pressure to a faulty water metabolism, which allows water to collect intracellularly, resulting in subcutaneous infiltrations, overloading of the fluid in the labyrinth, and increase of pressure in the cerebro-spinal fluid. To the well-known signs of Ménière's disease—namely, tinnitus, vertigo, and deafness—they add the attribute of variability of these signs, the variability being due to the amount of water retained at the time. Thus, after exercise sufficient to produce perspiration, or following a decreased intake of water and salt, air conduction and bone conduction improve; while after an increased intake of fluid, air conduction and bone conduction decrease, and the latter may even be absent. Low notes are usually not audible, while high notes are well heard. This shows that the cochlea is intact and that hearing can be saved. In late cases the high notes are lost. These writers find the tympanic membranes retracted as a result of stenosis of the Eustachian tube, and so they look upon catheterization as an essential part of the treatment. The stenosis is caused by waterlogging of the lining mucous membrane. The examination of the labyrinth reveals abnormality of the semicircular canals; nystagmus occurs spontaneously, or it can be induced by the inhalation of amyl nitrite, and the turning chair shows a difference in the direction of right and left after-turning nystagmus. The proof that these patients suffer from a faulty water metabolism is that if 1,000 c.cm. of water is administered, only 400 to 500 c.cm. will be passed in four hours, whereas a normal person will pass the 1,000 c.cm. or more during this period. Furthermore, a patient with Ménière's disease will increase in weight corresponding to the amount of water retained; that is to say, if a patient retains 500 c.cm. he will increase in weight by 400 grams, allowing 100 c.cm. for loss through the skin and lungs.

A haemocritic test also shows that in a normal person the blood becomes diluted half an hour after intake of water and regains its normal concentration an hour later, while in a waterlogged patient with Ménière's disease there is no alteration in the dilution of the blood. A waterlogged patient also shows a loss of haemoglobin, the haemoglobin being about 73 per cent. The third proof offered is that an intravenous injection of salyrgan (1 c.cm.) causes diuresis, which commences immediately and lasts two days in a patient with Ménière's disease, while in a normal person the diuresis lasts one day, and there is a decreased output of urine on the second day. In certain patients with only tinnitus and catarrhal otitis disordered water metabolism has been found. These cases can be recognized by noticing an alteration from hour to hour in the perception of low tones or in the air conduction.

TREATMENT

The treatment of Ménière's disease, based on this theory, consists in diminishing the intake of fluid so that the patient loses weight and is actually thirsty. For dietetic purposes fruit and vegetables are considered to be fluid. One also must promote the loss of water by carbonic acid, fir needle, and mud baths, and by the Scotch douche, by exposure to the carbon arc up to one hour three times a week, and by massage. Diet must be salt-free. Local treatment consists in catheterization of the Eustachian tube. The drug treatment in this Danish school is unimportant. Like others they treat the acute attack with atropine, but have found ergotinine also useful. An injection of salyrgan is followed up by a long course of calcium-diuretin; while calcium, ovarian, and thyroid extracts are also used.

I myself have had great success in employing a salt-free diet with a decreased intake of fluid. I have also used a drug (in a few cases) which has been investigated by

Berggren—namely, bulbo-capnin (Merck). This drug is as valuable in Ménière's disease as ephedrine is in asthma. My patients take one tablet (0.1 gram oral tablet) a day, and this is sufficient to prevent vertigo, while the acute attack is treated by a hypodermic injection (0.1 gram hypodermic tablet), which will almost at once relieve the patient.

BIBLIOGRAPHY

- Rigaud, P., and Riser, M.: Les Vertiges. Étude critique, *Paris méd.*, 1929, i, 613.
 Dandy, W. E.: Ménière's Disease; its Diagnosis and Method of Treatment, *Arch. of Surg.*, 1928, xvi, 1127.
 Aboulker, H., and Sudaka, P.: Pathogenie et traitement chirurgical du vertige de Ménière, *Ann. des maladies de l'oreille*, 1929, xlviii, 991.
 Drury, D. W.: Syndrome-complex Ménière, *New England Journal of Medicine*, 1929, cc, 173; *Laryngoscope*, 1929, xxxix, 141.
 Rebattu, J.: Le vertige de Ménière et son traitement, *Journ. de méd. de Lyon*, 1929, x, 455.
 Gundrum, L. K.: Ménière's disease, *Laryngoscope*, 1928, xxxviii, 726.
 Portmann, G.: Vasomotor Affections of the Internal Ear, *Proc. Roy. Soc. Med.*, Section of Otolaryngology, 1928, xxi, 97; *Journ. of Laryngol. and Otol.*, 1928, xliii, 860.
 Aboulker, H.: Pathogenie et traitement chirurgical du vertige de Ménière, *Presse méd.*, 1927, ii, 1412.
 M'Kenzie, D.: Ménière's Original Case, *Journ. of Laryngol. and Otol.*, 1924, xxxix, 446.
 Von Sture Berggren: Über den Einfluss des Bulbo-capnins auf spontanen Nystagmus beim Menschen, *Acta Oto-Laryngol.*, 1929, xiii, 233.
 Dederding, Dida: Ibid., 1929. Supplementum xi, vols. i and ii.
 Mygind, S. H.: Ibid., 1929, vol. xiii, Fasc. 4.

