view of the posterior part can be obtained.

The Naso-Pharynx is healthy and all the parts seen by posterior rhinoscopy.

Diagnosis.

Owing to the extent of the swelling, the absence of nasal symptoms, and the incomplete fluctuation, it was thought to be a sarcoma, but the operation proved it to be an Ethmoidal Mucocele.

Operation. Jan 28th, 1910.

An external incision was made over the prominence which was then found to be cystic, and upon opening into it, a large quantity of chocolate-coloured mucus was evacuated. The cavity communicated with the nose by a large opening either through, or just posterior to, the lachrymal bone. The tear sac was excised, the cavity scraped and sewn up with a drain on to the face, and by the sixth day the wound had healed by first intention.

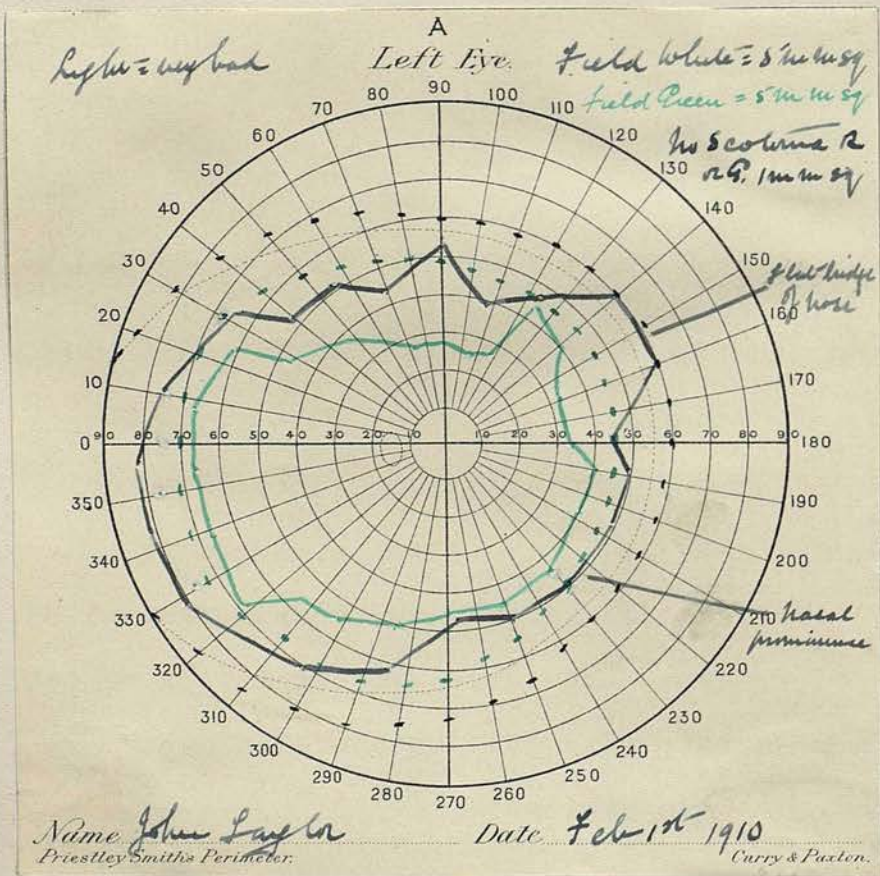
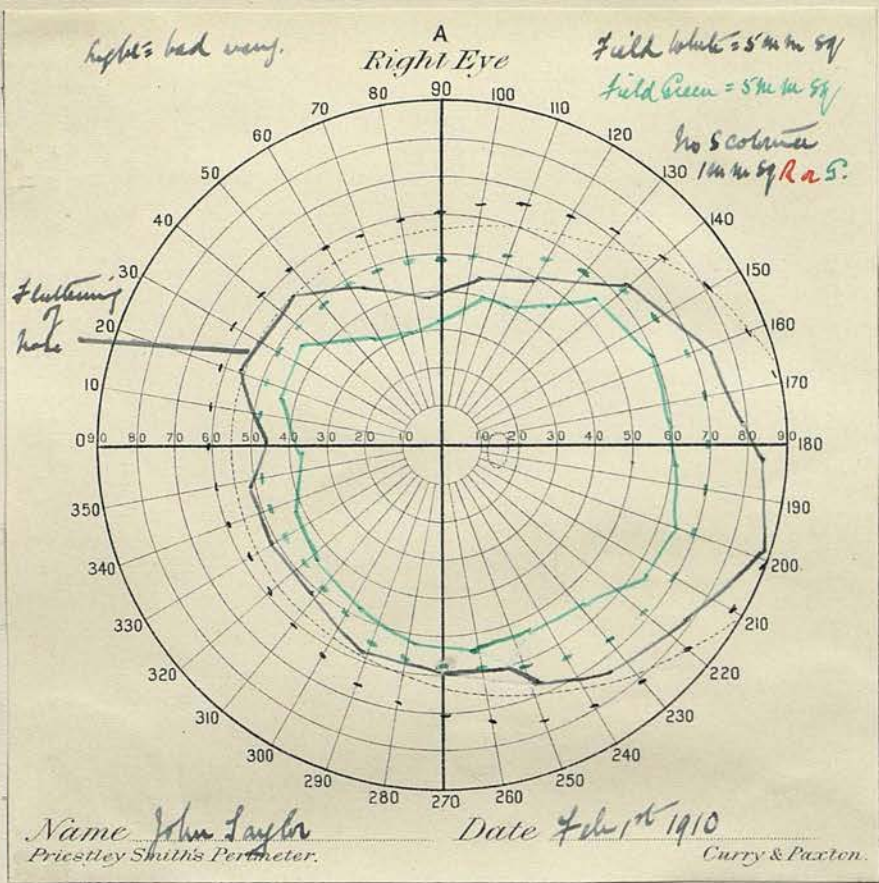
General Health.

Is good, and he has had no illnesses of importance, and all the organs are healthy.

Ocular conditions. Feb 1st.

He complains of watering of his left eye, and that his sight has not been very good of late.

96a



There is no proptosis, nor outward displacement of the globe.

The Lachrymal sac is greatly displaced, but there is no dacryocystitis. and apart from injection of the ocular conjunctiva opposite the swelling, externally the eyes are healthy.

Muscles. The movements and convergence are good and painless, and Maddox rod develops no latent strabismus.

There are no signs of orbital periostitis, and no pain on pressing the globes backwards.

The pupils react to light, convergence, and consensually, and hippus is not present.

Vision: Right = $\frac{6}{12}$ J 14 with +1 sph = $\frac{6}{9}$ + 4 sph = J1
 Left = $\frac{6}{12}$ J 14 " " = $\frac{6}{9}$ " " J1

Ophthalmoscopically.

Right and Left. The media are clear; but both optic discs are very pallid, and the vessels are attenuated, and there is a marked scleral ring around the right disc.

There is some atrophic cupping.

Visual Fields. page 96a

These could not be taken till after the operation, as the swelling on the nose was so much in the way.

Allowing for the very bad light and the deformity of the nose, the visual fields are full.

G R O U P C.

Case 12.

Left Frontal Mucocele or Chronic Frontal Sinusitis.

Proptosis; visual fields normal.

Henry Barret, aet. 65. Motor-car cleaner.

Complaint and History.

A swelling began to form at the left orbito-nasal angle more than twelve months ago, which broke, discharged and healed several times, and

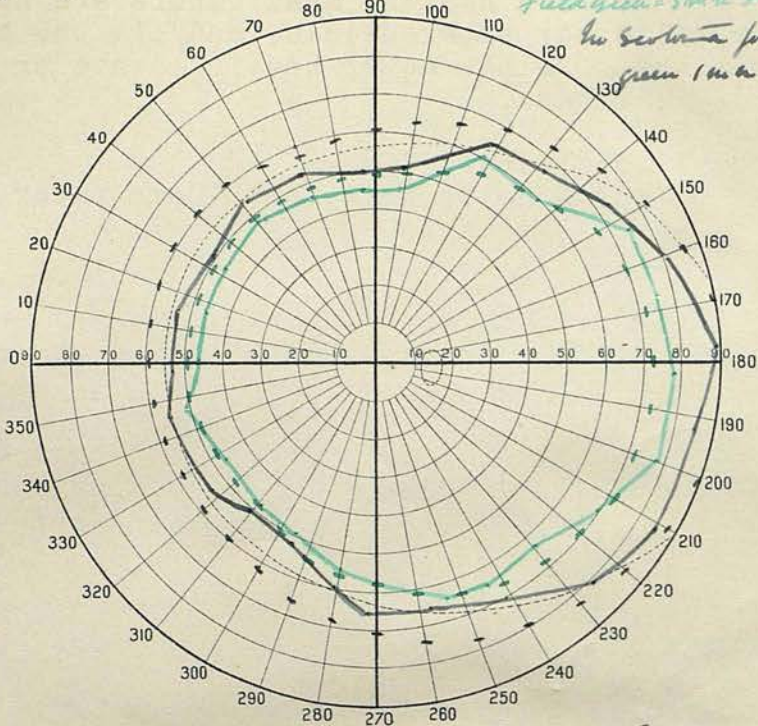
Height 5 feet

A
Right Eye

Field White = 5 m sq

Field Green = 5 m sq

No scotoma for
green 1 m sq



Name Henry Barrett.

Date Mar 7th 10.

Priestley Smith's Perimeter.

Curry & Paxton.

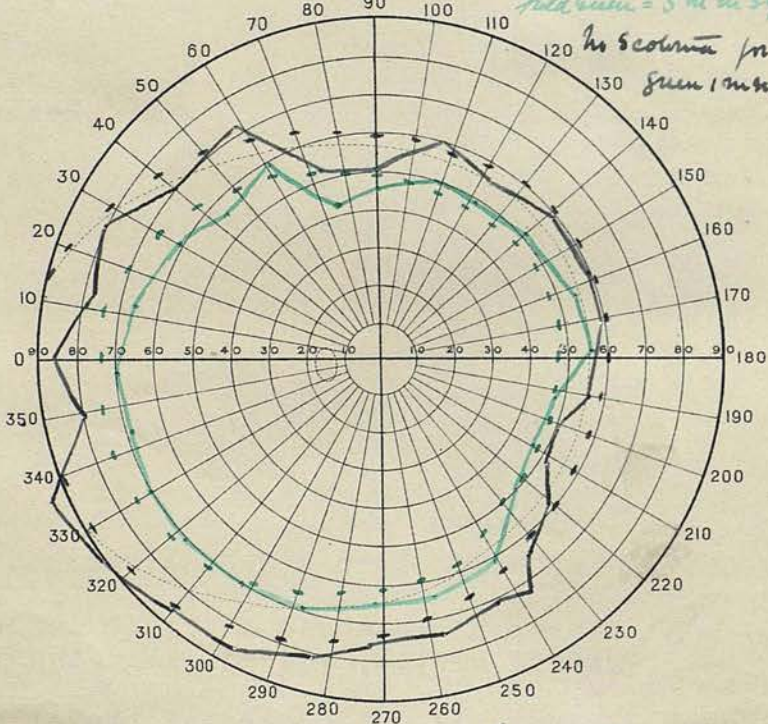
Height 5 feet

A
Left Eye

Field White = 5 m sq

Field Green = 5 m sq

No scotoma for
green 1 m sq



Name Henry Barrett.

Date Mar 7th 10

Priestley Smith's Perimeter.

Curry & Paxton.

General Health.

He is a healthy man. There are no signs of syphilis nor tuberculosis, and all the organs are healthy. He has never had influenza or any other serious illness.

Nasal Conditions.

He is quite sure that there never has been any nasal discharge.

There is no tenderness of the frontal region. A probe can be passed in the sinus slightly backwards and then upwards into the left frontal sinus.

Anterior Rhinoscopy. The mucosa is ^a good deal atrophied, and there are some crusts, but there is no ozoena; the left inferior turbinal is adherent to the septum.

Posterior Rhinoscopy. There are a few crusts about the septum, and the turbinals are pale.

Diagnosis.

This has either been a chronic frontal sinusitis or a mucocele of that sinus. More probably the latter, because of the bony distension, absence of pain and headache, and the normal visual fields, and the discharge being more or less mucoid.

March 7th, 1910. Under treatment by nasal douching with Dobell's recipe the sinus has healed over.

The ocular conditions are the same as a week ago.

No operative treatment was advised.

Visual fields. page 98a

The fields for white and green in both eyes are full, and there are no scotomata.

C a s e 13.

Right and Left Chronic Frontal Sinusitis.

Diplopia; weakness of right superior oblique; marked hippus; visual field contraction.

Harry P., aet. 32. Commercial traveller.

History. Eleven years ago he began to be troubled with headache over the eyebrows for which he consulted two oculists, and was ordered correcting lenses, but without relieving the headache, and



H.P. Case 13. Antero-posterior.

The anterior wall of the right sinus had been removed some time before the skiagram was taken, as there is only one layer of bone, a white patch is seen, on the left side there is a very deep shadow over the frontal sinus - it is diseased.



H.P. Case 13. Lateral.

The sphenoidal sinuses are small.

this continued for five years before any cause could be discovered. His nose had been obstructed all the time, and he was then sent to Dr Watson Williams, who found both nasal cavities full of polypi, and a very much deviated septum. The polypi were removed and the septum was straightened; up to that time he had had no nasal discharge, but from then onwards it was profuse, though the headaches were no better. The polypi recurred, and were repeatedly removed during the next five years.

About one year ago, the headache - which was always located to the forehead - became so severe that he was absolutely unable to do his work, and being in London, he saw Dr Dundas Grant, who advised an operation upon the right frontal sinus. This was performed, and for a short time the headache was very much better, but it returned as badly as ever.

He still has a great deal of nasal discharge, which tends to form crusts, and which he has to remove with his handkerchief.

Nasal condition. Jan 10th, 1910.

Objective. There is a large depression over the right brow from a former Killian operation. There is tenderness of the left brow and supraorbital notch, but no swelling.

Anterior Rhinoscopy. There are polypi in the right and left nasal cavities, and pus in the superior and middle meatūs on the left side., and there is also pus in the floor of the post nares.

Transillumination. The right and left antra and left frontal sinuses illuminate well, and the right frontal very well (it has no bony wall.)

Jan 15th. Under local anesthesia, the polypi and portions of both middle turbinates were removed. The right and left antra were explored by Lickwitz and found healthy. The right frontal sinus was washed out, and no pus was found. The right and left sphenoidal sinuses were washed out and explored and found healthy.

He was advised to have the left frontal sinus operated upon.

General Health and Previous Illnesses.

Apart from headache he has enjoyed good health. He has never had influenza nor syphilis. Urine healthy.

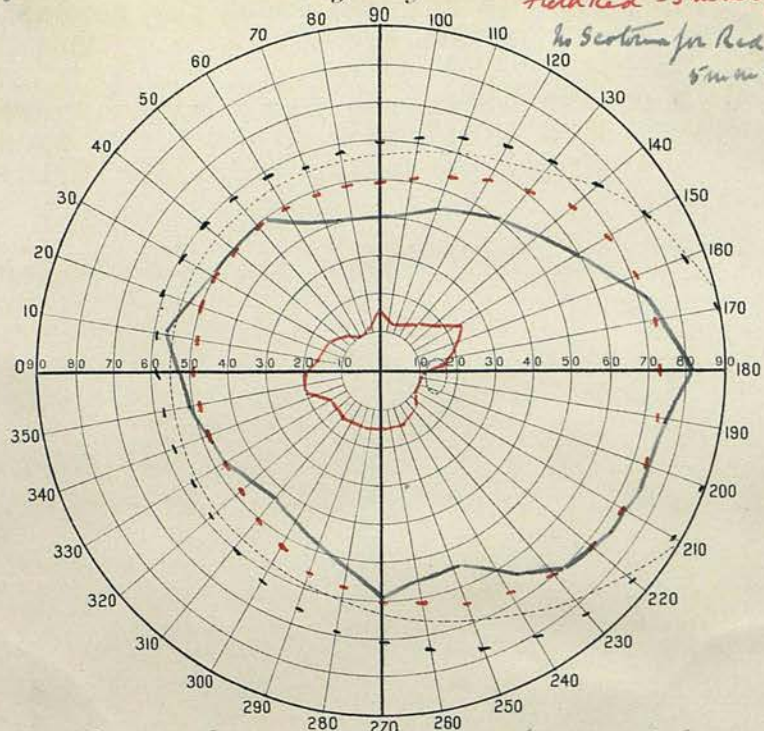
Ocular conditions. Feb. 23rd, 1910.

He believes that the sight is not as good as it was

Light = Sunlight

A
Right Eye

Field White = 5 m m sq
Field Red = 5 m m sq
No Scotoma for Red
5 m m sq



Name Harry Payne
Priestley Smith's Perimeter

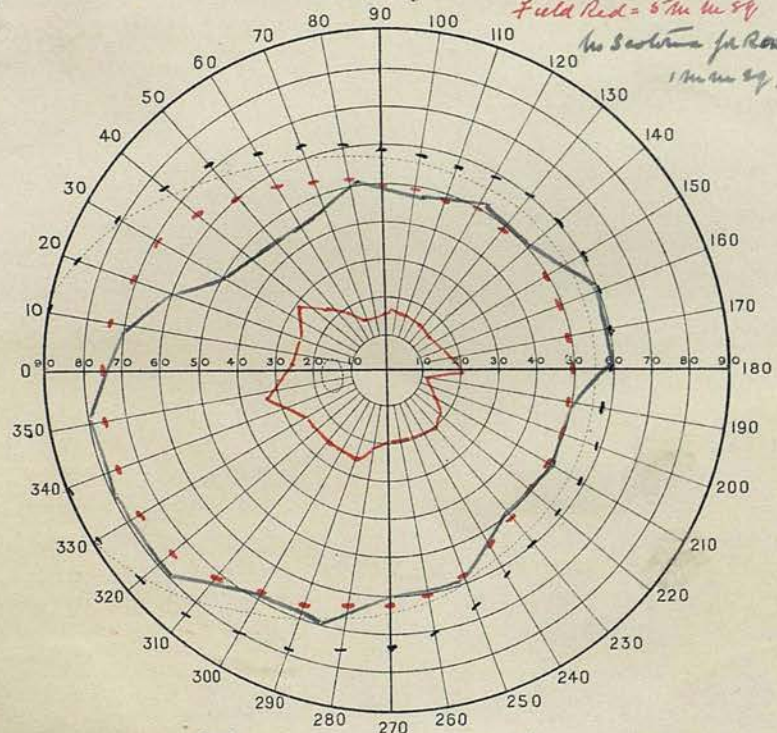
Date Feb 23rd '10

Curry & Paxton

Light = sunlight

A
Left Eye

Field White = 5 m m sq
Field Red = 5 m m sq
No Scotoma for Red
5 m m sq



Name Harry Payne
Priestley Smith's Perimeter

Date Feb 23rd '10

Curry & Paxton

a few months ago. He has pain and the sensation of fire at the backs of the eyes.

For several months after the right sinus operation, he saw double, and he still does if he looks down and to the left, one object appearing to be three inches above the other.

There is no proptosis, and the lachrymal apparatus is healthy.

Muscles. The movements are good and painless, but he cannot converge beyond 20 c.m. There is no obvious squint, but Maddox rod shows insufficiency of the right superior oblique. There is slight tenderness on pressing the globes backwards.

Pupils. Both react to light, convergence, and consensually, but on concentrating the light hippus is marked and they remain dilated.

Vision. Right with + 2 cyl. axis vertical = $\frac{6}{12}$ J1
left with + 1 cyl. axis vertical = $\frac{6}{9}$ J1

Ophthalmoscopically both eyes are healthy.

Visual Fields.

The right and left show some general contraction for white, and very markedly for red. He is colour blind for green.

There are no scotoma.

Operation. Feb 23rd.

A Watson Williams osteoplastic operation was performed upon the left frontal sinus. It was well developed, but did not extend far back into the orbit; it was full of pus and polypi. Part of the inner orbital wall was removed.

March 3rd. The headache is very severe, and the anterior wall of the sinus is reddened and inflamed, and there is a great deal of nasal discharge.

March 16th. He has not been free from headache once since the operation, and there is still some pus in the nose.

Ocular conditions show no change.

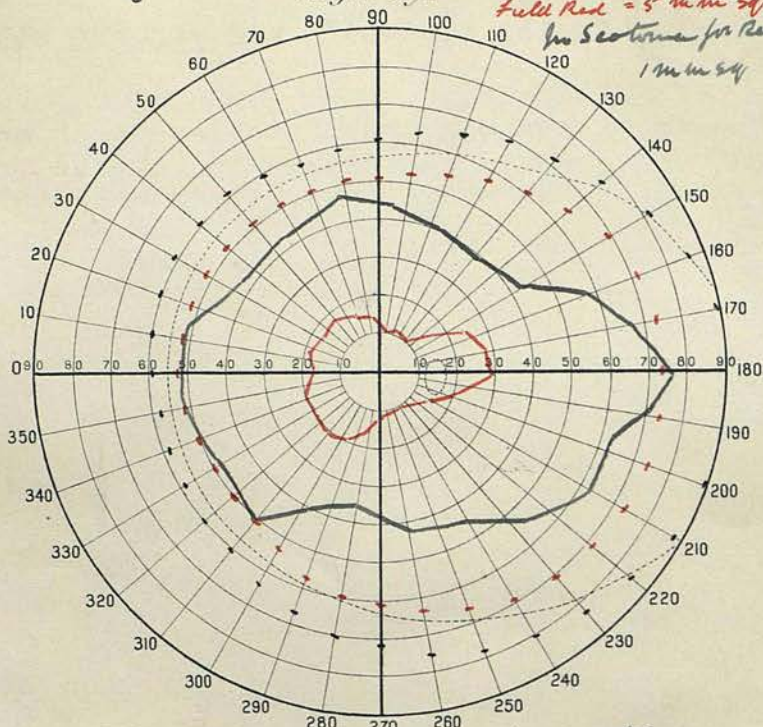
Vision: Right = $\frac{6}{12}$
Left = $\frac{6}{9}$

101a

Sunlight

A
Right Eye

Field White = 5 m m sq
Field Red = 5 m m sq
For Scotoma for Red
1 m m sq



Name Harry Payne
Priestley Smith's Perimeter.

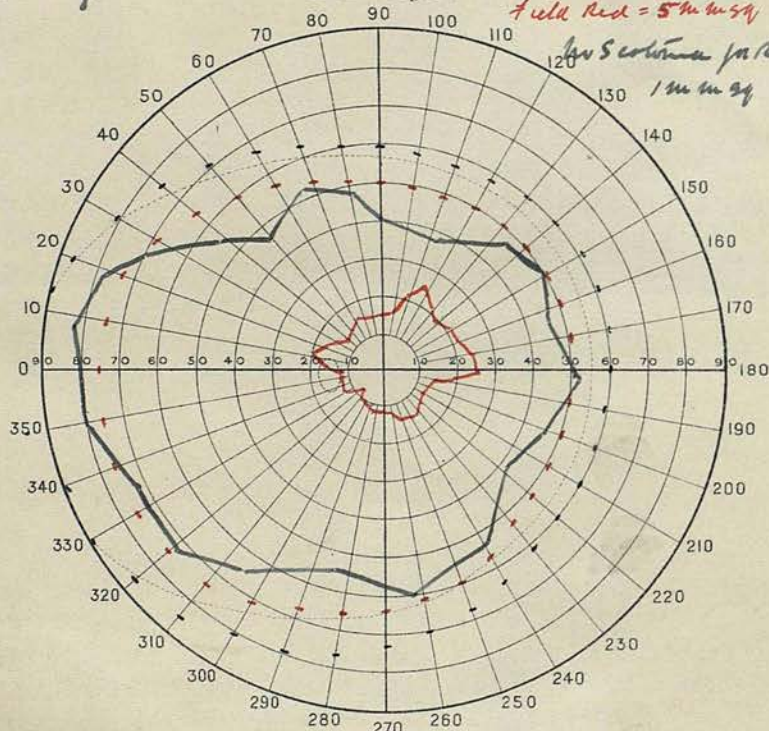
Date Mar 16th 10

Curry & Paxton.

Sunlight

A
Left Eye

Field White = 5 m m sq
Field Red = 5 m m sq
For Scotoma for Red
1 m m sq



Name Harry Payne
Priestley Smith's Perimeter.

Date Mar 16th 10

Curry & Paxton.

Visual Fields. Page 10/a.

The fields for white and red are slightly more contracted.

The Frontal Sinus was probed to-day under an anaesthetic, and a small sequestum was removed from the lower part of the sinus, everything was otherwise satisfactory.

C a s e 14.

Chronic Right and Left Frontal Sinusitis, with Bony Expansion of the Anterior Walls.

Visual field contractions.

S.B., aet.28, Clerk.

History. His trouble began five years ago with severe headache confined to the left brow, and which he believes followed upon a severe cold in the head. At this time the eyebrow and eyelids were so swollen that he could scarcely see out of his eye, and an antral abscess on the left side was opened.

Since that time he has suffered from almost constant headache and discharge from his left nostril, never from his right.

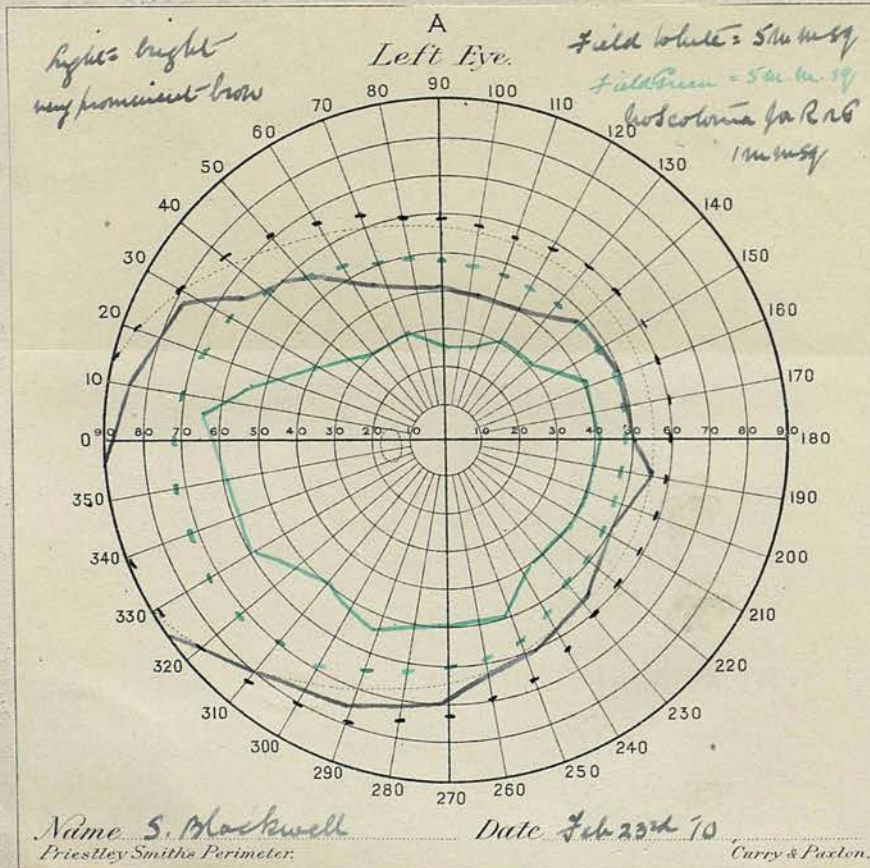
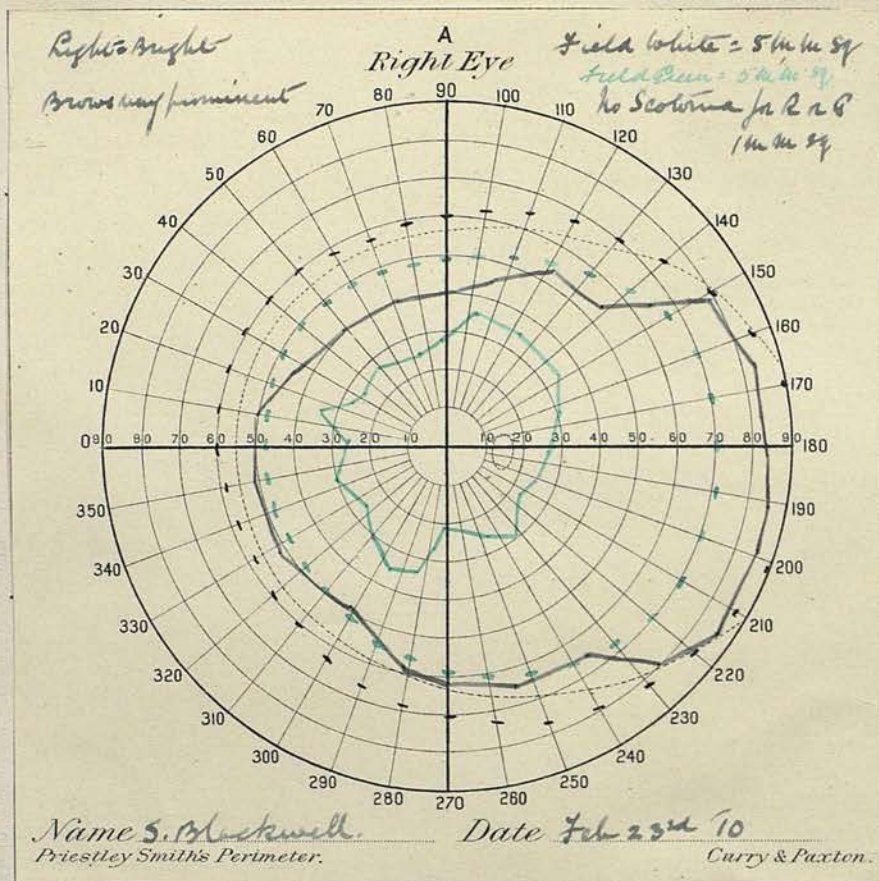
During the summer of 1909, several intra-nasal operations were performed at the Bath Hospital, and in September of that year the left frontal sinus was explored externally through the eyebrow, since when there has always been a discharging sore.

Nasal Conditions. Feb 14th, 1910.

There is a discharging sinus in the left eyebrow, which leads into the left frontal sinus. The brows are very markedly prominent and rounded, as if from bony expansion.

Anterior Rhinoscopy. There is a good deal of pus in the left ~~middle~~ nasal cavity, which comes from the middle meatus. There is no pus in the right cavity. The left middle and right inferior turbinals are greatly enlarged and oedematous.

By Posterior Rhinoscopy there is a good deal of pus seen in the left middle meatus.





S.B. Case 14. Lateral.

The great size of the frontal sinuses, and the bulging of the anterior wall, are well seen.



S.B. Case 14. Antero-posterior (poor skiagram).

The skiagram should be held three feet distant, when the frontal sinuses can be seen extending outwards to the fronto-orbital angle and upwards to the forehead limit. There is a very thick septum between them.

Transillumination. The right and left antra illuminate well as also the left frontal sinus, but the right frontal is very poor.

Ocular Conditions. Feb 22nd.

His sight is good and he has never had any attacks of bad vision.

There is no proptosis.

The lachrymal apparatus is healthy, as is also the corneae, conjunctivae, and irides.

Muscles. The movements and balance as tested by Maddox bar are perfect.

Pupils, are equal in size and react to light, convergence, and consensually, and hippus is not present. There is no tenderness on pressing the globes backwards.

Vision: Right = $\frac{6}{6}$ J1

Left = $\frac{6}{5}$ J1

Ophthalmoscopically, both eyes are healthy. The Visual Fields (nose untouched), page 102a. The fields for white in both eyes are slightly generally contracted, and both show some loss of the superior field corresponding to the prominent brows. Both the fields for green show some concentric contraction, but there is marked contraction of the right temporal field. There are no scotomata.

Operation. Feb 23rd.

A Watson Williams osteoplastic operation was performed upon both sinuses.

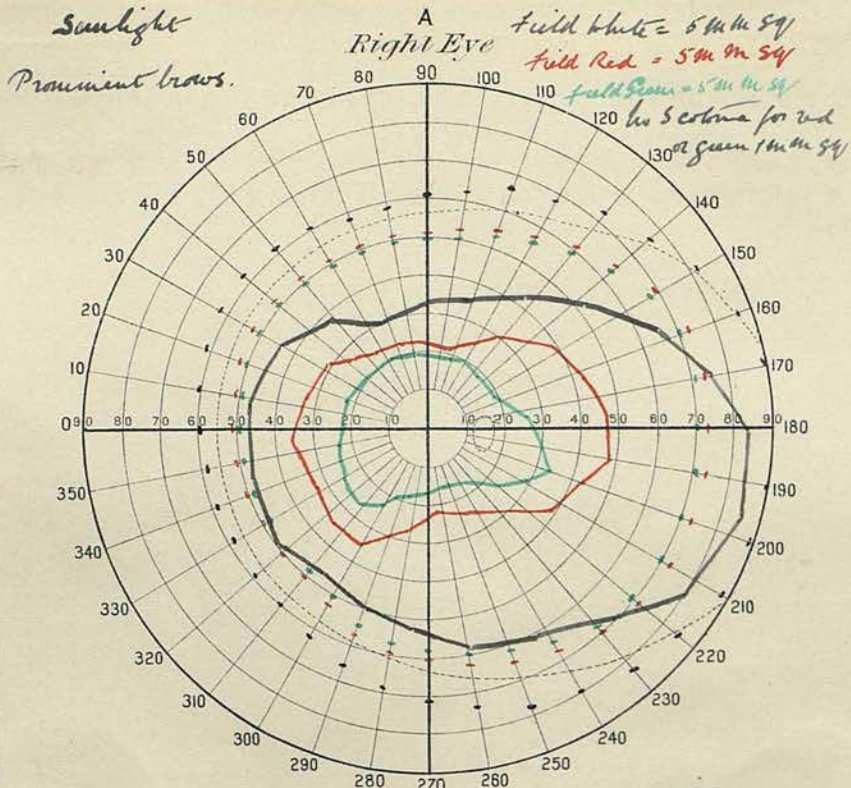
The left frontal sinus was found to communicate with the right through the partially destroyed septum. They are very large, extending outwards to the external angular process on either side, upwards for $2\frac{1}{2}$ inches, and backwards between the orbital plates for $\frac{5}{8}$ th inch.

They were full of foul smelling pus.

