mens illustrate in detail the four arbitrary stages of the disease mentioned by Adams³ and Alter,⁵ viz.:

1. Case 4 presents a comparatively small tumor which has not involved the eye to any great extent.

2. Case 1 presents a larger tumor coming to operation because of the pain.

3. Case 3 presents an excellent example of extraocular involvement in

which the tumors have grown into the optic stalk.

4. Case 2 is a study of the liver in an instance of melanosarcoma. These tumors frequently metastasize from the eye to the liver and to the lungs.

In conclusion the authors wish to acknowledge their indebtedness to Drs. C. F. Clark, Ivor G. Clark, Arthur M. Schaeffer, and H. R. Wright for the use of the material upon which this study is based.

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THE ROLE OF THE DUCTLESS GLANDS IN OPHTHALMOLOGY

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A general review of the subject with three illustrative cases. Read before the Third Colorado Ophthalmological Congress, August 10, 1917, with discussion.

That the eye is influenced by the secretion from the ductless glands we know; but just how, when or what changes are produced in each case, we do not always know so well. Likewise we know relatively little concerning the chemistry of the internal secretions, in spite of the fact that our knowledge of this subject has increased tremendously during the past decade. This subject should receive more consideration from ophthalmologists than it does, in order to classify the etiology, symptomatology, diagnosis, prognosis and treatment, even though we are dependent upon physiologists, physiologic chemists and other laboratory experts for our basic knowledge.

The literature of the past 10 years contains many valuable articles upon this subject and the author has reviewed many of these, especially those appearing in ophthalmic journals. Notable among these, during the past year,

are those by Lamb, Lissner, Schirmer and Zentmayer. However, to give all due place would make a book, even upon the hypophysis alone. It is needless to state that in the brief time allowed me such a discussion is impossible.

If we could be sure in any given case, from the eye symptoms alone, or even from the general symptoms, that we were dealing with hyper- or hyposcretion from this or that ductless gland, singly and unmodified by other glands, the problem would be greatly simplified. Fortunately or unfortunately, as the case may be, nature does not, as a rule, prescribe such an easy task, because overabundance of secretion from one gland is apt to be followed by the same condition in another gland as Lamb and others have mentioned. The result is stimulation of the sympathetic nervous system, especially in the incipient stage of hypersecretion from

the thyroid and later stimulation of the autonomic or vagotonic system from the thymus and posterior pituitary.

In as much as many of these cases consult an oculist first, either because of headache or predominating eye symptoms in the early stage of their glandular disease, it behooves us to be on the alert and to remember, as Grünwald has so tersely stated, that "we are physicians first and specialists second."

THYROID.

The sympathetic system is stimulated by secretion from the thyroid, circulating in the blood and lymph. In cases of slight hypersecretion from this gland, in which the secretion is not reinforced or antagonized, we see a transitory dilation of the pupils combined with slight widening of the palpebral aperture. This early in the disease we might not suspect the thyroid; but we should especially in women whom we are inclined to designate as neurotic. According to Noyes and many others, goiter occurs with much greater frequency in women. If this stimulation is continued over a long enough period of time, Kocher's or Rosenbach's (Hoeman's) or even Stelwag's signs appear. As the disease becomes more definitely established, Gifford's and von Graefe's signs appear, leading ultimately to the clinical entity known as Grave's or Basedow's disease. By the time exophthalmic goiter is well established, there is hypersecretion from the adrenals as well. In fact, at this stage of the disease the symptoms are produced by secretions from several of the ductless glands. For instance, if the blood contains secretions from the thymus or posterior pituitary, the pupils will be smaller than in the early stage of thyroid hypersecretion.

The following are the commonly recognized signs and symptoms of exophthalmic goitre:

1. Knies' sign is manifested by dilated and often unequal pupils. However, there is retained reflex activity. This is due to stimulation of the sympathetics and is so often present in the early stage of goiter. According to Lamb there may be associated with

this a low grade chorioretinitis of the macula, and ciliary congestion. He believes this is worse in the eye with the more widely dilated pupil.

