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LATENT NYSTAGMUS

BY

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I.—Review of Literature

IN 1912, C. and H. Fromaget described a peculiar case under the term of latent nystagmus. Their patient was a man, aged 21 years, in whom nystagmus could be elicited on covering up either of the eyes; with both eyes open there was no nystagmus. The nystagmus appeared instantaneously as soon as an eye was covered and disappeared just as instantaneously with the uncovering of the eye. The patient was the subject of right convergent concomitant squint, with poor vision in the squinting eye. Vision with both eyes open at the same time was full (1.0); each eye tested separately gave a remarkably lower visual acuity, being < 0.1 for the squinting right eye and only 0.4 for the left; this reduction in visual acuity was, of course, associated with nystagmus owing to the exclusion of one of the eyes during the test. The nystagmus elicited by covering the right eye differed from that excited by covering the left; when the squinting right eye was covered, the uncovered left showed rapid nystagmus, oscillatory in type and horizontal in direction, the movements being at the rate of 72–80 per minute; on covering the left eye, the nystagmus in the right was markedly slower, being only 20–24 per minute; in type it was horizontal and rather irregular. When nystagmus was elicited the covered eye could be seen also to be nystagmic behind its

screen, the movements being of the same type and rapidity as those of the uncovered eye; with monocular vision there was, therefore, bilateral nystagmus, of the type given by the uncovered eye. Nystagmus, though not normally present with both eyes open, could be excited in this state if the patient were made to read for more than a few minutes; it could also be excited when, with both eyes open, extreme positions were taken up, more especially on looking down and to the left, when the nose acted as a screen separating the two eyes. Whenever nystagmus was excited the patient had the sensation of things swimming about. Apart from squint there was also evidence of imbalance of the internal musculature of the eyes, as shown by the fact that the pupils had a tendency to hippus. Further investigation of the eyes yielded negative or insignificant results. The refractive error was low, about +1.0 D. astigmatism; the fundi were normal; the field of vision of the left (tested when not nystagmic, *i.e.*, with both eyes open) appeared to be full, and the colour vision good. Apart from exciting nystagmus by putting up an opaque screen in front of one eye, nystagmus could also be obtained if a + 8.0 D. sph. were used for that purpose; the nystagmus thus produced was similar in all details to that already described, and associated with it was the decline in monocular visual acuity already noted. Nystagmus could similarly be excited by a pencil held up between the eyes and reading matter, as soon as the eyes reached that part of the print where the presence of the pencil destroyed binocular vision. The authors named the condition latent nystagmus, on the analogy of latent squint; just as the desire for fusion keeps a squint latent, so fixation by both eyes, or at any rate excitation of both retinæ, keeps the nystagmus latent.

A year later, H. Fromaget followed up this case by publishing the details of three more. In one of these there was a concomitant strabismus; in another congenital paralysis of the external rectus, giving a non-comitant squint; in the third there was no squint, but there was corneal scarring due to ophthalmia neonatorum. These three cases showed some departures from the conditions observed in the first case. Thus, in two, no nystagmus could be elicited when the patient was made to read. In one case the nystagmus was of the same type whichever eye was covered, though the two eyes had unequal visual acuity. None of the three cases showed any tendency to imbalance of the internal musculature of the eye.

To these four cases the authors added another six in a further paper published in 1916, some of these having most interesting features. Thus, in the first case the right eye was blind and divergent from an old perforating wound which had caused a traumatic cataract necessitating removal of the lens; the left eye

had full vision (with correction). With both eyes open, there was no nystagmus; there was likewise no nystagmus on covering the blind right eye; but on occluding the good eye, the blind eye showed rapid nystagmus (160 per minute). Another case (the third of this group) was very similar. Here the right eye was blind and divergent from a perforating wound which had led to a traumatic cataract. Vision in the good eye was full, as in the above case, and as in that case there was no nystagmus on covering the blind eye, but there was nystagmus when the good eye was covered. This nystagmus, however, was very much slower than in the above case, there being only 60 movements per minute as against 160. In another case nystagmus was present when both eyes were open, but this case was included in the series because the nystagmus became much more marked when one eye was covered. A most interesting case was the last, in which the latent nystagmus became manifest and permanent owing to the loss of one eye. This is the case of a man whose right eye had to be enucleated on account of a war injury. Vision was then found to be defective in the remaining eye, which showed a slow, irregular, feeble nystagmus (40—50 per minute), constantly present.

