tion in the shade or upon cutaneous irritation. In both of his cases the incidence of the paralysis was chiefly upon the muscles of the forearm and hand. There is never any active contracture—that is, a persistent shortening of muscle dependent upon spasm of the fibres and not upon tissue change. The limb nevertheless assumes certain positions on account of the pull of the antagonists of the paralysed muscles. One of the commonest of these is internal rotation of the humerus, chiefly resulting from paralysis of the infra-supinator and the consequent unantagonised pull of the subscapularis. The elbow is usually extended on account of the frequent affection of the flexors. The wrist is generally pronated because of supinator paralysis, and it is sometimes also dropped. When the small muscles of the hand are affected the palm is flattened out in consequence of wasting of the thenar and hypothenar eminences, the proximal phalanges over-extended, and the two distal flexed from paralysis of the interossei. All these positions assumed by the limb are easily overcome, resulting as they do, not from spasm, but from a physiological condition of tone of certain unantagonised groups of muscles. The electrical examination can only be very incomplete in most of these cases on account of the cries and struggles of the patients. It can usually, however, be shown that the faradic contractility is diminished or gone, and sometimes that there is an increase of voltaic irritability and the reaction of degeneration is obtained. It is very difficult to test the degree and extent of anaesthesia in young children, but it is generally evident that there is some loss of sensation of the paralysed as compared with the healthy limb. Trophic disorders are rare. In a case published by McDaldowie⁹ it is noted that for five months the affected arm did not grow at all, and the ridged nails of my own cases may be taken as evidence of nutritional disturbance. Vasomotor troubles are more common, for the paralysed parts have frequently a dusky red or bluish colour, and are at the same time colder than normal.

DIAGNOSIS.

The diagnosis is not always so easy as might at first appear. A case may not come under observation until the early history is forgotten, and as at any rate one instance is recorded in which several members of a family were successively affected, the absence of such history might lead to the belief that they were suffering from a hereditary form of amyotrophy. In the cerebral variety of birth palsy it is extremely uncommon for a single limb to be implicated, and difficulty can only arise when the arm is the part affected, for, as far as I know, no case has yet been recorded of peripheral birth palsy of the leg. The paralysis of cerebral origin is at one time or another associated with a certain amount of spasm, giving rise to a true contracture, which contrasts with the simple flexion or extension of the joints occurring in peripheral paralysis. Duchenne¹⁰ has recorded a very interesting case, and one very difficult to explain, in which there was spasm of some of the muscles of the arm associated with atrophy of the interossei and thenar muscles. There is no defect of sensation in cerebral cases, but convulsive seizures of the Jacksonian type may possibly occur. Peripheral birth palsy is not likely to be mistaken for cerebral syphilis or infantile paralysis, since the latter occur only during the later periods of infancy. Parrot's or pseudo-paralysis may occasion some difficulty, though only rarely, for its most frequent date of onset is from the second week to the second month. Porak,¹¹ Parrot,¹² and Guénoit¹³ have, however, described cases existing from birth, and as in two of these the paralysis was associated with certain fractures, the likeness to peripheral birth palsy was very close indeed. The points of distinction are these. Pseudo-paralysis is, as the name implies, no paralysis at all, and if the limb be carefully watched movements of some of the distal joints may generally be observed; although too none of the cardinal signs of syphilis are at first present they soon develop, and there is periostitis, separation of epiphyses, or some evidence of syphilis of the long bones. The course of the disease is at first progressive, and its termination is either towards rather rapid recovery under

treatment or death. In peripheral birth palsy, on the other hand, the paralysis is at first complete, there are not necessarily any signs of syphilis, and the condition is chronic. Besides, the muscles do not respond normally to the faradic current, and the paralysis is limited to one arm and possibly the face of the same side.

PROGNOSIS.

Ross¹⁴ considers the prognosis unfavourable, but Gowers¹⁵ asserts that most obstetrical cases recover slowly. The records of such cases as I have been able to consult would seem to show that complete recovery is rare, but that no improvement at all should take place is perhaps equally rare. The rule is that some movements eventually become possible, but, compared with those of the healthy limb, are weak and ill-sustained, for example, a child whose arm hung pendulous by its side at birth may after a time be able to raise the hand to his mouth. That such cases, which have possibly been under treatment for some months, should completely recover when lost sight of appears very improbable. The retention of faradic contractility, though diminished, shows that the rupture or laceration of the nerve trunks is not complete, and is therefore a favourable prognostic sign.

TREATMENT.