2. Von Graefe's sign, which consists in lagging of the upper lid in looking down.

3. Gifford's sign evidenced by difficulty in everting the upper lid. This is due to retraction and rigidity and often occurs early in the disease.

4. Dalrymple's retraction of the upper lid with widening of the palpebral aperture.

5. Mueller's sign, which is the same as Dalrymple's except that he includes the lower lid.

6. Next comes Höman's or Rosenbach's sign of tremor of the upper lid.

7. Stelwag's diminished frequency of winking often followed by a rapid succession of winks or a long interval without winking.

8. Retraction of the upper lid while an object is being fixed is Kocher's sign.

9. Joffroy's is present upon failure of the forehead to wrinkle, when the head is lowered and the patient looks up.

10. Aschner found that the pulse can be made slower by pressure upon the eyeball.

11. Loewe believes that adrenalin dilates the pupil in such cases.

12. Berger has called attention to lacrimation as an early symptom of Graves' disease. He believes this is due to stimulation of the sympathetic. Schmidt-Rimpler, on the other hand, believes this is due to irritation of the conjunctiva, as a result of the exophthalmos.

13. Jellinek and Rosin have noted the early pigmentation of the lids which later disappears.

14. Sattler and Gifford have each mentioned a solid-looking thickening immediately beneath the eyebrow and the latter author states this is found early and without marked exophthalmos.

15. Möbius noted a deficiency in, or even a complete loss of convergence power.

16. Sattler has attributed the occasional falling of the eye lashes and eyebrows to trophic disturbance.

17. Becker found spontaneous arterial pulsation of the retinal arteries in six cases out of seven of this disease.

18. As a new ocular symptom of exophthalmic goitre Suker has described a "deficient complementary fixation in lateral eye rotation" as follows: "After extreme lateral rotation of the eyes to either side with the head fixed and with fixation of an object at this point maintained for a second or two, on attempting to follow this fixation point as it is rapidly swung into the median line, one of the eyes—it may be either—fails to follow the other in a complementary manner into proper convergence and from this point when it is brought into the median plane. Either the right or left eye makes a sudden rotation into the fixation with its fellow, but before it does so, an apparent divergent strabismus is manifested. According to Suker, it is no doubt due to a dissociation in the functions of the sympathetic and the extraocular motor nerves of the eye, and perhaps also to exhaustion on extreme lateral rotation of the eyes."

19. Ocular bruit has often been mentioned as a symptom and has been discussed at great length many times.

20. A very infrequent symptom is ocular nystagmus.

PARATHYROIDS.

Insufficiency of the parathyroid glands may be responsible for zonular cataract and for eclampsia, convulsions of childhood and epilepsy. Tetany may also occur.

PINEAL GLAND.

The secretion, if there is any, from the pineal gland does not seem to have any effect upon the eye. It is possible to explain all of the eye symptoms present, when there is hyperplasia of this gland, upon the basis of pressure and it is reasonable to assume that this is the only way in which eye symptoms are produced.

However, Oppenheim believes that the symptoms from this gland are similar to those from tumors of the corpora quadrigemina. With disease of the

pineal, the third, fourth and fifth nerves are not involved so often as when the corpora quadrigemina are diseased, but nystagmus is more often present. Frankl-Hochwart has expressed the opinion that tumor of the pineal body is responsible for unusual height, obesity, drowsiness, excessive growth of hair and a premature genital and sexual development associated with precocity of adolescence.

THYMUS.

In marked contrast with stimulation of the sympathetic by thyroid hypersecretion is stimulation of the vagotonic or autonomic system by hypersecretion from the thymus. Under such circumstances we find contracted pupils, narrow palpebral apertures, esophoria, spasm of accommodation, deep ciliary congestion and chorioretinal and scleral disturbances of circulation.

