tigo. And just now another patient, a lady of middle age, having an intensely pigmented face, suffers from inco-ordination of the pharyngeal muscles to such an extent as to suggest to her medical attendant the possibility of glosso-labial paralysis, so great was the difficulty of swallowing.

There are links which bind together osteo-arthritis, tabetic arthropathy, and the arthropathy of hemiplegic limbs. I venture to put forward the theory that the term "osteo-arthritis" will be found to include several kinds of joint lesion. There is what is commonly called the acute type, and there is the chronic type, and in both the anatomical changes are the beginning and end of the whole thing. But I contend that there is a large and hitherto undescribed group in which the pathology of joints is merely one sign of a profound nerve disorder. We call it conventionally an arthritis; but really the arthritis is only one neural symptom among many others, and possibly not the most important. Synthetically we do not build osteo-arthritis out of pulse, pigment, perspiration, or pain; the special morbid anatomy must be there; but one or more of these symptoms may eclipse the arthritis so far as to make it insignificant in any given case. A new name seems to be wanted for a complex state in which the neural and trophic phenomena of the body are so curiously upset and confused; but I do not venture beyond my allotted province of merely recording what I have seen and heard.

To sum up. A patient (male or female) walks into our consulting room with a slightly forward attitude, spare habit of body, and very likely a halting walk from something wrong in the lower limbs. We note the ovoid face, the melasmic tinge around the eyes, or the shining yellow pigment on the forehead; we feel the cold wet hands, and glance at the nodular fingers; and our diagnosis is made—made, I affirm, beyond the possibility of doubt or failure; and if there be besides the hard quick pulse, one more element is added to the diagnosis already assured. Our ancient friend, the practical man, is now certain to be pleased; he can begin his treatment without hesitation and without fear; he knows, or ought to know, that time lost in applying his remedies is time which cannot be recalled.

I have refrained from touching many minor points, and from travelling along some interesting by-paths, because I desire the main outlines of my theme to be vivid and unblurred. Fallacies of observation and induction beset all human inquiries; and with every caution and reserve I offer for the judgment of this veteran Society some material for the elucidation of an obscure and almost malign disease.

ON SOME POINTS CONNECTED WITH CONCOMITANT CONVERGENT SQUINT.¹

By W. ADAMS FROST, F.R.C.S.,

Assistant-Surgeon to the Royal Westminster Ophthalmic Hospital;
Assistant Ophthalmic Surgeon to St. George's Hospital.

IN man, and probably also in other animals whose eyes command a common visual field, the two eyes are intimately associated in the act of vision; not merely in the sense of doubling the intensity of a visual impression, but, the two retinæ transmitting to the sensorium impressions which differ from each other much as the two sides of a stereoscopic slide, the mind is enabled to fuse these into a single mental picture, from which impressions of solidity, depth, and distance are obtained with much greater certainty than could be obtained from a single retinal image. Perhaps the simplest way of demonstrating the advantage of stereoscopic, or, as I shall hereafter call it, "binocular" vision, is by means of Hering's test. A horizontal string is held at the level of the eyes at a distance of about two feet, and small bodies such as beans are dropped from a height of a few inches either on the proximal or distal side of the string, and close to it. With both eyes open there is not the slightest difficulty in seeing on which side of the string the object falls, but with one eye alone it will be found impossible, even with the closest attention, to be certain.

Binocular vision cannot, however, be obtained of all points in the visual field simultaneously, but only of such as fall upon certain parts of the two retinæ, which are for that reason said to be "corresponding areas." The yellow spots correspond, and if the retinæ be divided into quarters by lines meeting at this point, the right upper, left upper, right lower and left lower sections in

one eye would correspond with those of the same name in the other. The result of this is that when the visual axes are directed to any point (so that its image falls on the fovea in each eye), images of other objects in the same vertical transverse plane as the object fall on corresponding areas, while those which are at a greater or less distance have their images on non-corresponding areas. In the latter case double vision, or "diplopia" results if the mind takes cognisance of both images. The impressions, however, produced by retinal images at a distance from the fovea do not force themselves on the consciousness; and although, by a little practice, most people can convince themselves that this diplopia really exists, we are as a rule as unconscious of it as of the existence of the blind spot. If, on the contrary, the object to which the attention is directed has its image on the fovea in one eye and on some other part of the retina in the other, then diplopia is produced.