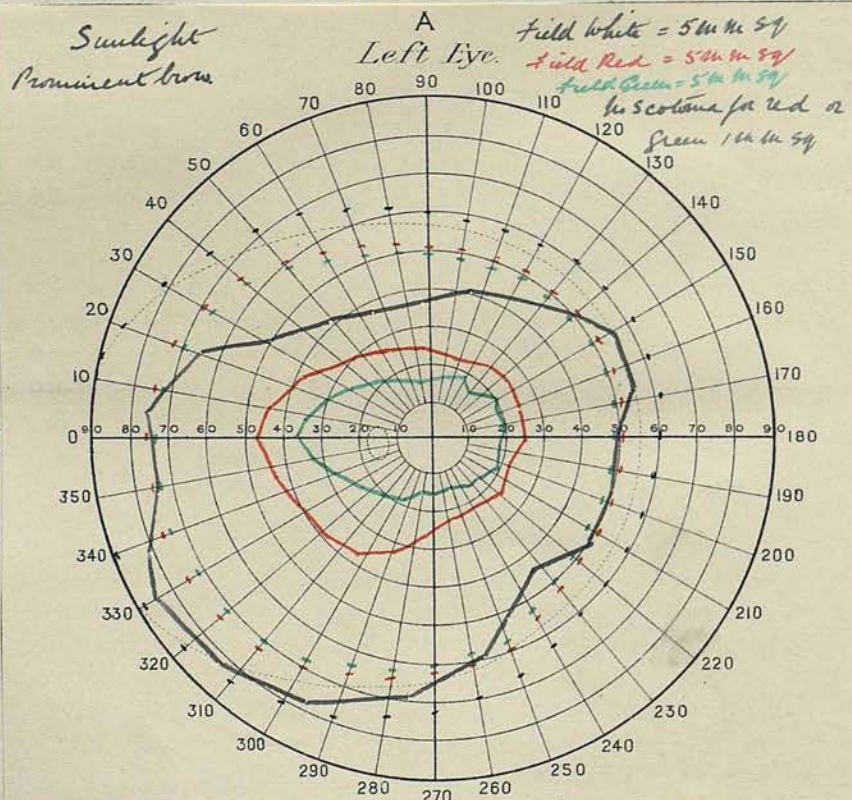
A culture from the pus showed Gram-positive cocci, with a preponderance of streptococci.

Feb 26th. Is quite free of headache.

March 16th. There is very little nasal discharge now and the external wounds have almost healed.



Name S. Blackwell Date Mar 16th 10.
 Priestley Smith's Perimeter. Curry & Puxton.



Name S. Blackwell Date Mar 16th 10.
 Priestley Smith's Perimeter. Curry & Puxton.

Vision: Right = $\frac{6}{5}$ Left = $\frac{6}{5}$

Ophthalmoscopically, the eyes are healthy.

Visual Fields, page 103a, are not quite so full, but the lids are oedematous and the palpebral apertures small.

G R O U P D.

Case 15.

Sarcoma of the Right Antrum and Polysinusitis
and Recurrent Polypi.

Dacrocystitis; post-neuritic atrophy or
chronic glaucoma; contracted fields.

John T., aet. 73, married, brick maker.

Attended the Shrewsbury Eye, Nose and Throat Hospital Dec 29th, 1909, complaining that both nostrils had felt blocked for some months past, and that it is associated with a great deal of discharge.

At this date, several polypi were removed from the right cavity under cocaine.

Jan 19th. The blockage and discharge are as bad as ever, and during the last week he has had severe pain in the right cheek and brow.

Externally. The right cheek is considerably swollen the swelling being mainly bony and but very slight in the soft parts; it is very tender, but there is no egg-shell crackling. There is no tenderness of the frontal region.

Anterior Rhinoscopy. The right and left nasal cavities are full of pus and polypi, which latter are growing from the superior and middle meatūs. The mucosa is generally very oedematous and "boggy" particularly in the inferior turbinals. Pus is so freely secreted on both sides, that it is impossible to get the cavities cleaned out. There is a large mass of pus on the posterior pharyngeal wall, and in the floor of the post nares together with polypi.

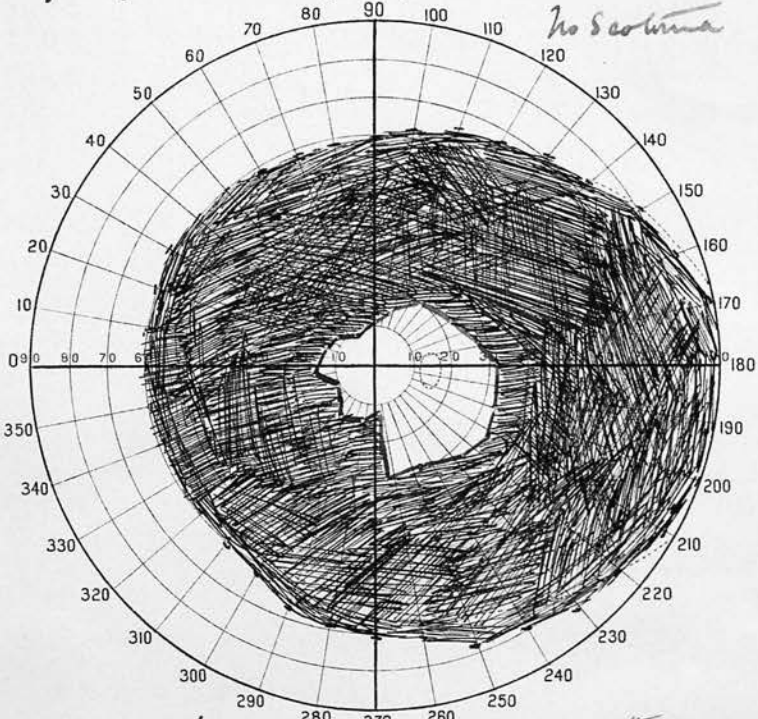
Transillumination- The frontal sinuses illuminate well, but the antra scarcely at all, and it is particularly bad on the right side.

light = good

A
Right Eye

white = 5 mm sq

no scotoma



Name John Litley
Priestley Smith's Perimeter.

Date Jan 20th 1910

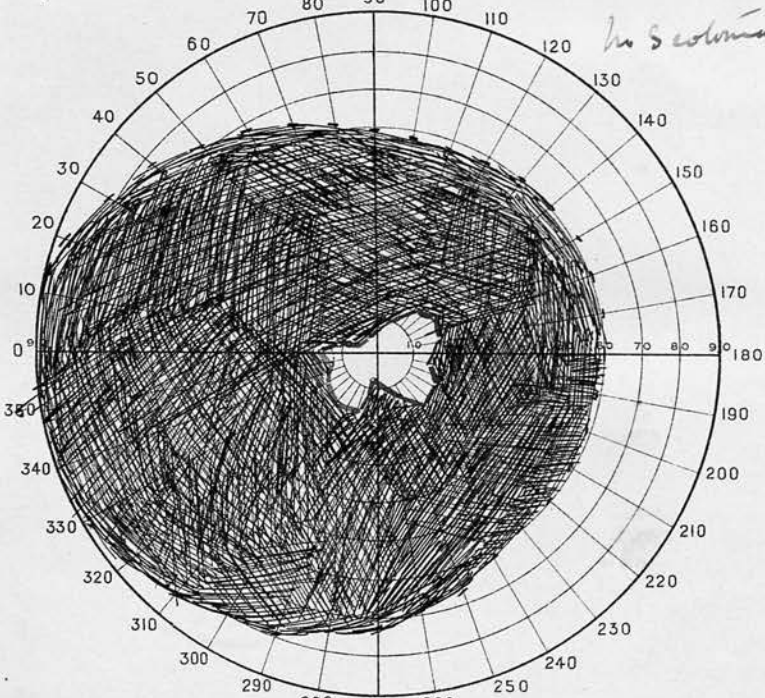
Curry & Paxton.

light = good

A
Left Eye

field white = 5 mm sq

no scotoma



Name John Litley
Priestley Smith's Perimeter.

Date Jan 20th 1910

Curry & Paxton.

General Health.

For his age , he is a strong and apparently healthy man, and has been at his work up to the day of his coming in.

All the organs appear healthy.

Urine. Faint trace of albumin.

Ocular Conditions. 20th Jan.,

He complains that he has not seen well for some months now. There is no history of halos around lights, or of attacks of bad vision.

There is no proptosis in either eye.

The lachrymal apparatus is healthy in the left eye, but there is a large dacrocyst in the right, full of pus which upon very slight pressure readily empties itself into the nose.

There is some conjunctivitis in the right eye, but otherwise both eyes appear healthy externally.

Muscles. The movements and convergence are good and painless and Maddox rod develops no squint.

There is slight tenderness on pressing the right globe backwards, but there is no sign of orbital periostitis.

Pupils. Both react to light, convergence and consensually and hippus is not present.

The anterior chambers are rather shallow.

Vision: Right = $\frac{6}{18}$ no lens helps.

Left = $\frac{6}{12}$ " " "

Tension. Right and Left normal.

Ophthalmoscopically. Right and Left eyes.

The media are clear and healthy. The discs are pale, and on the outer side are merged into the surrounding retina from old neuritis. The arteries and veins are very attenuated.

There is a good deal of cupping of the nerves and some of the vessels bend fairly sharply at the edges, and it is very difficult to say whether it is due to the atrophy only, or to chronic glaucoma in addition.

The Visual Fields. Page 104a

The fields were only taken for white because of his great age. In the right, there is extreme general contraction with almost complete loss of the nasal field especially the inferior quadrant - it is a typical field of vision of glaucoma.

The left shows very extreme general contraction.

There are no scotomata.

Diagnosis. There is very marked atrophy of both nerves and there has been some neuritis; but whether the cupping is entirely due to atrophy or to glaucoma is difficult to say, but the field of vision in the right eye rather points to glaucoma.

Operation. Jan 21st, 1910.

The inferior turbinals were partially removed, together with as many polypi as could be seen. There was such profuse haemorrhage that the nose had to be firmly packed, and this continued on and off for four days.

This severe haemorrhage, together with the bony swelling of the right cheek with the dacryocystitis and recent history, led to a suspicion of its being of a malignant nature; a portion was therefore removed, and found to be a malignant sarcoma.

No further treatment was advised.

The causal relation cannot be proved in this case, but it is extremely probable.

C a s e 16.

Acute Left Antral Sinusitis with Necrosis.

No ocular disturbances. Very slight temporal contraction in the left eye.

Henry B., aet. 37, married; Post Office Linesman.

Came to the Shrewsbury Eye, Nose and Throat Hospital Dec 30th, 1909, complaining of swelling in the left cheek and palate.

He caught a severe cold one month ago, and a week later he had a great deal of pain over his left eye and in the left cheek, which became very swollen and tender, and whilst the cold lasted there was a great deal of discharge from both nostrils.

As the pain persisted in his left upper jaw, he consulted a qualified dentist who extracted three of the teeth in the left upper jaw, and a few days after the extraction of the teeth the palate began to swell and was very painful.

Objectively.

There is considerable swelling of the soft part of the left cheek and it is very tender. In the hard palate mid-way between the middle line and the teeth margin there is a large swelling semi-elastic on palpation. There is no laceration of the gums, and they are quite healed. Anterior Rhinoscopy. There is a film of pus in the left middle meatus, but not in any quantity and none in the right nasal cavity.

Vision: Right = $\frac{6}{5}$
Left = $\frac{6}{5}$

Jan 1st, 1910. Under gas, the swelling was incised, and much curdy pus was scraped away and a large area of dead bone was felt in the hard palate, but not in the alveolar process.

The cavity was dressed and packed thrice daily, and tablets of formamint were ordered to be sucked two-hourly.

Jan 13th. There is not a great deal of pus from the wound now. A probe was found to pass through an opening in the centre of the left hard palate, into the antrum which was washed out through a Eustachian catheter, but there was no pus. He was ^{advised} ~~ordered~~ to have some of the dead bone removed, but before this could be done he had to leave the Hospital, and he was lost sight of.

General Health. Has always been good; and he is temperate in his habits. The urine is healthy, and there is otherwise nothing to note.

Ocular conditions. Jan 13th, 1910.
He has no complaint.

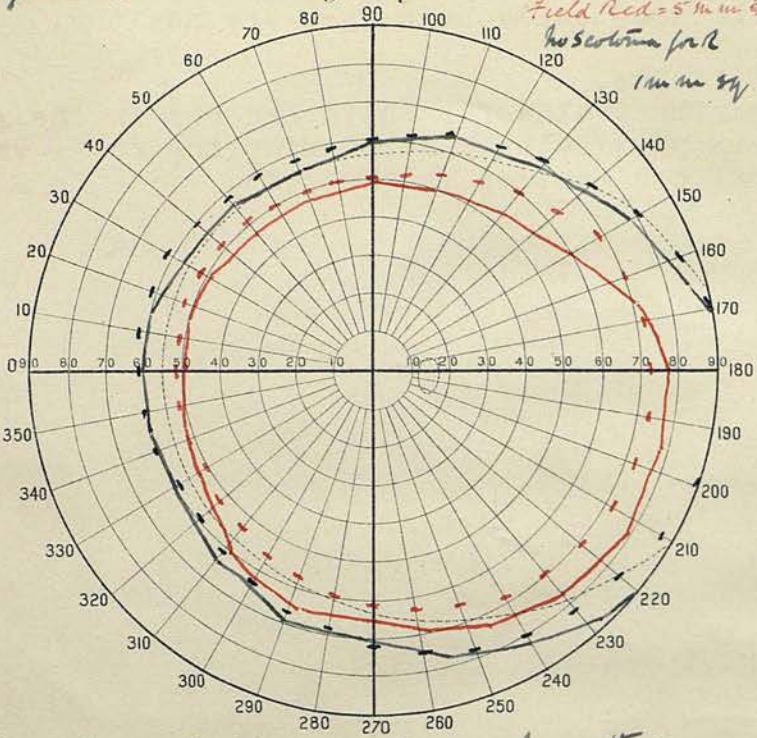
There is no proptosis. The lachrymal apparatus, corneae, conjunctivae, and irides are healthy. Muscular movements and balance are perfect. There is no tenderness on pressing the globes backwards, and there are no signs of periostitis. The Pupils react actively to light, convergence and consensually, and hippus is not present.

Vision: Right = $\frac{6}{5}$ J 1 Left = $\frac{6}{5}$ J 1

lighter = brighter

A
Right Eye

Field white = 5 m m sq
Field Red = 5 m m sq
No Scotoma for R
1 m m sq



Name Henry Bailey
Priestley Smith's Perimeter.

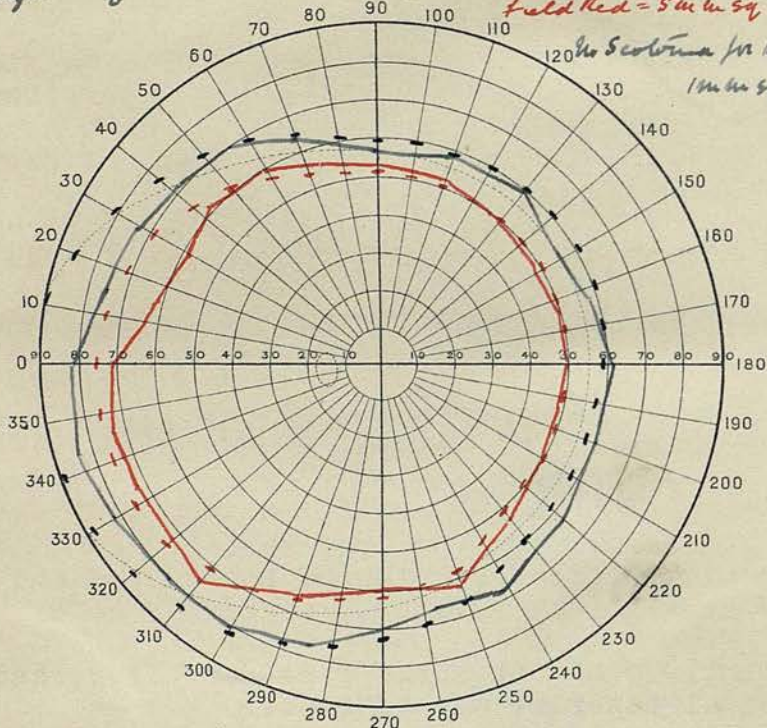
Date Jan 13th. 10.

Curry & Paxton.

lighter = brighter

A
Left Eye

Field white = 5 m m sq
Field Red = 5 m m sq
No Scotoma for L
1 m m sq



Name Henry Bailey
Priestley Smith's Perimeter.

Date Jan 13th. 10.

Curry & Paxton.

Ophthalmoscopically both eyes are healthy.

Visual Fields.

The fields for white and red in the right and left are particularly full excepting for a very slight temporal contraction in the left.

There are no scotomata.

C a s e 17.

Bi-lateral Chronic Antral Sinusitis.

Marked hippus; other ocular conditions normal.

Ellen C., aet. 15, Domestic servant.

Complaint and history. 1909

She has had difficulty in breathing through her nose during the past two years, and also a discharge from both nostrils.

She has not been troubled with headache.

Anterior Rhinoscopy. There is pus in both middle meatūs and on the floor; the inferior turbinates are very engorged.

There is a little pus in the floor of the posterior nares.

Transillumination. The frontal sinuses are small, but illuminate well, and the antra on either side very poorly.

Operation. June, 1909.

Both antra were trephined into and pus evacuated, but the patient developed scarlet fever three days later, and she was not seen again until January, 1910, when she complained that her symptoms were as bad as ever.

By Anterior Rhinoscopy, there is much pus and several polypi seen below the middle turbinals on either side.

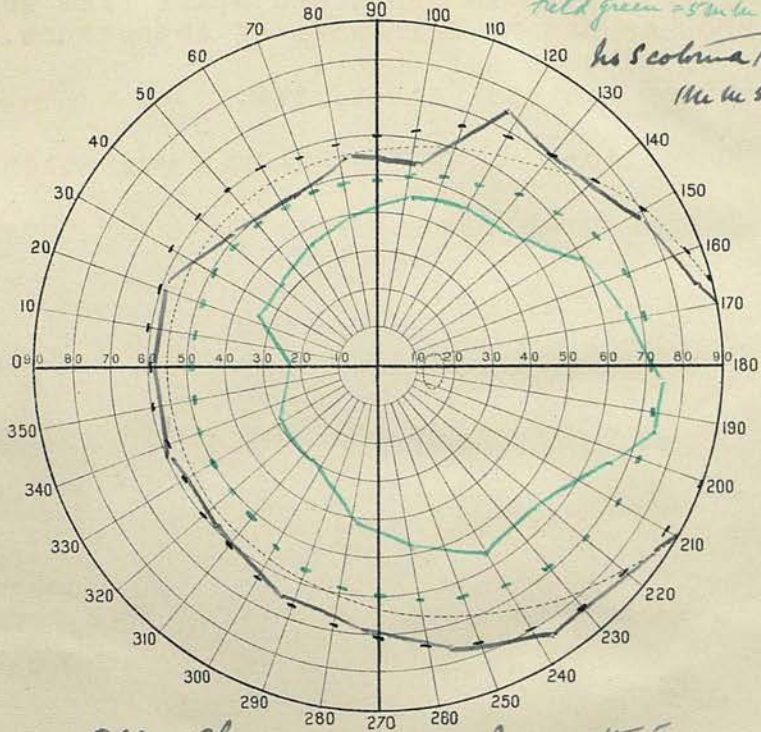
Jan 28th, 1910. Both antra were curretted, and much polypoidal material was removed.

Jan 31st. The cavities are washed out daily, and there is now very much less discharge.

Sunlight.

A
Right Eye

Field white = 5 m in sq
Field green = 5 m in sq
hs Scotoma R & L
1 m in sq



Name Ellen Cheesman Date Jan 29th 10

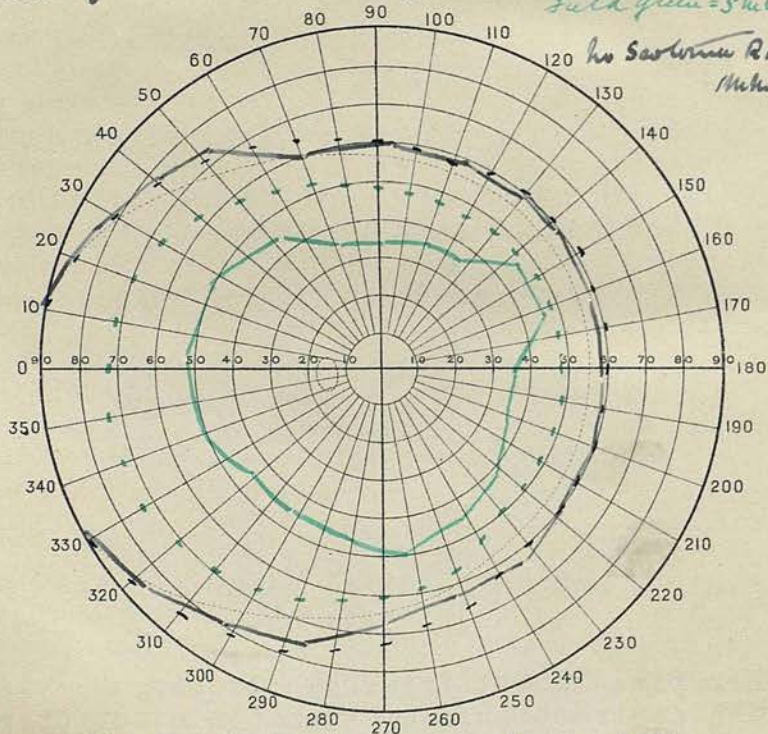
Priestley Smith's Perimeter.

Curry & Paxton.

Sunlight.

A
Left Eye

Field white = 5 m in sq
Field green = 5 m in sq
hs Scotoma R & L
1 m in sq



Name Ellen Cheesman Date Jan 29th 10

Priestley Smith's Perimeter.

Curry & Paxton.

General Health and Previous Illnesses.

Her health is good, and apart from scarlet fever she has had no illnesses of importance. Urine: No albumin nor sugar. Menstruation has not yet started.

Ocular Conditions. Jan 31st (after operation)

She has no complaint. There is no oedema nor tenderness of the cheeks nor supra-orbital margins. There is no proptosis; and externally, the eyes are healthy. The lachrymal apparatus is healthy and competent.

Muscles.

The movements and balance are good. There is no tenderness on pressure. of the globes backwards.

Pupils. Both react actively to light, convergence, and consensually, but when the light is concentrated upon them hippus is very marked, and they come to rest two-thirds dilated. This was confirmed two days later.

Vision: Right = $\frac{6}{9}$ J1 No improvement by lenses.
Left = $\frac{6}{9}$ J1 " " " "

Ophthalmoscopically the eyes are healthy.

Visual Fields.

The fields for white in each eye are particularly full, but there is apparently some contraction for green, which I believe is only apparent depending upon her somewhat feeble perception for colours. She recognises green as yellow very much further to the periphery. (There is a good deal of yellow in the green used.)

There are no scotomata.

Case 18.

Chronic Right and Left Antral Sinusitis with Recurrent Polypi.

Athenopia: latent internal strabismus; visual field contraction, and extension after operation; slight hippus.

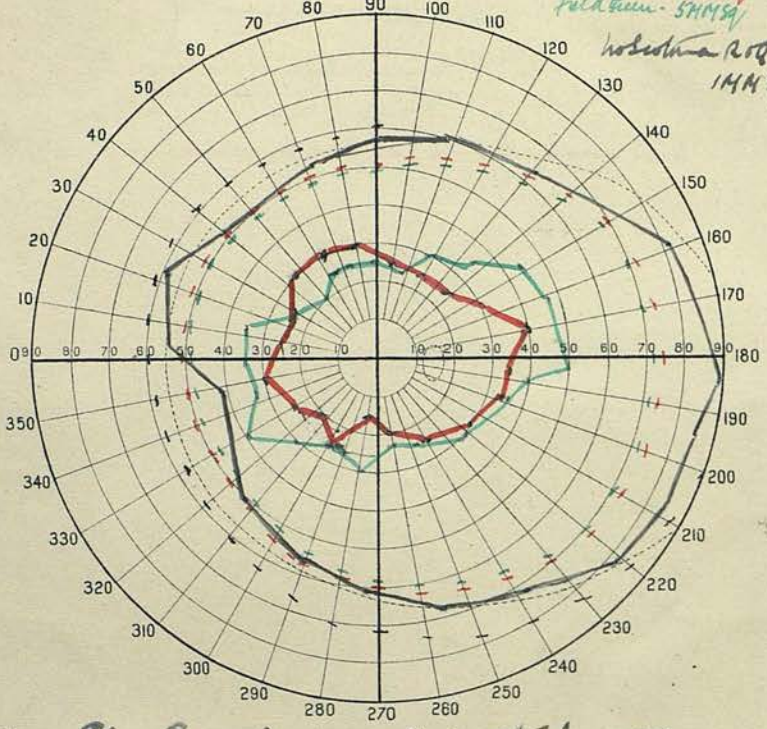
Miss E.G., aet.21, Housework.

Light - very fair

A I
Right Eye

Gold White 5MM Sq
Gold Red 5MM Sq
Gold Green 5MM Sq

Goldstone ROP
1MM Sq



Name Elsie Grenslade Date 13th Nov 09

Priestley Smith's Perimeter.

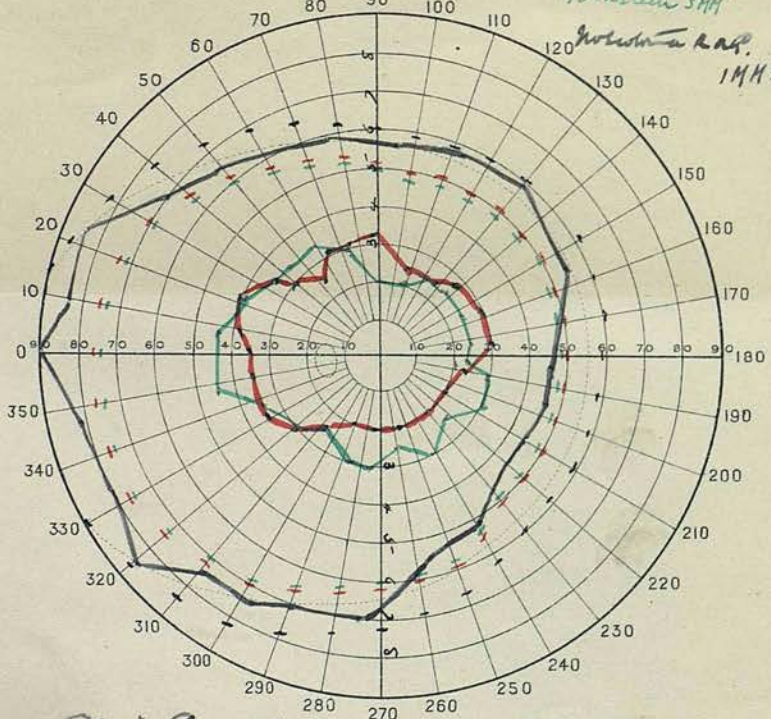
Curry & Paxton.

Light - very fair.

A I
Left Eye.

Gold White 5MM Sq
Gold Red 5MM Sq
Gold Green 5MM Sq

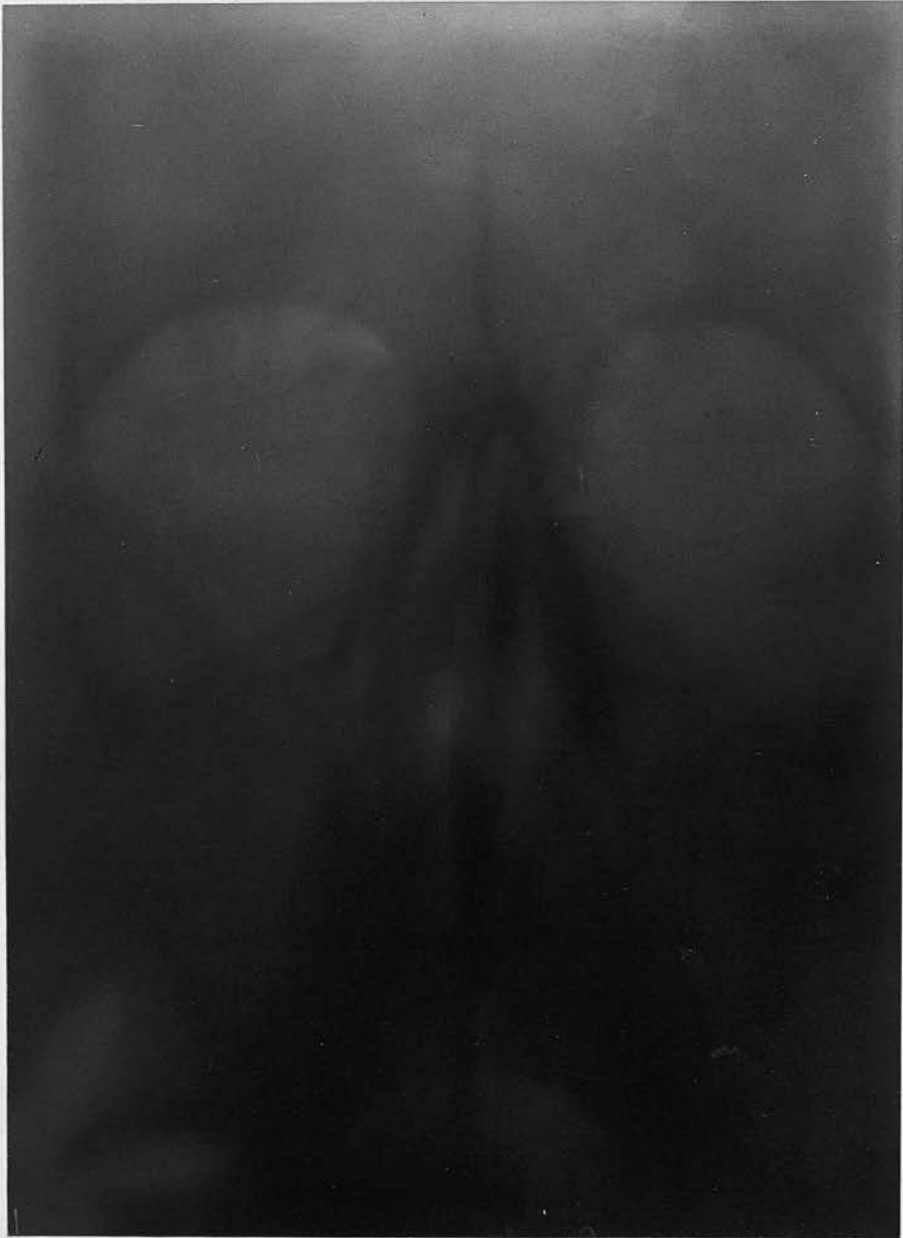
Goldstone ROP
1MM Sq



Name Elsie Grenslade Date 13th Nov 09.

Priestley Smith's Perimeter.

Curry & Paxton.



E.G. Case 18. Antero-posterior.

Examine at 3 feet distant. The posterior sinuses are of average size, the right being the larger, the septum is mesial and they are healthy.



E.G. Case 18. Lateral.

The sphenoidal sinuses are large, extending posteriorly to the dorsum sellae and well forwards.

The frontal sinuses are well seen.

Complains of discharge from both nostrils and headache.

For the past twelve months she has had a discharge of matter from the nose and into the throat, which has a bad smell - cacosmia, and taste. She has difficulty in breathing through her nose, and she snores at night.

She has had severe headaches at times, which are mostly frontal in situation and are not relieved by an increase in the nasal discharge.

Objectively. There is no oedema nor tenderness of the cheeks and forehead.

Anterior Rhinoscopy. The nasal cavities are roomy; the middle turbinals are enlarged and oedematous; and there is pus in the middle meatūs on each side.

There are numerous polypi on both sides.

The septum is deviated to the right below and the left above.

Transillumination. The frontal sinuses illuminate fairly well, the right antrum poorly, and the left very badly.

General Health and Previous Illnesses.

She is a healthy-looking girl, and has had no severe illnesses.

Suffered from influenza two years ago.

Genito-urinary system healthy.

Ocular conditions.

She complains that her eyes ache after she has done any reading.

There is no proptosis.

The lachrymal apparatus is healthy and competent.

Externally, the eyes are healthy - corneae, conjunctivae and irides.

Muscles. The movements are good and painless, and there is no obvious squint, but Maddox rod develops a latent internal strabismus corrected by a 7° and 8° prism bases out before the right and left eyes respectively.

The globes are not tender to pressure.

The pupils react to light, convergence and consensually, and hippus is not present.

Tension normal in both eyes.

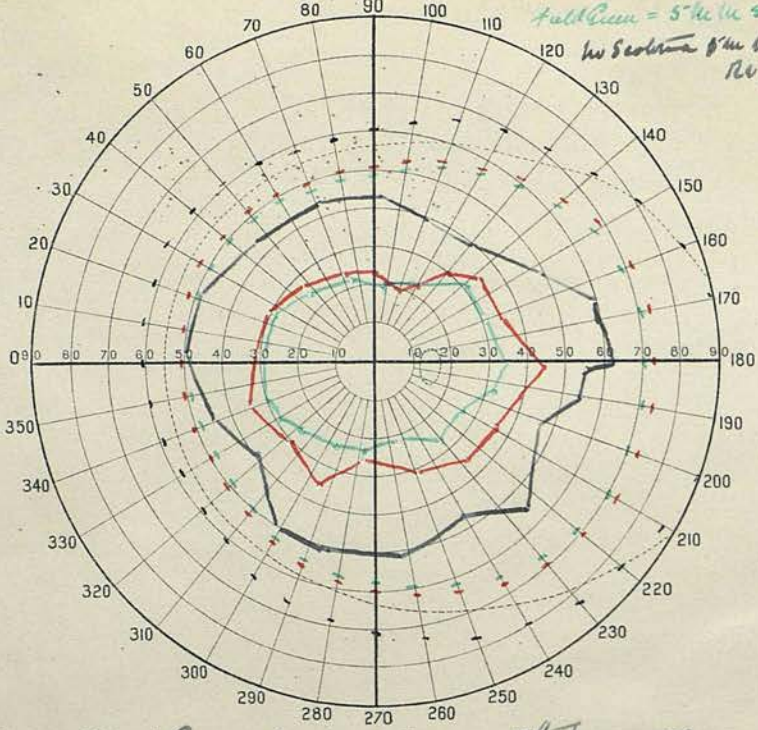
Vision: Right = $\frac{6}{9}$ J1 with +1 cyl axis vert. = $\frac{6}{5}$ J 1
 Left = $\frac{6}{9}$ J1 " " " " " = $\frac{6}{5}$ J 1

Ophthalmoscopically both eyes are healthy.

Light = very fair.

A ^{III} Right Eye

Field White = 5 m. m sq
Field Red = 5 m. m sq
Field Green = 5 m. m sq
No Scotoma 8 m. m sq
R.O.G.

