known as cerebral pressure, as well as the facts of general experience, seem to indicate that it is capable of relief by surgical interference.

2. That further and more extensive experience of the results of operations for the relief of cerebral pressure is desirable in the present state of our knowledge.

3. That such operations are quite justifiable on the ground that they are eminently safe, and practically unattended with any mortality if carefully performed.

Trephining in Meningitis, with Notes of a Case. By JOHN KEAY, M.D., F.R.C.P.E., Medical Superintendent, District Asylum, Inverness.

The patient was admitted into Mavisbank Asylum on the 5th of October, 1891, suffering from monomania of suspicion of probably about a year's duration. He was a well-nourished man, 50 years of age, 66 inches in height, weighing 160lbs.

Physical examination, against which he strongly protested, did not reveal any disease of the bodily organs, but it was noted that he had auditory hallucinations, and that his pupils were equally contracted. The special senses were moderately acute. Mentally he was an excitable, irritable monomaniac, full of delusions of suspicion. He charged people with hatching plots to do him injury, was extremely angry, and answered the most civil remark with a torrent of abuse, and threats of legal action, or physical violence.

In this excitable, delusional condition of mind, and in moderately robust bodily health, the patient continued until the middle of February of this year, when it was observed that his appetite was failing, and his weight diminishing. He also became more restless at night. Physical examination, with the object of discovering if possible the cause of this deterioration, was attempted, but the patient resisted with determination, and declared that there was nothing the matter with him. A week later it was observed that he frequently placed his hand on the right temporal region, and at the same time it was noticed that there was a slight purulent discharge from the right ear. Attempts were thereupon made to examine the ear, and to apply appropriate cleansing treatment, but, as before, all interference was

ceased. The patient still insisted that he had no pain, but his hand was frequently placed over the ear and temporal region, and it was noticed that he was partially, if not altogether, deaf on the right side.

The patient remained in this condition until an early hour on the morning of the 5th of March, when he was found in a semi-comatose condition. He could not be roused to answer questions, nor could he swallow. The pupils were small, and reacted feebly to light. There was well-marked ptosis on the right side. The mouth was drawn a little to the left, indicating a slight amount of right facial paralysis. The arms and legs were flexed, and he rolled his body from right to left. The neck was rigid, and the head slightly retracted. There was a little swelling, and apparently tenderness on pressure over the mastoid bone, and any movement of the head seemed to cause pain. The meatus contained some semi-liquid purulent matter. The temperature was 101° F., the pulse 84, and respiration 18.

The patient being in this grave condition, our Consulting Surgeon, Dr. Joseph Bell, after a careful examination, agreed that the case was one of meningitis, arising from the purulent otitis media, and probably involving not only the basal membranes, but also those of the cord. Notwithstanding its hopeless nature, however, it was decided that the skull should be opened, so as to obtain the removal, if possible, of some of the purulent material, and thus to—temporarily, at least—relieve the patient's most urgent symptoms. He was, therefore, put under chloroform, and after very careful cleansing precautions Dr. Bell trephined the skull over the sigmoid groove, about half-an-inch posterior to the external auditory meatus, examined the sinus, which appeared healthy, and opened the dura. A slight discharge of purulent bloody fluid took place, and continued after antiseptic washings of the wound, and for several hours after it had been dressed and the patient returned to bed.

The further history of the case may be shortly told. The patient vomited a little half-an-hour after the operation, and the sickness recurred several times during the day. His power of swallowing considerably improved, and he took milk in small quantities freely. The ptosis became less marked; he regained consciousness, and spoke sensibly. His general condition seemed materially improved. At night, however, the temperature rose to 102° F., and the pulse rate to 130. He became restless, tossing about a good deal. On the morning of the 6th he had a slight rigor, followed by profuse sweating; temp. 102·2°, pulse 110. Dr. Bell again saw the patient, examined and dressed the opening in the skull, from which there was still a slight discharge, and decided that there were no grounds for hoping that improvement

were softened, particularly those of the temporo-sphenoidal lobe on the right side. The walls of the ventricles were also soft, and they contained a quantity of semi-purulent fluid. The sinuses were not thrombosed. The pia mater at the base was much congested, and covered with pus. There was no localized abscess. The case, in fact, was one of diffuse, suppurative, lepto-meningitis, having its origin in the middle ear, and spreading thence by infection to the basal membranes, and by infection and gravitation to those of the spinal cord.