Persistent hyperplasia of the thymus was found by Garre in 95 per cent of fatal cases of exophthalmic goiter. Von Haberer obtained remarkable improvement, in a patient whose condition was very serious following a thyroid operation, by removing part of the thymus. According to Halstead's recorded cases, thymus feeding, radium and Roentgen-ray treatment improved remarkably patients who had not been benefited by thyroidectomy and ligation of the thyroid arteries for exophthalmic goiter.

Lamb states that "the more chronic inflammations may usually arise in conjunction with vagotonia, but such a condition as simple glaucoma is probably the end result of gonadal and adrenal insufficiency. Whereas acute inflammatory glaucoma is probably the result of a sudden imperative demand upon the adrenals for secretion to sustain the body in its attempt to defend itself against shock, fear, etc., in the presence of gonadal and adrenal insufficiency; for, although the secretion is forthcoming for a short period, the inability to continue to supply it causes a precipitate lowering of sympathetic tone and throws the balance under the control of the vagus. This, of course, in the presence of predisposing factors,

such as high hyperopic eyeballs and other anatomic abnormalities."

"This idea of the etiology is substantiated by the fact that pilocarpin and adrenalin, by hypodermic injection, overcome the attack; and, furthermore, stimulation to the sympathetic is well known to be always beneficial."

Bruner had his suspicions aroused concerning the pituitary in a patient requiring a frequent change of lenses, with the result that an early diagnosis was made and an early operation resorted to with a good result.

ADRENALS.

It is now, I believe, a well recognized fact that hypersecretion from the adrenals stimulates all the other ductless glands as well as the sympathetic system. Hypodermic injection of adrenalin seems to have the same effect as stimulation of the sympathetic nerve endings over the entire body. Adrenalin also produces contraction of the pigment cells in the skin, and probably in the retina of the frog, just as stimulation of the sympathetic does. However, the pituitary secretion seems to have a direct effect upon the blood vessels and not upon the sympathetics.

PITUITARY.

Bitemporal hemianopsia is present as a late symptom in hyperplasia of the hypophysis in about 40 per cent of the cases, but is a symptom for which we should not wait before making a diagnosis. The fields, according to Cushing, may early show a slight contraction from pressure of the pituitary upon the chiasm, and homonymous hemianopsia is by no means uncommon. In the absence of acromegaly, Uhthoff believes homonymous hemianopsia is very rare. Other authors have reported superior temporal slant of the peripheral field, scotomas and hemichromatopsia. Cushing ranks the ocular signs and symptoms as the most serious disturbance of the disease, and these are not always in proportion or direct relation to the enlargement of the sella turcica.

Neuroretinitis and optic atrophy are almost always late symptoms of the disease, although the former may occur

quite early. Paralysis of the third nerve occurred in 15 per cent of the cases tabulated by Uhthoff. G. E. de Schweinitz has called attention to "antecedent amblyopia" as a very early and probably not a constant symptom of disease of the pituitary. This precedes other demonstrable ocular signs and symptoms.

One of the very best articles I have found on the ductless glands from the internist's viewpoint is by Dr. George Dock, of St. Louis, and appears in Osler's *Modern Medicine*, 1909, part 2, under the title "Diseases of the Ductless Glands." He gives due importance and place to the ocular symptoms.

Ott and Scott state that the secretion from various ductless glands produces hypersecretion of adrenalin into the blood, i. e., the thymus, thyroid, parathyroid, pancreas, pituitary, testicle and ovary have this effect. The reverse is equally true. Lissner and many others have emphasized the fact that very rarely do we see the result of disturbed or altered secretion in only one gland.

CASES.

The three following cases may be of interest:

1. Mr. G. W. M., age 44, banker, first consulted me February 21, 1912. He stated that at 9 years of age he lost his right eye from an injury, but that it was not removed until three years ago, in Iowa, because of sympathetic ophthalmia in the other eye. Recently, his vision has been failing, so that it was reduced to 15/20, and J. No. 2.