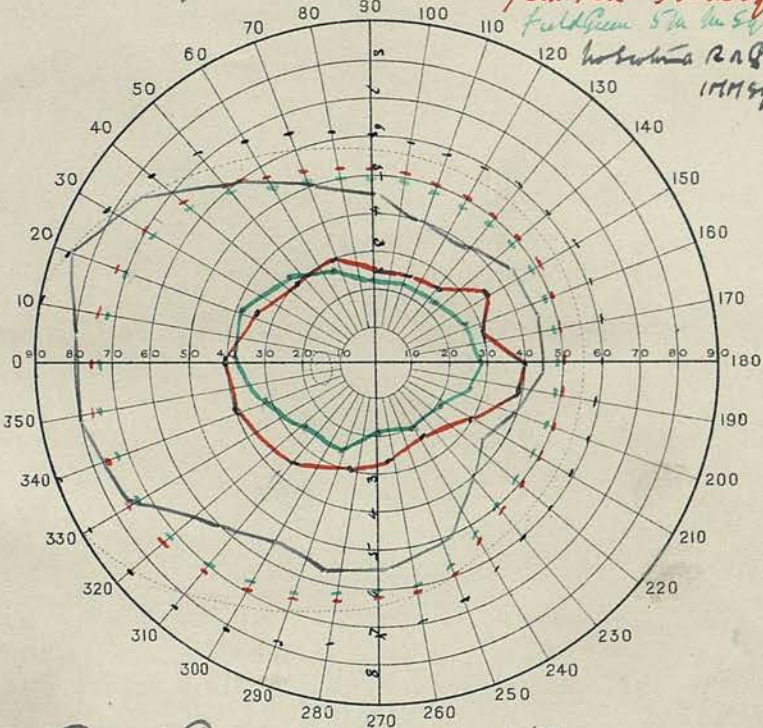


Name Elsie Greenblade Date 18th Dec 09.
Priestley Smith's Perimeter. Curry & Puxton.

Light = very fair.

A ^{III} Left Eye

Field White 5 m. m sq
Field Red 5 m. m sq
Field Green 5 m. m sq
No Scotoma R.O.G.
11/11/09



Name Elsie Greenblade Date 18th Dec 09.
Priestley Smith's Perimeter. Curry & Puxton.

Fundi Oculorum. Both the discs are hazy at their edges, but the vessels are healthy.

Fields of vision. page 111a

(not menstruating and nose untouched)

There is very considerable extension of the field for white, and slightly for red and green.

Mar 10th, 1910. She complains that her nose has again been blocked, and that the discharge is as bad as ever; and on examination, there are several polypi in the left nostril, but no pus.

Ocular conditions. The pupils react to light and convergence, but there is now slight hippus.

Vision: Right with correction = $\frac{6}{5}$
 Left " " = $\frac{6}{5}$

Ophthalmoscopically the eyes are healthy.

Visual Fields (not menstruating and nose untouched) page 112a
 The fields in the right are about the same as on Dec 18th, but in the left they are much more contracted - which agrees with the nasal findings of this date.

C a s e 19.

Right Chronic Antral Sinusitis and Polypi.

Retinitis proliferans in left;
 dacryocyst in right; visual field
 contractions right and left.

Mrs A.P., aet. 39.

came to the Nose, Ear and Throat department in Nov., 1909, complaining of obstruction of, and discharge from, the right nose. Her right nostril had been obstructed on and off during the past fifteen years, after her first child was born; there was, however, no particular cause, and she was not ill at the time.

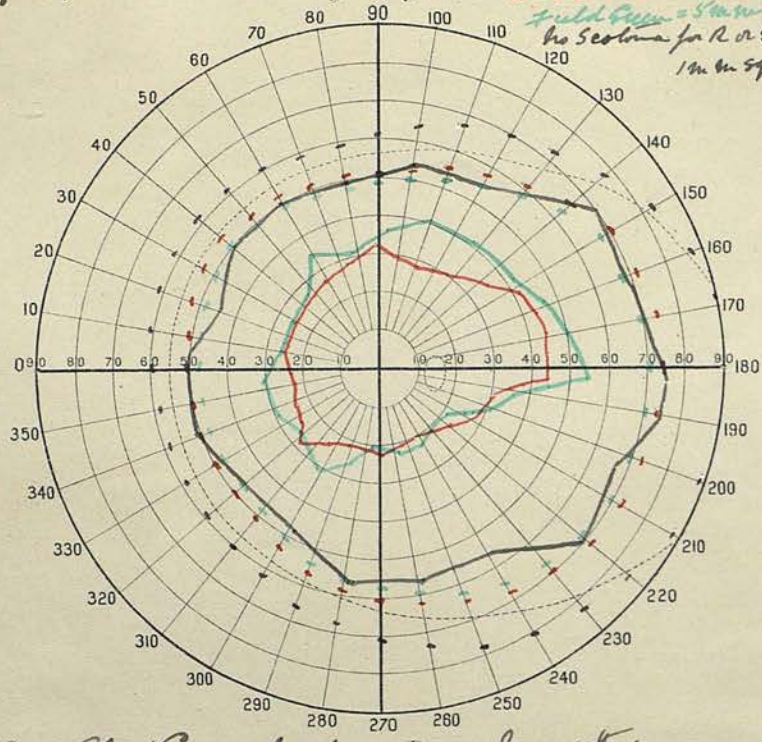
During the last year, the right nostril has been constantly obstructed, and the discharge goes backwards into her throat, and it often smells badly (cacosima).

She has suffered from headache during the past fifteen years, which have always been situated over the brows, particularly the left; since the nose has been completely obstructed it has been much worse.

Light = good

A
Right Eye

iv Field white = 5m in sq
Field Red = 5m in sq
Field Green = 5m in sq
No Scotoma for R or G
1m in sq



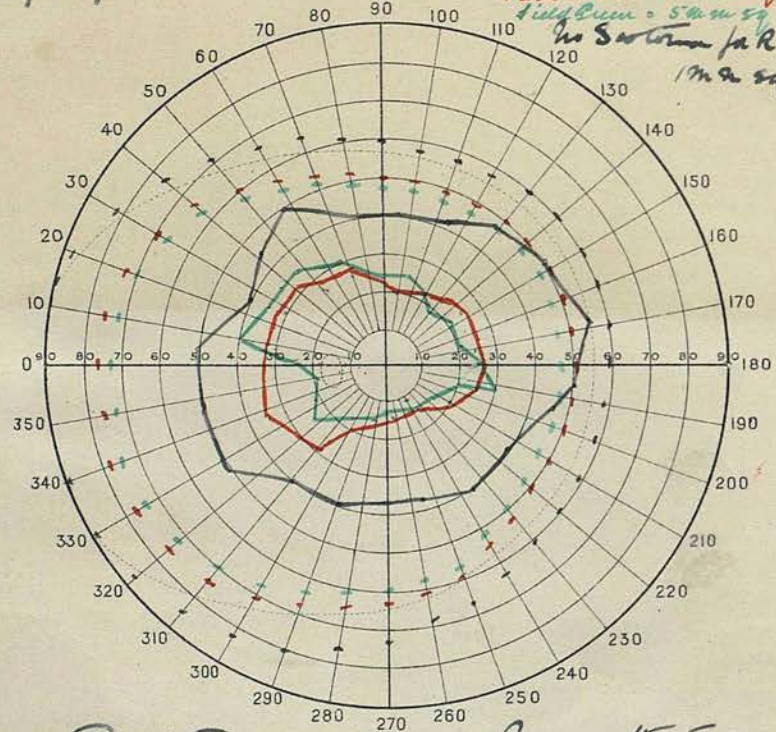
Name Elsie Greenlade Date Mar 10th 10
Priestley Smith's Perimeter.

Curry & Paxton.

Light = good

A
Left Eye

iv Field white = 5m in sq
Field Red = 5m in sq
Field Green = 5m in sq
No Scotoma for R or G
1m in sq



Name Elsie Greenlade Date Mar 10th 10
Priestley Smith's Perimeter.

Curry & Paxton.



A.P. Case 19. Antero-posterior.

Both the frontal sinuses are healthy, the right is moderately large and the left is very small, the septum being deviated to the left.

The antra cannot be seen on the same skiagram with the frontal.



A.P. Case 19. Lateral.

The antra and ethmoid cells are well developed. The anterior wall of the frontal sinus is very thick. The sphenoidal sinus extends well under the pituitary fossa.

Objectively.

There is no swelling over the forehead nor cheeks, and no tenderness.

Anterior Rhinoscopy. There are polypi and pus in both nasal cavities, which appear to arise in the middle meatus; and both inferior turbinates are enlarged and oedematous.

Posterior Rhinoscopy. There is a good deal of pus in the floor of the post nares.

Transillumination. The frontal sinuses illuminate well, but both antra poorly, particularly the right.

General Health and Previous Illnesses.

She has but very feeble health.

All the organs are healthy.

Urine: no albumin nor sugar.

Menstruation healthy.

She has a large bi-lateral goitre, but it does not trouble her, and there are no signs of Graves's disease.

There are no signs of syphilis nor tuberculosis.

Ocular Conditions. Nov., 1909.

She often has aching at the backs of the eyes, but the sight of the right is very good; she has never seen well with the left, which was injured by a fall in infancy.

There is no proptosis nor exophthalmus.

There is epiphora in the right, but no regurgitation, though she says she can often press, sometimes matter, and sometimes water from a swelling in the corner into the nose.

Externally the eyes are healthy.

Muscles: The movements, excepting convergence, are good. There is slight external concomitant strabismus in the left.

There is some tenderness on pressure of the globes.

Pupils: The right is 3.0 m.m. and the left 3.5 m.m.

diameter. The right reacts to light and convergence actively, but the left only just reacts and very sluggishly.

Vision Right = $\frac{6}{5}$ J1

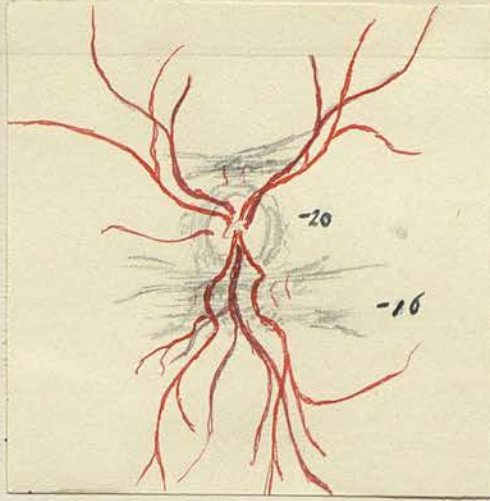
Left = $\frac{5}{60}$ no improvement with -16 D

Ophthalmoscopically. The right is healthy.

Left. There are several synchysis in the vitreous.

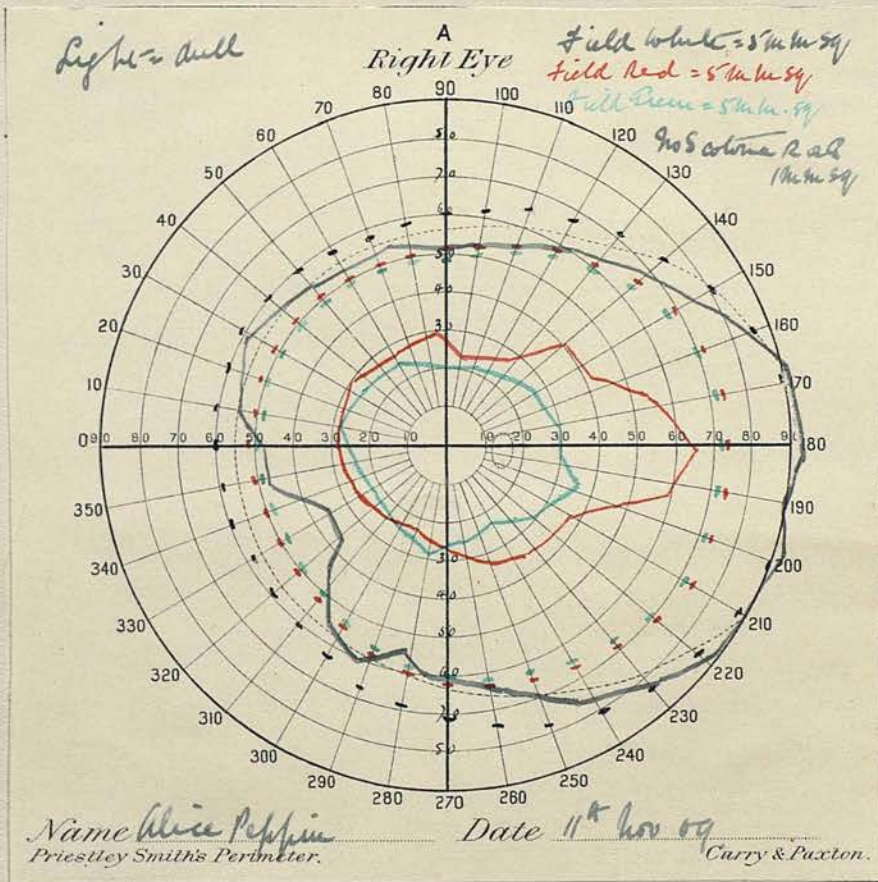
The disc is surrounded by a myopic crescent, shading off below into a large mass of retinitis proliferans, and above into a smaller mass.

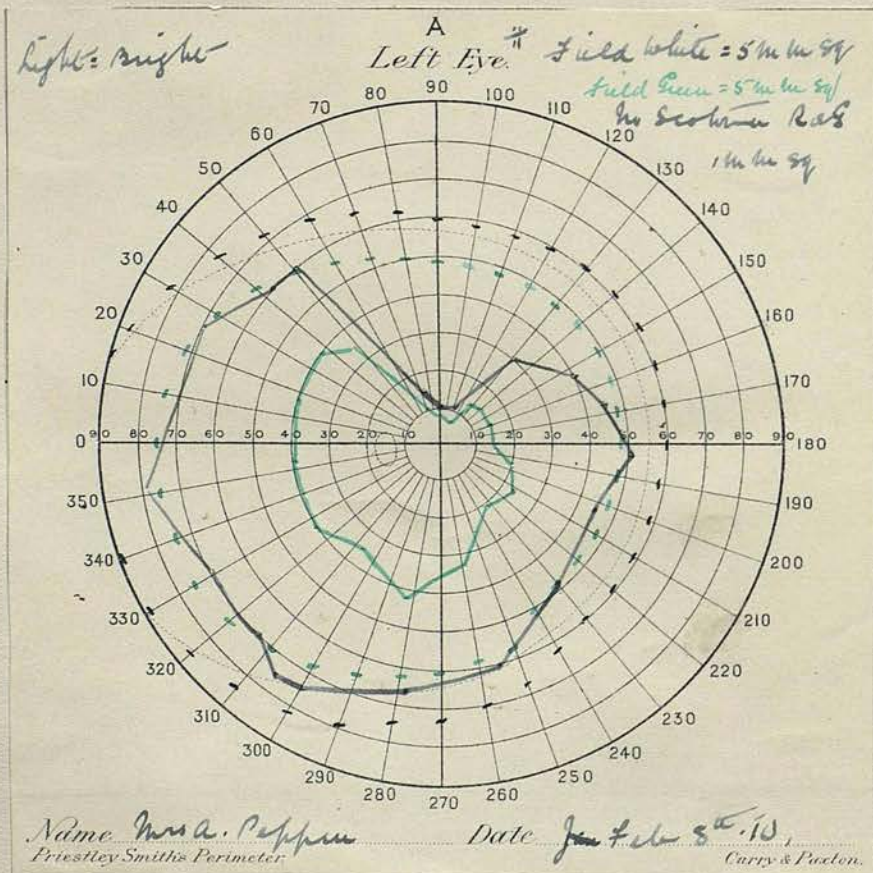
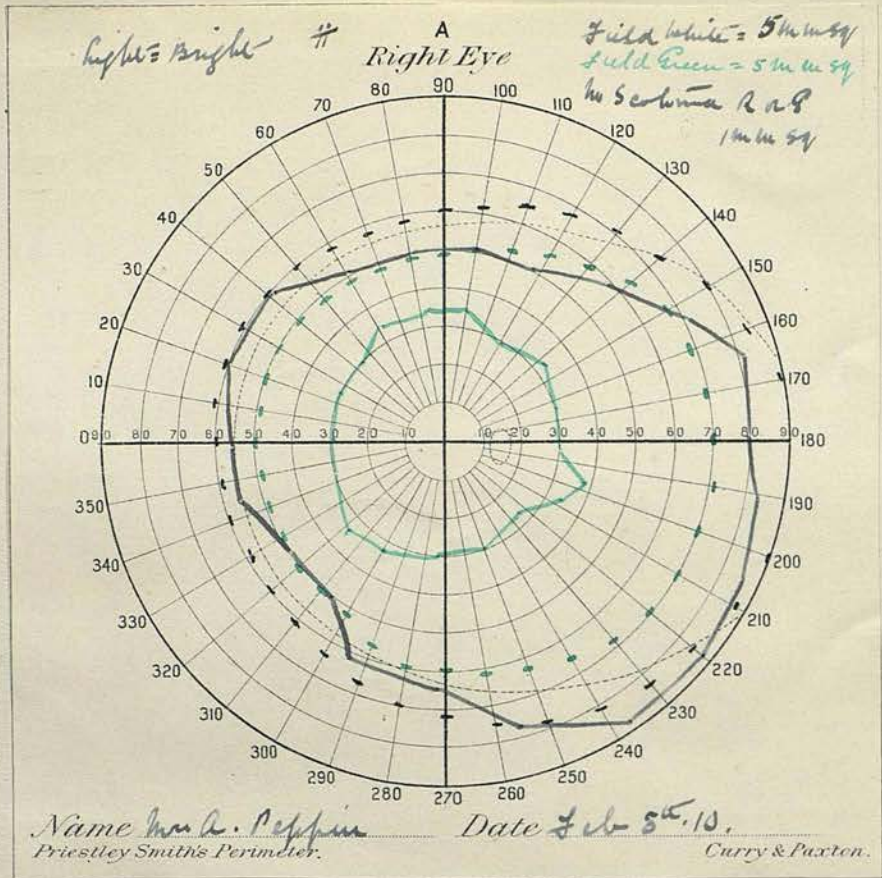
The larger mass is seen with -16 D, whilst the refraction of the rest of the fundus is -20 D. The vessels bend over it sharply.

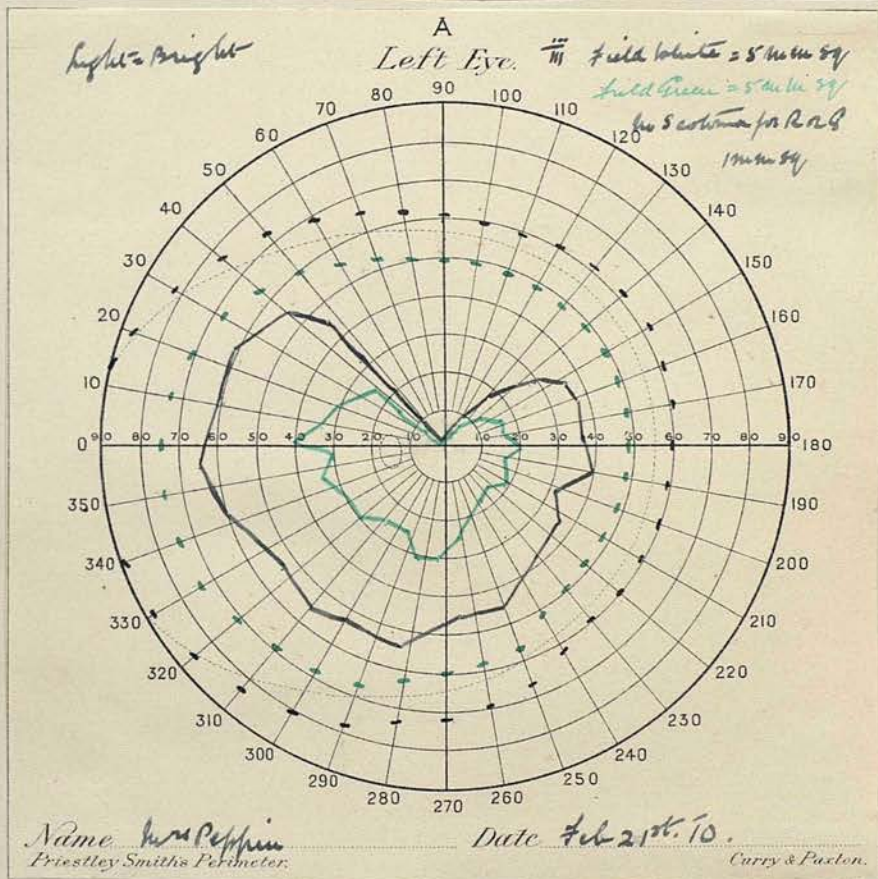
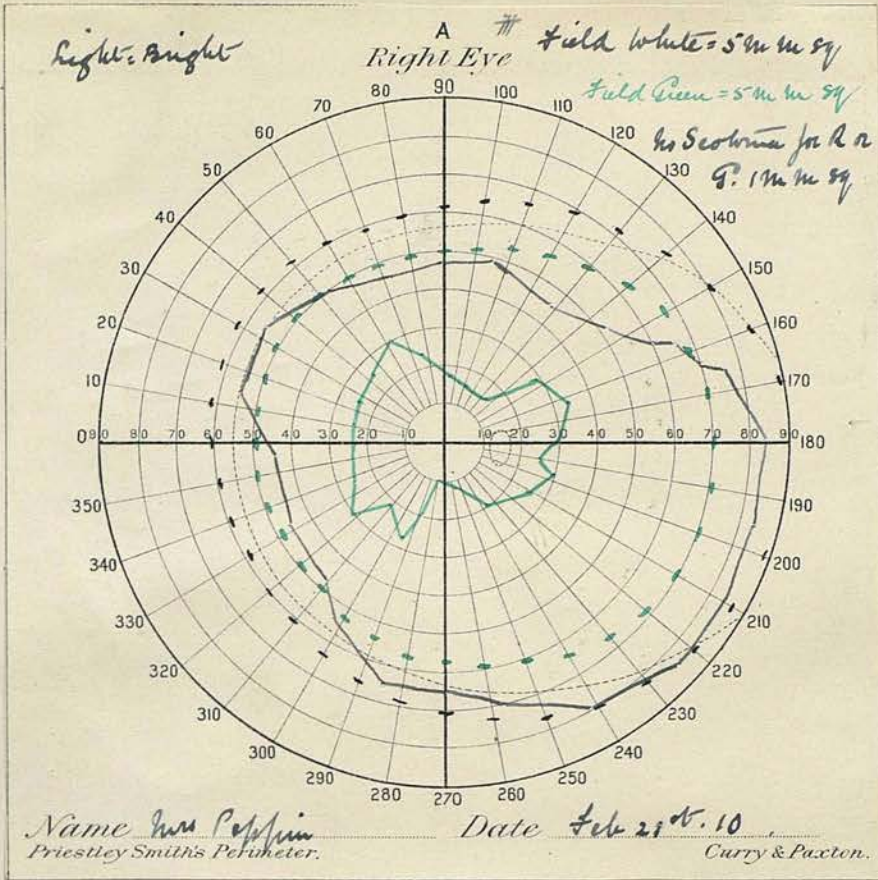


Visual Field. (Not menstruating)

The field for white in the right is particularly good, but red and green are considerably contracted, particularly above and below.

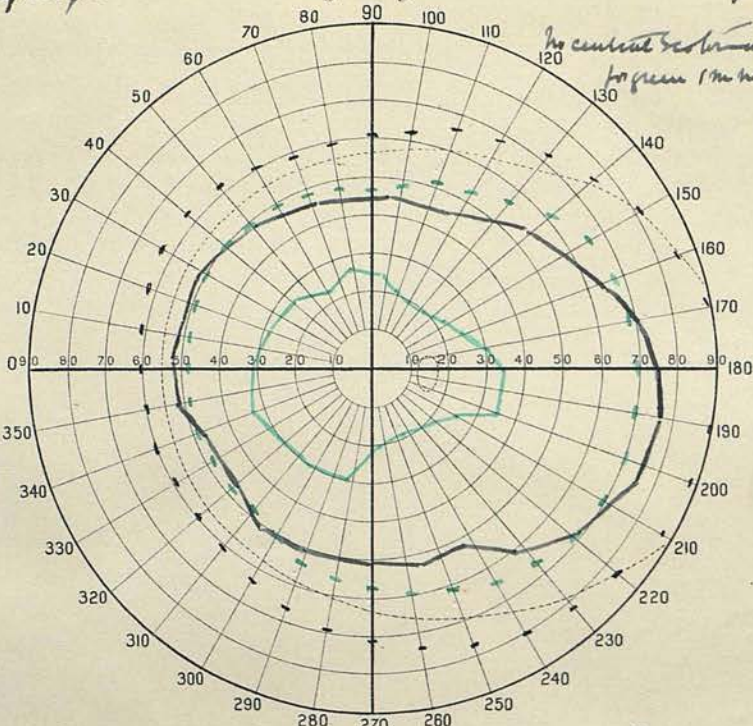






Height 5' 10"

A
Right Eye $\frac{1}{2}$ Field White = 5' in sq



No central scotoma
for green 1' in sq

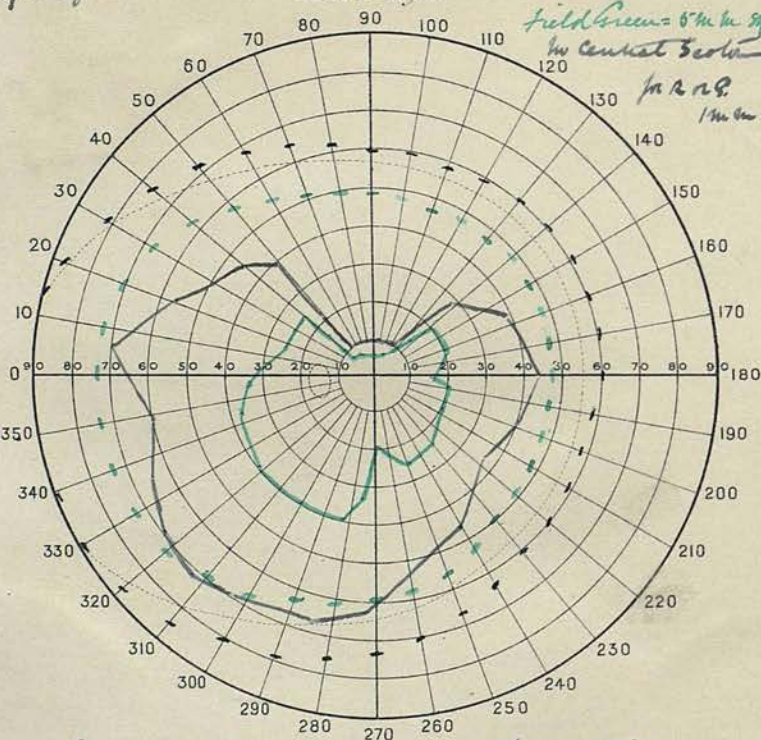
Name Mrs Peppin
Priestley Smith's Perimeter.

Date Feb 26th 10.

Curry & Paxton.

Height 5' 10"

A
Left Eye $\frac{1}{2}$ Field White = 5' in sq



Field Green = 6' in sq
No Central Scotoma
in R.E. 1' in sq

Name Mrs Peppin
Priestley Smith's Perimeter.

Date Feb 26th 10.

Curry & Paxton.

Feb 8th, 1910.

The ocular and nasal conditions are much the same as in November, 1909.

Visual Fields (not menstruating) page //4a

Right. The fields are much the same, excepting the green is more extensive (better light).

Left: There is some general contraction for white, and very marked for green. Both fields for white and green show a large sictor shape loss in the superior field, corresponding to the area of retinitis proliferans

There are no scotomata in either eye.

Feb 9th. A Radical operation was performed upon the right antrum to-day, and much pus and polypi were removed

Feb 14th. There is still a great deal of pus in the right antrum; she has developed a double otitis media.

Feb 21st. There is still some discharge from the right antrum, and from both ears.

The ocular conditions, other than the visual fields, are in statu quo.

Visual Fields. (not menstruating, and nose untouched) page //5a

There is slightly increased contraction for both red and green in each eye, and in the left the sector shaped loss has approached to almost the fixation point.

26th Feb. She is quite comfortable and is free from headache. There is still a little pus in the antrum and in both ears.

Fields of Vision (not menstruating, and nose untouched) page //5B

There is very considerable improvement for white and green when due allowance for light is made.

C a s e 20.

Chronic Right and Left Antral Sinusitis with Polypi:
possible polysinusitis.

Dacryocystitis; visual field contraction;
case lost sight of.

Joseph T., married, aet. 58, cabinet maker went to the Bristol Eye Hospital complaining of watering of the right eye, and was referred to the Nose and Throat department.

He has ^{had} polypi removed from both nostrils several times during the past few years, and his nose has again become blocked.

He does not complain of any nasal discharge, nor does he suffer from headache.

Objectively.

There is no oedema, swelling, nor tenderness of the forehead and cheeks.

Anterior Rhinoscopy. Both the right and left nasal cavities are blocked by numerous polypi which are growing from the middle meatūs; the middle and inferior turbinates on both sides are enlarged and oedematous.

There is no pus present either anteriorly or posteriorly.

Transillumination. The frontal sinuses illuminate fully, but the antra very poorly, particularly the right which scarcely lights up at all.

Nov. 5th, 1909. He was advised to have radical operations upon both antra, and the polypi were removed. Bleeding supervened when he got home, for which he went to the Bath Hospital, and the operation upon his antra were performed there at a later date, and the case was lost sight of.

General Health and Previous Illnesses.

Has always enjoyed good health, and his habits are strictly temperate to alcohol and tobacco.

He has never had syphilis, and there are no signs of tuberculosis.

Urine healthy.

Ocular conditions. Nov 3rd, 1909.

There is no proptosis.

Lachrymal Apparatus: There is regurgitation of tears on pressure over the right tear sac, and a probe passes down the tear duct with some difficulty.

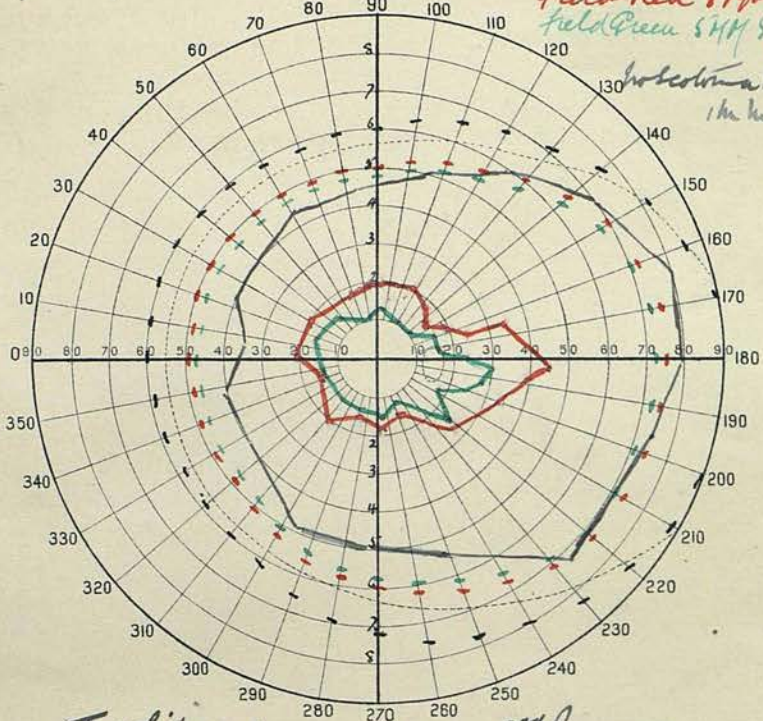
The right conjunctiva is irritable, but otherwise the eyes are healthy externally.

Light fair.

A
Right Eye

field white 5744 sq
field red 5744 sq
field green 5744 sq

Robertson R.A.S.
1 1/2 in sq



Name Jos. Lipney
Priestley Smith's Perimeter.

Date 3rd Nov 09.

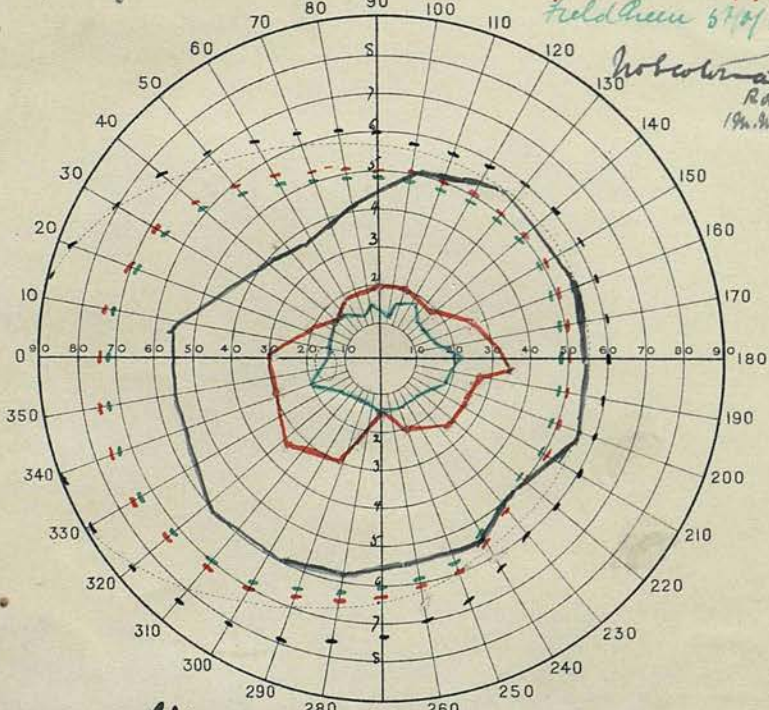
Curry & Paxton.

Light fair

A
Left Eye

field white 5744 sq
field red 5744 sq
field green 5744 sq

Robertson
R.A.S.
1 1/2 in sq



Name Jos. Lipney
Priestley Smith's Perimeter.

Date 3rd Nov 09

Curry & Paxton.

Muscles. The movements and convergence are full and painless, and Maddox bar does not develop a squint. There is no pain on pressing the globes backwards.

The pupils react to light, convergence, and consensually, and hippus is not present.

Vision: Right $\frac{6}{5}$ pt + .75 = sph = $\frac{6}{5}$ + 4.25 sph = J1
 Left $\frac{6}{5}$ pt + .75 = " = $\frac{6}{5}$ + " " = J1

Ophthalmoscopically: The eyes are healthy.

Visual Fields. (Before nasal operation) page 116a.

Right. There is some general contraction for white, and much more marked for red and green particularly in the superior temporal field.

Left. The visual fields show much the same contractions as are seen in the right, but the temporal field is more contracted, and the white, as well as the red and green, is contracted in the superior temporal quadrant.

C a s e 21.

Chronic Sinusitis of Left Antrum, and probably of the Right.

Insufficiency of left inferior oblique.
 Visual field contractions.

George S. aet. 25. Motor cleaner.
 complains of tenderness of the left cheek.

History. The left cheek has been tender frequently during the last year, especially when he has a cold. There has been some obstruction to breathing through the nose, particularly the left, for about two years which is worse during, and for some time after, a cold. For the past year, there has been a good deal of matter discharged from the nose.

Objectively. The left cheek is swollen and tender.

Anterior Rhinoscopy. There is some pus in both nasal cavities and in the middle meatus, particularly on the left side.