MINERS' NYSTAGMUS

BY

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The following investigation favours the theory that defective illumination is the major factor in the causation of miners' nystagmus.

I have investigated the same seam in two pits which are about a mile apart; they are steam-coal pits. In Pit A 0.303 per cent. of the workers are on compensation for nystagmus; in Pit B 1.27 per cent. are on compensation. I have examined the men who are working on the day shift in both pits: suffering from nystagmus—Pit A, 26.25 per cent.; Pit B, 41.42 per cent. In both pits the greatest incidence is among colliers, but there are many more acute cases in Pit B than in Pit A.

Comparison of Conditions

	Pit A	Pit B
Number of men employed ...	1,300	1,280
Number of oil lamps ...	550	590
Number of l.e.p. electric lamps ...	804	770
Depth of seam ...	1,500 ft.	1,800 ft.
Average thickness of seam ...	4 ft. 2 in.	3 ft. 1 in.
Mechanically handled ...	100 %	100 %
Barometric reading ...	28.35	28.43
<i>Analysis of Air</i>		
Carbon dioxide ...	0.24 %	0.14 %
Methane ...	0.78 %	1.63 %
Oxygen ...	21.62 %	20.36 %
Nitrogen ...	78.36 %	77.87 %
Hygrometer ...	68° F.	73.75° F.
<i>Analysis of Coal</i>		
Moisture ...	0.6 %	0.5 %
Ash ...	3.6 %	3.0 %
Volatile matter ...	14.9 %	16.5 %
Fixed carbon ...	81.5 %	80.8 %
Sulphur ...	0.83 %	0.84 %
Phosphorus ...	0.042 %	0.007 %
Quantity of air ...	1,000 c. ft. per miner	4,920 c. ft. per miner
Velocity of air ...	17 ft. per min.	122 ft. per min.

The only differences of any importance in this comparison are the depth of seam, the amount of methane, and the velocity of the air. It is nearly as difficult to work in a 4-foot seam as it is in a 3-foot seam, because in both seams the worker has to perform his duties in the reclining and semi-reclining positions. The amount of methane in either pit is so slight as to be of no importance. An increase in the velocity of air means more dust.

A comparison of the reflecting power of the coal faces in the two pits shows a very distinct difference. I am indebted to J. H. Shaxby, D.Sc., physicist and physiologist of the University of Wales, for his co-operation in taking photometric data and making the following comments on reflection and minimum candle power considered necessary to ensure macular vision.

It was noticed that the face of the coal of the same seam in two pits differed appreciably in the size of the facets of the fractured surface. In Pit A these facets are relatively large, and reflect light moderately well; in Pit B they are much smaller, and give the face a more uniform but a duller appearance. The difference seems to be accentuated by the smaller fragments which result from the cuttings of Pit B sticking to the cut surface and increasing its dullness. It was decided to measure the effective reflecting power of the seam in the two pits at the working face, and for this we used a specially made small photometer, which was worked by the illumination of an ordinary electric collier's lamp of 1 candle power.

The instrument consists of a tube about six inches long, in which is mounted a small Lummer-Brodhun cube. Light from the coal face to be examined passes directly through the middle strip of the cube, while light from the lamp falls on the cube from a lateral aperture, and is reflected to the eye from the outer parts of the cube. A simple eyepiece aids observation of the cube. The field of view thus consists of a central strip illuminated by the reflection from the coal face, and areas on either side illuminated directly by the lamp. The light from the latter is subdued and made diffuse by a window of opal glass in the side aperture of the photometer, and over this window slides a neutral absorbing "wedge," fitted with a scale defining its position relative to the centre of the window. By adjusting the setting of the wedge the field is made equally bright in both parts. The fractional amount of light transmitted by the wedge is known for each point on its length. The fraction transmitted by the opal glass window is determined once for all. Thus, from the setting of the wedge the relative amounts of light falling on the instrument from the coal face and from the lamp are determined, and, knowing the distances of the lamp from the coal and from the photometer, it is easy to calculate the reflecting power of the coal.