The whole function of the ocular muscles is to direct the visual axes to the object on which our attention is fixed. Partly, no doubt, from the anatomical fact that the centres which govern accommodation and convergence are in close connection, and partly from the physiological fact that the accommodation and convergence have from the first dawn of vision been associated in action in order to obtain binocular vision, both in the individual and through an innumerable succession of generations, it comes to pass that on accommodating for a given distance, the visual axes are converged to meet at that distance, instinctively and without conscious effort. But the power of adaptation to environment is a characteristic of organised beings, and if from any cause the conditions are so altered that binocular vision can only be maintained by an alteration in the normal relation between convergence and accommodation, that alteration may be made unconsciously if it does not exceed certain limits. This may be illustrated by placing prisms or lenses before the eyes.

Within certain limits, then, the desire for binocular vision will lead to binocular fixation. It remains for us to consider under what conditions continuous binocular fixation either demands a conscious effort or becomes impossible.

Now, in the first place, having regard to the variations in the conformation of the face, in the shape and size of the orbits, and the degree of prominence of the eyeballs, it is not to be expected that the range of the ocular movements should be the same in all cases. The admirable investigations of Motais have shown that the limitation of movement of the eyes depends on the parts of Tenon's capsule which form the check ligaments, and that these are called into play not merely when the limit of movement is reached, but that they exert a continuous and increasing control during the whole range of movement. It would seem probable, therefore, that the variations in the power of moving the globes depend less upon actual differences in the power of the muscles than upon the anatomical connection of the ligamentous processes, although, of course, when there is feeble muscular tone, an impediment would be noticed which might otherwise be unimportant.

For much of our knowledge of the variations that exist in the relative amount of convergence and divergence we are indebted to Landolt. Adopting the metrical notation, and taking parallelism as zero, we may say that the normal condition is a power of divergence (negative convergence) which would cause the visual axes to meet at a point one metre behind the base-line connecting the centres of rotation (that is, one metrical angle -1 M a); and of convergence (positive) to a point distant one-ninth of a metre ($+9\text{ M a}$), the range of convergence being thus ten metrical angles. Now it is evident that this may vary in many ways. The range may remain unaltered, but it may be displaced towards the positive or negative side, or it may be shortened at the expense of either positive or negative end, or of both. A consideration of these varieties would be beyond our present purpose, and I must refer those of you who are interested in it to Professor Landolt's paper, of which an excellent translation by our late clinical assistant, Dr. Law, appeared in the *Ophthalmological Review*, July and August, 1886.

It is evident that any great departure from the normal condition will render binocular fixation difficult or impossible, according to its degree. In the former, the use of the eyes upon near objects for long periods will cause the symptoms classed under the term "asthenopia" with which you are familiar in hypermetropia, a symptom which has been well defined as "a strike for less work or better tools." In the higher degrees of abnormality binocular fixation may be impossible, and then we get a squint

¹ An abstract of two lectures delivered February 14th and 21st at the Royal Westminster Ophthalmic Hospital.

developed. When binocular fixation is only performed under protest, as it were, and in order to avoid diplopia, a squint may be said to be latent, and it will become manifest if anything happens to prevent binocular vision, or to impair its value. A latent squint may therefore artificially be rendered manifest by covering one eye, or by causing vertical displacement of one retinal image with a prism, for, since the eyes can only be moved together in the vertical meridian, fusion of the two images then becomes impossible. The best test object for this latter examination is the well-known one of Graefe, a vertical line with a dot in the centre. When binocular fixation occurs for the distance of the object the lines are fused; in other conditions two complete lines are seen, too great convergence being shown by divergence of the images, too little by their crossing.

A latent squint may also be rendered manifest by impairment of the vision of one eye.

So far we have considered the interference with the normal relation between convergence and accommodation from the side of the former function, but it may of course depend on defects in the latter. Myopia acts thus by requiring less accommodation, and hypermetropia by requiring more; the tendency in both cases is to equalise the use of the two functions, and therefore of myopia to cause either spasm of the accommodation or defective convergence, and of hypermetropia to cause either defective accommodation or excessive convergence.