Remarks.—The foregoing case is none the less instructive because it was unsuccessful. In the first place, on contrasting the condition of the patient when suffering from simply a curable inflammatory affection of the tympanic cavity with his state when comatose from the practically incurable one of diffuse cerebro-spinal meningitis, one is forcibly taught the lesson that such an apparently slight and unimportant ailment as a "running ear," which is apt to be looked upon more as an inconvenience than a disease, is, as Professor Macewen* says, "as dangerous as a charge of dynamite in the mastoid antrum and cells." Chronic otorrhœa should be regarded as a disease in which vigorous treatment is demanded, first by the ordinary cleansing methods recommended by aurists, and then, if the discharge persists, and particularly if it is offensive, containing pathogenic organisms, or osseous *débris* indicating erosions of the bony walls, the case should be taken in hand by the surgeon. The mastoid antrum and cells should be opened and thoroughly cleansed, the whole of the tympanic cavity explored, and everything diseased, including even the ossicles if necessary, freely removed. This operation may be said to be quite free from risk to life, and though the sense of hearing may be impaired or destroyed on the affected side, this is a small matter when compensated by the removal of a disease which at any moment might infect the meninges of the brain and cord and destroy life itself. Even though it should be found that all diseased tissue cannot be removed, a free outlet for discharges is secured, and a barrier of connective tissue is formed to protect more vulnerable parts.

Another well-recognized fact which was brought out in

affection which must have given rise to considerable pain, and probably caused agonizing torture, who not only did not complain of it, but denied that he had pain, or even felt discomfort, and resisted with all his might every attempt at alleviation.

As to the operation for the cure or relief of meningitis, unless it be undertaken very early, it is, of course, more or less a forlorn hope. The disease is an exceedingly fatal one, whether left to itself or treated by palliatives. Martin Barr* reports 13 recoveries out of 51 recorded cases. Charlton Bastian † puts the mortality as high as 90 per cent. Vigla‡ reports 30 deaths out of 39 cases.

On the other hand Macewen § reports six cases of infective purulent lepto-meningitis, without spinal involvement, which were operated upon, and all of which recovered. Other six cases which were not operated upon died. The same surgeon reports five cases of *cerebro-spinal* lepto-meningitis operated upon, one of which recovered. A clear case is, I think, therefore made out for operation in all these cases, and the earlier it is undertaken the better the chances of recovery. If operated upon before the disease has become general, recovery is probable, but if the purulent inflammation has extended to the cord recovery is improbable, even with operation. Without it the disease is absolutely fatal.

In cerebro-spinal meningitis Macewen suggests opening the spinal canal and membranes at various points, draining away the pus, and irrigating the membranes by introducing antiseptic solutions into the cerebellar intra-dural space, which would find exit through the previously-made openings into the spinal canal and membranes. This daring operation has not yet been even attempted, but in these days of wonders performed in cranial and spinal surgery one would not be astonished to hear of successful cases treated by some such operative procedure.