These ten cases reported by the Fromagets, therefore, cover a considerable range of manifestations. Thus, under the term latent nystagmus they have included cases in which originally there is no nystagmus at all when both eyes are open even if the eyes are in the extreme positions (*e.g.*, Cases 1 and 2, 1913); cases in which nystagmus is present when both eyes are open, if the eyes are either converging or are in extreme positions (Case 1, 1912); and cases in which nystagmus is present normally with both eyes open (Case 5, 1916). The one feature these cases have in common is that exclusion of an eye either converts a latent nystagmus into one which is manifest, or makes a manifest nystagmus more marked. It must, however, be noted that whilst the exclusion of one eye in all these cases leads to interesting results, such results are by no means uniform in their detailed appearances.

Whilst the credit for establishing latent nystagmus as a clinical entity undoubtedly belongs to the Fromagets, earlier observers were acquainted with the condition. Thus, Faucon recorded a case as early as 1872; this case is described in great detail and shows some interesting features; in this case nystagmus was usually, though not always, present with both eyes open, especially if the patient looked into the distance, but when made to converge and fix an object (in between the range of 1·60 m. to 0·25 m.) no nystagmus could be obtained, thus being exactly contrary to Fromaget's first case in whom no nystagmus was present for distance, but nystagmus readily revealed itself when reading was attempted. If during a phase, when with both eyes open there

was no nystagmus, one of the eyes were covered, nystagmus in the uncovered eye appeared at once, more marked in the position of abduction than in adduction. Faucon also noted that the nystagmus consisted of two phases, the rapid phase always being towards the side of the uncovered eye. Well over a dozen cases of this type of nystagmus are to be found recorded in the literature before 1912, but they were reported as curiosities and not as a clinical entity. In this country, Ernest Clarke demonstrated a case in 1895 before the Ophthalmological Society of the United Kingdom. Clarke's contribution is of considerable importance, for he gave a remarkably detailed study of his case. Thus he showed that the nystagmus could be excited not only by an opaquescreen in front of one eye, but also by putting up a prism base up or down, and likewise by coloured or smoked glass. He further showed that a light thrown on to one of the eyes also produced nystagmus. At the same meeting Grimsdale brought forward four cases in which "the nystagmus was of the same kind but less marked," and he also showed that the use of prisms gives results which vary from case to case. In the recognition of the clinical picture presented by latent nystagmus, Grimsdale and perhaps Alfred Graefe before him, must be given priority to Fromaget, though this does not deprive the Fromagets of the credit for establishing the condition as a clinical entity. Other English observers are Brewerton, who in 1903 demonstrated a carefully investigated case; J. F. Cunningham, who showed a case in 1914; Ernest Thomson, who reported one in 1916 and Beatson Hird in 1923. Cunningham's case is of considerable interest. His patient had 6/6 vision with both eyes open simultaneously, but only 6/60 in the right and 6/36 in the left with each eye tested separately. There was no manifest squint, but if with both eyes open the patient were made to fix with the left, the right eye moved outwards and up.

Following on the first two papers by Fromaget, Dorff published two cases, one of which was examined with great care. In this case colour vision and light sense were good. With both eyes open there was no nystagmus; nor was there nystagmus on convergence; but nystagmus appeared on movement to right or to the left as soon as the eyes were in a sufficiently extreme position for the nose to act as a screen between them destroying the binocular field; if, furthermore, the hand were put up as a sort of forward prolongation of the nose, nystagmus in the lateral position was excited much sooner. As in Fromaget's first case nystagmus could also be excited by putting up a high plus lens in front of one eye; but high plus lenses in front of both had no effect. Diplopia could not be excited by the use of prisms, though there was binocular vision, for the patient (who had been the subject of convergent squint) could recognize coloured objects with the non-fixing eye. Yet in

spite of the absence of stereoscopic vision a strong prism base down could excite nystagmus, just as readily as could a screen, a strong plus lens or a blinding light. The central nervous system and the labyrinths were found to be normal.

In 1916, Wehrli, in reporting six cases drew attention to an important feature of this type of nystagmus, namely that it is always of the spring-nystagmus type, the rapid phase always being towards the side of the uncovered eye. Both Faucon (1872) and Dorff (1914) had noticed this without paying it any closer attention. In one of Wehrli's cases the nystagmus was more marked in the dark—as it also was in the first case reported by Dorff.