The patient is unusually fleshy; his face "looks flabby"; his lids droop, are edematous and the edges hyperemic; the eyelashes and eyebrows are brittle. Cerebration is quite slow. In fact, he states it is quite difficult to think.

Examination of the anterior segment of the left eye revealed a slight pericorneal injection of the scleral vessels; the cornea, iris and aqueous were hazy; there were a few posterior synechia, and very fine deposits on Descemet's membrane.

The fundus was negative except the disc looked quite pale even through hazy media, and there were a few fine

dust-like opacities in the anterior portion of the vitreous.

The field was concentrically contracted for colors, although the form field was negative, but there was no evidence of temporal hemianopsia.

The diagnosis of serous iridocyclitis associated with hypothyroidism must be evident from the symptomatology. Dionin and atropin were used locally and thyroid extract internally; the latter was prescribed by his family physician. He improved slowly but steadily under this treatment with a return of good vision and good general health.

As I see this case now, I believe the hypophysis, as well as the thyroid, was diseased. But, without an X-ray of the sella turcica, positive conclusions are less certain, although an X-ray examination could, of course, have been negative with disease of the pituitary.

Beck has reported a case in which the hypophysis was found quite large post-mortem, as he expected from his clinical findings, but in some respects the case bears a striking resemblance to those of hypothyroidism, formerly called myxedema.

2. Mrs. V. D., age 32, married, complains of headache, slight nausea and prominence of the eyes for the past year. V. O. U. 15/15-1 and J. No. 1. There was noticeable exophthalmos of O. S. and more of O. D. with increased injection of the ocular and palpebral conjunctival vessels. Von Graefe's, Gifford's, Möbius', Knies' and Stewarts' signs of exophthalmic goiter were present. The fundi were negative.

Under a cycloplegic V. O. D. 15/30 — = 15/10 + 1.00 $\odot$ + 0.50 Ax. 95°; V. O. S. 15/30 — = 15/10 + 1.00 $\odot$ + 0.50 Ax. 80°. She was given a full correction for constant use.

Organotherapy, prescribed by her family physician, has produced less exophthalmos and an improvement in her general health. As all her symptoms are mild, operation has not been advised.

3. While writing this paper a third patient, Mrs. H. T. T., age 33, married, presented herself for examination with more than a moderate palpable enlargement of both lobes of the thyroid.

She gave the usual history of asthenopia and neurasthenia. Her mother and one sister each have a goiter.

The anterior segment of each eye was normal and V. O. U. 6/6 — and J. No. 1.

Under a cycloplegic V. O. U. 6/7.5 + = 6/4 + 0.50 Sph.

The fundus of each eye showed a low grade chorio-retinitis, which may be due to her hyperthyroidism, as her family physician has failed to find anything else in her general health to account for this. However, this was near the disc on the temporal side and did not involve the macula. In fact, I have not found involvement of the macula often.

There was a slight deficiency of convergence, but with so little hyperopia I advised against the wearing of lenses. She had been treated systematically by organotherapy without improvement, and, as two competent general surgeons had advised an operation for goiter, I concurred with their opinion.

In conclusion, kindly permit me to emphasize the importance of the low grade chorio-retinal changes in exophthalmic goitre or thyroid hypersecretion, as I believe these are too often overlooked. Too many observers probably expect to find grosser lesions. These changes may be due to the fact that too much light is permitted to reach the macula, as Lamb states he finds these more marked in the eye with the more widely dilated pupil; but I believe it is just as reasonable to assume that the stimulation of the sympathetic is the cause. Perhaps it is both.

We, in Colorado, should have a better opportunity to study this, on account of our excessive light, than our more distant confreres, if the former assumption is correct. If the latter is true, the increased pigmentation of the lids, which occurs early, may occur simultaneously with the chorio-retinitis.

DISCUSSION.