Electricity is the only method as yet suggested for the treatment of these cases. This, to be successful, must be commenced at an early stage of the disease, and carried out in a systematic manner. Henoch¹⁶ truly observes that "the persistent employment of electricity can be of service only so long as the nerves have not undergone fatty degeneration and the muscles still react," that is, to faradism. There are chiefly two indications in carrying out the electrical treatment: (a) to play upon the affected nerve roots, and (b) to preserve as far as possible the nutrition of the muscles. The former is best obtained by placing a comparatively large electrode over the supra-clavicular fossa, where the roots of the brachial plexus lie, and another in the armpit. The current to be employed in this area is either the faradic or interrupted voltaic of moderate strength, and the application should be continued for five minutes or more. Each of the affected nerve trunks may be treated in a similar, though less thorough, manner. The second indication is fulfilled by subjecting the paralysed muscles to a galvanic or galvano-faradic current with both poles successively for about five minutes. This treatment should be continued for several weeks.

HEADACHE CONSIDERED IN RELATION TO CERTAIN PROBLEMS IN CEREBRAL PHYSIOLOGY.

By HARRY CAMPBELL, M.D.,
London.

HEADACHE may be defined as pain felt in any part situated above the base of the skull. It will be convenient to group together under the head of common sensibility (or, as I shall for convenience symbolise it, "C.S.") all the sensations, painful or otherwise, which may be therein felt; and we may then speak of headache as due to some perturbation of the C.S. centres belonging to the suprabasal structures of the head. Let me here parenthetically suggest that the C.S. centres of the entire body are not, as is generally supposed, limited to a comparatively small region of the cortex, but that their extent is proportional to the enormous extent of tissues which they "represent."

The chief purpose of this paper is to show that there is a very close connection between the C.S. centres of the head, and those of the special senses. The special sensations (of sight, hearing, etc.) having differentiated from common sensation, the nervous systems of the one have differentiated from that of the other. Hence the special sense nerves and their end-organs have differentiated from the neighbouring nerves of C.S., and the special sense centres in each higher level from the neighbouring C.S. centres. From this we might expect to find the special sense centres in the cortex em-

⁹ *Brain*, vol. ix, p. 243.

¹⁰ *Loc. cit.*

¹¹ *Soc. de Chirurg.*, October 31st, 1877.

¹² *Archiv. de Physiologie*, 1871-2, p. 326.

¹³ *Gaz. des Hôpitaux*, February 9th, 1869.

¹⁴ *Diseases of Nervous System*, vol. i, p. 490.

¹⁵ *Diseases of Nervous System*, vol. i, p. 78.

¹⁶ *Diseases of Children* (Lou's Library), p. 93.

bedded in the general area of C.S., more particularly in the C.S. area of the head. Such, however, is not generally held to be the case, nor should I be surprised, for reasons soon to be given, if it is not so proved; but I venture to contend with some confidence for a very close anatomical connection between the centres in question; that is, the C.S. centres of the head and the special sense centres. To be yet more precise, I suggest that the C.S. centres of the eyeballs and orbits are in closer relation with the visual centres than are any other centres of C.S., the one having differentiated from the other; and the same remarks apply to the centres of hearing, smell, touch, and taste, on the one hand, and the C.S. centres of their respective organs of sense, on the other. Consider the sensation of taste. The gustatory nerve is a branch of the fifth; and who can doubt that there is a close connection between the C.S. centres of the tongue and the gustatory centres? Take again the tactile centres belonging to the finger-tips. These subserve sensations ranking intellectually after those of sight and hearing, and will anyone deny that these centres are evolved out of the C.S. centres of the skin in general, more particularly out of those of the hand, and that the two sets of centres are in close connection? Nay, such a specialisation may take place in a single lifetime. An individual born blind and without hands may cultivate a delicate sense of touch in his toes—may develop amid the C.S. centres belonging to the skin of the foot a group of special sense centres subserving highly intellectual ends; in which case the close anatomical connection between the two groups of centres is patent.