To these data on latent nystagmus were added a year later some valuable observations by van der Hoeve. He confirmed the description of spring nystagmus that Wehrli had given. van der Hoeve further showed that the nystagmus itself was the cause of the reduction in vision when one eye was covered, for vision could be restored in full if the globe were kept steady by pressure through the finger or by means of forceps. In one of his cases a 20° prism placed horizontally in front of one of the eyes, base in or out produced no nystagmus, but nystagmus was excited at once if the prism were placed base down or up. If the prism were rotated, nystagmus appeared when the base was midway between the horizontal and vertical meridian. A prism of 60° in the horizontal position was tolerated; beyond that nystagmus was produced. If smoked glass (London smoke) was put in front of one eye, no nystagmus was excited, until a glass sufficiently dark was used (glass D) to prevent the eye from seeing clearly; with such glass nystagmus appeared as soon as it was put up in front of one or both eyes. A screen put up between the two eyes produced nystagmus as soon as binocular fixation for the same object was abolished; nystagmus appeared even if the two eyes were shown separately, similar test types. Spherical or cylindrical lenses were tolerated only up to a point; thus a plus 5 in front of one eye produced nystagmus, but a plus 3 did not. Finally, van der Hoeve showed, as Berg had done before him, that if labyrinthine nystagmus were excited (by either the rotation or caloric tests), it took the usual form when the patient kept both eyes open; but if one were closed, the latent nystagmus excited, markedly affected the labyrinthine nystagmus, increasing or neutralizing it, depending upon the direction of the latent nystagmus being with or against the labyrinthine. The result of both types of nystagmus being excited at the same time "amounts to the algebraic sum." Of van der Hoeve's six cases three had squint; choroido-retinitis was present in four; only one case had normal eyes. The ears were normal in three cases; in two there was middle-ear deafness, and one had deafness of the internal ear type.

In 1920, Lafon published ten cases; a most interesting feature in two of his cases was the fact that the eyes were normal and possessed good stereoscopic vision. In three of his cases though the nystagmus was much more marked on covering one eye, it was also present when both eyes were open.

Observations of considerable interest were also made by Kestenbaum (1920—1921). He confirmed the findings of Dorff that a high plus lens in front of one eye produced nystagmus in the uncovered eye; but that such lenses in front of both eyes had no effect. He showed further that the nystagmus excited by putting up a + 20.0 D. lens could be checked if the eye thus covered were made to fix reading matter at a distance of about 5 cm. (*i.e.*, the focal length of the lens). In another experiment both eyes had + 20.0 lenses put up in front of them; no nystagmus appeared, but nystagmus appeared at once as soon as reading matter was brought up at a distance of about 5 cm. in front of one eye only; if each eye separately were provided with reading matter nystagmus "ceased altogether or at any rate diminished." To Kestenbaum, perception by the macula is the all-important factor and he illustrated it by the following observation: a needle is carried from right to left in front of a patient with latent nystagmus, who has been provided with + 20.0 lenses. There is no nystagmus as long as the needle is not in the central field of the eye; nystagmus is, however, excited as soon as the image of the needle falls on the macula; when it falls on the left macula there is nystagmus with the rapid phase to the left; nystagmus is in the reverse direction when the image of the needle is perceived by the right macula. Kestenbaum, however, admits that a clear macular perception is not always the essential factor in such phenomena for in one of his cases, one eye had a cataract, making detailed vision impossible, and yet in this case the exclusion of the eye with the opaque lens produced nystagmus.

To this mass of data Roelofs added some highly painstaking observations (1928). As a result of exhaustive experimentation on one of his patients (who had a mild latent nystagmus) he agrees with Kestenbaum as to the great significance of macular perception in these cases, but does not hold that condition essential. He believes that whilst nystagmus is brought out when contours are presented to one eye only, it is not essential that these contours should be perceived by the macula, though an image confined to one of the maculae is more effective in producing nystagmus than if the image were on the periphery of one of the fields. Once nystagmus is excited, illumination of the fellow eye will not suppress it (except in special circumstances) but the presentation of contours to that eye, provided they fall near the macula, will do so. Roelofs also found that his three patients localized

objects faultily, and his result of experiments with optokinetic (so called optic) nystagmus are rather conflicting. In one case (the mildest) the optokinetic nystagmus was "fairly normal"; the rapid phase was rather slow. In the second case, the rapid phase was absent altogether, and in the third (and most severe case) the rapid phase was inverted, *i.e.*, it was in the direction of the moving objects instead of being away from them. Apart from these observations, Roelofs also found that in two of his cases the light sense was normal; the third one had night blindness; the position of the head apparently had no effect on the nystagmus in his cases. Hering's test applied to two cases gave a normal perception of depth.

II.—Case Reports

Latent nystagmus is by no means a rarity, though it is not common. Some of the cases in which for no apparent reason vision is poor after correcting lenses have been put up in front of each eye separately, are probably cases of this affection. The present writer has seen seven cases during the past three years, and of these five have been studied on several occasions, and these five form the basis for the following observations.