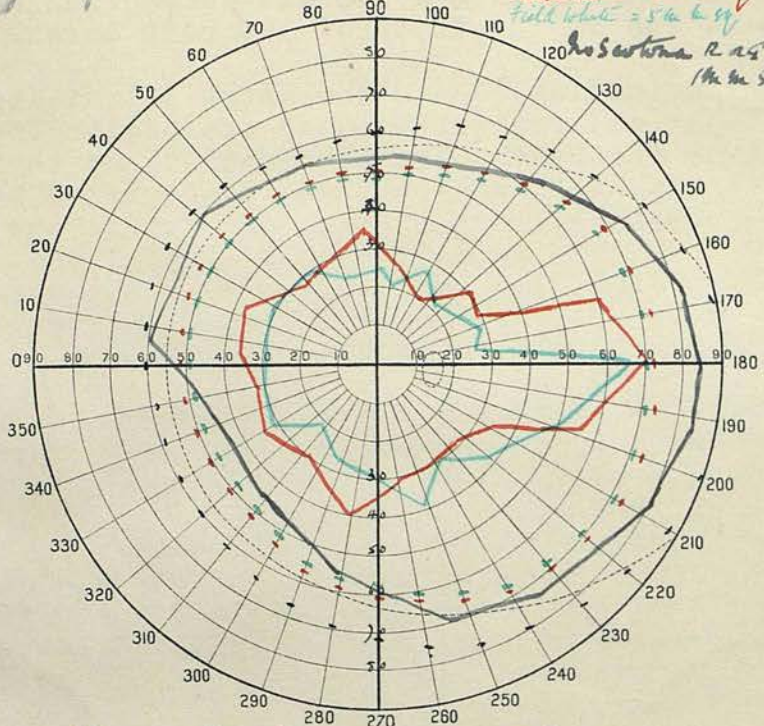
The middle turbinals on each side are very engorged and polypoidal.

There is some slight ulceration of the columella on the left side.

Light = fair

A
Right Eye

Field white = 54 in sq
field Red = 54 in sq
field white = 54 in sq
No Scotoma R or L
1 in in sq



Name George Scott
Priestley Smith's Perimeter.

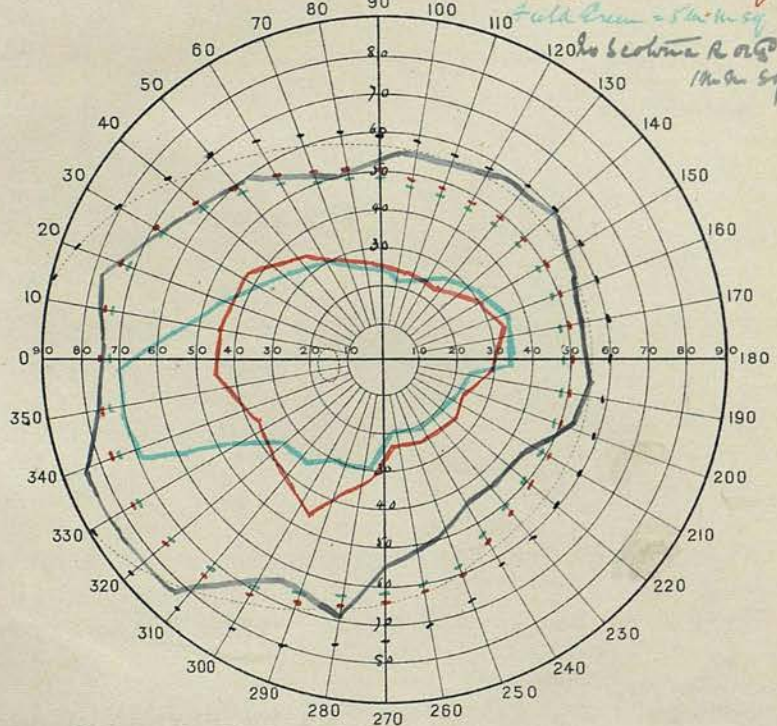
Date 12 Nov 09

Curry & Paxton.

Light = fair

A
Left Eye

Field white = 54 in sq
field Red = 54 in sq
field Green = 54 in sq
No Scotoma R or L
1 in in sq



Name George Scott
Priestley Smith's Perimeter.

Date 12 Nov 09

Curry & Paxton.

The naso-pharynx is greyish and very granular, and there is pus in the floor of the post nares.

Transillumination. Both the antra illuminate very badly, but the frontal sinuses are healthy. The right and left antra were washed out through Lichwitz cannulae passed into the cavities below the middle turbinals, and it was doubtful on the right side whether pus was, or was not, present; but on the left as soon as the trochar was withdrawn from the cannula the pus began to flow out from its own pressure - which is very unusual.

Bacteria. A culture was taken from the pus, and only a very small growth occurred, consisting mainly of diphtheroid bacilli.

Ocular Conditions.

Complains that he does not see well with his right eye.

There is no proptosis, and externally the eyes are healthy, as is also the lachrymal apparatus.

Muscles. The movements and convergence are good and painless in all directions, but Maddox rod shows insufficiency of the left inferior oblique, which is corrected by a 5° prism base upwards in the left.

There is no tenderness on pressing the globes backwards.

Pupils react to light and convergence and consensually and hippus is not present.

Ophthalmoscopically the eyes are healthy.

Vision: Right $\frac{6}{60}$ J 14 with + 7.5 sph = $\frac{6}{18}$ J 1
 Left $\frac{6}{12}$ J 8 " + 3.0 sph and + 1 cyl axis
 vert = $\frac{6}{5}$ J 1

Visual Fields, page //7a

There is slight general contraction for white in both eyes, and somewhat more marked in the left.

There is more marked contraction for red and green particularly of the superior temporal fields in both eyes. In the left, there is a curious partial reversal, the green being very much more extensive in one spot.

The case was lost sight of, as he refused operative treatment.

The insufficiency of the left inferior oblique muscle is of interest as it lies in intimate relation to the antral cavity, and it would seem as if due to the antral sinusitis, for any weakness of muscles where the refraction of the two eyes is so markedly different, is usually in the one with the greatest refractive error, which is the right eye.

G R O U P D.

C a s e 22.

Right and Left Chronic Sphenoidal, Ethmoidal and Antral Sinusitis.

Asthenopia; con^ttracted fields.

Ethel H., aet. 22. Domestic Servant.

Firts attended the Shrewsbury Eye, Nose, Throat and Ear Hospital six years ago for an acute mastoiditis, and it was then found that she complained of difficulty in breathing through her nose and of nasal discharge, and she has attended on and off for the latter ever since.

During the last few years the discharge has been constant, and often in the form of crusts, and up to eighteen months ago she breathed constantly through her month, at which date the middle turbinates were removed on either side, as they were very enlarged, and since that time the discharge has been mainly into the throat.

She is not troubled with headache.

Objectively. Jan., 1910.

There is no tenderness nor oedema of the frontal and malar regions.

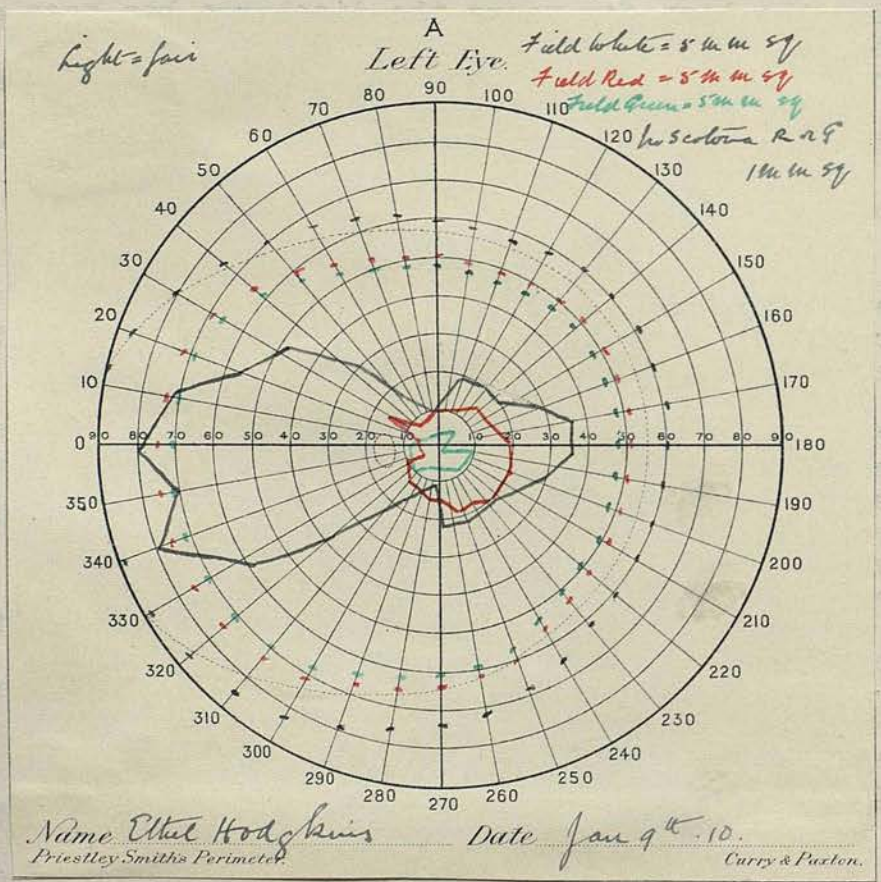
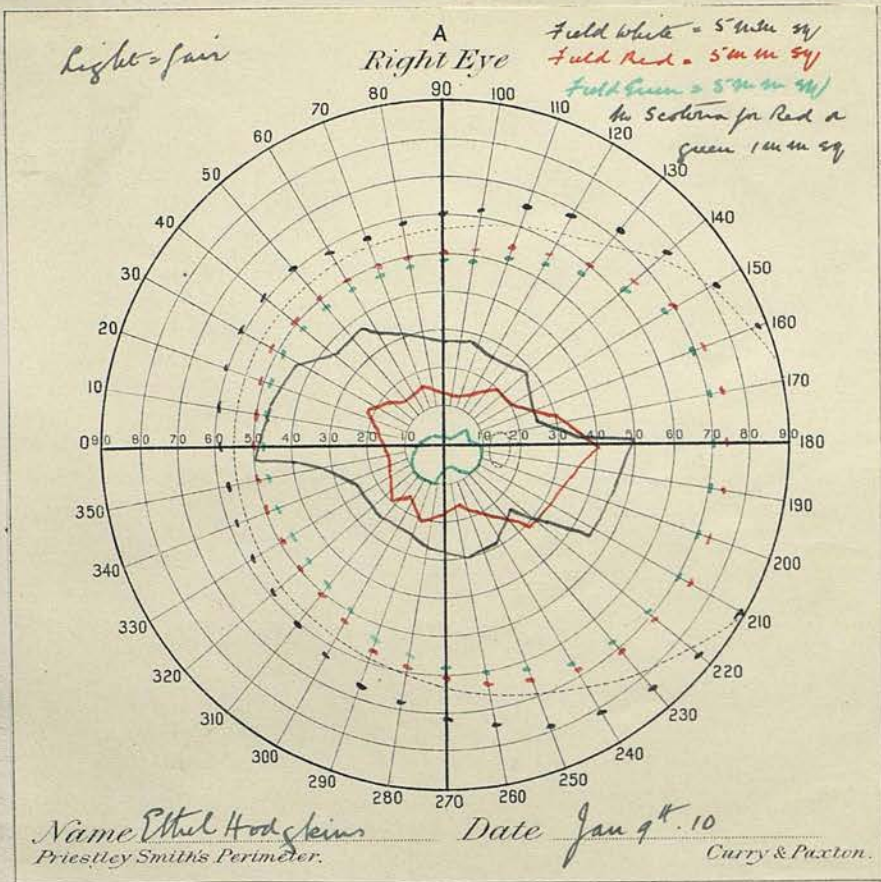
Anterior Rhinoscopy. There is a great deal of pus in both nasal cavities, high up and posteriorly, which is so copious that it is with difficulty cleaned away; when this is accomplished it is seen to reform in the posterior parts of the superior meatūs on either side, and below the middle meatūs.

The inferior turbinals are atrophied, and the posterior pharyngeal wall can be seen.

There is a great mass of pus on the posterior pharyngeal wall and in the choanae, which rapidly reforms after washing away by Frankel's syringe.

There are mucous crusts upon the walls and septum of the posterior nares, and pus on the roof of the choanae.

Transillumination. The frontal sinuses illuminate well but both antra scarcely at all.



Diagnosis.

From the position of the pus and the rapidity of its production, there can be no doubt that the sphenoidal, posterior ethmoidal and antral sinuses are at fault on both sides.

General Health and Previous Illnesses.

She is a pale, thin, anaemic girl with adenoid facies. Acute mastoiditis followed scarlet fever six years ago. There are no signs of syphilis nor tuberculosis. Genito-urinary system is healthy.

Ocular Conditions. Jan., 1910.

She complains that she cannot see to sew or read, as her eyes very quickly get tired.

Externally the eyes appear healthy in every way - no proptosis, and lachrymal apparatus healthy.

Muscles. The movements are good and painless, but convergence is not sustained; Maddox rod does not develop any strabismus.

There is no tenderness on pressure of the globes backwards.

The pupils react to light, convergence and consensually, and hippus is not present.

Vision: Right = $\frac{6}{6}$ J1

Left = $\frac{6}{6}$ J1

Ophthalmoscopically, both eyes are healthy.

Visual Fields (not menstruating).

In both eyes, the visual fields for white are very markedly contracted superiorly and inferiorly.

There is very marked general contraction for red, and the green is extremely contracted, particularly on the temporal sides. There are no scotomata in either eye.

C a s e 23.

Chronic Right and Left Frontal, Right Antral and possibly Right Sphenoidal Sinusitis.

Hyperphoria, neuritis and contracted fields.

Cure of the hyperphoria and neuritis, and improvement in the visual fields.

Mrs H., aet. 49.

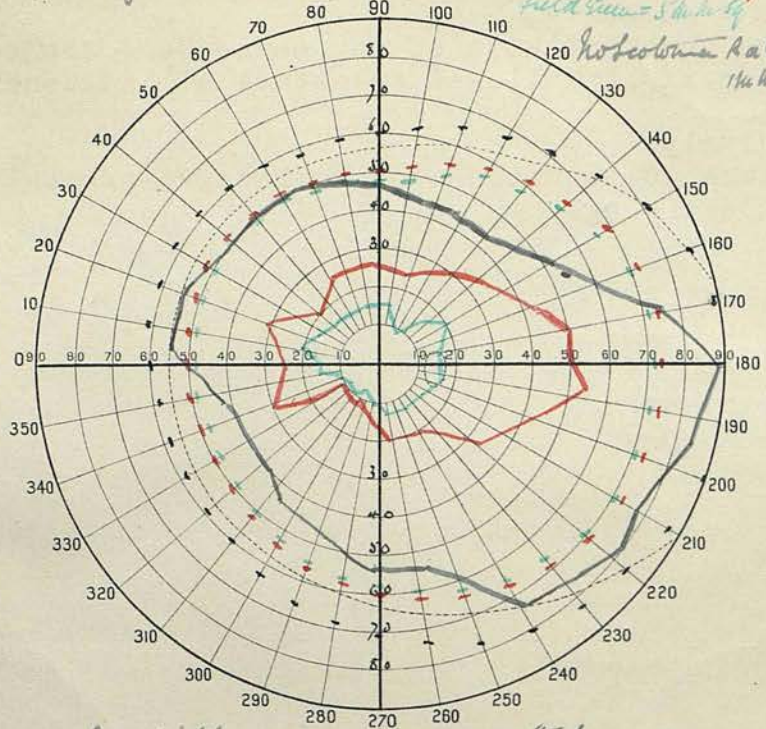
was sent from the medical wards in June, 1908, to the Ear, Nose and Throat department because of headache and nasal discharge.

History. Since 1906 she has had more or less constant headache and discharge from the left nostril; both are worse when she has a cold, which she very

Light = good

A
Right Eye

Field White = 5' 1/2 in sq
Field Red = 5' in sq
Field Green = 5' in sq
Horseshoe R & S
1 1/2 in sq

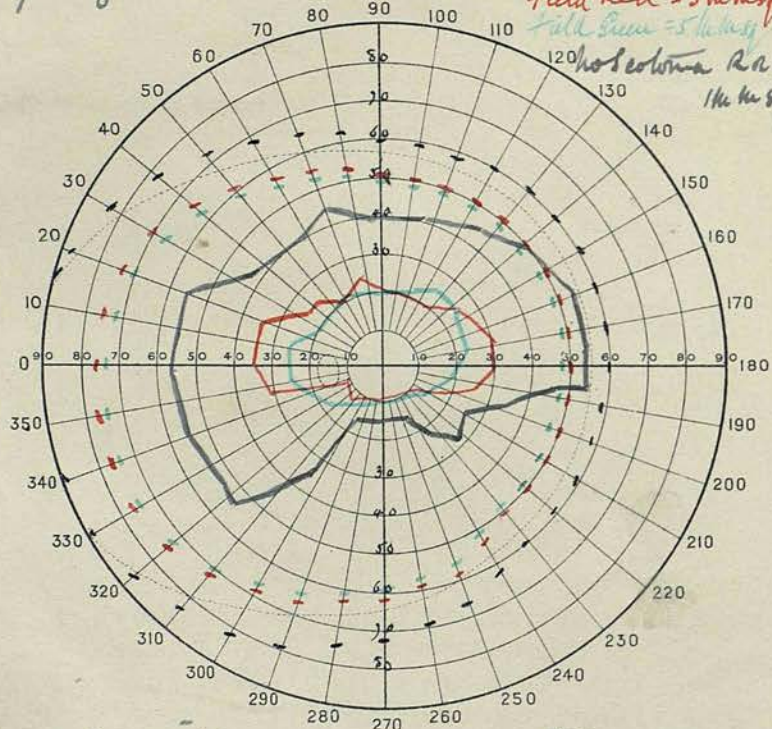


Name Mrs Hillborne Date 5th Nov 07
Priestley Smith's Perimeter. Curry & Paxton.

Light = good

A
Left Eye

Field White = 5' 1/2 in sq
Field Red = 5' in sq
Field Green = 5' in sq
Horseshoe R & S
1 1/2 in sq



Name Mrs Hillborne Date 5th Nov 07
Priestley Smith's Perimeter. Curry & Paxton.

frequently suffers from. During the last few months the discharge has been from both nostrils, which she smells - cacosmia.

She does not know of any cause, and she cannot rememehr if it followed an attack of influenza.

Objectively.

There is tenderness of both supra-orbital regions, but no swelling.

Anterior Rhinoscopy. The right middle turbinal is considerably enlarged and there is ~~no~~ pus in both the middle meatūs.

The posterior pharyngeal wall is covered in pus, and there is pus upon the upper surface of the right middle turbinal by posterior rhinoscopy.

Transillumination. Both the frontal sinuses illuminate very poorly, but the antra are very good, there being a pupillary reflex.

General Health and Previous Illnesses.

There is some emphysema of the lungs and the heart is a little dilated.

Urine healthy, and the menopause occurred two years ago. She has had several attacks of influenza during the last few years.

Sept 7th, 1908. The right sphenoidal sinus was explored, after the right middle turbinal had been removed, and was apparently healthy; it was only half-an-inch in depth.

The right antrum was full of foetid pus and polypi, so a radical operation was performed.

The symptoms - headache, nasal discharge - were greatly ameliorated for about nine months, after which they were as bad as ever.

Oct 6th..1909. A Watson Williams osteoplastic flap operation was performed upon both frontal sinuses. They were drained into the nose and through an opening into the forehead, from both of which pus continued to escape for some weeks, but the former eventually healed.

Ocular Conditions. Nov 5th, 1909.

She complains that she cannot see near objects. The eyes are somewhat sunken into the orbit, probably because of the post-operative displacement of the orbital fat into the frontal sinuses.

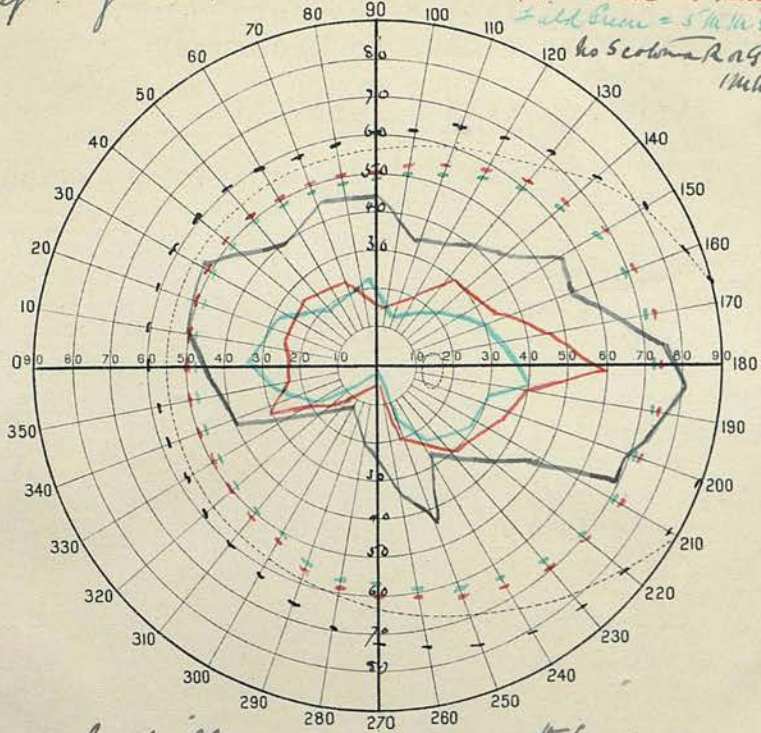
The conjunctivae, corneae, and irides are healthy. The lachrymal apparatus is competent and healthy.

Muscles. The movements are good and painless; Maddox rod develops a hyperphoria corrected by 3° prism base up in the right eye.

Light = good.

A
Right Eye

field white = 5 m. sq
field red = 8 m. sq
field green = 5 m. sq
no Scotoma RAG
1 m. sq

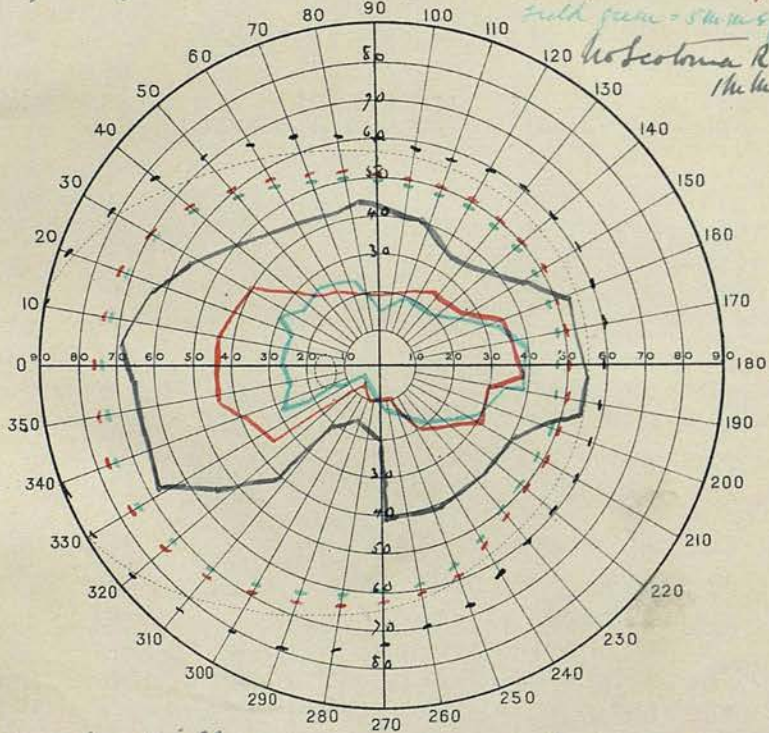


Name Mr Hillborne Date 20th Dec 09
Priestley Smith's Perimeter. Curry & Paxton.

Light = good.

A
Left Eye

field white = 5 m. sq
field red = 8 m. sq
field green = 5 m. sq
no Scotoma RAG
1 m. sq



Name Mr Hillborne Date 20th Dec 09
Priestley Smith's Perimeter. Curry & Paxton.

Pupils. Both react to light, convergence and consensually, and hippus is not present.

The right globe is tender to pressure.

Vision: Right = $\frac{6}{5}$ with +2 sph J1

Left = $\frac{6}{36}$ with +1 cyl 40° down and out = $\frac{6}{12}$ and

+2 sph +1 cyl = J1

Ophthalmoscopically.

The media are clear in both eyes, but the discs with the surrounding retina are blurred and streaked.

The discs are swollen 1 D. The arteries are attenuated and the veins are engorged and parts of the vessels near the disc are covered in exudate; there are no haemorrhages. The condition is slightly more marked in the right. It is a slight neuro retinal oedema in both eyes.

Visual Fields. (nose untouched. Menopause) Page 120a

Right. There is a considerable contraction of the superior fields temporal and inferior parts of the field for white, and those for red and green exhibit marked general contraction, particularly in the inferior half.

Left.--The field for white is markedly contracted below and on the temporal side, and those for red and green beside general contraction in a marked degree, extreme contraction inferiorly.

Nov 16th. The frontal wound has broken down and pus is freely escaping, and bare bone can be felt. The wound healed again after a few days irrigation of the cavity.

Nov 23rd. The right disc is now more blurred.

Dec 20th. The muscular balance is now perfect, and Maddox rod does not develop any hyperphoria.

The vision and other external conditions are in statu quo.

Ophthalmoscopically. The right disc is not swollen now, but it is still very blurred, and the left disc is healthy.

The Visual Fields. . page 121a

In both eyes the contractions present the same characteristics, but all colours are very much less contracted. There are no scotomata.

Feb 15th.1910. She is now quite comfortable and is free from headache and has practically no nasal discharge. The fundi oculorum are healthy.



F.S. Case 24. Antero-posterior.

Skiagram well seen at 1 yard distant. The frontal sinuses are seen with a hazy outline. The right does not extend quite so far up the forehead as the left, but further over the orbit. The septum is mesial. There is a deeper shadow over the left frontal sinus, and it is probably not healthy. The ethmoid cells are well seen and the antra are large.

C a s e 24,

Chronic Left Frontal, Antral, and Sphenoidal Sinusitis, with acute attacks in the Frontal.

Contraction of right, and extreme contraction of left visual fields.

Frank S., single, aet. 34. Corporation fireman.

First began to complain of headache thirteen years ago, since when he has suffered from headache localised to the forehead, particularly the left side, which is much worse when he gets a head cold. During this period, there has been a constant nasal discharge, most of which is from the nostrils, but some goes back into the throat.

Six weeks before admission, he had an attack of influenza, during which the headache was extremely severe and which continued after he recovered so severely that he was compelled to seek advice.

Objectively.

There is tenderness, redness and swelling over the frontal region.

By anterior rhinoscopy, a good deal of pus is seen in the left middle and superior meatus.

Posterior rhinoscopy. There is a good deal of pus in the posterior pharyngeal wall and on the floor of the choanae.

Sept. 30th, 1908. An ~~extreme~~ osteoplastic flap operation was performed upon the left frontal sinus, and a radical operation upon the left antrum, both cavities being full of pus.

He was quite comfortable and apparently cured until April 30th, 1909, when he came complaining of severe frontal headache, and the integuments of the left cavity were very much swollen and inflamed.

The cavity was washed out several times and though no pus was obtained, it rapidly subsided.

There is still a great deal of pus in the left superior meatus.

July 7th, 1909. The left sphenoidal sinus was opened and pus and polypoid material were removed.

Oct 6th. Pus has again collected in the left frontal and sphenoidal sinuses; both were scraped out.

Nov 3rd. Is now almost free from headache and discharge.

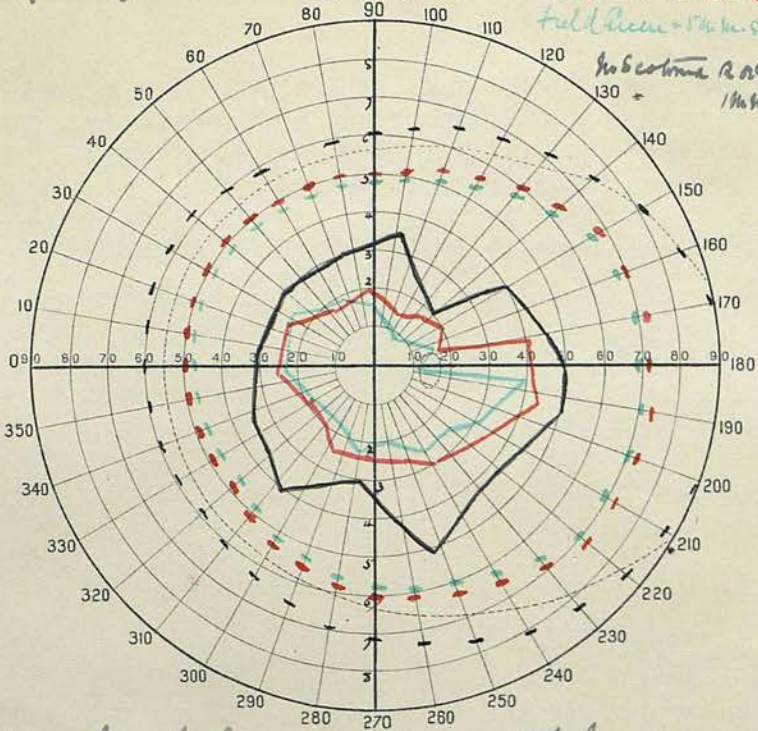
Present Condition and Previous health.

He is a strong, big, healthy man, and temperate in his habits. Up to two months ago he used to

Right = good.

A
Right Eye

Field White = 5 M. H. Sq
Field Red = 5 M. H. Sq
Field Green = 5 M. H. Sq
No Scotoma R. OS.
1 M. H. Sq



Name Frank Sage
Priestley Smith's Perimeter.

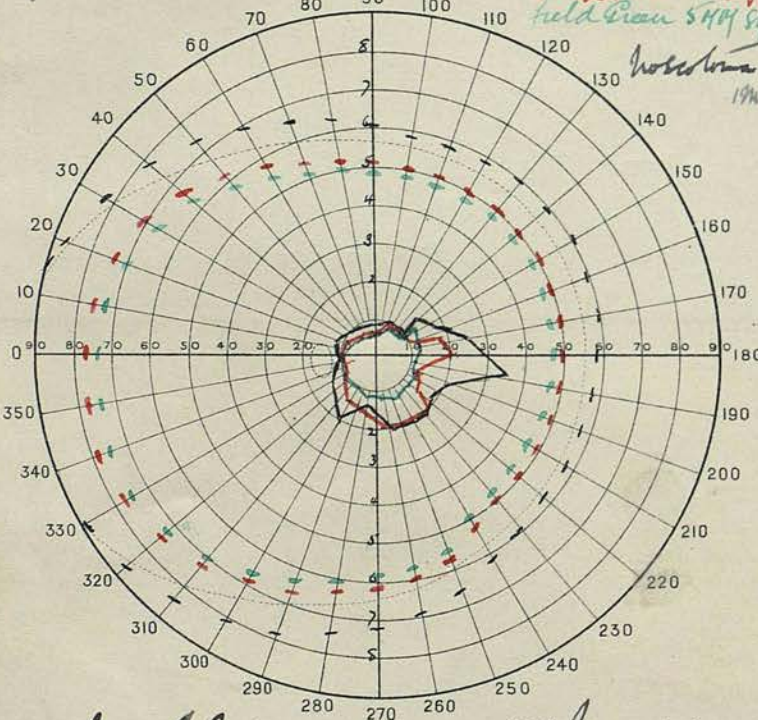
Date 3rd Nov 09

Curry & Puxton.

Right = good.

A
Left Eye

Field White = 5 M. H. Sq
Field Red = 5 M. H. Sq
Field Green = 5 M. H. Sq
No Scotoma R. OS.
1 M. H. Sq



Name Frank Sage
Priestley Smith's Perimeter.

Date 3rd Nov 09

Curry & Puxton.

smoke 3^{vii} of tobacco per week, and since then only 3^{ii}

He has not had syphilis, and there are no signs of tuberculosis. Suffered from influenza two years ago, otherwise he has had no illnesses.

Urine: no albumin nor sugar.

He complains that he cannot see to read well, and that his sight has recently got worse.

There is no proptosis, and externally the eyes are healthy - corneae, conjunctivae, and irides.

The Lachrymal apparatus is healthy.

Muscles: The movements and convergence are full and painless, and Maddox rod proves the balance to be perfect.

There is no tenderness on pressure of the globes backwards.

Pupils--both react to light actively, convergence and consensually.

Vision: Right = $\frac{6}{24}$ J1 with -3 cyl axis horiz = $\frac{6}{12}$ J1

Left = $\frac{6}{60}$ J 10 with -4 cyl " " = $\frac{6}{18}$ J4

Ophthalmoscopically both eyes are healthy.

Fields of Vision. page/23a

(taken after operation, when the nose was almost free of pus)

Right--There is marked general contraction for all colours, and for red and green there is almost a complete loss of the superior temporal field.

Left--There is extreme contraction for all colours, which is more marked relatively and absolutely in the temporal and superior fields.

March 14th, 1910. Has been entirely free of headache during the past four months that he has been back at work, and there is scarcely any discharge from the nose.

C a s e 25.

Right and Left Chronic Nasal Suppuration and probable Polysinusitis.

Chronic glaucoma, with acute attack subsiding by nasal treatment only after myotics had failed.

Mrs M.H., aet. 63. Widow.
came to the Eye, Nose and Throat Hospital at Shrewsbury on Oct 12th, 1909, complaining of defective sight in both eyes.

The right eye had been gradually failing for the past nine months, and she thinks the sight of the left is getting worse.

She has not had any pain in either eye, but there have been times when things have appeared misty, and when she has seen halos around the light.

Ocular Conditions, Oct 12th, 1909.

The anterior chambers are shallow, and the pupils are somewhat dilated, and react sluggishly particularly the right.

The corneae are not hazy.

Vision: Right = Hand movements

Left = with +2 sph. $\angle = \frac{6}{9}$

Tension Right +2. Left increased. $\frac{6}{9}$

Ophthalmoscopically. There is deep cupping of the right disc, and slight cupping in the left.

Oct 18th. An iridectomy was performed on the left.

Oct 27th. Both eyes are quiet, and the tension is normal.

Vision: Right and left, in statu quo.

She was given $\frac{1}{2}$ p.c. eserine drops to use in the right eye once a day.

Jan 4th, 1910. She returned to Hospital to-day because the right eye was red and very painful. She had been using the eserine drops regularly and had had no trouble.

Right eye. The pupil is dilated, and there is very marked ciliary injection; the eye is very tender and the tension is $+1\frac{1}{2}$ or +2.

The cornea is so cloudy that only a dim fundal reflex can be obtained.

Left eye in statu quo.

Vision: Right query perception of light.

Left = $\frac{6}{9}$ pt.