Lack of time prevents me from saying much as to the treatment of these conditions of disturbed relation between convergence and accommodation without actual squint. If the amount of positive convergence is defective, the symptoms can be relieved by the following methods: 1, the use of prisms with their bases inwards; 2, tenotomy of one or both external recti; 3, advancement of one or both internal recti; 4, a combination of several of these. Prisms alleviate the symptoms without removing the condition to which they are due; the weight of the stronger prisms and the chromatic aberration that they cause limit their usefulness. The choice between 2 and 3 will depend upon the relative amount of negative and positive convergence; 2 diminishes the former, while 3 increases the latter.

We will now pass from latent to actual squint, still confining our attention to cases in which there is no paralysis, and which are called "concomitant" because the eyes, although always too convergent or divergent, accompany each other in all their movements in the normal manner.

Concomitant convergent squint is most commonly caused by hypermetropia. The mode of causation is probably well known to all of you. The hypermetrope has to use an excessive amount of accommodation in order to see; he has, therefore, three courses open to him: 1. He may dissociate his convergence and accommodation, and use the necessary accommodation with only the normal amount of convergence; he would, *a priori*, seem more likely to do this if his hypermetropia were of low degree. 2. He may not use the necessary accommodation, and be content to have defective near vision; it was formerly assumed that this actually occurred in the higher degrees of hypermetropia, although this is theoretically possible, but I think that it is much more probable that a hypermetrope who may be unable to neutralise his defect always endeavours to do so. 3. He may facilitate the use of accommodation by employing his convergence at the same time. We are now concerned only with this last.

To Donders we owe the discovery of the connection between hypermetropia and strabismus, and his theory has been universally accepted till recently. Lately, however, two objections which have been urged against it seem to have shaken the faith of some. One is that, according to it all hypermetropes should squint; the second is the alleged immunity of the higher degree of hypermetropia from squint. The first I believe to be unreasonable and the second untrue.

Why do not all hypermetropes squint? Is there any opposing influence? Surely the desire for binocular vision in this case, as in those we have already considered, will tend to prevent the development of a squint. If binocular vision exists, the immediate effect of loss of binocular fixation will be diplopia, and the choice has to be made between the inconvenience of diplopia and that of dissociating accommodation and convergence. It is true that most children who squint have no diplopia, but then we seldom see them until the habit of squinting is well established, and children learn very early to disregard or "suppress" one of the retinal images. I do not think it surprising

that children do not oftener mention the diplopia; they are generally very young when they commence to squint, and are not accustomed to mention subjective sensations unless they are painful; but I have met with many instances in which it has been complained of, and in some of these I have had an opportunity later of finding that it had entirely disappeared. Given the tendency to squint, it is evident that anything that lowers the value of binocular vision will remove an obstacle to that tendency. Squint will, therefore, be the more likely to occur if the vision of one eye is defective; the same effect will be produced if one eye has a higher degree of hypermetropia than the other, for since the accommodation can only be used equally in the two eyes, the more ametropic must have blurred images when the hypermetropia of its fellow is neutralised. Now, as a matter of fact, we do find in the majority of cases of squint that the squinting eye has either a higher degree of ametropia, an inferior visual acuity, or both. It used to be supposed that the impairment of the vision was the result of the squint, and was due to the constant suppression of impressions received from it. I cannot now examine the evidence bearing on this; my own belief is that there is, in such cases, an original inferiority of one eye, but that this is largely increased by the habit of voluntary suppression. Eyes which present this amblyopia in a high degree often possess a very fair amount of indirect vision, but the vision of the central portion of the retina does not show that marked superiority over the peripheral, which is the normal condition, and is often obviously inferior to it. There is a class of cases in which the two eyes are equal, and in which it seems to be a matter of utter indifference to the patient which eye he squints with. In these cases of "alternating" squint also diplopia is absent when the squint is fully developed. It is not unlikely that in such cases there is an original preponderance of the internal recti.

It remains for us to consider the alleged immunity, comparative or absolute, of the higher grades of hypermetropia from squint. The explanation usually given that those affected with extreme hypermetropia, being unable to neutralise it, give up the attempt, always seemed to be *a priori* improbable, and has no foundation in fact. It is strange that this statement has been generally accepted without question of its accuracy. When some learned philosophers disputed as to the reason why a dead cod-fish weighed more than a live one, it occurred to someone to test the fact, with the well-known result. Low hypermetropia is exceedingly common, while high degrees (over 6D) are comparatively rare; therefore among cases of squint we cannot expect to find a preponderance of high over low hypermetropia, but I believe that it will be found that the proportion of the former is much greater than among the non-squinters. Last year I went over my notes, in order to ascertain whether this was so or not. I found a record of 123 cases in which the refraction had been tested. The following table shows the relative proportion of the different degrees of hypermetropia (when the eyes differed the refraction of the working eye is given).