I. *Boy aged 10 years.*

A boy first brought up to the Central London Ophthalmic Hospital at 2 years and 10 months of age for left convergent squint. A diagnosis of probable weakness of left external rectus possibly since birth, was made. Neither on this occasion nor on a subsequent one, two years later, is there any reference to nystagmus, this condition being first noted on a third visit at the age of 7 years, when nystagmus, was observed on covering one of the eyes, though there was no nystagmus with both eyes open simultaneously. The boy has since been seen on five occasions during a period of three years. Vision with both eyes open is 6/12—6/9; that of the right separately is 6/24, that of the left 6/60. At no time has he shown nystagmus with both eyes open; on three occasions nystagmus was readily produced in either eye by covering its fellow, but on the remaining two nystagmus in the squinting left eye could not be obtained at all or only produced after repeated attempts, and then generally only when the eye was made to fix. In the extreme right or left positions there was no nystagmus. The nystagmus excited is a typical spring-nystagmus with the rapid phase towards the side of the uncovered eye. This inconstancy in the response of the squinting eye to covering of the right is supplemented by another feature, namely that whilst generally the better right eye shows the more marked and frequent nystagmus (when the squinting eye is covered) there are occasions when it is the squinting eye which is the more violently nystagmic. At no examination has the boy been aware of the sensation of objects floating about, nor of any other subjective sensation of nystagmus. His colour vision is good, but the attempt to determine his fields has not been successful. Putting up a screen between the two eyes and then attempting to map out his central field gave no definite result, for under such conditions the eyes remained non-nystagmic for only a limited and variable time. The impression has, however, been gathered that there are no central or paracentral defects in the fields. At no time could diplopia be produced. Experience with this patient has made it impossible to predict the result of any of the approved attempts to produce nystagmus. Apart from one certain feature, namely that nystagmus in the right (the better) eye can always be elicited when covering the left with a screen or a plus 20·0 D. lens, attempts to produce nystagmus by blinding one of the eyes with light, or by the use of prisms have always been most uncertain in their results, being

positive at one time and unsuccessful at another. The only constant features that repeated examinations have revealed is, therefore, that nystagmus can be excited in the better eye by effective exclusion of the worse from binocular vision, and that the nystagmus thus produced is spring-nystagmus with the rapid phase towards the side of the open eye.

II. *Girl aged 14 years.*

This patient has been under observation at the Royal Eye Hospital since the age of six days, when she was brought up for ophthalmia neonatorum with corneal involvement. A note written when the patient was 8 years of age states that violent nystagmoid movements are present on covering one eye (Dr. J. Keyms). When seen at the age of 12 years monocular vision (with correction) was 6/60 in each eye; with both eyes together vision was 6/24. The patient is highly myopic and has corneal nebulae. During the past two years this patient has been seen eight times. Nystagmus is always elicited on covering up one of the eyes: it is always of the spring type with the rapid phase towards the side of the open eye. High convex lenses do not, however, always give nystagmus and prisms have generally failed. There is no squint, but no diplopia can be produced by the use of prisms, though diplopia is excited by coloured glass. Although nystagmus has always been readily excited by complete exclusion of one eye, yet there has been no constancy in the minor details of the nystagmus; generally it is the right eye which is the more nystagmic, but the left not infrequently showed the more marked nystagmus. At one visit in particular, when the patient was being exhaustively investigated, this discrepancy was strikingly illustrated; for within the space of two hours nystagmus was more marked first in the one, then in the other eye. It must be added that on all occasions there was a marked difference in the type of nystagmus excited by covering the two eyes alternately and this marked difference was constant; what was variable was the eye which resulted in the more marked nystagmus. This case though variable as regards some of the subsidiary features of the nystagmus, was constant otherwise, nystagmus never having been observed when both eyes were open, and nystagmus never failing to appear when one was fully covered.

Colour vision is good and there appears to be no central scotoma. The patient is never conscious of the subjective sensations of nystagmus.

III. *Boy aged 14 years.*

Like the last patient, this boy has been under observation since birth, also having suffered from ophthalmia neonatorum. He has a marked left convergent squint. The first note as to nystagmus was made when the patient was 3 years of age ("Refraction very difficult; nystagmus and irregular astigmatism.") Two years later, a note states that the left eye is nystagmic (Dr. J. Keyms); a note made when the patient was 10 years of age states that "violent nystagmus is present on covering the right eye" (J. Keyms). Seen a year ago at the age of 13 years, it was found that the right eye was the one that is nystagmic if the left is covered, and that the left showed tendency to nystagmus if the right is covered. Yet on repeating these observations the reverse was noted, the right eye being steady on covering the left, and nystagmus appearing in the left when the right was covered. To this contradictory behaviour was added the further inconstancy, that occasionally during these tests either eye would be nystagmic if its fellow were covered. A note states that "on facing the window the nystagmus is in the right; facing away from the window the nystagmus is in the left." However, when seen again a month later it was found that this observation did not hold true. The marked inconstancies and contradictions that the patient shows were also observed when he was examined again on four further occasions. In addition it was also noted that there were times when nystagmus was present with both eyes open. At no time could one be sure of the response to any particular test: on one occasion there were transient phases when no nystagmus could be elicited in either eye on covering its fellow.