Mr. W. THORNLEY STOKER (President of the Royal College of Surgeons, Ireland)—Your President has kindly asked me to take part in this discussion, and I have to apologize for appearing without certain facts that I could have put before you. He knew that I have been engaged a great deal in operating upon the cranium. But I am not prepared to say if there is intra-cranial pressure in the earlier stage of general paralysis. In any case where pressure exists the operation of trephining is a logical and justifiable procedure. I feel very

free from danger, and need not be approached with any great fear as to the possibility of immediately unpleasant consequences. Now, I have been very much struck, even in cases where I failed to do any permanent good, by the relief by which the operation is followed. I can look back to operations for intra-cranial tumours where life was prolonged and the conditions that existed were relieved. I have here a photograph of a boy, 7½ years of age, who 2½ years ago was kicked by a horse in the forehead, in the right frontal region. He sustained a depressed fracture which was not elevated, and began to suffer from epilepsy. He was brought to me last month, when I removed the piece of bone from the place where the cock of the horse shoe had depressed it, and found no perceptible injury to the brain itself. When I say that this boy has had no fits since the operation, I do not intend to present it as a case of cure—we will talk about that in a year or two hence—but it shows the effect of relief of pressure. The amount of additional space given to the brain in this case, having regard to the moderate size of the trephine hole, is exceedingly small, and yet it has up to the present prevented any recurrence of the fits. I am entirely opposed to the idea of implanting either a trephined piece or any of it in the hole. No matter how carefully the operation is performed a certain amount of the fragments may necrose afterwards. In early life a considerable amount of bone matter is secreted, and the size of the trephine hole diminished. But there is another matter—attention has been called by Dr. Claye Shaw to it—that is, that the membrane which fills the trephine hole does not equal in thickness the bone which has been removed, and thus greater increase of space is given by allowing membrane to close the trephine opening than if bone be implanted.

Dr. ANDRIEZEN—Supposing one part of the skull is depressed by injury, we have one condition of pressure, viz., of rapid and sudden development. Then we have a general and rapid increase according to the amount of general intra-cranial pressure. But on the other hand, supposing we have an abscess somewhere in the substance of the cortex, or deeper down, we have another state of affairs which may produce an increase of pressure in the elements in the immediate neighbourhood, and yet, owing to compensating causes, may not produce general intra-cranial pressure. Again when from effusion within the ventricles the cerebral envelope is expanded and pushed against its bony walls, we have another condition of intra-cranial pressure. Now, when we speak of increase of intra-cranial pressure in various forms of insanity, in what respect are we to understand this term? In the earlier conditions of general paralysis the distinct and unmistakable condition which we can recognize as pathological is a change in the peri-vascular region. Then one does not find an increased amount of fluid in the brain-substance inside or outside the cortex. A little later on we have an increase of fluid in two places, viz., (*a*) outside the cortex in the pia-arachnoid vessels, and (*b*) within the substance of the cortex. The whole substance oozes on section. But one case was tried at Wakefield, and there was nothing to indicate that the danger was averted, for the pia-arachnoid at the seat of operation showed no excess of fluid. It was not swollen or infiltrated with fluid. On the other hand, in undoubted cases of intra-cranial pressure (I am not referring here to general paralysis, of course) the evidence is remarkably conclusive—immediately the bone is removed the dura mater bulges, and the brain substance itself bulges when the dura mater is opened. And when the tumour is excised, or the abscess let out, as the case may be, the brain substance returns to its normal condition, and normal pressure is restored. In a case where, from increase of pressure following unilateral hæmorrhage or abscess, the pupils were unequal, immediately on relief the pupils became equal. Upon

parable to these in value? We have, in general paralysis, inequality of the pupils. But the pupils in such cases vary from day to day. Reference was made to optic neuritis. I am not sure of the value of that symptom. One may, or may not, have optic neuritis. It may result from toxic effects, or trophic changes. We are not at present justified in assuming that in cases of general paralysis the apparent remissions after trephining should be put down to the relief of intra-cranial pressure. On dogs and on monkeys we can increase pressure and affect the pupils very uniformly; but in clinical cases we have not any certain indications to make us sure that there is increase of intra-cranial pressure. Further, general paralysis, which begins with spinal symptoms much like tabes, shows that it is a system disease; and I think the time has not yet come when we can accept the statement that general paralysis is curable by the trephine.