Under 1 D	...	...	8.13 per cent.
1 to 2 D	...	...	16.03 " "
2 " 3 D	...	...	18.5 " "
3 " 4 D	...	...	17.5 " "
4 " 5 D	...	...	15.3 " "
5 " 6 D	...	...	12.7 " "
Over 6 D	...	...	11.9 " "

I suppose no one will contend that 11.9 per cent. is the proportion in which H. of over 6D occurs in comparison with other degrees, but this is not all; squint is a prominent symptom, and a large proportion of the cases are brought for advice, H. without squint in the child often produces few symptoms, and therefore only a minority of the cases are brought. These facts are quite consistent with the view that the liability to squint is proportionate to the amount of hypermetropia.

If defective vision of one eye, or preponderance of the internal recti, is present in most cases, you may ask why should not they alone be held responsible for the squint? For the simple reason that the very large majority of cases of squint in the early stage can be cured by correcting the hypermetropia with convex glasses. At first, and sometimes for months, the squint will return the moment the glasses are removed, but eventually a permanent cure will result in most instances. The best test of the curability of a squint with glasses is the effect of atropine; if there is no squint when the accommodation is rendered impossible, there will usually be none when it is rendered unnecessary. It is not always so, for habits that have been acquired may persist after

the original cause has been removed. I know that some authorities are sceptical as to the cure of squint with glasses, but positive evidence must be allowed to outweigh negative, and those of you who have followed the practice of this hospital can have no doubt on the subject. I would go still further, and say that in many cases the glasses may subsequently be laid aside, if binocular vision exists, without the squint relapsing.

Of the operative treatment of squint I will not here speak, but I wish to direct your attention to a method of producing or restoring binocular vision when binocular fixation has been obtained. This in this country has been much neglected; we are too apt to think that, when we have cured the squint, we have done our work, while in reality we have but scamped it. It is true that a deformity has been remedied, but the correction of the squint in the majority of cases does nothing towards restoring binocular vision. Of this you can easily convince yourself by means of Snellen's coloured letters.² You will find that the patient can, if each eye has good vision, see after a little practice either set of letters at will, but seldom both at once. He is not, therefore, really cured, for he does not see as in the normal condition. We owe much to Landolt in the matter of the treatment of affections of the muscles, but in my opinion his greatest achievement is that he has taught us how binocular vision may be restored in a large number of cases of squint. For this purpose a modification of the stereoscope is most useful. In the ordinary instrument the picture before each eye is, by means of a prism with the base outwards, projected to the same point on the middle line and a little further from the observer than the actual picture, so that a slight amount of convergence is used. For our purpose it is necessary that we should be able to regulate the amount of convergence required in order that such pictures may lie on the foveæ centrales. Accordingly the prisms must be capable of rotation, by which means their effect on convergence can be gradually altered. There must also be an arrangement by which either the distance of the object or the strength of the lenses can be altered, in order that the amount of accommodation can be regulated. The objects before the two eyes should be dissimilar, but capable of being fused into a single picture. A bird on one side and a cage on the other make a very serviceable slide.

If the vision of one eye is defective, it must be improved as much as possible by practice, and a more conspicuous object chosen for that eye. In most cases it is at first necessary to attract the child's attention to the picture before the eye that squinted by covering the other. Even when both images are seen simultaneously, it is seldom that they are fused, usually at first there is homonymous displacement, which must be overcome by rotating the prisms, and, if necessary, by adding others.

When once the patient has succeeded in fusing the images, and understands what is required of him, he should be encouraged to practise with other slides, and to amuse himself daily with it. From time to time Hering's test should be used to see whether any progress has been made towards habitual binocular vision. This mode of treatment has been little practised hitherto owing to the difficulty of procuring a stereoscope which would be within the means of hospital patients. Messrs. Pickard and Curry have, however, now manufactured an instrument after Dr. Landolt's model which will, I believe, obviate this difficulty; and it is not unlikely that by this means many more squints will be cured without tenotomy than has hitherto been possible.