In this patient the squinting left eye was amblyopic, vision at no time being more than 6/24, and sometimes only 6/60. The right had 6/12 when not nystagmic. Colour vision was good, and no central scotoma could be elicited. No gross corneal scarring was present, and the fundi were normal. There were never any subjective sensations of nystagmus.

The most striking feature in this case was the constantly changing features of the

nystagmus even at one and the same examination. Taking the different occasions together, he has exhibited every range from nystagmus with both eyes open, to no nystagmus on covering one eye; nystagmus on covering one eye was present, irrespective whether right or left was covered, and nystagmus was present occasionally only if the right was covered, and at times only if the left was the one covered. The one constant feature present was that with monocular vision the type was spring-nystagmus with the rapid phase towards the side of the open eye; nystagmus present with binocular vision was of the oscillatory type.

IV. *Man aged 21 years.*

This patient shows latent nystagmus, the movements being of a fine type. He was seen on three occasions during one year, on two of which slow spring-nystagmus could be readily excited by covering one of the eyes and was of the same character whichever eye was covered. On the third no nystagmus could be elicited. Vision on the first two occasions was 6/18 in each (after correction) and 6/6 partly with both eyes open simultaneously. On the third, vision in each eye separately was 6/12, both eyes together 6/6 partly. The patient was never conscious of any of the subjective symptoms of nystagmus.

An interesting feature in this case was the presence of large colobomata bordering on the temporal side of each macula. Ophthalmoscopically it is difficult to say whether the maculae are involved or not, but the good visual acuity excludes that possibility. Apart from that and the myopic astigmatism with which the eyes are affected there is nothing else. Colour sense is good, stereoscopic vision is present; diplopia is readily excited by the use of prisms. Generally, the production of diplopia produces nystagmus, but this is not invariably the case.

V. *Woman aged 26 years.*

This case was only observed on two occasions within a month. There is a slight left convergent squint, and with both eyes open nystagmus of a distinct rotary type, both phases being equal. There is compound myopic astigmatism in both eyes, vision in the right being 6/12 (after correction) and <6/60 in the left. With both eyes together vision is not improved. On covering one eye, irrespective whether right or left, there is a marked increase in the frequency and excursion of the nystagmus, though the type (rotary) remains unchanged. Although the nystagmus is increased, vision does not suffer. No diplopia could be elicited in this patient; colour vision was good. There were no subjective sensations of nystagmus. When seen a fortnight later, the nystagmus with both eyes open was unchanged, and all attempts invoked to produce latent nystagmus failed. Thus on the two visits the patient presented on the first occasion the undoubted features of latent nystagmus; and on the second an "ordinary" case of nystagmus.

III.—Discussion

All the writers on the subject have assumed that latent nystagmus is a distinct entity with constant clinical features. A careful study of the cases reported in the literature leads one to doubt such a belief, for there appears to be very little that is common to all the cases. Thus under latent nystagmus, cases have been included which have nystagmus when both eyes are open, becoming enhanced when one is covered (Fromaget, van der Hoeve, Lafon, Roelofs), and cases in which nystagmus is only elicited when one eye is covered, there being no nystagmus when both eyes are open. In most of the reported cases an internal squint was present, but was not invariable, even divergent squint being reported (Brewerton, Roelofs); in most vision in one eye was much better than in the other, but again this is not an invariable rule (Clarke, Cunningham, Beatson Hird). The direction in which the nystagmus was most marked similarly varies considerably; though