The GENERAL SECRETARY—I have had an opportunity, in the West End Hospital for Nervous Diseases with which I am connected, of seeing four operations on the skull of a child who suffered from intra-cranial pressure. The first extended from the middle of the skull forwards, and after a fortnight it was extended backwards. Then the surgeon made another operation about half-an-inch from the former, on the right-hand side, forwards and then backwards. So that at the end of about a month the child had two fissures in the skull. Of course there was a rise of temperature after each operation; but, treated antiseptically, the child did very well, became lively and regained sight, and at present it has improved. I don't think that we could say the same thing with reference to a microcephalic skull, because we have not only the small brain, but other symptoms to show that it is a disease of the whole system. Of the sixty operations performed in these cases only five or six improved.

Dr. MERCIER—My opinion in regard to these operations is already known, and I see no reason to alter it. But I should like to add a small contribution to the debate with regard to the pupillary symptoms mentioned by Dr. Andriezen. In the London Hospital we used to have a large number of cases brought in suffering from coma from various causes, and the conditions which are laid down in the text books as indicative of intra-cranial pressure were found to be absolutely unreliable. In some cases it was found that, by pouring water on the face, the dilated pupil could be made to contract; and that by slapping or pinching the face, or twitching the hair, the contracted pupil could be made to dilate. The condition of the pupils could be altered again and again in the course of half-an-hour. I submit that this symptom as indicating intra-cranial pressure is quite unreliable.

Prof. BENEDIKT—As I have proved long ago neuroretinitis is not a symptom of pressure. A little tumour may cause neuroretinitis, and during the growth of the tumour the neuroretinitis may disappear, *e.g.*, by mercurial inunction. Headache, in cases of intra-cranial disease, is the result of a complicated connection between internal irritations of the brain and the circulation in the skull, as is proved by the dependence of the growth of the skull on the growth of the brain. One cannot speak in general terms of cerebral pressure. It cannot be severe, for in that case the great veins would be compressed, and we should have asphyxia of the brain. But there is a special mechanism for preventing great oscillations of pressure, positive and negative. This mechanism, as I have explained, is the choroid plexus, which is a secretory organ, and the secretory function is excited when pressure becomes negative, while absorption occurs when pressure becomes greater. Of the same nature is the function of the cells

room. Even small tumours in the brain are capable of giving rise to optic neuritis, but it is thought that this occurs when the tumour gets to the surface of the brain; while one which is of some size, but not at the surface, does not produce optic neuritis. Well, if this be the rule there are exceptions to it, as to everything, for I remember one of Dr. Thornley Stoker's cases where a large tumour of the brain reached the surface and gave rise to no optic neuritis before the patient's death. My own idea, and I think that it is the current one among ophthalmologists, is that tumour of the brain gives rise to optic neuritis if it grows rapidly. A slowly growing tumour is less likely to cause it. Then again the increase of the intra-cranial pressure depends not merely upon the presence of the new growth within the cranium, but also upon the presence of more or less internal hydrocephalus. In this way a small tumour accompanied by hydrocephalus might cause optic neuritis, whereas a large tumour without hydrocephalus might be unattended by optic neuritis. We know that hydrocephalus alone, without tumour or meningitis, may cause choked disc. It seems to be the opinion of some here that intra-cranial pressure is not the cause of optic neuritis. Well, this may not be the only factor, but I believe it to be the chief and initial cause. Dr. Andriezen has very properly stated that intra-cranial tumours probably give rise to toxic products, and that to these the neuritis may be mainly due. This view, first suggested by Leber, of Heidelberg, is very strongly held by some ophthalmologists. But these products, if they exist, are driven into the intervaginal space of the optic nerve by the increased intra-cranial pressure, and produce their deleterious effect locally. Professor Benedikt pointed out that tubercle at the base of the brain, that is to say, tubercular meningitis, is a frequent cause of optic neuritis. But this is not merely true for this kind of meningitis, but also for all kinds—the syphilitic, the rheumatic, etc. The increase of intra-cranial pressure in these cases must be insignificant, and the optic neuritis due to another sequence of events. It is true that neuritis has been seen to pass away and atrophy to come on while the patient ultimately died from the tumour of the brain. We assume in such cases that the optic neuritis passed away when the normal contents of the cranial cavity had gradually accommodated themselves to the abnormal pressure. I have had no experience of trephining in cases of tumour of the brain. But I would say from Dr. McEwan's work and that of Mr. Victor Horsley that it is a very desirable measure, apart from any intention to remove the tumour. It not only seems to lengthen the life of the patient, but to preserve a much longer possession of sight than could be expected otherwise. Its good effect on the optic neuritis is a strong argument in favour of the theory that increased intra-cranial pressure is the main cause of this neuritis in cases of tumours of the brain.