This intimate connection between special sense centres and the centres of C.S. obtains at each successive level, but one would naturally expect it to be most strikingly shown in the lowest level, which is simplest in construction and phylogenetically the oldest. These lowest centres are represented by the grey matter surrounding the neural canal in the spinal cord, and by the grey nuclei of the cranial nerves, which now no longer surround in a continuous mass the neural canal, but, owing to the opening up of the latter into the fourth ventricle, and from other causes, have come to lie for the most part ventrally to the canal, in the form of a number of apparently disconnected masses. Now if these centres are separated by distinct intervals, it may be argued that the like obtains among their representatives in the higher levels. If, for instance, the nuclei of the optic nerves are not placed in juxtaposition with those of the sensory portions of the fifth nerves (which supply such a large part of the head with common sensibility), we might expect to find their respective representatives in the highest cortical level similarly separated. Into this question I shall not further enter; but I desire to emphasise the fact that anatomical position is no necessary index of anatomical (and therefore physiological) connection. Two grey masses, situated at a considerable distance apart, may yet be connected most intimately through the medium of long drawn out cell-processes.

The above *a priori* conclusions are borne out by clinical facts. In considering the causes of headache, the question why this ache is more common than any other is one of the first to present itself; we have to explain why the C.S. centres of the scalp, skull, meninges (and brain?) are more apt to take on the algic state than those belonging to the rest of the body. The explanation lies, I take it, in the close connection between the former group of centres and those of the special senses. The latter by virtue of their high evolutionary grade are exceedingly irritable, and are, moreover, during the waking state kept in almost ceaseless activity. Bright lights, loud noises, and in a less degree certain odours (tastes?) readily cause and intensify headache. The perturbation thus induced in the special sense centres communicates itself to the C.S. centres of the head, giving rise to headache and other abnormal head sensations; and the readiness with which this communication takes place suggests a peculiarly close connection between the two groups of centres.

Let us briefly consider the effect of irritating the (a) optic, (b) auditory, and (c) olfactory and gustatory nerve expanses. (a) The effect of a long-continued bright light on the retina is to interfere with vision and visual ideation, and to cause pain in the eye and forehead. The visual centres are so violently disturbed that they are no longer able to take on those complex processes involved in objective and subjective

vision; hence not only is objective vision blurred, but thought processes are interfered with also. Moreover, the central disturbance communicates itself to the C.S. centres of the head, and especially to those of the eyeball, orbit, and forehead. In migraine the disturbance similarly spreads from the visual centres to the C.S. centres of the forehead and eyeball, the visual troubles, where they occur, always preceding the pain in the latter parts.

It is necessary to add that the wave of disturbance may spread in the opposite direction, that is, from the nerves of C.S. of the eye to their centres and thence to the visual centres. This happens, for instance, in the photophobia of conjunctivitis and in the visual paralysis induced by eye-strain. Thus the hypermetrope may after close reading suffer from impaired vision to a degree that cannot wholly be accounted for by the inability of the tired and defective muscles to accommodate properly. Such cases are explained by assuming a temporary paralysis of the visual centres wrought through the C.S. centres of the eyeballs. That the visual centres may be thus affected seems to be proved by those common cases of frontal headache with eye pain in which, during the exacerbation of the pain, vision becomes impaired—at times almost to the extent of blindness.¹

We can now offer an explanation of the extreme frequency of frontal headache. It is because the C.S. centres of the eyeballs and neighbouring frontal region are liable to constant irritation, on the one hand through the C.S. nerves of the eyeballs as in eye strain, and on the other hand through the sensitive retina and visual centres, as by bright lights and colours. These C.S. centres are thus so habituated to the algic state that they assume it under morbid conditions of the body generally; and hence frontal headache occurs in diverse bodily states in which neither the retina nor ocular muscles are necessarily involved.

(b) The effect of violent irritation of the auditory expanse, as by loud noises, is to interfere with hearing and with sound ideation, and to cause pain in the ear and its neighbourhood. Thus, the firing of a big gun, to take an extreme example, will occasion in the uninured bystander not only temporary deafness and the inability to think of sounds, but an acute pang in the ear. This may be thought to result from the direct irritation of the nerves of common sensibility supplying the middle ear, but without absolutely denying that it may in part so arise, I believe it to be largely due to the spread of violent perturbation from the hearing centres to the centres of these nerves. As in the case of the eye, so here, the irritation may spread in the converse way. Thus neuralgia of the ear may not only cause hyperæsthesia of the auditory system, but, as I have satisfied myself, partial deafness also.

(c) The olfactory and gustatory systems are of far lower evolutionary grade than the two we have just considered, they are accordingly much less sensitive to irritation; they are, moreover, not specialised from the areas of common sensibility (situated above the base of the skull) which are involved in ordinary headache. Nevertheless, the C.S. areas from which they are specialised are closely connected with those involved in headache, and hence stimulation of them may cause it. When a powerful odour, as of some flowers, causes headache, it may be thought to act through the absorption into the blood of certain substances. Would, however, the effect be the same if the nostrils were plugged?