apparently there are no cases reported in which it was most marked in the position of adduction, there are some in which it was most marked in the central position (Kestenbaum, Roelofs) and in others it was most marked in the position of abduction (Faucon, Wehrli). In some cases covering the better eye elicits the more marked nystagmus (Fromaget); in others the reverse holds true (Fromaget, Dorff, van der Hoeve). The effect of convergence on the nystagmus when both eyes are open varies also; in some cases convergence excites it (Fromaget, Dorff); in others it checks the nystagmus previously present (Faucon, Lafon). The effect of nystagmus on vision is just as variable. In some cases monocular vision amounts to about 6/60 in each eye separately, though binocular vision is 6/6 (Clarke, Cunningham, Beatson Hird); in others the difference between monocular and binocular visual acuity is almost negligible (van der Hoeve No. 1); and all sorts of intermediate variations occur. The stimulus sufficient to excite nystagmus varies considerably from case to case. Generally, occlusion of one of the eyes by means of a screen brings on nystagmus in the uncovered eye, but this is not always the case (Fromaget, personal observation). The use of substitutes for an opaque screen gives most uncertain results. High convex lenses in front of one eye seem to give fairly constant results (though the power of the lenses varies from case to case) but discordant results are obtained if such lenses are put in front of both eyes and test-types shown to the two eyes separately (van der Hoeve, Kestenbaum). The results with prisms are particularly discordant in such cases, hardly two cases reacting in the same way (Grimsdale, van der Hoeve). Again the ocular condition has varied from apparently normal eyes (Cunningham, van der Hoeve, Lafon) to those interesting cases of Fromaget and Dorff, where one eye was missing or completely blind as a result of war injury. It is worth noting that even in these cases the results as to the nystagmus were discordant; in two of Fromaget's cases, the blinding of one eye did not release nystagmus, in another it produced permanent nystagmus of the remaining eye, and in Dorff's case of the loss of one eye the result was nystagmus of an intermittent periodicity. Subjectively when nystagmus is elicited it has been associated with the sensation of objects moving (Fromaget, Dorff) but probably in most cases this association is lacking (it is generally not mentioned, and was absent in all the seven cases seen by the writer). Stereoscopic vision is usually precluded by the state of the eyes, for squint is often present; but normal stereoscopic vision has been found present (Lafon, personal observation, No. 4). In such of the cases in which light sense has been tested, the results have also been discordant, most showing the normal condition but some cases have night blindness (Dorff, Berg, Roelofs).

Negative findings are more constant; colour vision has been found normal (Fromaget, Dorff, personal observation), and the labyrinths have likewise been found normal in the cases investigated (Dorff, Berg, van der Hoeve, Lafon). The one constant feature of latent nystagmus, at any rate in the later cases, is the fact that once nystagmus is excited, it is always of the spring type, and the quick phase is towards the fixing eye. The earlier cases and some of the later give no description of the type of nystagmus, but where it has been observed and described this is the condition given (Faucon, Dorff, Wehrli, van der Hoeve, Hairi, Kestenbaum, Roelofs), the one exception to this being the ten cases of Lafon, according to whom oscillatory nystagmus is the type, and spring-nystagmus appears only when the eyes are moved towards the side of the fixing eye. Lafon's observation has, however, not been confirmed.

It would, therefore, appear that latent nystagmus is not the clear cut clinical entity that the detailed reports of cases suggest, for these case reports deal with that which is true for the particular case rather than with a class as a whole. Nor do the five cases reported in the present paper help to build up a clear cut clinical picture, for it is found that not only do the observations for one case fail to apply to another, but these findings do not hold for the same case at a subsequent occasion. This is true for almost every point investigated. It is not necessary to repeat the observations made as to the vagaries shown by these cases on repeated examination; it is enough to recall case No. 3, which illustrated almost every extreme that it is possible to meet in these cases. No nystagmus with both eyes open; nystagmus present under the same condition, nystagmus only when the better eye is covered, nystagmus only when the poorer eye is covered, and nystagmus as readily obtained if either is covered and no nystagmus if either eye is covered, all these extreme variations being seen in this one case. Practically all these conditions have indeed been noted in cases reported by other observers, and had this case been seen only once it could have been described as a case showing only one of the many conditions it does actually show. It must be admitted that not every case shows these extreme variations, but at the same time it must be stressed that repeated examination of these cases has revealed inconstancies in them all. The literature on the subject makes it sufficiently plain that the response to any given stimulus is most varied with different cases, but indications are also not lacking to support the contention advanced here that the same cases behave inconstantly at a repeated examination. These inconstancies are well brought out by the sixth case in van der Hoeve's series and by the case reported by Dorff in 1919. van der Hoeve's case concerns a man, who when first seen had nystagmus with both eyes open.

Monocular vision was poor: 6/24—6/18; binocular vision was not much better: 6/18. Five months later when examined for latent nystagmus, an increase in nystagmus could not be elicited on covering one eye. Seen again after an interval of nearly a year, there was no nystagmus with both eyes open, but definite nystagmus of the spring-type with each eye separately; binocular visual acuity was as before 6/18, but vision with each separately was only 6/60. Here is a case of manifest nystagmus becoming converted into the latent type. Dorff's case concerns a man who lost an eye through a war injury. Vision in the remaining eye was practically full, but occasionally it would become nystagmic, things would appear to swim about, vision would drop quite suddenly to about 6/18. This occurred frequently and incapacitated the man from going back to his previous occupation (weaving). Dorff had to examine this man repeatedly to establish the presence of this periodic latent nystagmus.