125a

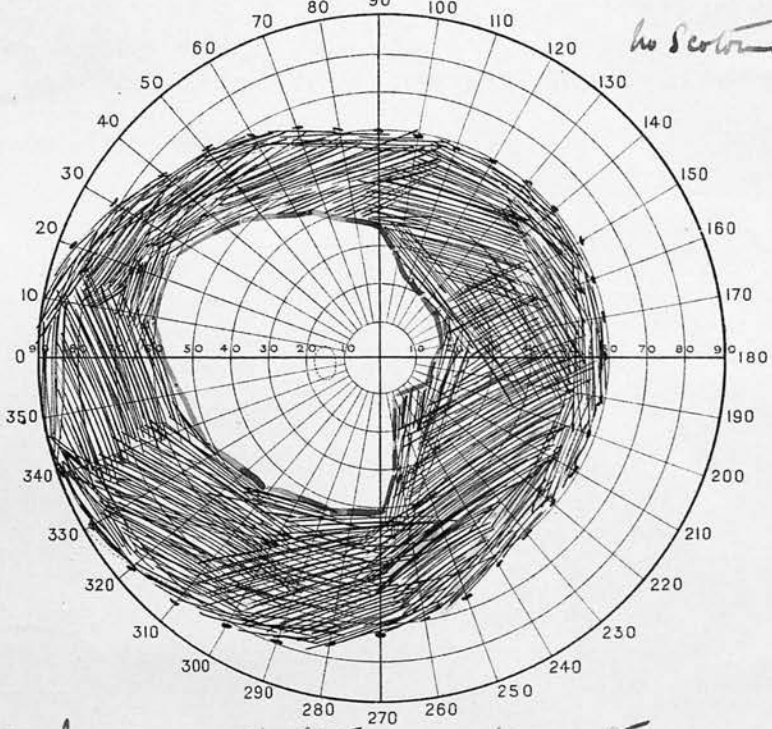
Right's skull

A

Left Eye.

field white & sunny

no Scotoma



Name Margaret Holton Date Jan 4th 1910

Friestley Smith's Perimeter.

Curry & Paction.

Visual Field, page 125a

Left. Is typical of glaucoma, there being general contraction, and extreme contraction of the nasal field

The right eye has a chronic glaucoma with an acute attack superadded.

Nasal Conditions.

As she appeared to have nasal obstruction, an enquiry elicited the fact that she has had nasal discharge for many years, some of which goes back into the throat.

Anterior Rhinoscopy. There is a great quantity of pus in both nasal cavities, which, on removal, rapidly reforms in the superior and middle meatūs on either side.

The inferior turbinals on both sides are oedematous and hypertrophied.

There is a large mass of pus in the naso-pharynx, and in the superior and middle meatūs on both sides posteriorly.

Diagnosis. Probable polysinusitis of both sides.

Treatment. As the myotics had failed to keep the right eye quiet, I determined to stop their use, and treat the nasal suppuration by frequent douching with Dobell's recipe (page 49).

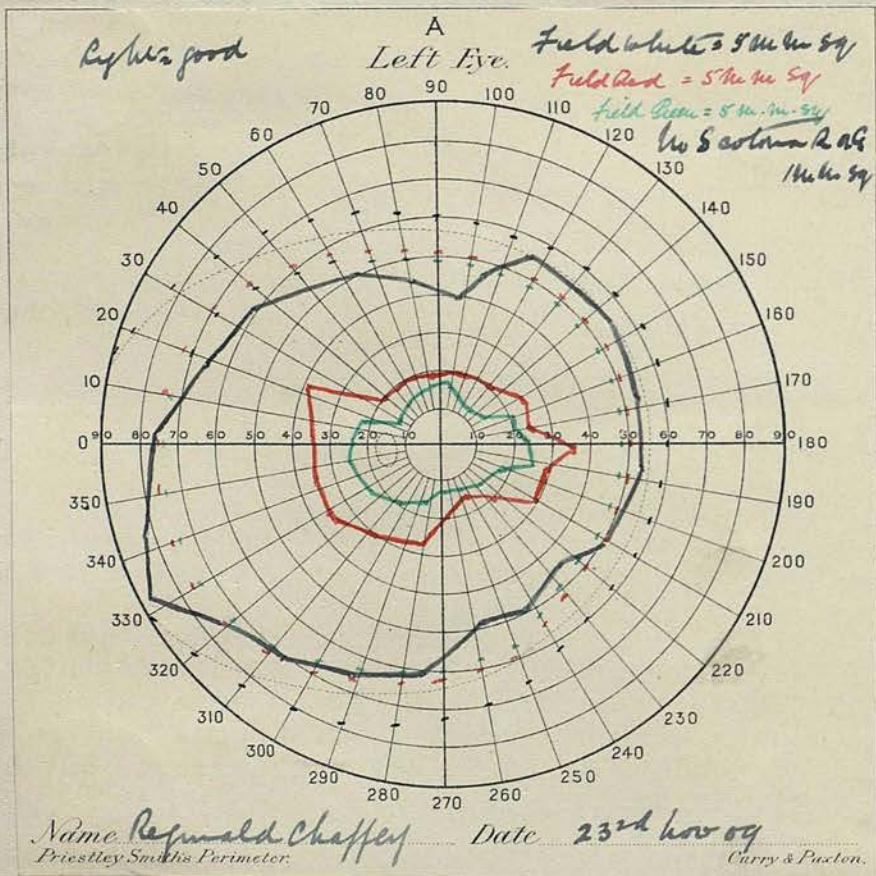
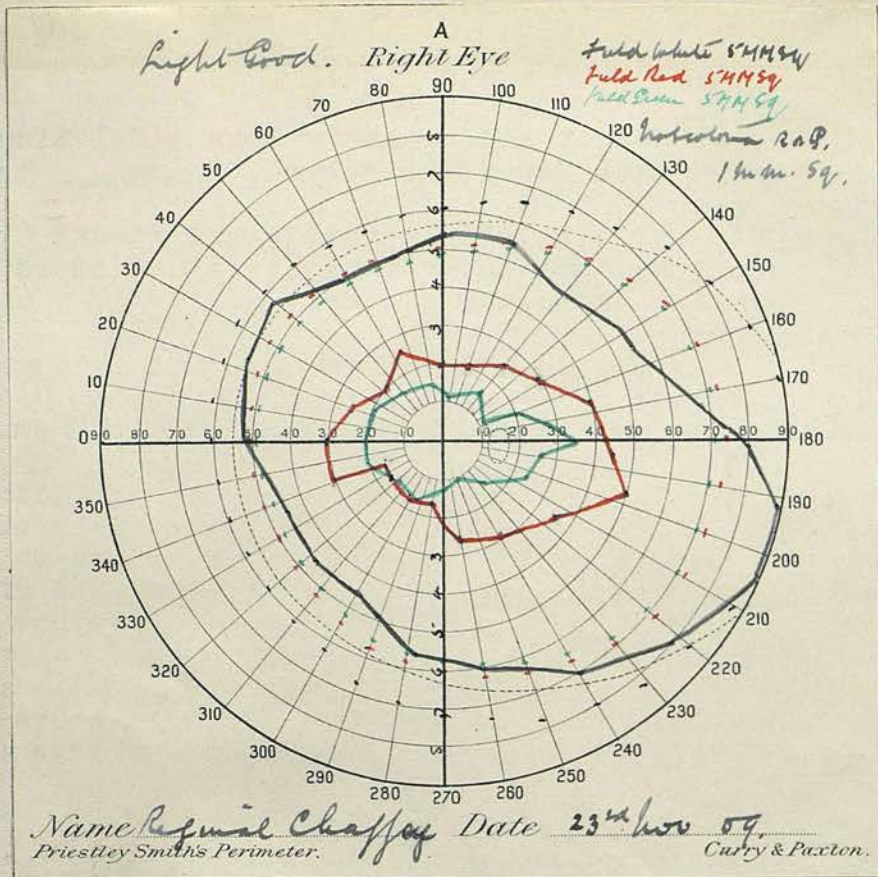
Within twenty-four hours the cornea was less hazy, the ciliary injection less, and the patient much more comfortable; and by the end of the second day some details of the fundus could be seen, the ciliary injection was practically gone, and the tension only slightly increased.

Vision: Right = Hand movements.

Left = $\frac{6}{9}$

Jan 27th (that is, twenty-three days after the attack) the right and left eyes had been perfectly comfortable, and she is still continuing the nasal treatment only.

It is evident that the nasal suppuration was the exciting cause of the acute attack, and probably of the glaucoma originally.



C a s e 26.

Bilateral Antral, and probably Sphenoidal, Sinusitis
with Recurrent Polypi.

Hippus, bilateral neuritis and visual
contraction; cure of neuritis and improve-
ment in visual fields.

Reginald C., aet.15. Glove cutter.

complains of obstruction to, and discharge from, both
nostrils.

Twelve months ago his nostrils began to be obstruc-
ted, and he felt something in his nose, so he consulted
his doctor, who removed some polypi then and several
times during the year; and during most of the year he
has had a free discharge of matter from both nostrils.

Objectively. 3rd Dec, 1909.

There is no swelling nor tenderness over the
cheek nor forehead; his nose is sunken, and he is a
mouth breather.

Anterior Rhinoscopy. There is a great deal of pus
in both nasal cavities, which are almost blocked with
polypi. The pus and polypi seem to come from the
middle and superior meatus.

There are pus and polypi in the posterior nares.

Transillumination. The frontal sinuses are well
developed and illuminate well, but the antra scarcely
illuminate at all.

Present Condition and Previous Illnesses.

He is a well-developed, healthy boy, but he
has a typical adenoid facies.

Urine. No albumin nor sugar.
He has had no serious illnesses.

Ocular conditions. 3rd Dec.

He has no complaint.

Externally the eyes are healthy - corneae, irides and
conjunctivae - and there is no proptosis.

Muscles. The movements and convergence are good and
painless. Maddox rod shows a tendency to internal
strabismus, corrected by 1° prism base out.

The globes are not tender to pressure.

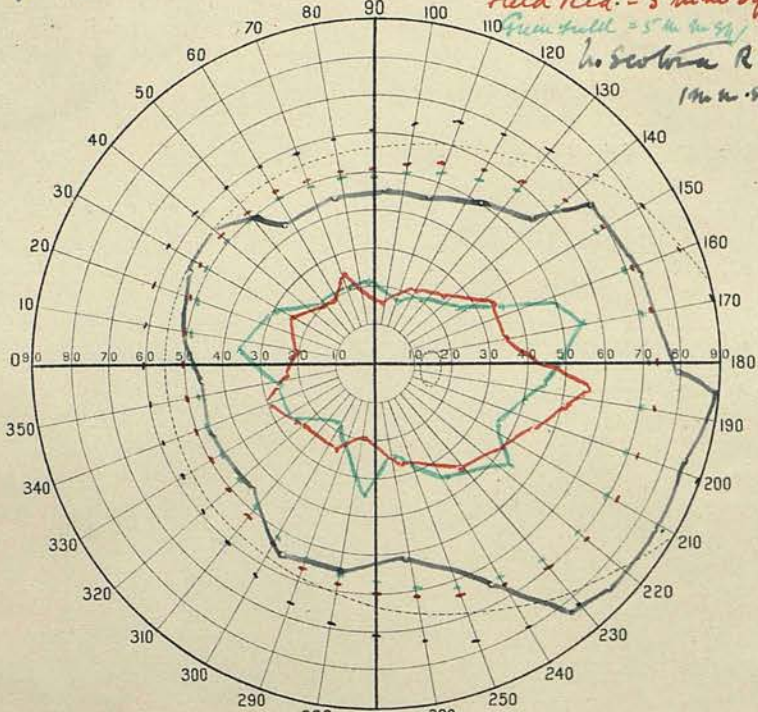
Pupils. Reacts to light and convergence, but hippus
is very marked.

Vision Right = $\frac{6}{5}$ J 1
Left = $\frac{6}{5}$ J 1

Right's good

A
Right Eye

White field = 5 m. m. sq.
Field Red. = 5 m. m. sq.
Field Green = 5 m. m. sq.
No Scotoma R. & G.
1 m. m. sq.



Name Reginald Chaffey
Priestley Smith's Perimeter.

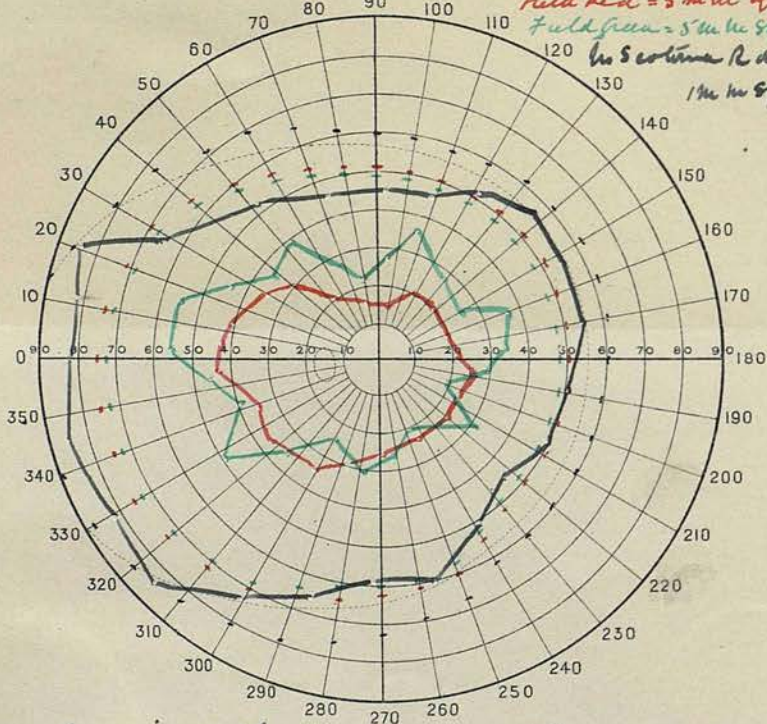
Date 13th Dec 09

Curry & Paxton.

Right's good

A
Left Eye.

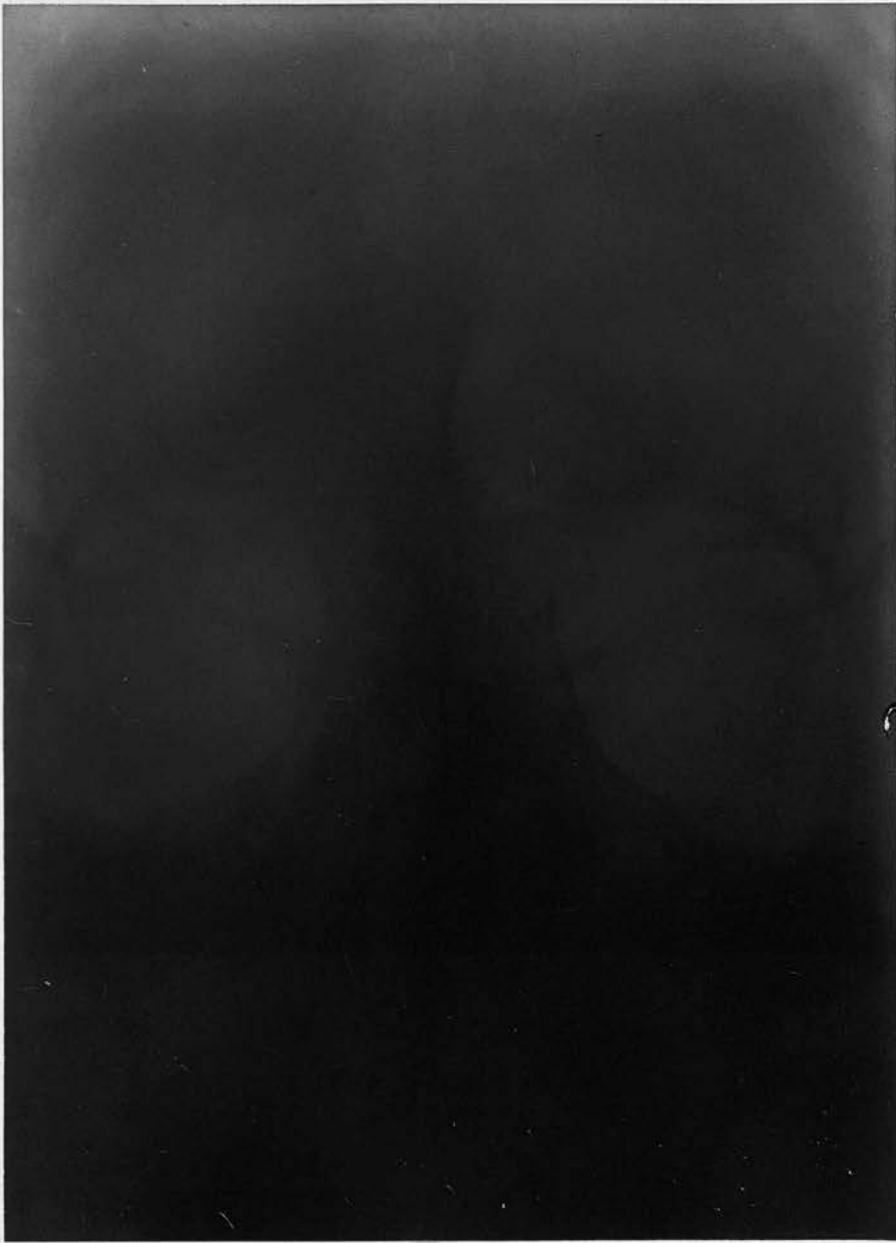
White = 5 m. m. sq.
Field Red = 5 m. m. sq.
Field Green = 5 m. m. sq.
No Scotoma R. & G.
1 m. m. sq.



Name Reginald Chaffey
Priestley Smith's Perimeter.

Date 13th Dec 09

Curry & Paxton.



R.C. Case 26. Antero-posterior, (poor skiagram)

Two large frontal sinuses (for his age) are faintly seen, with a mesial septum. The right is the larger but both extend well over the orbits.



R.C. Case 26. Lateral.

The frontal sinuses extend well backwards, and the sphenoidal sinuses are large, extending posteriorly below the pituitary fossa and anteriorly into the ethmoid region.

The antra are large.

Ophthalmoscopically.

The media are clear and healthy.

Right fundus. The optic disc is blurred and above it becomes merged into the surrounding retina

Left fundus. There is some exudate upon the superior temporal vessels close to the disc, which is very blurred, and on the outer side there is a dense mass of congenital pigment.

There are no haemorrhages, but the veins in both eyes are distinctly engorged, and they pulsate markedly on the disc.

There is a slight inflammation of both nerves.

Visual Fields. page 126a (nose untouched)

The fields for white in both eyes show moderate contraction of the superior temporal quadrants. There is marked concentric contraction for red and green in both eyes.

Operation. Dec 9th.

All the polypi were removed, together with a partial turbinectomy, on each side, and radical operations were performed upon both antra and pus and polypi cleared out from each antral cavity.

Bacteria. A culture was taken from the pus, and the pathologist reported "a growth of mixed cocci, but too small for identification."

After Treatment. The antral cavities were washed out daily, and on Dec 20th, when he left the hospital, the antra were free of pus, but there is still a very great deal of pus in both nostrils and posteriorly.

It is derived from the superior meatūs far back in the region of the sphenoidal sinuses, but although the turbinates have been removed, the ostia of those sinuses cannot be seen.

Ocular Conditions. 13th Dec., 1909.

The Fundi present much the same appearance only less marked - the inflammation is evidently becoming quiescent.

There is still marked hippus.

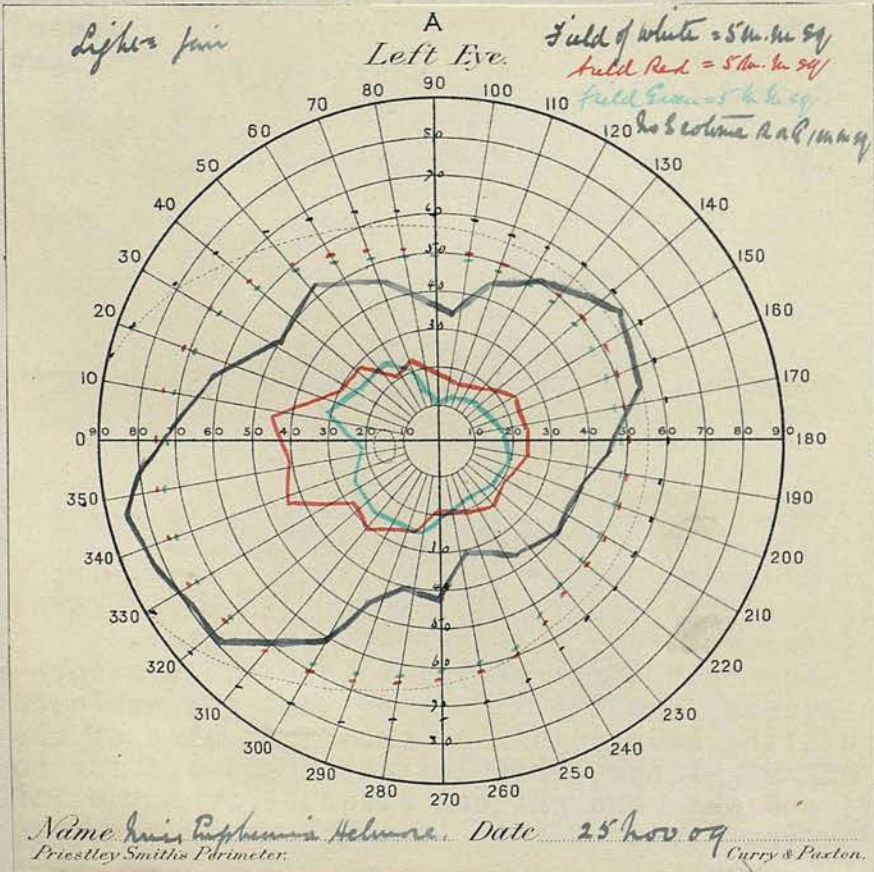
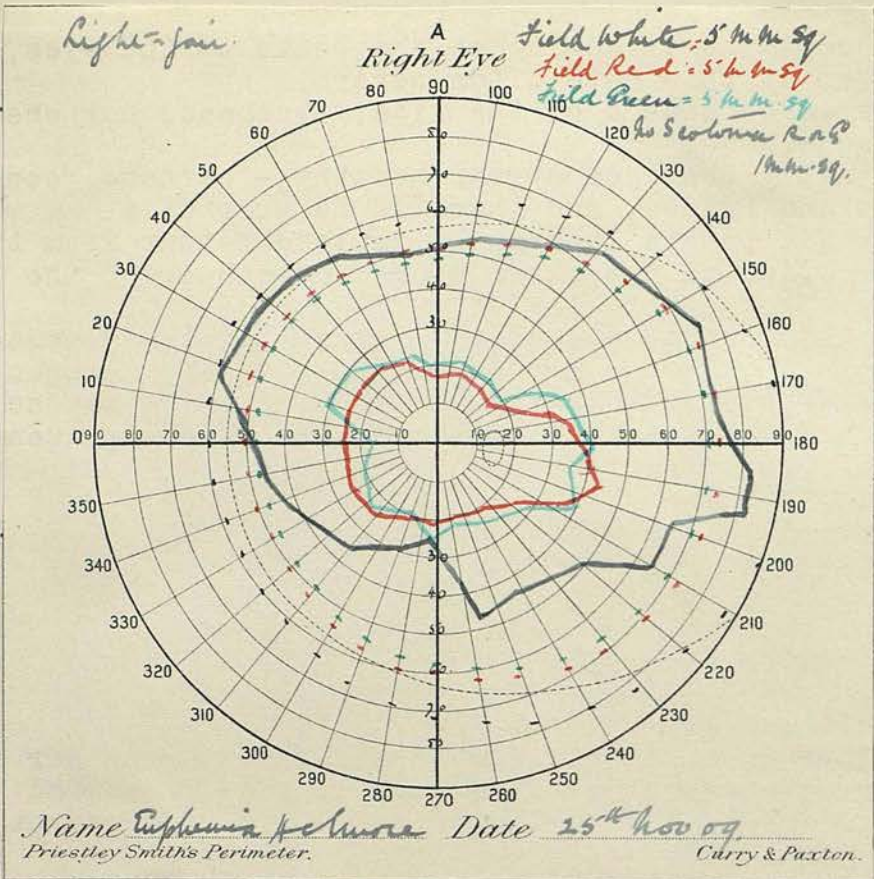
Vision. Right = $\frac{6}{5}$ J1

Left = $\frac{6}{5}$ J1

Visual Fields. (antral cavities washed out.) 127a

The fields for all colours - light and other conditions the same as on Nov 23rd - in spite of it being only four days after operation and of the antra having been washed out, show very considerable increase in extent.

There are no scotomata.



Ocular conditions. Nov 27th, 1909.

She complains of aching at the backs of the eyes, which is even at this date often severe.

There is no oedema of the lids, forehead, nor cheek, and no tenderness.

Externally the eyes appear healthy - corneae, conjunctivae and irides, and there is no proptosis.

The right puncta lachrymale is incompetent from the contraction of the nasal scar, but otherwise the lachrymal apparatus is healthy.

Muscles. The convergence is weak, but the movements are good, and maddox bar shows the balance to be good.

There is no tenderness on pressing the globes backwards.

The pupils react to light, convergence and consensually and hippus is not present.

Vision: Right = $\frac{6}{6}$ J1 no improvement by lenses.

Left = $\frac{6}{9}$ J1 " " " "

Ophthalmoscopically both eyes are healthy.

Visual Fields. Page 29a

There was no difficulty at all in taking her fields, she was not menstruating, and the nose untreated.

Right. The field for white shows marked contraction inferiorly and slightly on the temporal side.

Left. The field for white is contracted superiorly and inferiorly, and the fields for red and green in each eye are markedly contracted, but in the right the green is more extensive than the red.

C a s e 28.

Probable Right and Left Polysinusitis.

Neuritis; Irido cyclitis and secondary glaucoma; contracted fields.

Mrs A.P., aet 53.

History and Complaint. She came to the Bristol Eye Hospital 27th April. 1908, complaining of blindness, in one eye and of very bad sight in the other.

She states that eight weeks ago she had a severe attack of influenza, and the following week she was suddenly seized with a severe pain in the right side of the forehead and right eye, This lasted on and off for some weeks, and when she was convalescent from the influenza she was surprised to find that the right eye was blind and that she could not see out of the left properly.

There is no history of any glaucomatous prodrome.

Previous Health and Present Condition.

In 1890 she had a very severe attack of influenza, associated with very severe frontal headache and eventually became of unsound mind, and had to go to an asylum for six months.

Again in 1898 she had severe influenza associated with neuralgic pain in the teeth of the upper jaw, vertical headache and pain at the backs of the eye. The teeth of the upper jaw were all removed at this date.

She had a moderate-sized goitre, but apart from being neurotic it does not give rise to any symptoms.

All the organs are healthy, and there are no signs of syphilis nor tuberculosis.

Urine: No albumin nor sugar.

Ocular Conditions. April 27th, 1908.

Right.--There is marked ciliary injection, and the cornea is hazy, and the eye is hard, and the iris is discoloured and muddy - marked iritis

The pupil is two-thirds dilated, but contracts with eserine, which causes pain.

The anterior chamber is very shallow.

Left.--Externally the eye is healthy - cornea, iris, and conjunctiva, but the anterior chamber is, perhaps, a little shallow.

The pupil reacts to light and is normal in size and shape.

Vision: Right = $\frac{2}{60}$

Left = $\frac{6}{36}$

Tension. Right + $1\frac{1}{2}$, Left, normal.

Ophthalmoscopically.

The media are so hazy in the right that only a dim reflex can be obtained.

Left.--The disc is slightly swollen and is hazy, and there is some exudate upon the vessel - a definite neuro-retinitis.

28th April. Under chloroform, a large iridectomy was performed upon the right eye.

30th April. The tension is normal in the right, and there is a good deal of iritis, and she was ordered Liquor atropae Sulphatis to be instilled twice daily.

Vision: Right = $\frac{2}{60}$

Left = $\frac{6}{36}$

1st May. There is much less injection, and the eye feels much more comfortable.

Vision: Right = $\frac{4}{60}$

3rd May. Tension. Right and left normal.

Vision. Right $\frac{6}{50}$

16th May. The right eye is now quite quiet, and the tension is normal.

Vision. Right $\frac{6}{36}$ $-.50$ sph & $+4$ cyl axis 20° down in $=\frac{6}{9}$
 Left $\frac{6}{24}$ $+.50$ sph & $+1.5$ cyl axis vert $=\frac{6}{9}$

Ophthalmoscopically.

Right. The cornea is quite clear, but the vitreous is a little hazy, but there are no floating opacities. The nerve is not cupped, there is no neuritis, and the fundus is healthy.

Left. The media are clear; the exudate has not absorbed yet, but there are no active inflammatory changes now.

Dec 16th, 1909. She has no complaint now- she never sees halos now around the light, and the vision of the right eye does not ever become misty.

There is no exophthalmos nor proptosis, and externally - excepting the right iris - the eyes are healthy. The right iris is bound down to the lens by posterior synechia, and there is slight atrophy of the right pillar of the coloboma.

Muscles. The movements and convergence are full and painless, and Maddox rod develops no strabismus. There is no tenderness on pressure of the globe backwards.

Both pupils react to light and convergence, and hippus is not present in the left.

Vision: Right with correction $=\frac{6}{12}$ J1
 Left " " $=\frac{6}{9}$ J1

Tension. Right and left normal.

Ophthalmoscopically.

Right--The media are now quite clear and there is no synchisis.

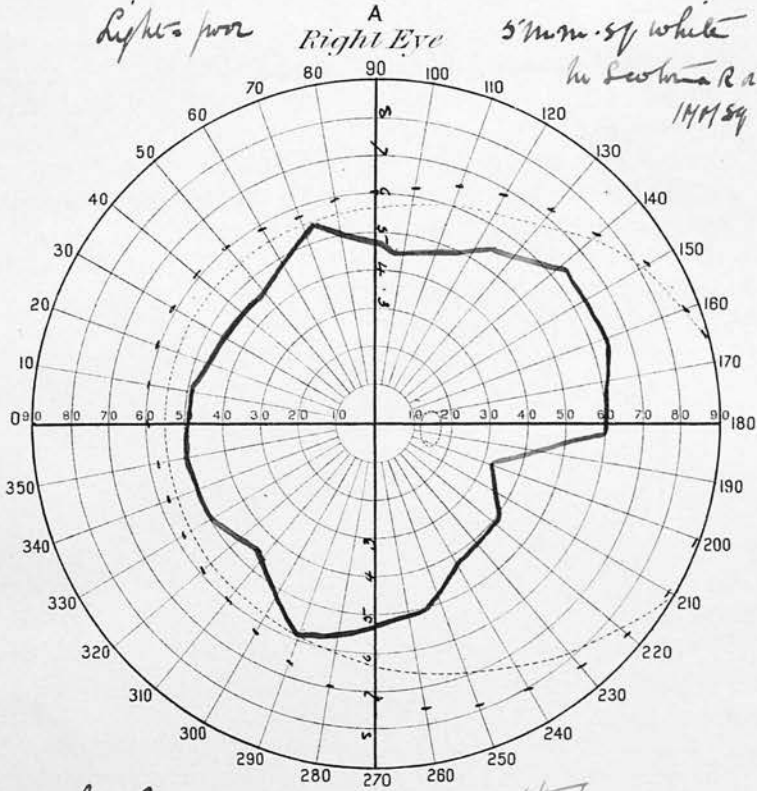
The disc is pale and shows atrophic cupping (not glaucomatous) and the vessels are attenuated.

Left--The disc is pallid and shows post-neuritic atrophy, and there is some organised lymph on the vessels near the disc; otherwise the fundus and media are healthy.

Light poor

Right Eye

5 mm. sq white
in Scotoma R 28.
144 sq



Name *J. W. Perry*
Priestley Smith's Perimeter.

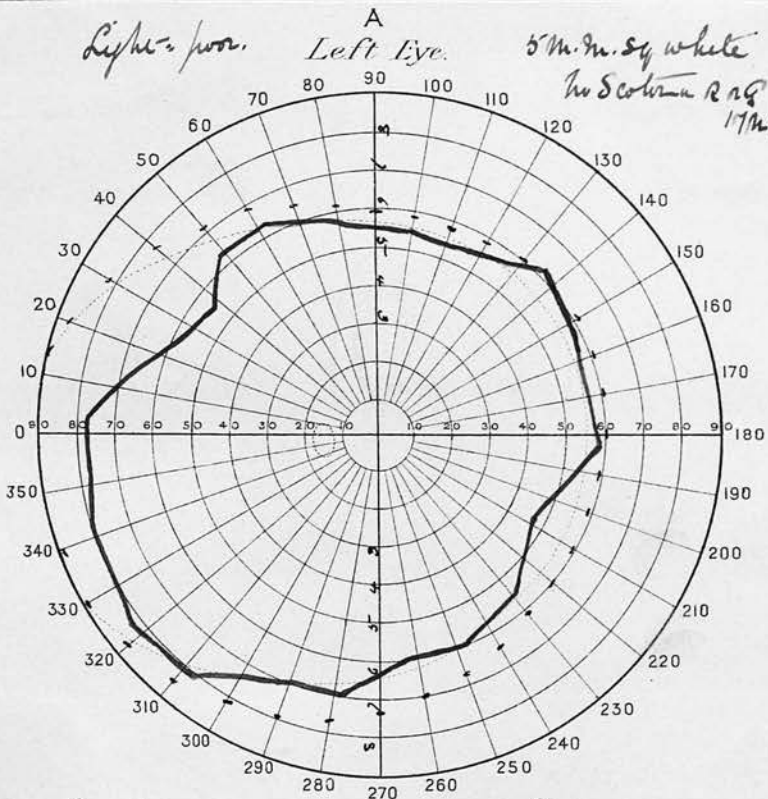
Date *16th Dec 09*

Curry & Paxon.

Light poor

Left Eye

5 mm. sq white
in Scotoma R 28.
172 sq



Name *J. W. Perry*
Priestley Smith's Perimeter.

Date *16th Dec 09*

Curry & Paxon.

Visual Fields. (menopause). Page 132a

The fields for white were only taken, as she is so neurotic.

Right--There is some contraction of the Temporal Field, particularly in the inferior quadrant, but the Nasal Field is Full.

Left.--Other than a slight contraction of the temporal field, it is very full.
There are no scotomata in either eye.

Nasal Conditions. Dec 16th, 1909.