Henry Sewall, Denver, Colo., stated there appears to be no important specific action of any internal secretion on the eye, in the sense that atropin is a mydriatic or eserine a miotic. But as the eye is a tissue

complex in physiologic relation with all the rest of the body, internal secretions operate on its tissues as they do on similar elements throughout the organism; and as a part of the organic whole the eye must be affected in its functions and nutrition by what goes on elsewhere.

I will therefore devote the few minutes allotted to me to a consideration of some of the general physiologic relations of the internal secretions. We find here, as in so many other fields, evidence that there is no such thing as narrow specialism in ophthalmology, but that the well equipped eye doctor belongs to that group which "knows everything about something and something about everything."

It cannot but be useful for us to evaluate the position of these mysterious ductless glands in the economy. I well remember the day of relative positivism in physiology; when the mechanism of the reflex arc was the key to all nervous activity; when the combustion in the calorimeter seemed to be the last word in the explanation of protoplasmic energy; when nutrition concerned only the metabolism of compounds of carbon with a little sulphur and phosphorus salts and water, and there were no vitamins. I remember that when Brown-Séquard announced the vivifying effects from the injection of testicular juice he well nigh shattered a hard earned reputation as a safe and accurate physiologist.

Now we are ready to believe that if the external secretions prepare the food for the metabolic activity of the cells, the internal secretions prepare the cells not only for metabolism of the food but for all their recondit physiologic relations.

For long years the lecturer on physiology had been introducing the unicellular ameba as an integration of all physiologic functions; and then he proceeded to show how, with the differentiation of tissues in the multicellular animal, there was a physiologic division of labor so that in the higher forms of life autonomous mechanisms were coordinated only through the fixed channels of nervous impulses.

It seems to me it was an advance comparable in importance with Harvey's discovery when in 1902 Bayliss and Starling showed that an acid extract of the duodenal or jejunal mucous membrane, when injected into the blood of an animal, caused its pancreas to secrete. They proved that the active principle, which they named "secretin," resided in the intestinal epithelium in an inactive condition (prosecretin); that wetting of the mucous membrane with dilute HCl, or the acid chyme, activated the prosecretin into secretin; that this product is soluble and is not discharged into the intestine but into the blood; and that the blood so charged, reaching the pancreas, causes this organ to secrete. Furthermore, it was found that secretin retains its properties after boiling. It is not an enzyme.

Starling looked on it as a type of specific substances which, procured in one organ, reached another through the circulation and made the latter act; and he gave to this type of compound the name "hormon," from the Greek word meaning "to excite."

Every organ of internal secretion undoubtedly gives off an analogous chemical body. In the case of the adrenals the active principle has been shown to have a definite chemical formula, to submit to crystallization, and the same has recently proved by Kendall for a product of the thyroid gland, and by Robertson for his tethelin extracted from the hypophysis.

An illuminating discussion of the vital relations of the whole group of internal secretions, under the title of "Hormonic Equilibrium" was one of the evidences of great capabilities given by the late Henry S. Denison, who was cut off at the beginning of a most promising career some three years ago.

It is not too much to say that, though our knowledge of internal secretions and of the class of reactions which they set up is certainly but a small fraction of the truth, we must conclude that, directly or indirectly, internal secretions are involved in every vital act of protoplasm, and Cannon has shown that they must be considered as a physical basis of emotions if not of all physiologic activity.

It is universally admitted that each gland of internal secretion produces a definite chemical product which enters the circulation and modifies the action of various cells in specific fashion. There are two ways in which modification of this secretory function may bring the ductless glands within the view of the pathologist and clinician, first through hypersecretion, second through hyposecretion. Both may be equally disastrous, and each adds to its own pathologic changes. But there is a respectable opinion that ductless glandular disorder is not simply quantitative in its influence, but may be essentially qualitative. That is, that there is a perversion in the chemistry of the glandular secretion, which deprives it of useful function and makes it distinctly poisonous to the body in any concentration.