That the mass of discordant details collected about latent nystagmus should have received most widely differing explanations is not surprising. Many of the theories advanced mutually cancel each other, for the obvious reason that they regard as an essential factor a feature only present in the particular case or group of cases, being absent in another group and this absent feature giving rise to a contrary theory. It will serve no useful purpose to discuss these theories at length, or to submit to a critical analysis the very voluminous literature on the subject, but the different tendencies may briefly be indicated:

I. Theories which assume a local origin (eyeball).

Faucon (1872) and later Wehrli held the condition to be due to insufficiency of the external recti. This theory gains support by the presence of internal squint in many cases. But insufficiency of the external recti is absent in many cases, and manifest or latent divergence is present in others (Brewerton, Roelofs, Cunningham). Besides it is difficult to fit in more than a few of the features ascribed to latent nystagmus under the nystagmus shown by a paretic external rectus.

Lafon adopts the contrary view. To him latent nystagmus is a really permanent nystagmus which is kept in check when the two eyes are open, as a result of the mechanism of convergence. When one of the eyes is closed convergence is abolished and nystagmus becomes manifest. "Latent nystagmus is a congenital nystagmus which becomes manifest as soon as an obstacle is present to convergence." But latent nystagmus has been observed repeatedly in conditions of convergence.

Kestenbaum has elaborated an ingenious hypothesis which assumes that normally each macula sends out two reflexes for

lateral movements, one to the muscles moving the eye outwards, the other inwards. These impulses neutralize each other and hold the globe steady. In latent nystagmus the homonymous reflexes are defective; when both eyes are open the four reflexes neutralize each other, but when one eye is covered the stronger in-turning reflex overbalances the weaker out-turning reflex, and hence nystagmus is produced, with the primary (slow) phase inwards. Kestenbaum's hypothesis has the merit that he has been able to elaborate it to include most forms of nystagmus under a simple classification. Kestenbaum holds that images on the maculae are necessary to liberate these reflexes; Roelofs has advanced proof that it is not always the case, and furthermore Kestenbaum himself has reported a case in which perception of images by the macula was out of question for his patient had an opaque lens in one eye, and yet latent nystagmus could be excited.

II. Theories which assume labyrinthine influences.

The characteristic of a slow and rapid phase which this type of nystagmus has, is the strongest support for the view that it is somehow connected with the labyrinth, disturbances of which typically show this form of nystagmus. It must, however, be noted that in cases in which the labyrinth has been examined the findings have been negative. Berg advances arguments in support of his view that in latent nystagmus the tone of the external rectus is diminished by diminution of impulses from the labyrinth. Ohm on the other hand sees in latent nystagmus a disturbance of co-ordination by cutting out impulses which normally would reach the labyrinth from the covered eye.

III. Theories which assume a supra-nuclear centre.

The established fact that it is possible to excite movements of the eyes by impulses from most diverse sources such as the vestibular apparatus, cerebellum, corpus striatum and cerebral cortex, has led to the assumption of supra-nuclear centres which distribute these impulses to the nuclei of the cranial nerves innervating the muscles of the eye. Disturbances of the hypothetical action of these hypothetical centres have been called in to explain not only latent nystagmus, but nystagmus in general.

Hairi holds that covering one eye weakens its corresponding supra-nuclear centre on the other side of the brain, giving the opposing centre the upper hand and this excites nystagmus with the primary (slow) phase towards the covered eye. The rapid phase is then brought about by the action of the cortex. Hairi's hypothesis ignores the established anatomical fact that each eye is represented on both sides of the brain, owing to crossing of the

nerve fibres at the chiasma. Dorff, accepting Coppez's theory of nystagmus as to the existence of both tonic and clonic subcortical centres, sees in latent nystagmus a justification for that theory; rather similar is the view of Fromaget who holds that the tonic centres must receive impulses from both eyes, otherwise the clonic centres assert themselves. van der Hoeve speaks of a labile equilibrium of co-ordination. He holds that the impulses from one eye act dominantly in driving the eye in the opposite direction, the impulses for driving the eye in the same direction as the eye itself being the feebler; if co-ordination is good, such movements can be suppressed during monocular vision; with poor co-ordination nystagmus appears. Roelofs accepts the greater part of van der Hoeve's view, but holds that the primary cause is to be sought in a disturbance in the mechanism of fixation of the globe in the orbit, and this in turn is dependent on musculo-sensory impulses and stimuli of light.

It will be seen that the theories advanced as to the nature of latent nystagmus lack illumination as much as the reported cases lack a co-ordinated clinical picture, and the explanation in both cases is probably the same, namely that latent nystagmus is not a separate entity and that, therefore, no special theory can explain it. Latent nystagmus with its varying clinical pictures is perhaps best regarded as so many different stages of incomplete nystagmus. At the one extreme is to be found the usual type of severe nystagmus commonly seen, a condition in which nystagmus is always present with both eyes open and in which there is usually some gross malformation of the eye. At the other extreme is the type of case discussed in this paper, *i.e.*, cases in which the nystagmus is only artificially excited, such as by attempts at convergence; some other form of exertion; or by the occlusion of one of the eyes; sometimes this occlusion has to be complete, nothing short of the use of an opaque screen will be effective; at other times putting up a prism or a smoked glass will do. There are far too many intermediate cases between these extremes to warrant the extremes being separated into clinical entities. Furthermore, the inconstant behaviour of these intermediate cases breaks down any artificial barrier which is erected, for on different occasions the same case will have to be put in a different group. It is also worth bearing in mind that the conditions which have been found associated with the reported cases are just the very conditions which have long been known to be associated with the ordinary type of ocular nystagmus. Squints, convergent and divergent, night-blindness, corneal opacities from ophthalmia neonatorum, fundus lesions, are all ocular defects prone to give nystagmus.