The data obtained in this way in the two pits work out as follows:

Percentage Reflecting Powers (Averages)

	Pit A	Pit B
	Per cent.	Per cent.
Freshly cut face	15.0	12.0
Slip	15.0	7.5
Roof (dry)	6.3	7.5

In the darkest parts of the face in Pit A the reflecting power fell to 12 per cent., while in one place, where the comparatively large facets of the coal caught the light, it rose to as much as 38 per cent. The reflection from the floor was never more than 2½ per cent., and was usually much less than this in both pits.

The impression gained by general inspection of the coals from the two pits is thus borne out by measurement; perceptibly more light is reflected in Pit A than in Pit B under the same conditions of illumination. As has

been stated, Pit A shows relatively much less miners' nystagmus.

It is of interest to calculate the strength of illumination necessary in a coal mine to ensure that the miner will use macular vision. The borderline between photopic and scotopic vision is given by the most trustworthy estimates as corresponding to a field of brightness about 0.0073 millilambert. It is presumably necessary, in order to ensure central fixation, to put a premium on the use of cones rather than rods by giving a brightness well above this borderline. If we assume that double the value is sufficient, and take the millilambert as the brightness of a perfectly diffusing reflecting screen under an illumination of 0.93 foot-candle, we find 0.0136 foot-candle to be required with such a screen. In a coal mine with average reflecting power 10 per cent. we shall then need 0.136 foot-candle, with a reflecting power 5 per cent. 0.272 foot-candle.

Thus, if the miner's lamp is to be 3 feet from the working face, it needs to be of intensity 1.2 or 2.4 for the two reflecting powers considered. If the working distance is 4 feet, the necessary candle power is about 2.2 or 4.4 respectively. It appears, therefore, that lights of less than 4 candle power cannot give an illumination from the coal face sufficient to ensure the employment of central vision.

It will be noted that the light reflected from the slip in Pit A was 15 per cent., whereas in Pit B it was only 7.5. A great amount of the coal in these pits is cut on the slip, and the miner is absolutely dependent on the reflected light to do his work, so in one pit the illumination from the slip was twice as good as in the other pit. In both these pits it takes about twenty minutes before the eyes are dark-adapted; there is no doubt about the fact that the worker must use the periphery of the retina for his work. Colliers and repairers suffer more from this condition than any other underground workers. I suggest that the reason is that their work is difficult form work, and the periphery of the retina was never intended to do seven hours' form work at a stretch.

Miners' nystagmus, like shell-shock and telegraphists' cramp, is a neurosis; there used to be thousands of telegraphists working under the same conditions, yet only some developed cramp; during the war thousands of men fought under the same conditions, yet only some developed shell-shock. We have all a certain amount of reserve nervous energy; some have much more than others. When all one's reserve nervous energy is exhausted a nervous breakdown follows. It is very similar in miners' nystagmus; the reserve nervous energy in the periphery of the retina is used up. In favour of this theory is the fact that all miners suffering from nystagmus complain of twilight blindness; the nervous breakdown in this disease manifests itself in inco-ordination of the eye movements, etc.,

It was thought that when the electric lamp was introduced nystagmus would cease, but it has increased in the proportion of 3 to 1. I will endeavour to suggest why this is the case.

1. The increase in illumination has been from 0.5 candle power in the flame lamp to 1 candle power in the present electric lamp; the increase is not sufficient.

2. The increase in glare with the 1 candle-power lamp as compared with the flame lamp is at least one hundred times. This is a great disadvantage.

3. Many men who had latent nystagmus when working with flame lamps developed acute nystagmus when they changed over to electric lamps, because of the increase in glare.

Why is it that nystagmus never occurs in house-coal pits, brown stone mines, or iron mines? Because the

illumination is better, and there is less absorption of light from the working areas.

Depending on the distance of the lamp from the coal face, the worker may only have 1/500 to 1/2000 of a candle power with which to perform his work. The ideal lamp is the cap lamp; it develops as much as 6 candle power; the worker directs his light upon the portion of coal face on which he is working; it ensures macular vision, and there is little annoyance from the glare of other men's lights.

RECOMMENDATIONS

1. The ideal illumination is by the cap lamp; many men object to them owing to the discomfort.
2. Where cap lamps will not be worn, a hand lamp of not less than 3.9 candle power should be introduced, with frosted prismatic glass with a slight greenish tint. The prismatic glass will mean that pillar shadows will be absent; the frosted glass with a slight tint will diminish glare. There are two lamps, with which I have done experimental work, which I consider are very good—the 3.9 candle-power Oldham lamp and the 4 candle-power alkali lamp. These lamps at the end of the shift should not diminish by more than 1 candle power.
3. Plain glass electric lamps should not be permitted underground owing to the marked glare.
4. An opaque shade should be worn on the back of every lamp by men going to and returning from the coal face, as the glare is a source of great annoyance to those following.
5. Where possible flood illumination should be used at coal faces.
6. Men returning to work after an attack should be employed in the afternoon shift, as they will then leave the pit in the dark, and they will have the maximum amount of daylight when at work; also they will have their week-ends free.