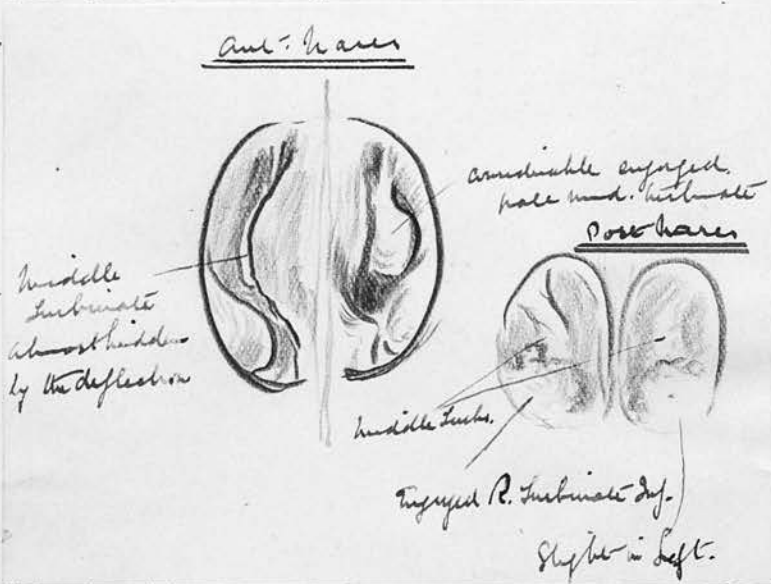
She does not remember a more pronounced nasal discharge than usual during and after the influenza attacks.

Anterior Rhinoscopy. The septum is markedly thickened and deviated to the right, but there is no obstruction to breathing.

The Left nasal cavity is roomy, and there is no pus present, but the middle turbinate is very enlarged, soft and oedematous, and the inferior turbinate is slightly enlarged.

The right cavity is small owing to the septal deviation, and only a small portion of the anterior part can be seen; there is apparently no pus present.

Posterior Rhinoscopy. There is marked enlargement of both inferior turbinates, particularly on the right side, but there is no pus.



Transillumination.

Both the Antral and Frontal Sinuses illuminate well.

There has evidently been some chronic nasal disease at a previous date, and in spite of the absence of pus, the appearance of the mucosa strongly suggests that the nature of the trouble was a polysinusitis.

Fish would regard such evidence as positive of sinusitis.

Diagnosis.

In the right eye there was an acute iridocyclitis with secondary glaucoma resulting from blockage of the pectinate ligament by lymph, and in the left eye a definite neuro-retinitis. These two ocular conditions occurred together, and followed a severe attack of influenza, but in spite of this I do not believe that Influenza was the direct cause, but that the influenza started polysinusitis of the accessory cavities, from which toxins passed through the walls and affected the structures involved.

This supposition is naturally difficult to prove. The intense localised headache during both attacks of influenza probably meant - knowing how frequently sinusitis occurs in influenza (vide page 39) - the presence of acute sinusitis.

The supposition of the two ocular signs being due to general influenzal toxæmia is to me impossible, because a general toxin would be unlikely to affect the nerve in the one eye and the uveal tract in the other, much more probable the same structure in each eye.

Further, influenzal toxin, according to Fuchs¹, very rarely causes iritis or gross optic neuritis; when neuritis is present in influenza it is usually a bilateral retro-bulbar neuritis. From a study of this series of cases, it is evident that optic neuritis is very common; and iritis was the first ocular symptom recorded by Ziem in sinus affections.

It is easy to suppose one of the anterior group of sinuses in the right nose, and one of the posterior in the left affected by sinusitis and allowing toxins to pass through and affect the uveal tract in the former, and the optic nerve in the latter.

1. FUCHS. Text-book of Ophthalmology, 1907.

C a s e 29.

Probable Acute Right and Left Frontal and Antral Sinusitis.

Some visual field contraction.

Mrs A., aet.30.

History. Was sent by her doctor to the Ear, Nose & Throat department in June, 1909, because during the past year she has had severe frontal headache which is worse when she has a cold, during which there is often swelling of the face and forehead.

Objectively. The left cheek and forehead were swollen and there was pus in the middle meatus and engorgement of the middle turbinals on both sides.

Dec 21st. There has been a recurrence of all the symptoms during the past week. The headache is mainly frontal in situation, and only occurs at times, particularly when she gets a cold - which happens frequently. She says that she has always a discharge from her nose, which she often smells offensively - cacosmia.

Objectively.

The left cheek is swollen and tender - no bad teeth - but there is no tenderness or swelling of the frontal region.

Anterior Rhinoscopy. The mucosa is hyperaemic, and the right inferior and left middle turbinals are engorged.

There is pus in both middle meatus.

Posterior Rhinoscopy. There is pus on the floor of the post nares, and the inferior turbinals are engorged.

Transillumination. The right antrum and both frontal sinuses illuminate well, but the left antrum very poorly.

She was ordered a nasal douche.

Jan 27th, 1910. The turbinates were in statu quo, but there was an entire absence of pus in both nasal cavities.

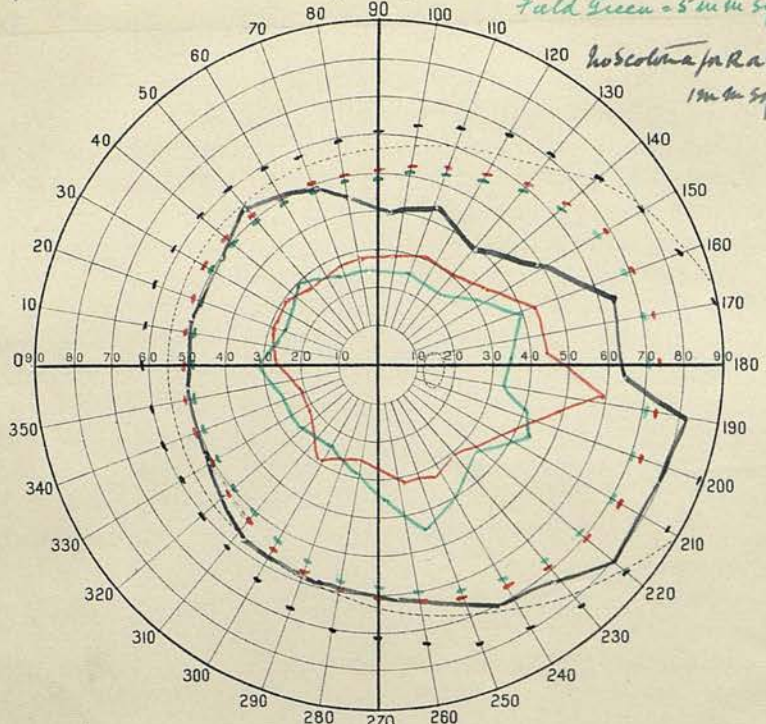
Diagnosis. From the history and signs and symptoms at the different dates there can be no doubt that this is a case of frequently recurring acute sinusitis

Reflex good

A
Right Eye

Field White = 5 m in sq
Field Red = 5 m in sq
Field Green = 5 m in sq

No Scotoma for R.A.P.
1 m in sq



Name Mrs Sarah Adams
Priestley Smith's Perimeter.

Date Jan 27th .10.

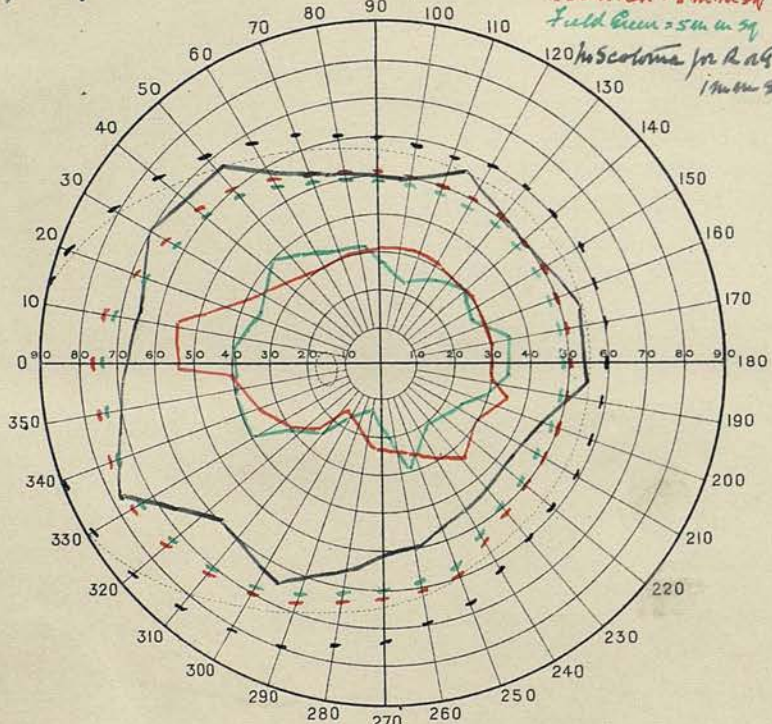
Curry & Paxton.

Reflex good

A
Left Eye

Field White = 5 m in sq
Field Red = 5 m in sq
Field Green = 5 m in sq

No Scotoma for R.A.P.
1 m in sq



Name Mrs Sarah Adams
Priestley Smith's Perimeter.

Date Jan 27th .10.

Curry & Paxton.

of the frontal and antral cavities, probably tending to become chronic.

Previous Illnesses and Present Condition.

She is a strong healthy woman who has always had good health, and apart from a tendency to frequent coryza there is nothing to note.

All the organs are healthy.

Ocular Conditions. Jan 27th, 1910.

She does not complain of any eye trouble.

Externally the eyes are healthy - corneae, irides, and conjunctivae - and there is no proptosis

The lachrymal apparatus is healthy.

Muscles. The movements and convergence are good and painless, and the balance perfect.

There is no tenderness on pressing the globes backwards.

Pupils; Both react to light, convergence and consensually, and hippus is not present.

Vision: Right = $\frac{6}{5}$ J1

Left = $\frac{6}{5}$ J1

Ophthalmoscopically both eyes are healthy.

Visual Fields. Page 135a (not menstruating)

There is general contraction for red and green in both eyes.

The field for white in the right is slightly contracted in the superior temporal quadrant, and the left field in the temporal half.

C a s e 30.

Chronic Right and Left Frontal, Antral, and Ethmoidal Sinusitis.

Hippus; contracted fields inferiorly.

Mary H., aet. 20, Parlour-maid.

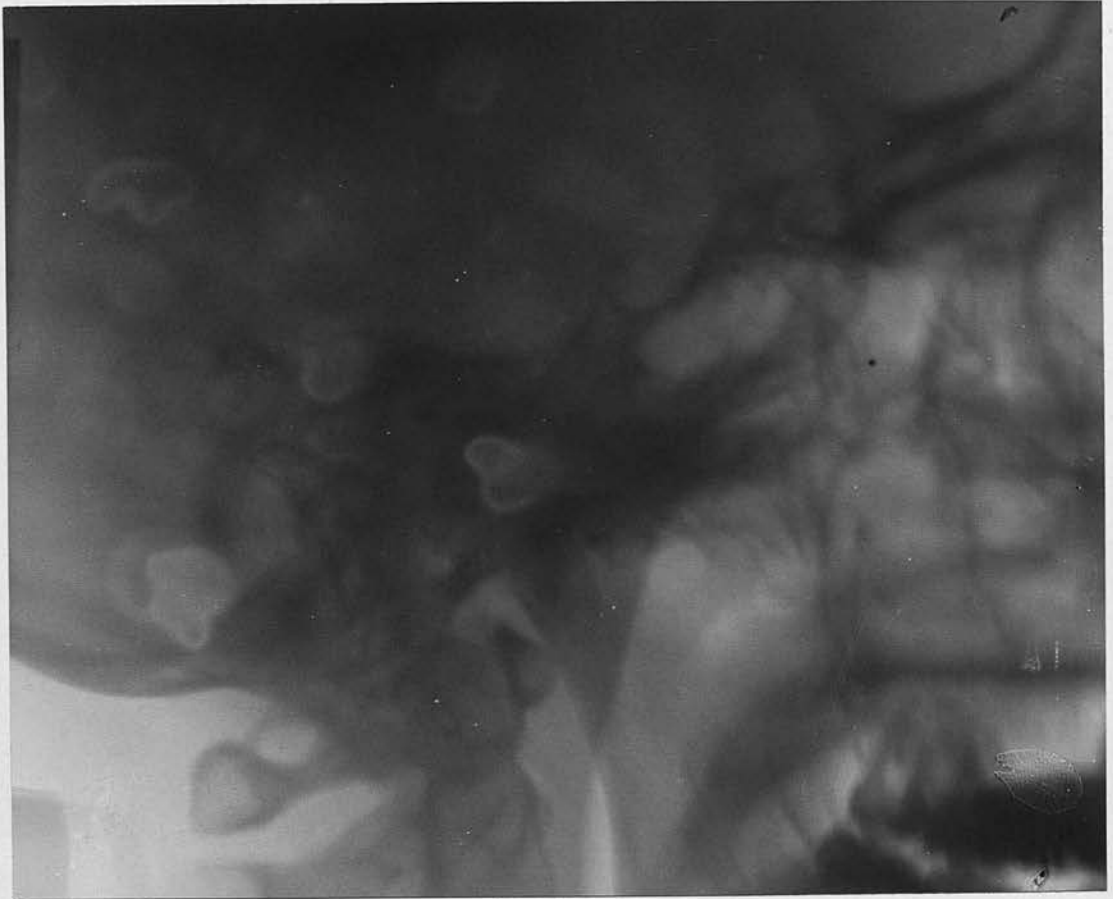
History. Six years ago, she began to notice discharge from the left nostril, some of which went back into the throat.

There was apparently no cause, and she had not just



M.H. Case 30. Antero-posterior.

The frontal sinuses are small and symmetrical.



M.H. Case 30. Lateral.

The sphenoidal sinuses are well developed and extend almost to the dorsum sellae.

The bone behind the limbus sphenoidalis appears to be thick.

previously had a cold or any illness.

Her attention was first drawn to the nasal discharge because she found matter all over the pillow an awakening; it had an offensive smell to other people and herself - cacosmia, and was thick and dark-yellow in colour.

The right nostril was not affected until eighteen months ago.

From the commencement of the nasal discharge, she has had severe and constant pain over the left eyebrow, but latterly it has been over both brows.

The headache is always better when the discharge is very profuse, and is not worse during menstruation and it has been so severe that she has been unable to work during the past three years.

The face is often puffy and swollen around the eyebrows and cheeks.

Objectively.

Anterior rhinoscopy.--There is some engorgement of the right middle turbinal, but there is no pus on the right side.

The left inferior and middle turbinates are greatly engorged, and there is a large quantity of pus which comes from the middle meatus.

There is pharyngitis chronica of the posterior wall, and there is pus in the floor of the left posterior naris and in the left middle meatus.

General Health & Previous Illnesses.

She is a well-developed, healthy-looking girl of twenty, and has had no serious illnesses. All the organs are healthy.

Menstruation normal.

Urine: No albumin nor sugar.

Ocular Conditions. Jan 4th, 1910.

Her eyes rapidly becomes tired if she reads or writes, and she frequently has pain at the backs of her eyes.

Objectively. There is some oedema and tenderness of the left frontal region.

Externally, the eyes are healthy - corneae, conjunctivae and irides - and there is no proptosis.

The lachrymal apparatus is healthy and competent.

Muscles: Movements are good and painless and the balance as tested by Maddox bar is perfect.

The globes are not tender to pressure.

Pupils: They both react to light and convergence, but there is moderate hippus.

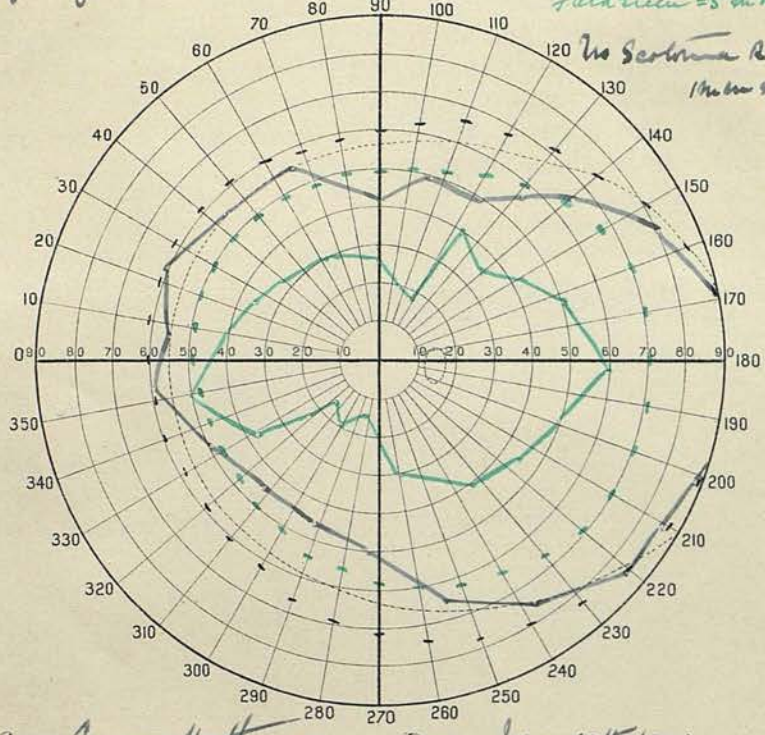
Vision: Right = $\frac{6}{5}$ J1

Left = $\frac{6}{5}$ J1

Light good

A
Right Eye

field white = 5 m m sq
field green = 5 m m sq
no Scotoma R or L
1 m m sq



Name Mary Hathaway
Priestley Smith's Perimeter.

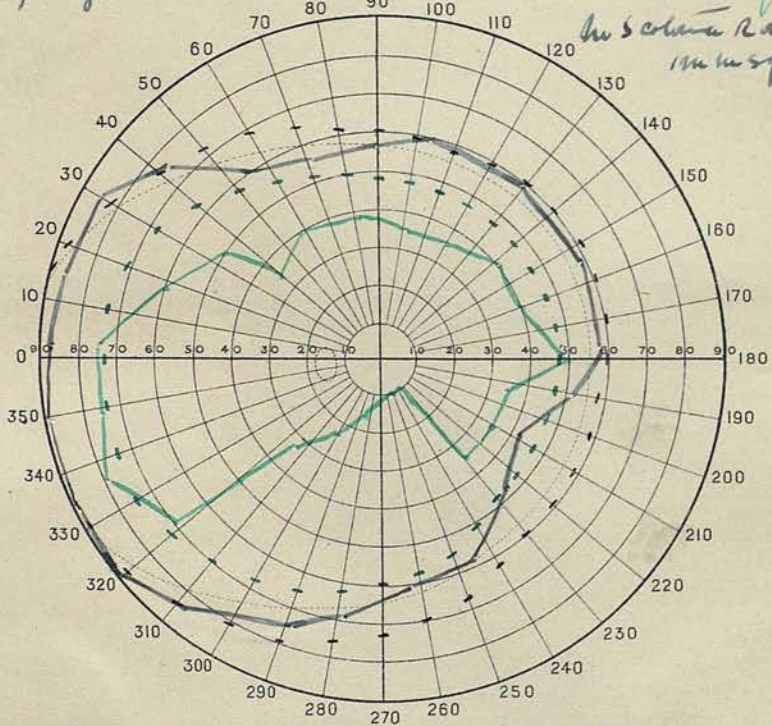
Date Jan 4th 1910

Curry & Paxon.

Light good

A
Left Eye.

field white = 5 m m sq
field green = 5 m m sq
no Scotoma R or L
1 m m sq



Name Mary Hathaway
Priestley Smith's Perimeter.

Date Jan 4th 1910.

Curry & Paxon.

Ophthalmoscopically both eyes are healthy.

Visual Fields. Page 137a (not menstruating).

The field for white is somewhat contracted above and below in the right, but is practically full in the left.

The fields for green in both eyes are contracted above and below, particularly in the right.

There are no scotomata in either eye.

Operation. Jan 5th, 1910.

A portion of the middle turbinate was removed on the left side, and a considerable quantity of pus escaped into the nose (in view of the operation result on March 16th probably from frontal sinus.)

The left frontal sinus was explored through an eye-brow incision, and was apparently healthy. A radical operation was performed upon the left antrum and the pus and polypi removed.

Jan 9th, 1910. She has had a great deal of pain in the left brow, and the left frontal region is red and swollen and pus is escaping through the wound.

Jan 24th. She still has severe frontal headache, but the exploratory wound has healed.

Feb 2nd. There are mucous polypi growing from the right and left middle turbinals; the middle turbinals with the polypi were removed.

The left ethmoidal cells were curretted and a large quantity of pus escaped, the cells near the roof being most affected.

Mar 10th. The headache is still as severe and there is a great deal of discharge from the both nostrils. The frontal sinuses were again explored together with the right antrum, and all three were full of pus. An osteoplastic flap operation was performed upon both frontal sinuses, and both laid into one (they were small); and a radical antral operation upon the right.

Resume and Analysis of Cases Table II

Case	No	Sinuses Affected	Diagnosis	Visual Fields	Ophthalmoscopic changes	Muscles	Papils	Lachrymal Apparatus	Other Ocular Conditions
F.H.	1	Acute R. & L. Sphenoidal	Positive	Bi temporal hemianopsia	Haemorrhagic neuroretinitis. Choked central		marked hyperopia		
A.H.	2	Chronic R. & L. Sphenoidal	"	marked contraction in R. Scotoma in R.	R. & L. Choked discs. [artery R]				
J.O.	3	Chronic R. & L. Sphenoidal	"	R. & L. contracted. Scotoma.	R. & L. gross neuritis	External strabismus 15° in	Moderate hyperopia		
J.H.	4	Chronic R. & L. Sphenoidal & Ethmoidal	Probable	R. & L. contracted. Scotoma.	R. & L. juxta macular chorioiditis				
E.B.	5	Chronic R. & L. Sphenoidal & Ethmoidal	Positive	R. & L. marked contraction.	R. & L. optic atrophy.				
E.J.	6	Chronic R. & L. Sphenoidal	"	R. & L. contracted.	R. & L. optic atrophy				
M.P.	7	Chronic R. & L. Sphenoidal	Probable	Moderate contraction R. & L.	R. & L. fine neuritis	Slight hyperphoria			Asthenopia
M.D.	8	Chronic R. & L. Sphenoidal & Ethmoidal	Positive	marked contraction & scotoma R. & L.	R. & L. Syphilitic chorioido-retinitis	Slight Esophoria			
J.S.	9	Chronic R. & L. Sphenoidal	"	Very marked contraction R. & L.		weak convergence			Asthenopia
A.S.	10	Chronic R. & L. Sphenoidal	"	Contraction for Decr R. & L.		Hyperphoria 10° in to coned			
J.J.	11	L. Anterior Ethmoidal mucocoele	"	Full fields	Slight atrophy R. & L.				
H.B.	12	L. Frontal mucocoele.	"	Full fields		Hyperphoria 11° in R = 3mm L = 3.5 mm.			
H.P.	13	Chronic R. & L. Frontal	"	marked contraction R. & L.		hyperopia. weakness R. superior oblique. weak convergence	marked hyperopia		Asthenopia
S.B.	14	Chronic R. & L. Frontal.	"	marked contraction R. & L.					
J.J.	15	Sarcoma R. & S in situ L. Ant. A.	"	Extensive contraction R. & L.	Post-neuritic atrophy R. & L. ? glaucoma			R. baryopteria	
H.B.	16	L. Acute Antrum	"	Very slight temporal in L.					
E.C.	17	Chronic R. & L. Ant. A.	"	Full field			marked hyperopia		
E.P.	18	Chronic R. & L. Ant. A.	"	Contraction R. & L.		Latent Internal Strabismus 15° in	Slight hyperopia		Asthenopia
A.P.	19	Chronic R. Ant. A.	"	Contraction R. & L.	Retinitis Proliferans L.		Left dilated, only part reacts	Recent anisocoria R	
J.J.	20	Chronic R. & L. Ant. A.	"	Slight contraction R. & L.				Lachrymal obstruction and regurgitation.	
H.S.	21	Chronic R. & L. Ant. A.	"	Moderate contraction R. & L.		weak L. inferior oblique			
E.H.	22	Chronic R. & L. Sphenoid, Ethmoid Ant. A.	"	Contracted R. & L.		weak convergence			Asthenopia
H.	23	Chronic R. & L. Frontal, R. Ant. A.	"	Contraction R. & L.	fine neuritis R. & L.	Hyperphoria 3° in R. Superior rectus weak.			
F.S.	24	Chronic Left pan sinusitis	"	Extensive contraction L.					
M.H.	25	Chronic R. & L. polysinusitis	Probable	Contraction L.	Glaucomatous cupping R. & L.				Chronic Glaucoma
R.C.	26	Chronic R. & L. Ant. A. & Sphenoidal	Positive	Contraction R. & L.	fine neuritis R. & L.	Slight latent Internal strabismus			
E.H.	27	Chronic R. & L. Frontal & Ant. A.	"	Contraction R. & L.				Epiphora. no regurgitation	
A.P.	28	Acute R. & L. polysinusitis	Probable	Contraction R. & L.	Vitreous Opacities R. neuritis L.				Acute Iridocyclitis and secondary glaucoma
S.A.	29	Recurrent Acute Frontal & Ant. A.	"	Contraction R. & L.				Epiphora, no regurgitation	
M.H.	30	Chronic R. & L. Frontal, Ant. A., & Ethmoidal	Positive	Contraction R. & L.			Moderate hyperopia		Asthenopia

Table III Resumé of Fields of Vision

Case	No	Sinuses affected	Diagnosis	General Contraction	Temporal Contraction	Altitudinal Contraction	Scotoma
<u>A. Sphenoidal and Posterior Ethmoidal Sinuses</u>							
F.K.	1	Acute R. & L. Sphenoidal	Positive	Moderate all colours R & L.	All colours R & L. Bitemporal hemianopia green.		
A.H.	2	Chronic " " "	"	Extreme for green in R.		Marked superiorly for white, superior & inferior for red ^[in right]	Very large in L.
J.O.	3	" " " "	"	Marked all colours R & L.	Slight in R & L. all colours.		Relative & absolute R & L. central
J.H.	4	Chronic R & L. Sphenoidal & Ethmoid	"			Superior for white, superior and inferior for red R & L.	Relative & absolute central for red & green
E.D.	5	" " " "	"	Extreme all colours R & L.	of all colours R & L.		
E.J.	6	Chronic R & L. Sphenoidal	"	Moderate all colours R & L. reversal red & green in L.	of white in R & L.		
M.P.	7	" " " "	Probable	Moderate in R, marked in L. all colours.	of white in R & L.		
M.D.	8	Chronic R & L. Sphenoidal & Ethmoidal	Positive	Marked in R, extreme in L. all colours.		Complete loss superiorly for red and green in R	Absolute central & peripheral [R & L]
J.S.	9	Chronic R & L. Sphenoidal	"	Marked all colours R & L.			
A.S.	10	" " " "	Probable	Slight for white, very marked for green R & L.			
<u>B. Anterior Ethmoidal Cells.</u>							
J.T.	11	Anterior Ethmoidal mucocoele.	Positive	Field full			
<u>C. Frontal Sinuses.</u>							
H.B.	12	L. Frontal mucocoele.	Positive	Full field			
H.P.	13	Chronic R & L. Frontal	"	Moderate for white, extreme for red R & L	for all colours R & L.		
S.P.	14	" " " "	"		Marked for green in L.	Slight superiorly for all R & L.	
<u>D. Antrum of Highmore.</u>							
J.T.	15	Sarcoma of R. sinuses of L. antrum	Positive	Extreme for white R & L.			
H.B.	16	Acute L. antrum.	"	Right full, left almost full.	very slight for red & white in L.		
E.C.	17	Chronic R & L. antra	"	R & L. full			
E.P.	18	" " " "	"	Moderate all colours R & L.			
A.P.	19	Chronic R. antrum	"	Slight for green R & L.		Superior sector lost all colours from retinae	[proliferans in L.]
J.T.	20	Chronic R & L. antra	"	Slight for white; red & green marked R & L.	Moderate for all colours in L.		
H.S.	21	" " " "	"	Slight for white; more marked red & green R & L.			

Table III Continued.

Case	No	Sinuses affected	Diagnosis	General Contraction	Temporal Contraction	Superior or Inferior Temporal	Altitudinal Contraction
		E. Polysinusitis					
E.H.	22	Chronic R & L. Sphenoid, Ethmoid & Antra	Positive	Marked for Red & green R & L.	White in R.; marked for red & green in L.	White. Superior & Inferior in R & L.	
H.	23	Chronic R & L. Frontal & R. Antrum	..	Marked for Red & green R & L.	Moderate all colours in L.	White. Superior in R.	All colours marked inferiorly [R & L]
F.S.	24	Chronic L. pan-sinusitis.	..	Marked for all colours R, extreme in L.	All colours in L.	Superior in R. for all colours.	
M.H.	25	Chronic R & L. polysinusitis	Probable	Marked & nasal in L. Right blind			
R.C.	26	Chronic R & L. Antra and Sphenoid	Positive	Moderate all colours R & L, & unusual green [and red]		Superior in R for all colours.	
E.H.	27	Chronic R & L. Antra and Frontal	..	Moderate red and green R & L.			R. marked inferiorly all colours L. marked superiorly and inferiorly all colours
A.P.	28	Acute R & L. polysinusitis	Probable		White R & L., particularly L.		
S.A.	29	Recurrent acute frontal and antra	..	Moderate for red and green R & L.	White in L.	Superior in R. for white	
M.H.	30	Chronic R & L. Frontal, Antra & Ethmoidal	Positive	Slight for all colours R & L.			Marked superiorly and inferiorly for green in R Superiorly for green in L.

Summary

Full Visual Fields = 3 cases. - 1 Chronic Antra, 1 Ethmoid mucocoele and 1 Frontal mucocoele.

General contraction = 23 times

Temporal Contraction = 15 times of which Bilateral in 8 cases -

Twice in Polysinusitis (Sphenoid sinus involved in each)

Once in Frontal Sinusitis

5 Times in Sphenoidal Sinusitis

Altitudinal = 8 times

Scotoma = 4 times - two due to Choroiditis.

Table II Treatment and Result.

Case	No	Sinuses Affected	Diagnosis	Treatment	Result
F.K.	1	Acute R & L Sphenoidal	Positive	Traphoretin, Mercuric etc.	Neuritis cured: recovery of vision from blindness; fields almost full.
A.H.	2	Chronic R & L Sphenoidal	"	Sinuses opened	Choked discs cured: restoration of sight from light perception; fields much improved
J.O.	3	Chronic R & L Sphenoidal	"	Turbinectomy, Septum straightened	Neuritis cured: fields improved: scotoma lost: relief of symptoms.
J.H.	4	Chronic R & L Sphenoidal and Ethmoidal	Probable	Nasal douching	Case lost sight of.
E.B.	5	Chronic R & L Sphenoidal and Ethmoidal	Positive	Sinuses opened	Optic atrophy before operation: visual fields same: sinuses not improved
E.J.	6	Chronic R & L Sphenoidal	"	Sinuses opened	Optic atrophy before operation: visual fields same: sinuses not improved.
M.P.	7	Chronic R & L Sphenoidal	Probable	Sinuses opened	Neuritis cured: fields enlarged: neuralgia and symptoms cured.
M.D.	8	Chronic R & L Sphenoidal and Ethmoidal	Positive	Sinuses opened	Gonorrheal conditions due to syphilis & no improvement: sinuses cured.
J.S.	9	Chronic R & L Sphenoidal	"	Sinuses opened	Fields worse: symptoms relieved, sinuses cured.
A.S.	10	Chronic R & L Sphenoidal	"	Sinuses opened	Fields not observed after: rapid relief of symptoms & cure of sinuses.
J.T.	11	Anterior Ethmoidal mucocoele.	"	Cavity drained	Fields full before and after: Epiphora cured: mucocoele healed.
H.B.	12	L. Frontal mucocoele.	"	Burst and drained naturally	Fields full before and after: proptosis continues: sinus healed.
H.P.	13	Chronic R & L Frontal	"	Osteo-plastic operations R & L.	Fields same. Sinus not improved: symptoms still severe
S.B.	14	Chronic R & L Frontal	"	Osteo-plastic operations R & L.	Fields same: Immediate relief of symptoms: sinus cured.
J.T.	15	Sarcoma R. antrum, L. antral sinusitis	"	No treatment advised	
H.B.	16	Acute L. Antrum.	"	Abcess opened	Fields almost full: sinus cured
E.C.	17	Chronic R & L. Antra.	"	Radical operation R & L.	Fields full: Antra cured [and polyneuritic]
E.G.	18	Chronic R & L. Antra.	"	Radical operation R & L.	Fields contracted, and worse after oper. then improved: then worse when antra
A.P.	19	Chronic R. Antrum.	"	Radical operation on R.	Field worse after operation; improved as discharge ceased. Antrum cured.
J.T.	20	Chronic R & L. Antra	"	Patient lost sight of.	
H.S.	21	Chronic R & L. Antra	"	Refused treatment	
E.H.	22	Chronic R & L. Sphenoid, Ethmoid & Antra	"	Nasal douching.	Not observed for sufficient time. [fields
H.	23	Chronic R & L. Frontal & R. antrum.	"	Radical operations on all three	For a time worse and neuritis: cure of neuritis & sinus; improvement in
F.S.	24	Chronic L. Antrum, Frontal, Ethmoid & Sphenoid	"	Radical operations on all.	Fields same. Sinus cured. Symptoms relieved.
M.H.	25	Chronic R & L. Polysinusitis	Probable	Nasal douchings	Attack of acute glaucoma subsided after myotics failed
R.C.	26	Chronic R & L. Antra & Sphenoid	Positive	Radical on Antra, Turbinectomy	Improvement in visual fields within three days. Antra cured.
E.H.	27	Chronic R & L. Frontal & Antral	"	Radical on all sinuses affected	Visual field contractions remain: symptoms relieved: sinus cured
A.P.	28	Acute R & L. Polysinusitis	Probable	Induction & medicinal	Subsidence of iritis & glaucoma & neuritis, recovery of vision and
S.A.	29	Recurrent acute frontal and antral	"	Nasal douche	Not observed long enough [of fields
M.H.	30	Chronic R & L. Frontal, Antra, and Ethmoid	Positive	Radical on all	Sinuses & symptoms unrelieved. Fields same

SECTION V.

ETIOLOGY AND PATHOLOGY OF OCULAR AFFECTIONS.

The Visual Fields.

At the British Medical Association Meeting in 1907, ocular affections, resulting from accessory sinus disease, were under discussion, but no mention of the visual fields was made, and Mackay in his opening paper at the same meeting in 1908, on the same subject stated that there was great need for investigation of the visual fields in accessory sinus disease.

In the literature I have not been able to find anything bearing on the subject beyond a few isolated cases where the visual fields have been recorded, and very conflicting statements by some writers that the visual fields are affected&by others that they are not.

Onodi¹ quotes Henkel as having treated twenty cases of sphenoidal suppuration without finding anything abnormal in the visual fields, and the same author goes on to say that "Ziem, Kuhnt, Henrici and Haffner in thirty-six cases of accessory sinus disease found normal visual fields, contrary to the findings of Grunwald. These facts are to be explained by the varying relations of the accessory sinuses and optic nerve."

Onodi's explanation does not seem at all adequate to me, because both sets of observers must have come upon more or less the same variations of the sinuses in their relation to the optic nerves.