The one fairly constant feature that seems to be present in latent

nystagmus is the fact that when nystagmus is elicited it is of the spring-type. It can be argued that this fact in itself is enough to establish latent nystagmus as a separate entity distinct from the ordinary type which is oscillatory. It must, however, be pointed out that whilst in some cases the existence of slow and rapid phases in the nystagmus is distinct and obvious, in others it is only with difficulty that the nystagmus can be recognized as having two phases. Even here intermediate groups seem to exist. Finally, it will be interesting to consider whether those cases which normally show nystagmus with both eyes open and in whom the nystagmus becomes more marked on covering one eye, have oscillatory or spring-nystagmus. The reports on such cases say but little on this aspect of the problem but obviously such cases cannot have the typical spring-nystagmus in both eyes with both eyes open, for then the nystagmus in the two eyes would be in opposite directions. It would therefore seem that when spring-nystagmus is excited in one eye on covering the other it must of necessity be a modified form of the nystagmus present with both eyes open. Spring-nystagmus in one eye cannot therefore be remotely separated from oscillatory nystagmus in both eyes. That they are indeed closely allied is illustrated by Faucon's case, three cases of van der Hoeve and by three of the present series. In all these spring-nystagmus is present when one eye is covered, but oscillatory nystagmus when both eyes are open. Spring-nystagmus in one eye, therefore, does not argue for a separate entity, but for the fact that it is a characteristic of nystagmus in one eye; and even so it is not a characteristic invariably present. That no hard and fast line can be drawn between spring-nystagmus and oscillatory nystagmus is well illustrated by a case carefully studied by Ohm (*Klin. Monatsbl. f. Augenheilk.*, Vol. LIV, p. 505) whose patient showed typical spring-nystagmus (binocular) which gradually in the course of a few months passed into oscillatory nystagmus. van der Hoeve's case (No. 6) of oscillatory nystagmus passing into latent nystagmus (and showing the spring-type) is another illustration showing the reverse process in operation.

The striking absence of any clear cut feature in latent nystagmus and the innumerable intermediate and inconstant stages between well-marked latent nystagmus and the fully developed binocular nystagmus commonly seen, warrants the conclusion that the so-called latent nystagmus is not to be regarded as something distinct, but as an incomplete form of nystagmus, bordering in some cases on the normal and in others on fully established binocular nystagmus. The understanding of these interesting intermediate forms must await our solution of the larger problem.

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Summary

1. The literature on latent nystagmus is reviewed. Latent nystagmus is a condition in which nystagmus not normally present when both eyes are open, becomes manifest on the occlusion of one eye, or through the action of other stimuli.
2. Cases are reported to show the extreme inconstancy of the detailed features of this type of nystagmus.
3. The conception of latent nystagmus as a distinct clinical entity is questioned.

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ON THE PIGMENTATION OF THE CONJUNCTIVA IN NORMAL INDIVIDUALS AND IN CASES OF KERATOMALACIA IN ADULTS

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IN his interesting studies concerning xerophthalmia and keratomalacia in China, A. Pillat^{12, 13} has called attention to a particular conjunctival pigmentation. He finds this to be one of the most striking symptoms of xerosis, being found with a frequency of about 70—80 per cent. of the cases.

In what concerns the origin of that pigmentation, some authors (Kirkpatrick, Wright) think it to be due to a disturbance in the functions of the liver, and see in it a connection with the icteric state of the conjunctiva, signs of cirrhosis, etc., frequently found in such patients.

Opposed to that opinion, Mori and Pillat think that such pigment is melanin accumulated through a mechanism still unknown, as a result of the processes of degeneration going on in a xerophthalmic conjunctiva. In his observations Pillat could not find any notable increase of bilirubinaemia or any liver insufficiency, as verified by the levulose test.

We have been interested in this fact because in our limited observations, which we could follow in the Ophthalmological Clinic of Jassy, we had never noticed such particular pigmentation. Pillat mentions not having found this symptom recorded, excepting in such Oriental races as Indians and Chinese.

From the literature that we have analysed, only the observations made in Poland by Narog¹¹ were found to mention it. In one