There is a fourth view of the origin of dyscrasias dependent upon glandular disorder aside from the secretory function. There is reason to believe, namely, that the ductless glands are specifically detoxicating organs necessary to the neutralization or destruction of poisonous matters added to the circulation as the result of normal cellular metabolism or of the intestinal absorption. It is worth while to touch upon the evidence from this point of view. Thus, it has been found that when an animal is thrown into tetany through removal of its parathyroids, the tetany is relieved by bleeding the animal and injecting salt solution. Presumptively, this treatment removes from the circulation certain poisonous matters

which it was the function of the parathyroids to destroy.

Still stronger evidence has been furnished for a detoxicating function of the adrenal capsules. When the suprarenal bodies are removed from a frog the effect is finally fatal. If, while still moribund, the frog is bled and its blood is injected into a normal frog, no ill effect is witnessed. But if the injection is made into a recently decapsulated frog, the latter suffers a rapid paralysis and death. Moreover, if this poisonous blood is injected under the skin of a normal frog in which a ligature has been previously thrown about one thigh, cutting off its circulation but not including the nerve trunk, after three hours the muscles of the ligatured leg contract normally when their nerve (omitted from the ligature) is stimulated; while stimulation of the nerve of the opposite leg, where the tissues have been bathed in the poisonous blood, produces no effect, though the muscles contract when directly irritated. The obvious conclusion is that the blood of a frog from extirpation of the suprarenal bodies contains substances which paralyze the end plates of the motor nerves somewhat as does curare.

Unfortunately for our therapeutic endeavors, the matter is still more complicated than has been represented. The investigations of Falta and others indicate that there is no such thing as the isolated action of a single ductless organ; that all the glands of internal secretion are mutually engaged in maintaining a normal biologic equilibrium and that necessarily there must be a readjustment in toto when the action of one is modified in order to preserve what we call health. A great service has been rendered by Falta and his colleagues in showing that there are natural mutual exciting and inhibitory relations between at least certain of the ductless glands. Thus the thyroid and the chromaffin tissues are mutually stimulating while the insular apparatus of the pancreas tends to inhibit both.

These relations may be represented by a triangle, the three angles representing the pancreas thyroid, and the chromaffin tissue:

The internal secretion of the pancreas tends to inhibit the effects excited by activity of either thyroid body or chromaffin tissue (most abundantly localized in the adrenal medulla) while the secretions of both the latter organs mutually stimulate their tissues of origin, or at least magnify their effects.

Finally, it may be said that a welcome and hopeful element of exactness has ac-

crued from researches in this field. It is generally granted that adrenalin or epinephrin, the active principle of the adrenal medulla, is a specific stimulant for the receptive substance at the peripheral termination of the sympathetic nerves, and that its pharmacologic effect, whether of excitation or inhibition, depends upon the corresponding function of the nerve involved. Contrariwise an interesting analogy is furnished by the discovery of Langley that nicotine is equally selective of the receptive substance mediating between the sympathetic filaments and the ganglion cells of the peripheral ganglia interposed in the paths of the centrifugal fibres.

I have tried to show that whatever facts of mechanics postulate a relation between any of the ductless glands or their secretions and the eye it is true to a peculiar degree that comprehension of any local reaction to the internal secretions must be founded on an apprehension of their general relations.

Edward Jackson, Denver, Colorado, thought that, with reference to exophthalmic goiter, the older observation of the influence on the sympathetic nervous system had been considerably overworked. Manifestations of nerve action in connection with the cranial nerves, observed in relation with the eye, seemed to have certain characters in common. They seemed to be all largely disturbances of coordination. At least we might group them in that way. The failure to wink is a failure of reaction to normal stimuli. The failure of the eyelid to follow the eyeball as the eye turned down (the Graefe sign), the failure of elevation of the eyebrow, all these things seemed to represent a failure of coordination of action on the part of the central nervous system, and probably of the cerebrospinal nervous system instead of the sympathetic. This suggestion might prove more fertile in the minds of those who, like Dr. Sewall, were studying the physiology, than in the minds of those who were concerned strictly with the eye.