Laurens² in a collective article of all the ocular signs and symptoms, states that contractions of the visual fields have been noted by Berger in 1887, Killian, Bronner and Ziem in frontal sinusitis, but he (Laurens) says "they are extremely rare."

Berger³ lays stress on the presence of concentric contraction of the visual fields as a sign of implication of the optic nerves.

1. ONODI. Optic Nerve & Accessory Sinuses, 1910.

2. LAURENS. Gazette des Hopitaux, 1895.

3. BERGER. Quoted by Parsons: Text-book of Pathology, vol. iv., 1907.

Birch-Herschfeld¹ observed in three cases of sphenoidal sinus disease, central scotoma from involvement of the papillo-macular bundle of fibres, and he believes that this bundle is always involved firstly, and that contractions of the visual fields are secondary.

He regards unilateral central scotoma, though it may be bi-lateral, as evidence of sphenoidal sinusitis in certain cases, in contra distinction to bi-lateral scotoma of toxic origin.

It is therefore evident that the opinions and statements are very conflicting.

In this series of thirty cases, I have only observed normal visual fields in three cases - a bi-lateral antral sinusitis, an ethmoidal mucocele, and a frontal mucocele - in all of which there was an adequate reason.

I find that general more or less concentric contraction is that most commonly observed, and equally in the various sinuses, whether frontal, ethmoidal, or sphenoidal, and in most cases the colours red and green are far more contracted in proportion than the white, particularly the field for green, in spite of the green used having an almost equal field to the red (vide normal charts, page 51a); and therefore the colour green is the best test for observing contractions of the fields in accessory sinus disease.

In a few cases, the fields for white have been as much contracted as have the fields for red and green, cases 5, 9, and 24 (pages 79, 90 & 123

In two cases, there was partial reversal of colours - (cases 6 and 26, pages 81 and 127), the green being more extensive than the red, but in the latter when the fields had become more extended after operation this disappeared.

As this occurred in two healthy boys showing no manifestations of hysteria, I think the explanation is that they possessed a deficiency of red perception.

This general contraction occurred in 23 cases, and the next most frequent variety of contraction was Temporal, either as a whole or in the superior or inferior quadrants, and was present in 15 of the cases. As a rule, the white, red, and green were all affected, and it occurs more frequently in sphenoidal and ethmoidal sinusitis, and in one case due to sphenoidal sinusitis there was bi-temporal hemianopsia.

1. BIRCH-HERSCHFELD. Ophthalmoscope. 1908.

Altitudinal contraction occurred in 8 cases. All the colours were affected and the inferior field was affected in four cases, the superior in three, and superior and inferior in one. It seems to be as common in the posterior group of sinuses as in the anterior, excepting the antrum, in which it has not occurred.

Where contractions occur, whether general, temporal, or altitudinal, they are always more marked for colours, with one or two exceptions for red and green.

In one case - case 2, page 64 - there was only a small island of vision in the temporal field. This island field of vision occurred in a case of sphenoidal sinusitis with choked disc, which had presumably been present for two-and-a-half years, and can only be explained by supposing that the sphenoidal sinus was so situated anatomically as to lie in relation to the temporal side of the nerve, but even then it is surprising that any one portion of the nerve should be less affected than another in so chronic a condition.

Central negative scotoma only occurs three times, and in only one of these - case 3 - from involvement of the papillo-macular bundle, in the other two, one was due to syphilitic chorio-retinitis, and the other to guttate macular chorioiditis. In the one case it was relative for red and absolute for green.

This rarity of central scotoma, contrary to the findings of Birch-hersfeld, I believe is due in part to the fact that there have been so few acute cases - by acute, I mean, acute onset of ocular symptoms, and also acute sinus affections - and partly from the etiological cause, vide page 146

Does any particular variety of field correspond to a particular sinus? Bi-temporal hemianopsia, of which I record one case (case 1) - is, I think, a characteristic of sphenoidal sinusitis, but Onodi says theoretically it is possible for it to be due to posterior ethmoidal sinusitis. It is rare, and only two cases have been reported, one by Redlich quoted by Fish (1) of which there are no details, and the other by Jameson Evans (2), in both of these the sphenoidal sinus was at fault, as in my own case.

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1. FISH. Loc.cit.
 2. JAMESON EVANS. Ophthalmoscope. 1908.

Bi-temporal contraction more or less marked has been noted by Glegg and Hay (1) in a case of sphenoidal sinusitis; and in my own series it occurs 8 times:- 4 times in right and left sphenoidal ^{sinusitis} - cases 1, 3, 6, 7. once in right and left sphenoidal and posterior ethmoidal - case 5.

twice in polysinusitis - (right and left sphenoidal in both) - cases 23 and 28.

once in right and left Frontal sinusitis - case 13.

Thus, in seven of these eight cases, sphenoidal sinusitis was present.

Other than bi-temporal it is impossible to say because so many of these cases, and those reported by others, are cases of polysinusitis.

The visual fields with the exception of central scotoma are much the same in character in the acute and chronic cases, though their mode of onset and prognosis are different.

The effect of the treatment of the accessory sinuses upon the visual fields is disappointing in most ^{chronic} cases, (knowing the great benefit usually resulting to the gross ocular conditions) for even when the associated optic neuritis, so often present, is cured, the fields do not become much extended in many cases; but in some of the acute cases the effect of treatment is marvellous as in cases 1 and 3, pages 53 and 71, and of the chronic cases - 2, 7, and 26, pages 64, 84, and 127, are examples of rapid recovery after operation.

A few cases are worse after treatment, notably case 9 and 23, pages 90 and 120

The explanation of the former is that the majority are chronic cases unassociated with any serious ocular or nasal trouble to call the patient's attention to the condition until the toxins have been acting a very long time and have caused permanent damage to the nerve fibres, and if not permanent the recovery is so slow that in the majority of cases I have not been able to observe it: whereas, in the acute cases - nasal or ocular - the patient's attention is drawn to the condition and treatment is at once instituted, and as a rule with markedly beneficial results.

And also the cavities in chronic cases often continue to secrete pus for a much longer time after the gross symptoms of headache or neuritis have disappeared and it is just possible that sufficient toxin may percolate through as to stay the complete recovery, and keep up the visual field contraction. This may be the explanation of case 1, page 59a, of the persistence of bi-temporal hemianopsia for green and

1. GLEGG & HAY. Lancet. 1905.

not for white and red because green is the most delicate perception and the attenuated toxin has just sufficient power to keep this up, or it may be that the damage to the nerve was such that its most delicate perception is permanently damaged.

In those that have been worse, probably in case 9 the lowering of the general health - increasing anaemia on the heart disease - had something to do with the contraction.

In others, as in case 23, where there was slight neuritis afterwards, probably some passive oedema in the orbit and periosteum around the canal causing slight pressure on the nerve, was the cause, for we know that after all surgical procedures there is some oedema afterwards lasting for a longer or shorter time according to whether it is simply paralytic or septic in origin. Therefore we ought not to be surprised at the vision being worse after operation on these septic cavities, particularly in the posterior group.

Fracture of the optic canal does occur during operations - Killian, and Kronlein in particular - but the symptoms produced are sudden loss of sight and a hemianoptic field of vision, but this has not happened in any of my cases.

The Etiology of Visual Field Contraction.

The general health - profound anaemia, etc - may undoubtedly cause visual field contraction as before mentioned, and then it is usually due to fatigue of the retina.

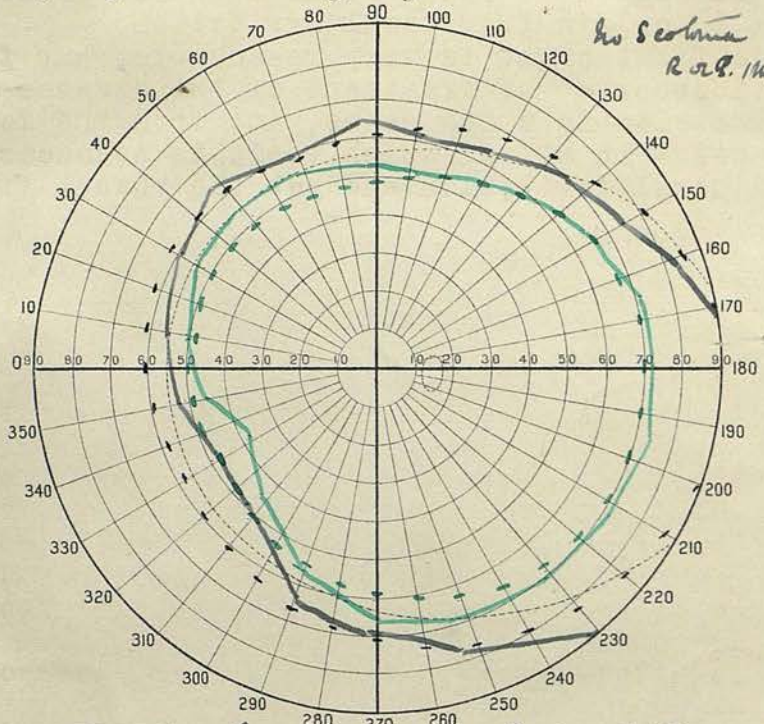
Another cause in sinus affection, apart from post-operative swelling which has already been mentioned, is oedema within the optic canal and this is the cause of sudden and rapid blindness in the acute (sinus and ocular) cases, and which is of course associated with rapid contraction of the visual fields. Cases 1, 2 and 3 (pages 53, 64 & 71) are examples of this in all probability. We must remember that the contents of the optic canal accurately fill that structure.

Gross neuritis also causes visual field contraction, but the most important visual field contractions which occur in eyes in which there are no ophthalmoscopic changes observed, or those in which the changes observed are quite inadequate to produce the visual field contractions, and it is these cases which I believe are toxic in origin.

Light = good

A
Right Eye

Field White = 5 M. W. Sq.
Field Green = 5 M. W. Sq.
No Scotoma
R. or G. 1 M. W. Sq.



Name *Esther Jay*
Priestley Smith's Perimeter.

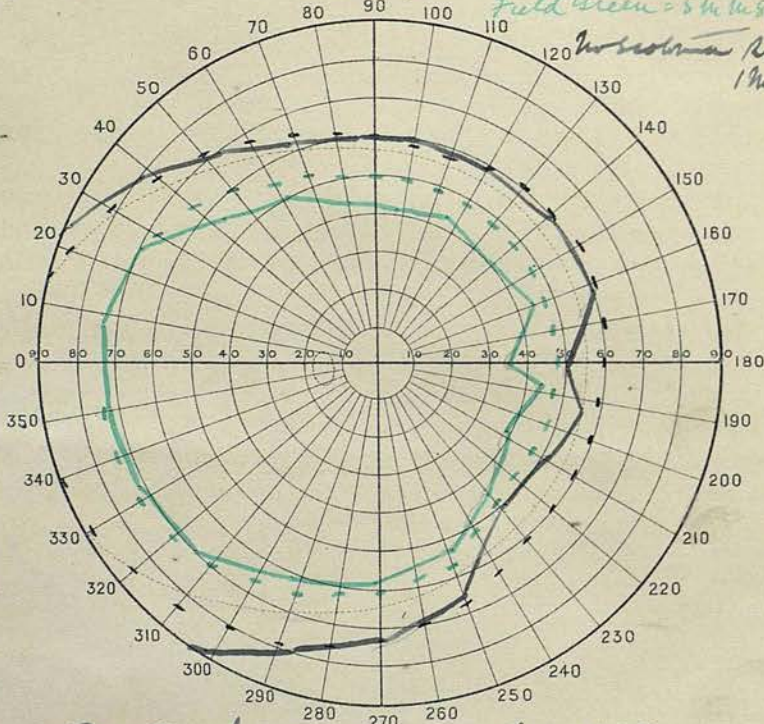
Date Feb 9th 10.

Curry & Paxton.

Light = good

A
Left Eye

Field White = 5 M. W. Sq.
Field Green = 5 M. W. Sq.
No Scotoma
R. or G. 1 M. W. Sq.



Name *Esther Jay*
Priestley Smith's Perimeter.

Date Feb 9th 10.

Curry & Paxton.

Before, however, describing the manner of action and origin of these toxins, I would mention that I have heard it suggested that visual field contractions are reflex in origin from nasal irritation.

This at first sight is very reasonable, but from the results observed of treatment of the sinuses upon the visual fields in a few cases, and from the following six cases - in all of which there is necessarily marked nasal irritation and yet the visual fields are normal, it is negatived.

Case 1. Recurrent polypi on both sides, with chronic rhinitis but no sinus affection - Full visual fields.

Gertrude J. Aet.22.

Has had polypi removed several times within the last six years.

During the past three months she has been unable to breathe through her nose, and has had a constant nasal discharge and into the back of the throat. The middle turbinals are greatly enlarged and the nasal cavities are blocked on each side by polypi, and there is a great deal of pus.

There is apparently no disease of the accessory sinuses.

The Eyes are healthy in every way, and the vision $\frac{6}{5}$

Visual Fields full, page 143 a.

Case 2. Very marked septal deviation, blocking up of one nostril, enlarged turbinal and rhinitis.

Albert B. aet.14.

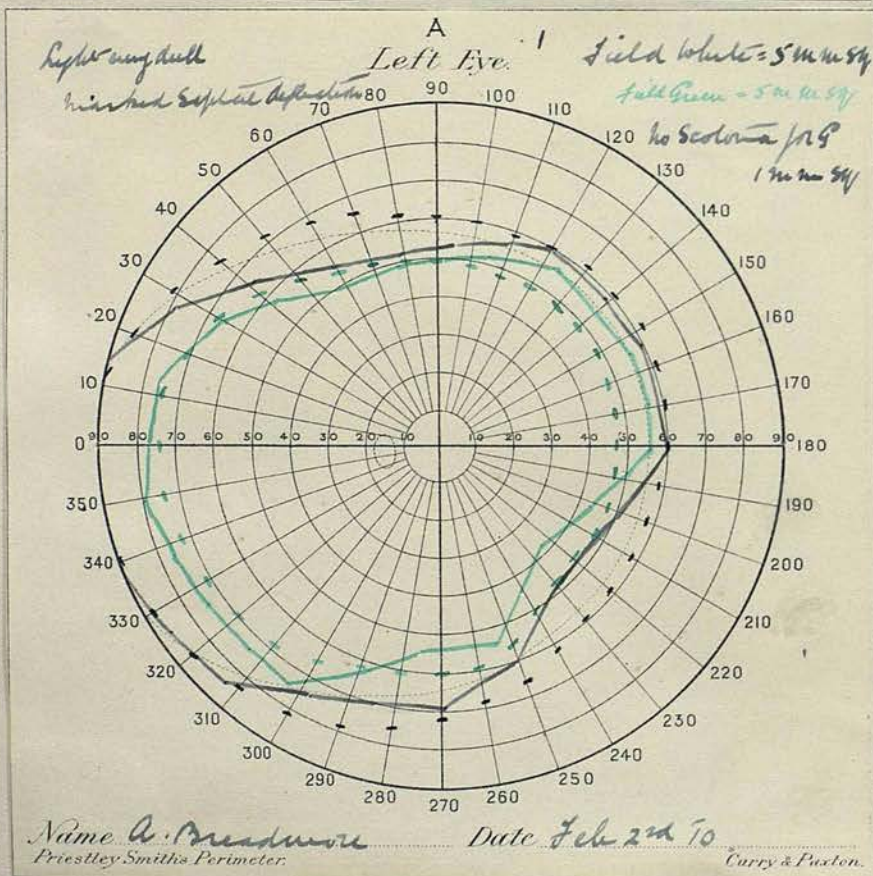
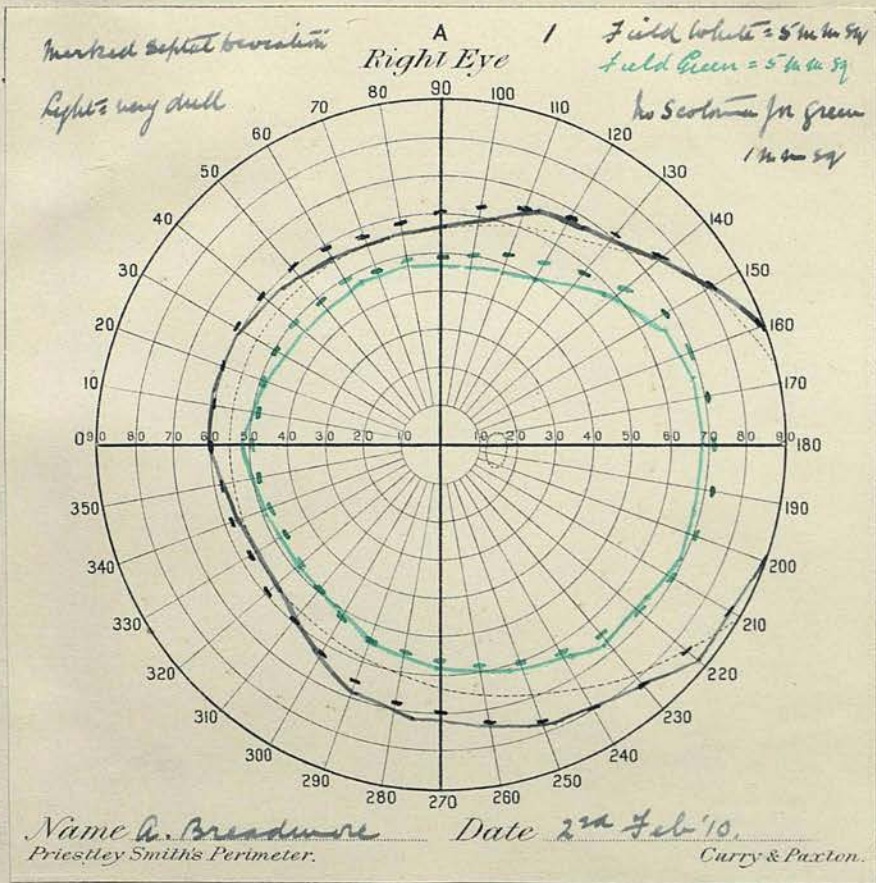
Has suffered from obstruction of the nose for several years past.

The septum is so bent to the left as to cause almost complete obstruction, and the left middle and inferior turbinals are so enlarged as to fill up the hollow of the septal deviation.

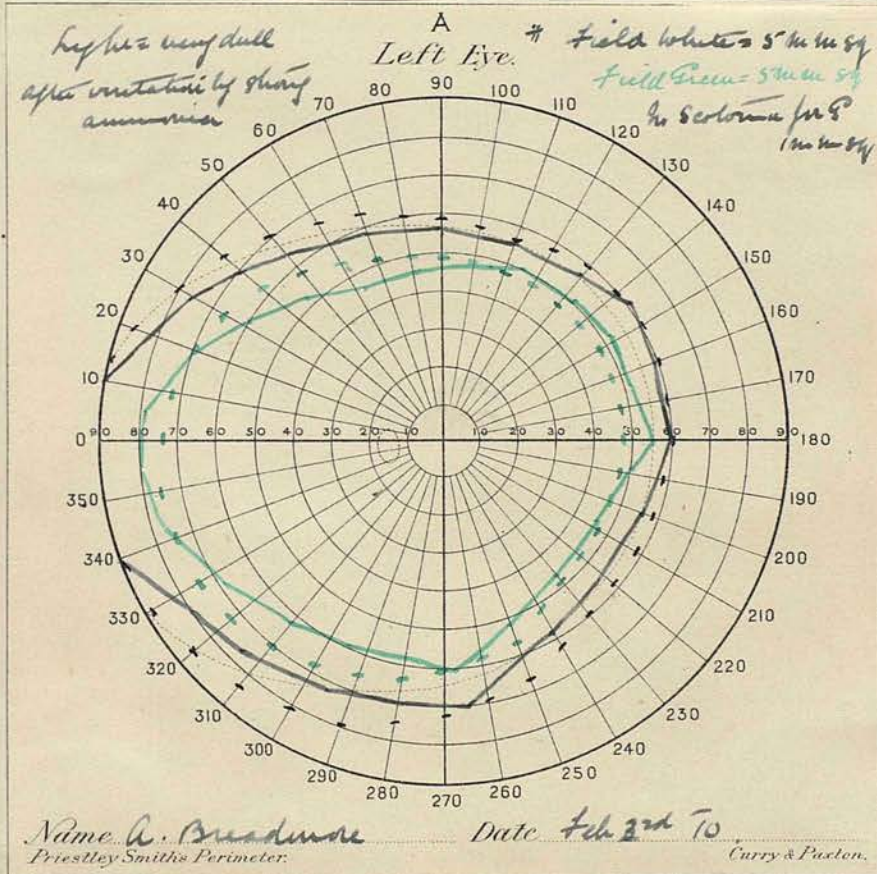
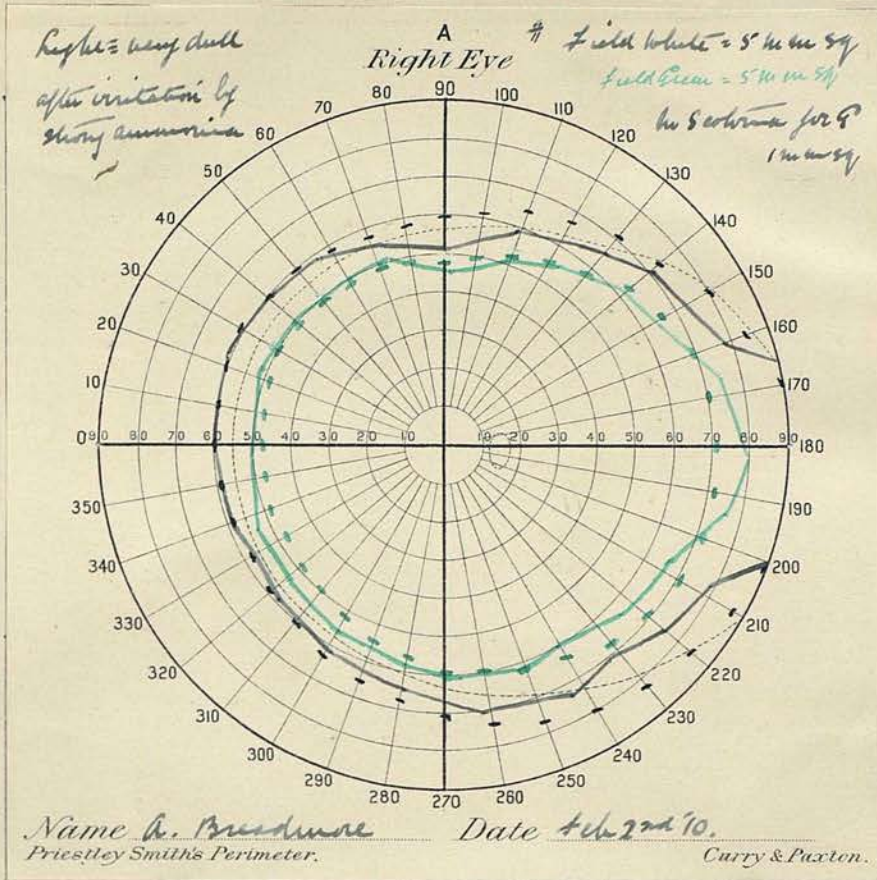
The Eyes are healthy in every way.

Visual Fields, full. Page 144a.

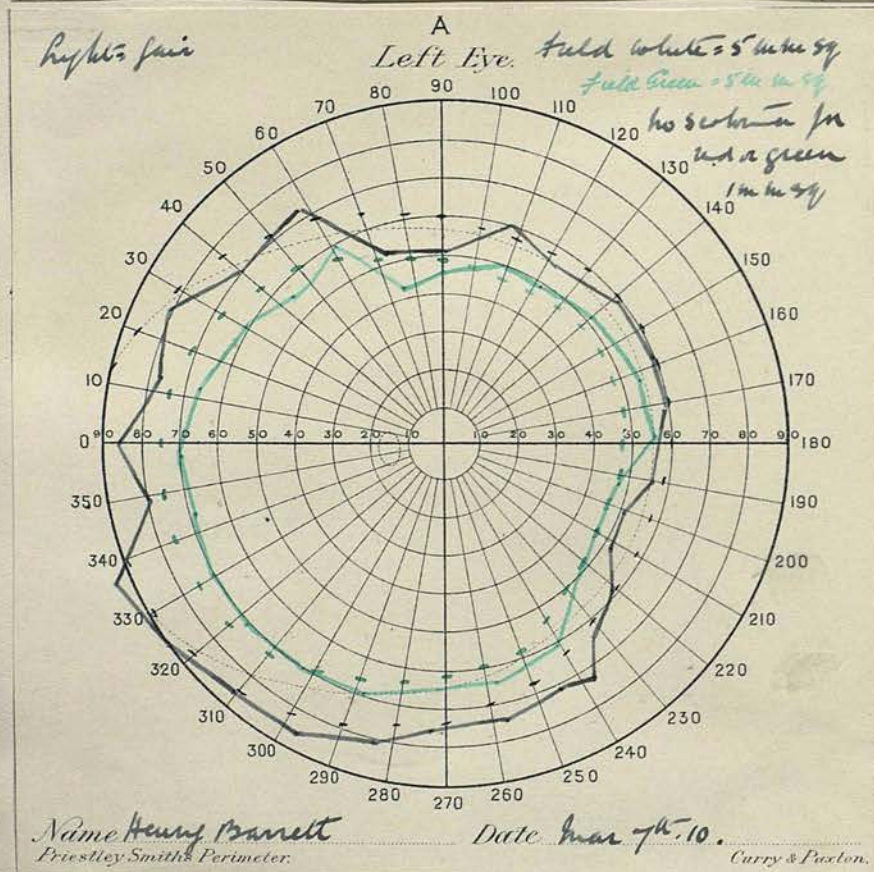
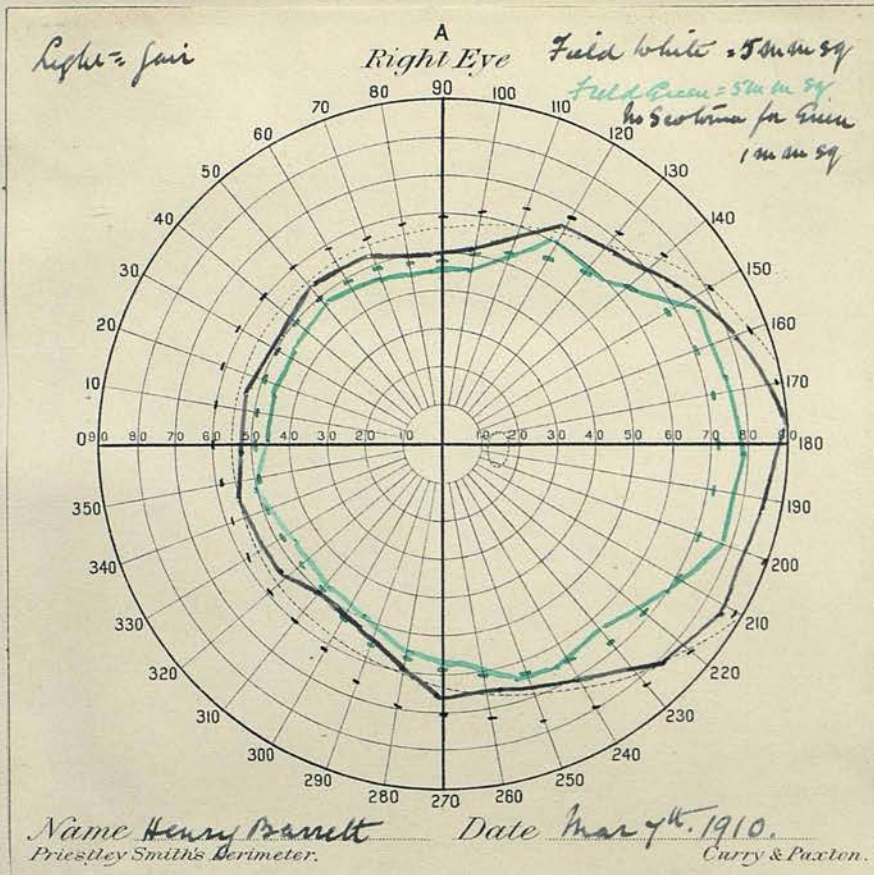
After taking the visual fields, I repeatedly irritated the nose by fumes of strong ammonia, avoiding as far as possible lachrymation, and again took the fields, and found them unaffected, page 144b.



Visual fields before irritation by ammonia.

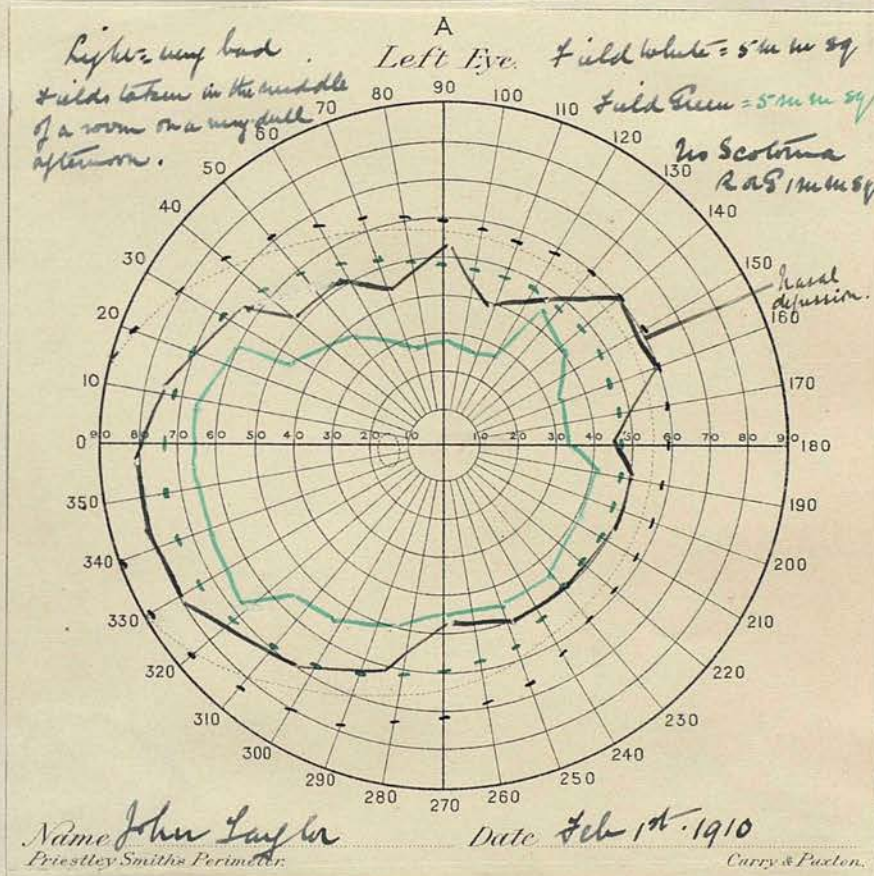
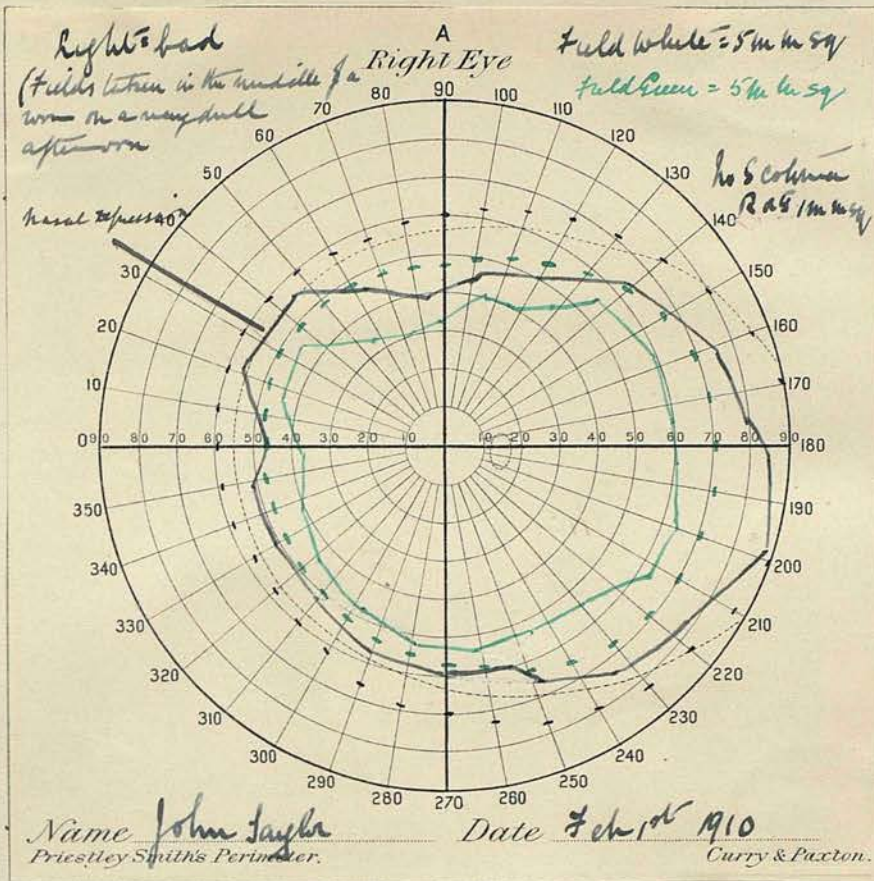


Visual fields after irritation by ammonia.