² Transparent letters of complementary colours, arranged alternately, and viewed through similar glasses—one before each eye. Since each glass quenches the light which has passed through the letter of its complementary colour, each eye can only see the alternate letters.

SATISFACTORY information as to the decrease of small-pox at Sheffield continues to be received. The malady is said to be decreasing both in the number of cases and in the malignancy of the disease.

It is suggested by President Cleveland that the United States Government should prohibit the importation of swine or porcine products from France and Germany, owing to the information received that disease exists among swine in those countries.

STEPS have been taken by the friends of the late Dr. Adey to connect his name inseparably with the Hastings, St. Leonard's, and East Sussex Hospital. A meeting with this object was held at the hospital on Thursday, March 29th, to consider the question of raising some permanent memorial to this physician, whose name is deservedly held in high esteem by the inhabitants of the district.

THE VALUE OF ELECTRIC ILLUMINATION OF THE URINARY BLADDER (THE NITZE METHOD) IN THE DIAGNOSIS OF OBSCURE VESICAL DISEASE.¹

By E. HURRY FENWICK, F.R.C.S.,

Assistant Surgeon to the London Hospital; Out-patient Surgeon to St. Peter's Hospital for Urinary Diseases.

THE new incandescent-lamp cystoscope has been before the profession for more than a year,² and sufficient knowledge has been acquired of the capabilities of this instrument, and of its predecessor, the Nitze-Leiter cystoscope of 1879, to warrant the discussion of certain important questions bearing upon the subject of vesical endoscopy. There can be no dispute as to the immense advantage which would be gained by a visual examination of the interior of the bladder in certain cases of obscure reno-vesical disease—cases in which neither the sound nor the microscope nor a careful estimation of the symptoms afford any clue to the nature and site of the disorder. Nor can there be, as far as the mere examination of the bladder is concerned, any difference of opinion as to the superiority of a successful cystoscopy over a digital exploration by the *boutonnière* operation. The questions which merit our consideration relate to the means at our command of obtaining a successful inspection of the interior of the bladder without a cutting operation. They may be thus formulated: Is the electric cystoscope of practical value? What rank will the instrument acquire as a diagnostic agent?

The former question can be readily answered by a reference to the work already done. Obscure vesical symptoms, in which an efficient cystoscope would prove of practical utility, may be elicited by foreign bodies (other than stones), latent and sacculated calculi, various forms of ulceration and vesical growth which cannot be diagnosed bimanually or otherwise. It is in the inferior zone of the bladder that these conditions are mostly to be met with. Given: an incandescent-lamp cystoscope in good working order and well lodged in the bladder, a clear medium, a practised eye and hand, and it can be affirmed beyond dispute that the entire inferior zone can be thoroughly searched without a cutting operation by means of electric light. The following briefly described cases from the literature and my own notebook will serve as illustrations.

Foreign Bodies.—No case could be more conclusive as to the practical value of the cystoscope than the following, which came under the care of Dr. Nitze, the able introducer of this brilliant innovation. F. S., aged 35, had left-sided ovariectomy performed by Martin; the pedicle being secured by several stout silk ligatures. Two years after the operation the patient was suddenly seized with acute cystitis. A calculus was discovered and partially crushed, a silk ligature being subsequently passed along with calculous debris. The patient then came under Dr. Nitze, who performed litholapaxy. In attempting to remove the lithotrite, it was felt to be firmly held by something in the bladder. It was withdrawn with an effort, and a silk ligature was found entangled in the jaws of the instrument. All the stone was removed. The electric cystoscope was introduced, and the ends of a thick glistening white ligature were seen projecting from a deeply congested pit in the mucous membrane of the left wall of

Fig. 1.

the bladder (Fig. 1). The lithotrite was introduced and the liga-

¹ Abstract of clinical lectures upon Electric Cystoscopy delivered in the out-patient department of the London Hospital, January 27th, 1888; and at St. Peter's Hospital, February 15th, 1888.

² Nitze, *Illustrirte Monatschrift der ärztlichen Polytechnik*, March, 1887; Leiter, *König. Gesellschaft der Aerzte zu Wien*, March, 1887; *JOURNAL*, February 4th, 1888.