M. Jean Gale, Denver, Colorado. I saw a case of exophthalmic goiter yesterday. With all the symptoms of exophthalmic goiter there were also marked choreic movements.

Harold Gifford, Omaha, Nebraska, said that with regard to the connection between the emotions and the secretion of the adrenals, he had had a curious corroboration in his own person. For some years, when he had become very much excited he had experienced a decided and depressing pain in the lumbar region, lasting about five minutes. Dr. Jackson's remarks on the lack of coordination seemed to him to be well worth considering. But it may be questioned whether some other explanation does not more accurately fit some of these symptoms. For example, the symptoms known as Dalrymple's, as well as several others, all

might be explained as due to overstimulation of the sympathetic. With regard to the connection between chorea and hyperthyroidism, there is another explanation. Every now and then a case of hyperthyroidism is cured by removal of the tonsils, and this suggests that both the chorea and the hyper-

thyroidism may have been due to tonsil infection.

F. R. Spencer (closing). I believe we should change our terminology a little and speak of exophthalmic goiter as hyperthyroidism, contrasting this with hypothyroidism.

RELATION OF RETINITIS PIGMENTOSA AND ALLIED CONDITIONS TO THE DUCTLESS GLANDS.

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This paper reporting a series of cases of retinitis pigmentosa treated by thyroid extract was read before the American Academy of Ophthalmology and Oto-Laryngology, October 30, 1917.

Some time in the year 1910 there came to me, for considerably impaired vision in both eyes not helped by glasses, a mulatto girl, 15 years of age. Ophthalmoscopic examination showed black spider splotches on the dark fundus natural to the negro; not readily visible at first inspection, and being the only case of retinitis pigmentosa I have seen in the colored race. Being mindful of the futility of treatment for this disease, as far as text-books and literature went, it occurred to me to strike out in some other direction; and as thyroid extract had been proven in late years to have so marked an influence on retarded mentality in certain states, as cretinism, and a mysterious influence over constructive metabolism, this was the agent selected. This view was further strengthened by the close relation of the optic nerve to the brain, giving rise to the expression that "The optic nerve is the finger of the brain." Unfortunately, this case could not be followed up, as the patient removed shortly afterward to Baltimore, and could not be traced.

The earliest case of which a record could be made is the following: C. E. J., male, aet. 42, August 16, 1910. Sight known to be failing for several years, with both temporal fields moderately contracted, and partial night-blindness. R. V. = 18/60, Jaeger No. 10. L. V. = 18/50, Jaeger No. 10 +.

No improvement by glasses, far or near. Pupils medium size, not reacting to light, but doing so on convergence. Marked retinitis pigmentosa, both eyes. Put on thyroid extract, one grain three times a day. Took one bottle of tablets, probably one hundred. As this patient did not return, a letter of inquiry was sent, to which he replied on February 5, 1912, sending samples of fine print for close, about Jaeger No. 7 for each eye, and 20/80 + for distance. He was located and induced to return on July 29, 1916; pupils slight movement to light, dilate slowly in dark. R. V. = 20/40. L. V. = 20/50. Each with Sph. + 4 Jaeger No. 3; together Jaeger No. 2 easily. Fields almost full, except temporal ends. Fundus the same, highly pigmented. Put back on one grain thyroid three times a day, to which was added 1/60 grain strychnia and 1/30 grain arsenic. The arsenic was added from a belief in its alterative value, and the strychnia as a bitter tonic, only indirectly beneficial to build up lowered nerve tone. This formula has been in use for several years past, as will be seen in later cases. He was induced to return on August 19, 1917, having taken four boxes of sixty pills each. R. V. = 20/40 - Sph. + 4. = Jaeger 1. L. V. 20/50 Sph. + 4. = Jaeger 1. Both eyes open V. = 20/40. Pupils fixed; fields probably a little more con-