A detailed account of my investigations on nystagmus will be found in the April number of the *British Journal of Ophthalmology*.

Memoranda

MEDICAL, SURGICAL, OBSTETRICAL

NEEDLES IN THE OMENTUM

The following is an unusual history of a foreign body in a patient, and appears to justify a description of the case.

An unmarried woman, aged 22, was sent by her dispensary doctor into this hospital for treatment for abdominal pains. These pains were irregular and intermittent, and of a stabbing character—they affected her mostly when she was walking or turning in bed. She was unable to remember their first onset, but was positive she suffered from them as long as she "could remember," and recently they were getting worse and made things very uncomfortable for her. She had been operated on two years previously in New York "for these pains," which she was informed were due to appendicitis, and had her appendix removed, but she suffered from similar pains after the operation. She returned home to this country over twelve months ago.

On admission her temperature and pulse rate were normal, abdominal examination revealed nothing abnormal other than a vague tenderness over the left iliac region; this, coupled with the marked discomfort revealed on movement, and the history, were sufficient symptoms to justify a laparotomy.

I opened the abdomen through a medial incision below the umbilicus. The appendix had been removed. In the pelvis I found a small mass of omentum slightly adherent to the posterior surface of the left broad ligament. This was found to conceal a needle, the eye and point of which were completely eaten away by rust. On continuing investigation I found two other needles in the upper part of the

great omentum and another in the gastro-hepatic omentum—all well ensheathed by part of the omentum, which resembled fibrous tissue. The needles were on an average $1\frac{1}{4}$ to $1\frac{1}{2}$ inches long, and only in one case was the eye present—rust had reduced each one to half its proportions.

It was obvious that these needles had been in the abdomen many years. I sent for the girl's mother, but she could not remember hearing her daughter complain at any time that she had swallowed a needle, but she confirmed her history of having had pains in the abdomen since an early age. I concluded, therefore, that the patient had swallowed the needles in her early days at school or possibly elsewhere, and that they had been present in the abdomen for perhaps fifteen or sixteen years. Where they perforated the alimentary tract it is impossible to say, and I was unable to find any adhesions except those in the omentum, which were altogether apart from any viscus. The patient left hospital perfectly well in fifteen days.

The deductions from this case are obvious, but I may mention I had not the facility of an x-ray apparatus at the time.

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CONGENITAL INTRACRANIAL ANEURYSM

The account given of this condition by Reid and Gleave in the *Journal* of March 14th (p. 445) prompts me to place on record two cases seen in the past few years.

CASE I

A man, aged 24, complained of occipital headache and pain in the back of the neck on the day following a water-polo match. There were no local or general signs to indicate an intracranial origin for these pains. Having been in contact with a recent case of encephalitis lethargica, he was kept under observation for ten days. No further symptoms or signs developed; the pain gradually subsided, and finally disappeared. He returned to work feeling well. About three weeks later he had a sudden seizure while at work, and a few minutes afterwards he was seen lying on his left side curled up in an attitude of general flexion. He was extremely irritable, and his breathing was deep and stertorous. He resisted all attempts at examination. There was a paresis of the right side of the face. The clinical picture closely resembled meningitis, but this was excluded by the rapidity of onset. He was taken to hospital and died the same night without regaining consciousness.

A necropsy revealed a subarachnoid haemorrhage from a ruptured aneurysm of the right middle cerebral artery. The greater part of the haemorrhage was recent, but there was an older clot close to the aneurysm suggesting an earlier leakage which had presumably occurred when he first complained of headache. The Wassermann reaction was negative, and he was in good health previously.

CASE II

In December, 1929, a single woman, aged 20, had a fit, followed by headache and vomiting, which lasted a day. She returned to work, but complained of occasional headaches. On the evening of March 20th, 1930, she had another seizure, which lasted forty-five minutes. She was seen by her doctor, who noticed that she had ptosis of the right upper eyelid and a dilated right pupil; she was sent to hospital. On admission she was dazed, but was able to reply to questions. A minute or two later she had another seizure, in which she was comatose, with cyanosis of the face, stertorous breathing, and frothing at the mouth. The coma deepened and she died fifteen minutes later. The Wassermann reaction was not known.

At necropsy there was a large subdural haemorrhage over the entire right cerebral hemisphere, extending down the front of the medulla. The haemorrhage was recent, and occurred from a small saccular aneurysm situated at the termination of the right internal carotid artery. Near the aneurysm was a small hardened clot resulting from earlier leakage.