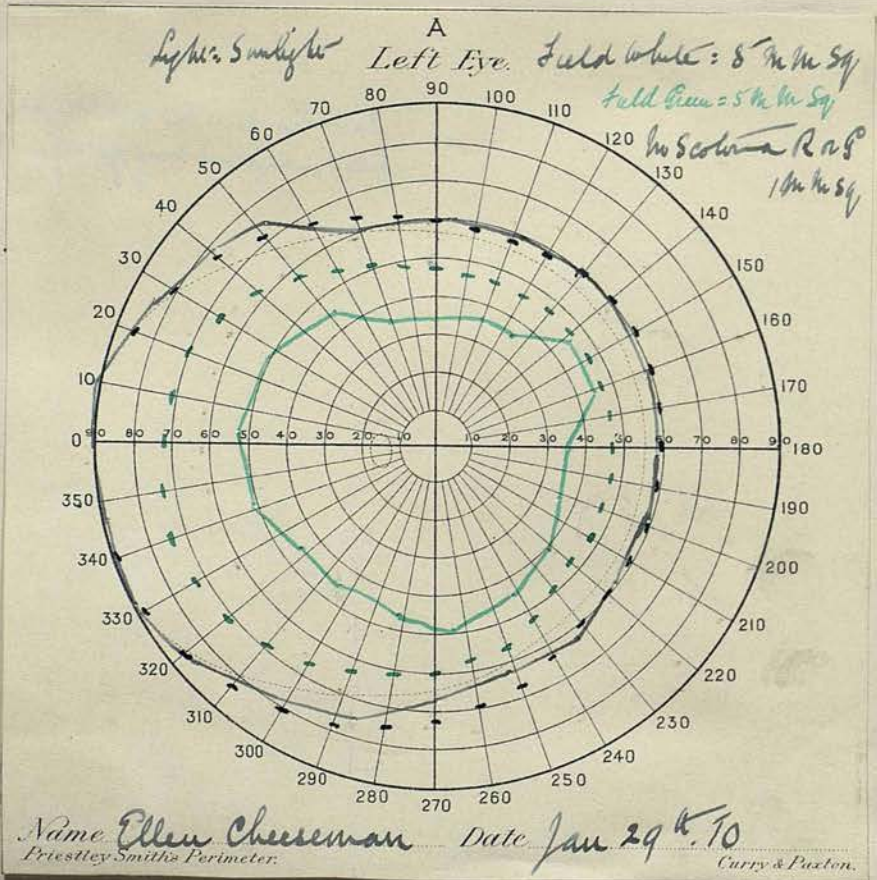
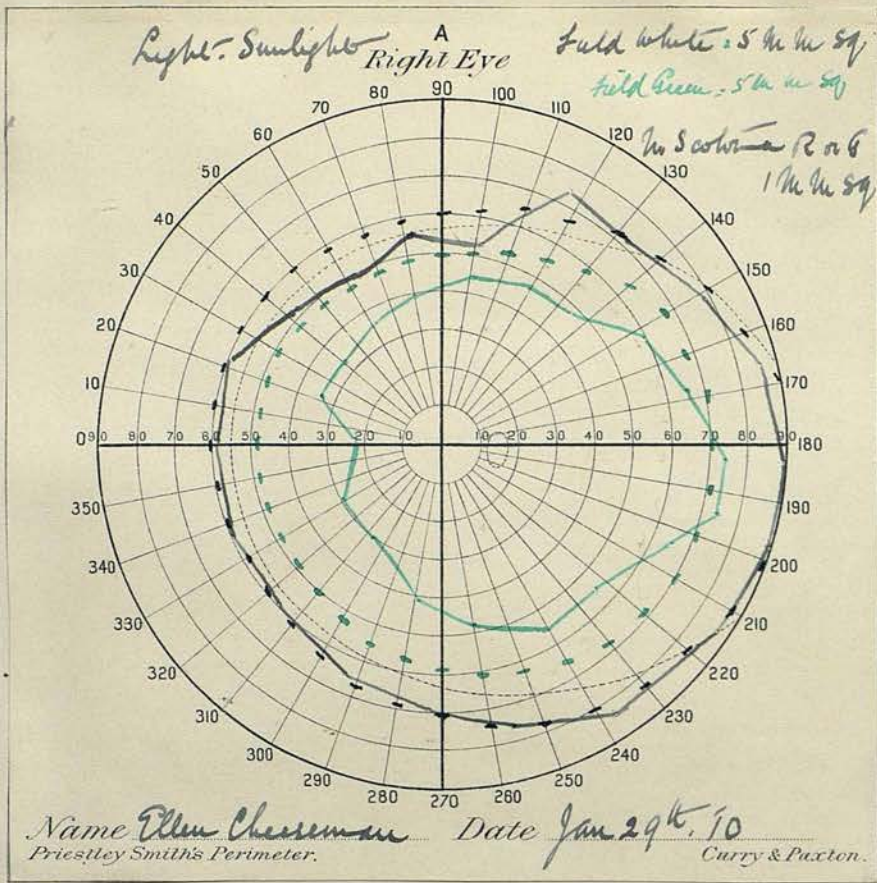
Case 3. Henry B. No 12 in text. Page 97

Left Frontal Mucocoele with proptosis. Fields full.

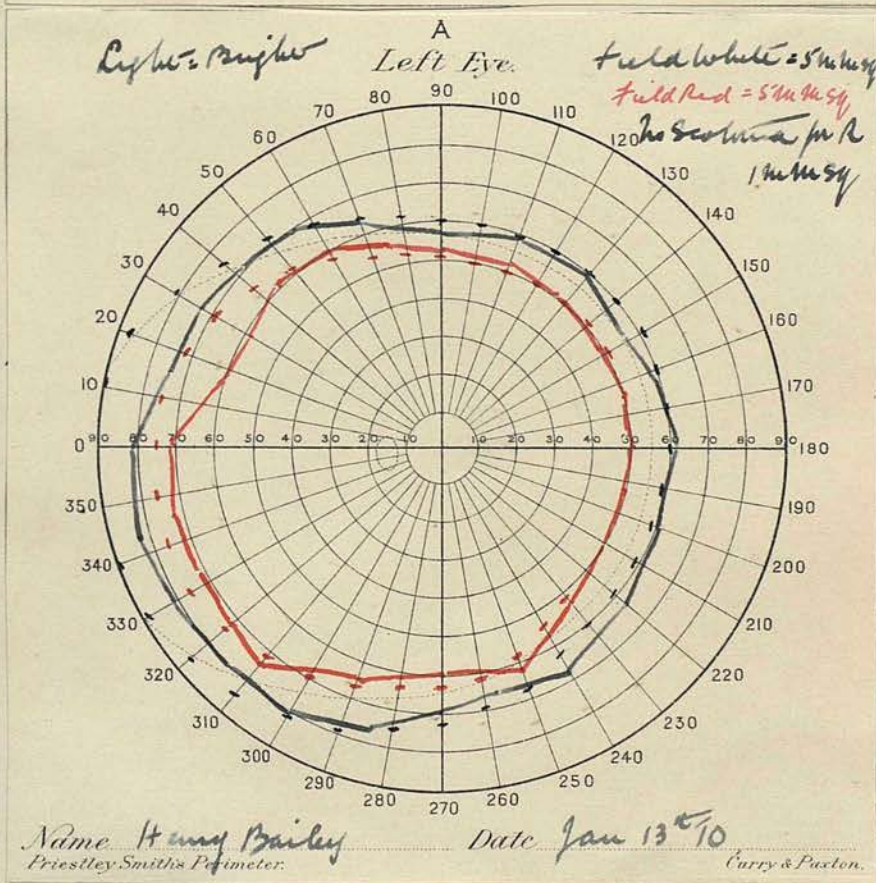
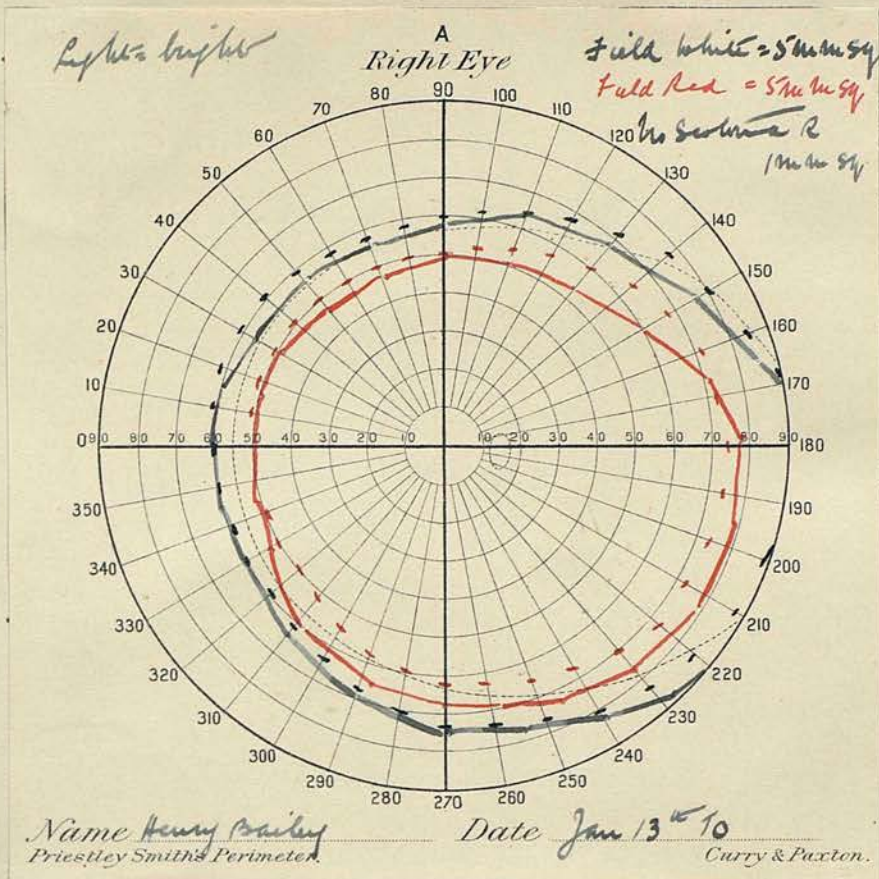


Case 4. John T. No 11 in text. Page 95

Mucocele of left ethmoidal cells. Allowing for the extremely bad light, the visual fields are full.



Case 5. Ellen C. No 17 in the text. Page 108
 Chronic Bi-lateral Antral Suppuration.
 The contraction for green is only apparent, and is due to poor colour perception for green.



Case 6. Henry B. No 16 in text. Page 106
Acute left antral suppuration with necrosis.
The right field is full, the left is slightly contracted in the
temporal field.

Now in all these cases there has been nasal irritation of necessity, and in none has there been any pathological contraction with the exception of the last (Right full, left contracted from toxin); it is therefore clear that nasal irritation alone is not capable of causing visual field contractions, and I believe it is due to the localised toxin, and I find that Johnstone (1) explains the production of certain reflex troubles by soakage through of the toxins, and Birch-Herschfeld (2) the production of central scotoma.

As to how the toxin spreads from the sinus is for the most part problematical, but Ortmann (3) has observed an acute sphenoidal sinus suppuration which caused extra dural abscess and cavernous thrombosis in which he was able to trace microscopically diplococci directly invading the mucosa and periosteum and bone of the sphenoidal sinus.

And Hajek (4), in a case of ethmoidal suppuration leading to meningitis, traced portions of the thrombosed veins to the meninges, showing the probable venous carriage of infection; and presumably, the lymphatics may also so act as carriers.

Although the cases of Ortmann and Hajek only trace the infection to the meninges, yet the venous and lymphatic connections with the orbit and sinuses are far more intimate than to the dura mater, so there can be little doubt of these paths of infection to the orbital contents also.

But I think the effect on the orbital contents and the optic nerve in particular is very often by a soakage through the thin walls into the orbit and acting directly upon the nerve, especially in the

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1. JOHNSTONE. Ophthalmoscope, April, 1908.
 2. BIRCH HERSCHFELD. Ibid.
 3. ORTMANN. Virchow's Archiv, Bd. CXX.
 4. GRAEF. Saemisch Handbuch, 1907.

chronic cases. Although there is no proof of this yet it is very probable, because the wall is very thin and often dehiscant, and in these chronic cases the mucosa is often atrophied, and this is a further aid to the passage of toxins. In the closed sinuses with the pus under pressure still more likely would toxins be to filter through.

Central Scotoma is generally due to some toxic agent, and Birch-Herschfeld lays stress on central scotoma being usually present. I agree with him as to the toxic origin of these central scotoma, but not as to frequency, for in this series there is but one case, regarding the toxin as percolating through the wall this is what one would expect because excepting near the globe the papillo-macular bundle is central in position and is protected by the more peripheral fibres, and in accordance with this I find peripheral contraction of the visual fields to be commonest.

And again the frequency with which the temporal fields in sphenoidal sinusitis are contracted shows the same point because that means the nasal side of the nerve is at fault, and this is the part of the nerve in most intimate relation to the sinus wall, and therefore the part most affected by toxin.

Whereas, if the toxin were conveyed by the blood stream - as in the case in tobacco poisoning - the whole nerve is equally affected, but the most delicate part - the papillo-macular bundle - is the first to show it by central scotoma and only later peripheral contraction occurs.

In acute cases where the mucosa is not atrophied or cicatrised and is very vascular, it is possible that the toxin is absorbed by the blood-stream and then is observed central scotoma, but more probably this is brought about by pressure in the canal, as I have already mentioned - although the whole nerve is compressed, the central fibres being more delicate are the first to respond.

In case 17, there are full visual fields associated with a chronic bi-lateral antral sinusitis, and I believe that this is because the subject was a child of 14 years, at which age the cavity has not finished developing and has therefore thick walls, through which toxins do not readily pass, (which is also in favour of a filtration passage). Cases 5 and 6 show primary atrophy, but particularly of the papillo-macular bundle, which points to a toxic origin.

The two cases 11 and 12, pages 95 & 97, were mucocoeles and showed no visual field contraction. It is established that mucocoeles are sterile, and therefore presumably free from toxin, which also points towards the toxic origin of visual field contraction.

The visual fields may also be contracted from pressure exerted by fluid poured out within the vaginal sheath of the optic nerve as the result of irritation by the toxin upon the endothelium (vide page 148 as is seen in case 23, page 120.

Optic Neuritis and Atrophy.

There have been a considerable number of isolated cases of optic neuritis and atrophy reported in the literature resulting from accessory sinus disease, and Fish (1) has given an excellent series of cases. He examined 32 consecutive cases of so-called idiopathic optic neuritis which occurred in his practice with regard to the nasal condition and found definite evidence of sinus affection in no less than 26 cases, and of these he was able to prove the definite causal relation in 15.

Optic neuritis as a result of sinus affection is present in this series of cases 8 times, or just over 25 per cent., and optic atrophy (primary) twice. So that optic neuritis very commonly accompanies sinus disease; but the presence or absence of neuritis is not always a guide to the intensity of the sinus affection, because cases have been recorded by Jessop (2), Onodi (3), and others where the sphenoid bone has necrosed, and frequently the ethmoid cells in which no neuritis has occurred, and in other cases intense neuritis occurs - case 1, page 53 - and comparatively little involvement of the sinus.

Neuritis is more likely to occur when the sinus is closed.

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1. FISH. Loc. cit.
 2. JESSOP. Transactions of the Ophthalmological Society. 1903.
 3. ONODI. Loc. cit.

Jessop (1) has recorded two cases of recurrent orbital cellulitis and abscess formation resulting from necrosis of the ethmoid and sphenoid, both terminating fatally without any intra-ocular manifestations; and Knapp (2) records a case of sphenoidal suppuration which caused meningitis and death, and yet caused no neuritis.

However, neuritis is usually a guide and also some aid in the diagnosis of the particular sinus affected.

The cause of the neuritis depends somewhat on the kind observed - Fine neuritic haze, gross neuritis, choked disc, and retro-bulbar.

Thus the fine neuritis, I think, is very possibly due to a Hydrops Vaginae Nervi Optici, because the ophthalmoscopic appearance is the same as presented in that condition, and it seems reasonable that the toxins filtering through into the orbit should be carried by the free lymphatic connections (page 29) into the vaginal lymph space and by the irritation of the endothelium lining cause outpouring of fluid and pressure upon the nerve.

Examples of this condition are, I believe, seen in cases 7, 17 and 23 (pages 84, 108 & 120)

Choked disc or better Papillo-oedema (Parsons) only occurs in case 2, page 64, and I have not come across any report of a similar case.

The site of the lesion here is in the optic canal where any inflammatory swelling must necessarily cause strangulation, and as I have elsewhere pointed out (page 37) the canal is of some length and its walls thin or dehiscant.

Choked disc was formerly thought to be pathognomonic of intra-cranial growths or inflammation in spite of operations and post mortems often proving the cranial contents healthy.

Gross Neuritis - a neuritis associated with swelling of the disc, haemorrhages, or exudate - is fairly common, cases 1 and 3, pages 53 & 64 being examples, and numerous cases have been reported in the literature.

Gross neuritis may arise far back on the nerve, and doubtless often within the canal and descend the nerve and appear ophthalmoscopically as such, or further forward. Doubtless some of those observed in affections of the anterior group of sinuses are due to inflammatory oedema or periostitis travelling backwards to the optic canal and there affecting the nerve, or to the toxins escaping and affecting the nerve directly.

The fine hazy neuritis apparently only occurs in chronic affections, but gross neuritis and papillo-

1. JESSOP. Transactions Ophthalmological Society, 1903.

2. KNAPP. Knapp's Archives of Ophthalmology, 1903.

oedema occur in both acute and chronic sinusitis. Choked disc probably only results from either sphenoidal or posterior ethmoidal sinusitis, but the fine and gross neuritis may result from any or all of the accessory sinuses, though most frequently from the sphenoidal (Onodi) owing to its position, and least frequently from antral suppuration because the roof is thick, and is necessarily the last part to be affected owing to the antral cavity having to be full before the pus is in contact.

Direct pressure from bony expansion of the wall is probably a rare cause of neuritis, because we but seldom see bony expansion, excepting from tumour growth and mucocoeles, both of which are uncommon. Bony expansion occurred in both mucocoeles, cases 11 and 12, pages 95 & 97, but no neuritis; Case 15, page 104 was a sarcoma of the antrum and post neuritic atrophy was present.

Retro-bulbar neuritis, according to Birch-Hirschfeld, is most commonly observed and he records three cases occurring in sphenoidal suppuration, and it probably is in post influenza sinusitis, (vide infra). I have, however, only seen it in one case - the right eye, case 1.

Optic neuritis was not present in either of my two cases of mucocoele, and I have not seen any report of its occurrence in that condition; and unless due to expansion and pressure it is ^{not} to be expected, for they are sterile.

A remarkable fact in regard to all forms of neuritis resulting from accessory sinus disease is the power of recovery, even after the neuritis has been present for years, and in some cases where the vision has been entirely abrogated for a prolonged period, recovery may be complete.

In some cases, the process is so acute that complete blindness results in twenty-four hours, and yet under suitable treatment vision is rapidly restored as is also the physiological condition.

Fish (1) records ^{The case of} a young man of twenty who had suffered from bi-lateral optic neuritis for three years with proptosis and muscular error, and which after operation rapidly returned to normal, and he quotes a similar case of Risely's.

In case 1, page 53, the patient had become blind in each eye in the course of a few days and remained so for more than three weeks with optic neuritis, haemorrhage and swelling of the disc + 6 D, and yet finally recovered with central vision of $\frac{6}{12}$ and $\frac{6}{9}$ in the two eyes.

And again in Case 2, page 64, papillo-oedema had

been probably present for two and a half years in the one eye and one and a half years in the other, and vision was restored after ten days of treatment from hand-movements to $\frac{6}{36}$, and later three weeks after operation on the sinus from perception of light to $\frac{6}{12}$.

These and other cases show that the toxin may be temporarily very virulent, and act very quickly and produce very severe optic neuritis (ophthalmoscopically) and last for a long time with complete or almost complete recovery if the cause can be removed.

The neuritis present does not act as a mere block in the conducting paths for in these as in other cases we not infrequently observe good vision along with a severe neuritis (e.g. the right eye in Case 2) and in others with but slight neuritis the vision is very severely disturbed.

Opportunity does not often present for histological work in these cases, but Bartel(1) has cut serial sections of the whole of the nerve in a case of orbital abscess secondary to sinus disease, he found it pink in section and microscopically infiltrated with leucocytes and much overgrowth of the glial tissue, and in one part actual necrosis.

It is interesting to compare the toxin in these acute cases with atoxyl, quinine and salicylic acid in toxic doses, which rapidly produce loss of central vision and in some cases complete blindness. In these cases, if the administration of the drug be immediately ceased the vision seldom recovers completely and generally some atrophy of the nerve ensues, and if it be continued, permanent blindness results.

And again the more chronic cases with tobacco poisoning, in which the nicotine poison is administered over prolonged periods. This latter acts firstly upon the central fibres causing scotoma and great reduction of vision, and later upon the peripheral fibres causing contraction of the field.

If this toxin be cut off completely, vision and the visual fields are usually completely restored, but if it be continued even in small doses, complete recovery does not take place.

Of all these four examples none possess the power of causing neuritis, in addition to poisoning the nerve fibres, as the toxin of sinus affections can, presumably because they are not of microbic origin.

1. BARTEL. Archives of Ophthalmology, 1908.

The probable reason of recovery in sinus affections and not in atoxyl, etc., is that the former is purely local and therefore is more easily and completely eliminated than the latter - which are general toxins; or it may be that the atoxyl group combine with the protoplasm of the nerve similarly to tetanus toxin.

More or less complete recovery does not always take place, and atrophy in some degree results; thus, primary atrophy is observed in cases 5 and 6, pages 79 & 81 and some post-neuritic atrophy in cases 1, 15, and 28, pages 53, 104 & 130; but during the year that I have had cases 1 and 28 under observation this has not progressed.

As to whether optic neuritis is uni-lateral or bi-lateral? Onodi says "unilateral neuritis is characteristic of sinus affections, and bi-lateral of cerebral conditions"; not unfrequently, however, the neuritis of intra-cranial disease is unilateral, and in this series of cases it is present as bi-lateral in seven out of the eight cases, and the two cases of optic atrophy were bilateral.

I think the reports of cases are more frequently of bilateral than unilateral, and remembering Onodi's work proving that one sinus in the posterior group is frequently in relation to both nerves, and the frequency with which one observes bilateral sinusitis, it is what one would expect.

Affections of the Uveal Tract.

Affections of this portion of the eye from accessory sinus disease are uncommon and are difficult to trace in their causal relation to sinus affections.

Fish (1) has related an undoubted case in which there was irido cyclitis and in which the keratitis punctata and vitreous opacities rapidly cleared up, and another case of choroido-retinitis; and Fromagat (2) had a case of iritis which resisted all treatment until the antral sinuses was treated.

Case 28, page 130, is, I believe, an example of irido-cyclitis due to post-influenzal sinusitis;

And case 4, page 76, is a bi-lateral choroiditis apparently due to sphenoidal and ethmoidal sinusitis on each side.

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1. FISH. Journal of Laryngology, Rhinology, & Otolology, 1907.
 2. FROMAGAT. Annales de l'Or et du Larynx, 1894; quoted by Laurens, Gazette des Hopitaux, 1895.

In thirty cases, therefore, there were only two affections of the uveal tract apparently the result of sinus affection (excluding retinitis in association with and due to neuritis.)

In one of this series, there was disseminated choroiditis (case 8), and in case 19 there was retinitis proliferans, but the former was certainly due to syphilis, and the latter probably resulted from an injury.

Logan Turner (1) says that when the globe in sinus suppuration is affected it points strongly to involvement of the anterior group of sinuses.

The infrequency of uveal affections, in spite of a very rich blood-supply and the frequency with which such affections - iritis, choroiditis, retinitis - are seen in general disease is probably due to the globe being surrounded and separated from the sinuses by a thick pad of fat and particularly thick around the part where the vessels (ciliary arteries) enter, into which toxins would have to gain ingress before they could be carried in to affect the uveal tract.

G l a u c o m a .

Both Primary and Secondary glaucoma have been reported as the result of accessory sinus disease.

Fish has reported two undoubted cases of primary and secondary glaucoma, in one of which treatment by myotics failed completely, but the case was cured by treating the frontal sinus. He states that he believes that glaucoma is very frequently started by sinusitis, and that in chronic glaucoma iridectomy does not cure because of chronic venous stasis from a chronic sinusitis, but in acute cases the iridectomy tides over the period of venous congestion and cure is the result.

Case 28, page 130, is apparently a secondary glaucoma from irido-cyclitis due to polysinusitis; and case 25, page 125, is a primary glaucoma, in which treatment of the nose caused an acute attack to subside after myotics had failed.

The Pathology of glaucoma is not known, but we do know that acute attacks are excited by causes which stagnate the outflow from the globe, and sinusitis with its

1. LOGAN TURNER. British Medical Journal, 1908.

associated engorgement of the orbital contents should be such a factor par excellence.

Blockage of the Central Artery of the Retina.

There has apparently been no case recorded in the literature of blockage of the central artery of the retina as the result of sinus affection, but there is a report by Jessop (1) of bi-lateral obstruction, which he suggested was due to a bi-lateral haemorrhage into the nerve sheath, but the veins were unobstructed, and the eye recovered to $\frac{6}{36}$ of vision, but the other remained

blind. No mention is made of any sinus symptoms, but to me a bi-lateral sphenoidal sinusitis is a much more probable explanation.

And Story (2) has reported two cases of unilateral obstruction, as in Jessop's case, with all the signs of embolus, and in which vision recovered in the course of a month from hand movements to $\frac{6}{6}$.

In one of the cases there was the history of onset after a severe cold which points to a sinus origin.

As I have pointed out in the anatomical section, page The explanation of Case 1, page 53, and similar cases, is that the central artery arises far back in the orbit and sometimes within the optic canal. Any pressure by inflammation within the nerve is felt by the veins long before the artery, and in this case and those by Jessop and Story, the central veins were not obstructed, so that the only place where this can occur is far back in the orbit where the two vessels run separate courses.

In case 1, it was due to the toxins from a sphenoidal sinusitis causing an inflammatory oedema of the arterial walls causing complete obstruction of the blood flow. (The arteries upon the disc were thread-like). The ophthalmoscopic appearances in this case did not show oedema of the retina, because there was collateral circulation.

The inverse increased calibre of the arteries (vide drawing, page 53) in a case of embolus has been observed by Lawson (3) in an even more marked degree.

1. JESSOP. Transactions Ophthalmological Society. 1900
2. J.B.STORY. Ibid., 1899.
3. LAWSON. Ibid., 1898.

It is stated that the arterial coats are thickened upon the disc, and if this be a fact, it explains why this inverse calibre should occur, because a collateral circulation would only be a feeble stream which would have insufficient power to distend such vessel coats.

Doyne (1) states that this is usually observed in cases of embolism of the central artery in which some circulation is restored.

As to where and how collateral circulation takes place I can offer no explanation, excepting that it seemed to be in the ciliary region.

There was no opportunity of knowing whether the collateral circulation was sufficient for good vision, as vision was lost from retro-ocular neuritis.

H i p p u s .

Expecting to find retro-ocular neuritis in frequent association with sinus affections, I also expected the condition of hippus would not be infrequent; and it was present ~~in~~ no less than 6 times, or about 20 per cent., though the retro-ocular neuritis was present but once.

By Hippus, I mean a very marked exaggeration of the normal pupillary reaction to direct stimulation. When the pupil is stimulated by direct light it shows slight oscillations of dilatation and contraction, finally remaining entirely contracted; in hippus the pupil excursions are very marked, and finally comes to rest contracted.

Fuchs (2) states that it is very difficult to draw a line between the normal physiological or increased physiological and true pathological, and that many people do not consider the latter exists.

Damasch, quoted by Swanzy (3), finds an increased hippus in multiple sclerosis, acute meningitis, and apoplectic attacks, and regards it in the same manner as increased tendon jerks in those conditions.

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1. DOYNE. Transactions Ophthalmological Society, 1900
 2. FUCHS' Textbook of Ophthalmology. 1907.
 3. SWANZY & Werner. Ophthalmology. 9th Edition.

Others have found it in post neuritic atrophy and retro-bulbar neuritis.

It occurs in cases 1 and 3, pages 53 & 71, the former being post-neuritic atrophy, and the latter a gross neuritis; and in cases 13, 17, 18 & 30, pages 99, 108, 109, & 136 in these four there were ^{No} ophthalmoscopic changes and no signs of retro-bulbar neuritis.

In cases 13 & 17, instead of the pupils coming to rest in the contracted state, they were widely dilated, which I confirmed on several occasions.

I have not seen any mention of the hippus pupil reaction in any reported case, nor can I give any explanation.

Muscular Imbalance.

Cases have been reported very frequently of this condition, either from Paresis or Paralysis.

I investigated with Maddox rod every case, and very frequently observed slight degrees of hyperphoria, exophoria and esophoria, but in seven cases there was a marked degree of imbalance - cases 3, 10, 12, 13, 18, 21, and 23. (vide table 2)

In case 3, page 71, whilst the patient suffered from central scotoma there was a marked external strabismus, but when the scotoma disappeared it was found to be the development into actuality of a latent external strabismus, usually associated with myopia.

Case 10, page 93, occurred in a bilateral sphenoidal sinusitis, the hyperphoria being apparently merely coincident.

Case 12, page 97, the hyperphoria was due to expansion of the bony wall by a frontal mucocele.

Case 13, page 99, was post operative, from involvement of the pulley in a Killian's operation.

Case 18 was a latent concomitant internal strabismus.

Case 21, page 117, There was weakness of the left inferior oblique and the left antrum was diseased. The inferior oblique is in direct relation to the roof of the antrum.

In case 23, page 120, weakness of the right inferior rectus was detected requiring a 3° prism to correct, this disappeared after operation upon the sinuses affected, of which the right antrum was one.

So that cases 3, 12, and 23 are the only ones actually due to sinus disease, though case 21 was probably so caused.

The muscles may be weakened or paralysed by a toxic action upon the 3rd, 4th, and 6th cranial nerves, as they pass through the sphenoidal fissure in contact with the sphenoidal sinus; or upon the muscular branches

within the orbit; or by a direct myositis; as was probably the explanation of the muscular pain in case 3.

Dacrocystitis.

Occurs in this series in cases 15, 19, and 20, pages ¹⁰⁴/₁₁₆ all being in association with antral disease. Dacrocystitis, when present, is usually the result of antral suppuration, which causes obstruction in the nasal duct. and secondary infection follows.

Solid tumours of the antra are said to always cause dacrocystitis. In case 15, dacrocystitis occurred on the side of the tumour growth, but the nasal duct was singularly free and patent.

Proptosis.

Occurred once in this series - case 12, page 97 due to bony expansion of a frontal mucocele.

Proptosis most frequently occurs from orbital cellulitis and abscess.

Section VI.

CONCLUSIONS.

The optic nerves, optic canals, sphenoid bone, chiasma and central artery of the retina vary greatly in their relations.

The optic canals vary greatly in length in different subjects, and often slightly in the same subject. They are much longer than is usually supposed, Vide table 1, page 38.

The central artery of the retina arises from the ophthalmic much further back than is usually believed, and sometimes within the optic canal if that structure be long.

The intra cranial portions of the optic nerves vary in length from 7 m.m. to 14.5 m.m., and the diameter from 3.5 m.m. to 6.5 m.m. in different subjects.

The table of bone between the limbus sphenoidalis and the olivary eminence (i.e., the roof of the sphenoid sinus) varies in antero-posterior length from 4.5 m.m. to 9 m.m., but is usually about 5 m.m. This is of importance because only when it is large can the optic chiasma rest upon it, explaining the infrequency of bi-temporal hemianopsia in sphenoidal sinusitis.

The Pituitary fossa, in antero-posterior diameter, from 5.5 m.m. to 11.5 m.m., more usually the latter; when it is large the table of bone above-mentioned is small and vice versa.

The optic chiasma may be so anterior as to occupy the usually accepted position in the optic sulcus of the sphenoid bone, but only very rarely, much more usually it lies over the pituitary fossa.

For the above references, vide table 1 and pages 31 to 38

Some form of visual field contraction occurs in 90 per cent of all cases.

The visual fields for green and red, particularly the former, are, with rare exceptions, much more contracted than the field for white. Therefore, white and green are the best tests to employ.

General - more or less concentric - contraction occurred in about 76 per cent of cases, and is the most frequently observed.

Temporal contraction occurred 15 times, or 50 per cent, and 8 of those 15 were bitemporal contractions; but bi-temporal hemianopsia is extremely rare.

Altitudinal contraction occurred in 8 cases.

A small island of vision may remain long after the rest of the nerve has become blind from papilloedema.

Central scotoma is said to be the field defect usually observed in sinus affections, it is uncommon only occurring twice in this series, because most of the cases are chronic, and the toxins only affect the nerve by infiltration and therefore affect the peripheral fibres (producing peripheral contractions), as the macular fibres of the nerve, excepting near the globe, are central in position (within the nerve); whereas in acute cases central scotoma is observed as it is either produced by pressure or by the toxins being conveyed by the blood stream.

Bi-temporal hemianopsia is the only characteristic field of vision of a particular sinus, and that sinus the sphenoidal: because it can only be produced by involvement of the chiasma.

Bi-temporal contractions are most usually observed in sphenoidal sinusitis, because the nasal sides of the nerves are in contact with that sinus.

The visual field contractions are of much the same character in the acute and chronic cases, though differing greatly in onset.

Visual field contractions in association with nasal suppuration point strongly to the suppuration being of sinus origin, and therefore the fields are an aid to diagnosis.

Visual field contractions do not occur apparently in mucocèles, because they are unassociated with toxins.

The contractions observed are not due to reflex irritation of the nose.

They may be caused by direct pressure either within the optic canal by swelling, or within the nerve sheath by hydrops vaginae nervi optici, causing pressure, or by optic neuritis.

But in chronic cases most frequently by percolation of toxins from the sinus cavity through the wall into the orbit affecting the nerve directly. This is usually unassociated with ophthalmoscopic changes.

The visual fields may be contracted by post-operative oedema, pressing upon the optic nerve.

The visual fields may rapidly be contracted, and restored by treatment; but treatment in the chronic has often little or no effect, because either the nerve is permanently damaged, or that sufficient toxin passes through from the pus which is usually secreted for a long time after operation, to keep up the contraction; or that the nerves only slowly recover in these chronic cases.

For references, pages 139 to 147

Optic neuritis may be in the form of Retro-bulbar which is rare and only occurs in acute cases: or as a Fine Hazy Neuritis usually observed in chronic cases, and is not uncommon; or as Choked Disc (Papilloedema) which is rare, and generally associated with chronic cases; and as Gross Neuritis, which, when present, is usually in acute cases.

The Hazy neuritis may be observed in any of the sinuses and is probably due to toxins causing hydrops vaginae nervi optici and pressure upon the nerve. Choked Disc can probably only occur in the posterior group of sinuses, and is due to oedema within the optic canal caused by the toxin; and gross neuritis by inflammatory changes within the nerve by toxins brought by the blood stream and lymphatics, and mostly observed in the posterior group of sinuses.

The kind of neuritis and its intensity is some guide to the sinus involved and the variety of sinusitis, but not absolutely.

The neuritic process may be very intense and very acute in onset, and under appropriate treatment recovery may be very rapid.

Vision may be almost completely restored after weeks of absolute blindness, and after neuritis has been present for even years with suitable treatment of the sinus affected, blindness and intense neuritis do not necessarily mean a bad prognosis.

Atrophy may supervene in some degree, either as post-neuritic, or presenting the appearance of a primary atrophy.

For references, pages 147 to 151.

Hippus reaction of the pupils in sinus affections is not infrequently observed, and for which there is no adequate explanation.

For reference, page 154

The Central Artery may become obstructed from pressure or inflammatory oedema of the vascular coats, and present the appearance of embolus.

For reference, page 153

Muscular paralysis and paresis is not commonly due to sinus affections as is generally supposed. Myositis may occur.

For reference page 155

Acute and chronic, primary, and secondary glaucoma may be excited by sinusitis; the primary by venous stasis, and the secondary by inflammatory affections of the uveal tract.

For reference, page /52

Affections of the Uveal tract are very uncommon, because the ciliary arteries by which toxins enter the globe are so well protected by a thick mass of fat from the sinuses.

For reference, page ./52

From the foregoing conclusions, it is clear that the nose must be examined in all obscure ocular conditions.