Dr. GEORGE M. ROBERTSON—I think that the papers and the discussion have rather passed away from the subject of cerebral pressure. I think that a more appropriate title would have been surgical interference in mental disease, and that the title selected is of the nature of a *petitio principii;* for increased cerebral pressure appears to be the only rational ground alleged for surgical interference. Has it been demonstrated that, before performing a surgical operation, we can with some certainty diagnose cerebral over-pressure? Among the symptoms quoted as proving the existence of this increased pressure is cephalalgia, but we know that this may be caused by anæmia and diminished pressure. There is no doubt that in former times many a case was bled to death on this false hypothesis, and we must not be led astray by similar error. Convulsions have also been mentioned, but we know likewise that convulsions may occur when an animal is bled to death, when there is

dural space—a common symptom in general paralysis, and one which I maintain is not a sign of over-pressure, but of diminished pressure. It is entirely compensatory; for normally little or none exists there, and in such an undoubted case of over-pressure as is caused by a large cerebral tumour, the dryness of the subdural space and the surface of the brain is a most remarkable and constant feature. Regarding the operation I believe that, if the pressure is caused by a solid growth, a trephine hole is not enough (as a dense membrane very soon forms), but that a large portion of bone should be removed on both sides. If the pressure is caused by cerebro-spinal fluid, which I very much doubt, it may be relieved by draining from the subarachnoid space of the spinal cord much more efficiently, and for a longer time. There has never been successful drainage from the subarachnoid space of the brain. If the pressure is due to the blood, the most frequent cause, I do not advise surgical interference at all, but more powerful, safer, more reliable, and more permanent medical agencies which act on the heart and blood vessels and blood pressure. It must not be concluded from my remarks that I am opposed to these surgical operations; I merely state that surgical interference in most cases is not justified. The operation is quite experimental; but there is full justification when performed in cases which would otherwise be hopeless, as it is simple and not dangerous. Surgical interference may have done good in several cases; but I maintain that its use is still in the empirical and experimental stage, and that we cannot yet put forward the true theory of its therapeutic action, nor can we yet diagnose the exact physical conditions that justify its use.

Hints towards the Prevention of Mental Disorders. By Dr. Curwen, Honorary Member of the Medico-Psychological Association; Medical Superintendent, Pennsylvania State Hospital for the Insane, Warren.

Every physician in charge of a hospital for the insane should do all in his power to aid in the advance of mental physiology, mental pathology, and physiological psychology, not only for his own immediate benefit as a study; but with the intent of reaching a better knowledge of the mental processes, and elucidating, as far as possible, the recondite problems of mind. These require careful and exact study, but that study will give power to the individual, while it will enable him more definitely to trace the intricate connection of cause and effect in the cases which call for his examination. It is certain that the more thoroughly these processes are studied the better will be the effect of treatment, and the more satisfactory will be the result to the patient and to the physician. He will learn more fully that while medical