There are two facts which may be considered here as showing the close connection between the C.S. centres of the head and the special sense centres. (a) The first is the fact that headache, more than any other ache, interferes with mentation, and with this we may couple the converse fact that intense mentation, irrespective of eye strain, may cause headache, as it did in Newton's case. An individual may suffer from the most violent lumbago or abdominal pain (for example, that of acute peritonitis), his intellect meanwhile remaining unclouded; nay, it may even be unusually clear, while headache is, of all bodily pains, the most apt to confuse thought. During an attack of migraine, the thinking powers may, indeed, as Wilks observes, remain unaffected, but this is certainly not the rule, and we must remember that

¹ It may perhaps be argued that in such cases the visual interference is due to local changes in the eyeballs, for example, spasm of the retinal arteries. I have not been able to obtain any evidence in favour of this view. Such a possibility, however, must not be lost sight of.

in migraine one side of the head only may be involved in pain. The muddling of thought which occurs in headache is due to the fact that in it the special sense areas are, for reasons already given, particularly apt to be implicated, and when these are perturbed clear thought is manifestly impossible, for it is they which chiefly constitute the anatomical substratum of thought processes.

(2) The other fact is the extreme sensitiveness during headache of the special sense systems, notably of sight and hearing. The sufferer is apt to be acutely sensitive to noises and bright lights, and this alone is strong evidence of the close connection of the auditory and visual centres with the C.S. centres of the head.

It may, perhaps, be thought that all the facts just given can be explained by supposing that the connection I affirm obtains in the lowest level only, and I do not deny that some of them may be. In the photophobia of conjunctivitis, for instance, the irritation may spread from the lowest level C.S. centres of the eyeball and lids (that is, the sensory nucleus of the fifth) to the visual centres on the same level (that is, the nucleus of the optic nerve). It would be strange, indeed, were it to ascend to the highest level before passing over to the visual centres. It is quite possible, however, that the irritation spreads across at each successive level.

But I now proceed to cite a fact which not only confirms my main contention, but tends to show that the connection in question obtains in the highest nervous level—the anatomical substratum of mind. "It is very common," writes Gowers,² "for an aura first felt in the epigastrium or limbs to seem to ascend to the head, and when it reaches the head consciousness is almost invariably lost." And from this the writer concludes "that the central representation (that is, the C.S. centres) of the head, and perhaps of the brain itself" (he speaks thus guardedly, for we do not know whether the brain is centrally represented) "is connected in a special way with structures related to the mental state of consciousness." Further than this he does not go. The interpretation I put upon these phenomena is as follows. The aura, as Gowers observes, "is the result of the spread of the discharge in the brain." The discharge in these particular cases evidently spreads along the C.S. centres of the limbs and trunk until it reaches those of the head. Directly this occurs the special sense centres, from their close connection with the latter, are necessarily involved. Now all these centres (the C.S. centres and the special sense centres) are related to consciousness, but the latter are infinitely the more important in this respect, for the special sensations of sight, sound, and so forth constitute the chief elements in our concepts and percepts. Wherefore, when the special sense centres are involved in the discharge, thought necessarily becomes impossible, and very soon consciousness itself.

A CASE OF MYXEDEMA CURED BY THYROID EXTRACT.

By JOHN P. HENRY, M.D., B.Ch.DUBL.,
Lewisham.

Mrs. S. L., aged 44, suffering from myxœdema, came under my care in the spring of 1892. She dated the commencement of her illness from the birth of a stillborn child about fourteen years ago. Her face and limbs began to swell, and her mind to become torpid. Six years later she had a severe attack of illness, with great prostration. One day she was quite unconscious. Since then she has been unable to do anything, while the symptoms have gradually got worse. When I saw her the face was swollen, and the lines of expression lost. The eyelids, lips, and *alæ nasi* were enlarged and thickened. The skin was dry, branny, and anæmic, with a bright malar flush. Perspiration was absent; the hair was very thin and dry; the hands were "spade-like." There were swellings over each clavicle; the thyroid seemed to be atrophied, and there was tenderness over its site. Thought, volition, and action were very slow. She had not been able to leave the house for three or four years, having fallen several times in the street. Her memory was bad, and was getting worse. Speech was slow, and devoid of tone. She complained of an

unpleasant taste and smell. The highest temperature noted before beginning treatment was 96.6° F., and several times the mercury of my thermometer would not rise out of the bulb,

Before Treatment.

when it must have been at least as low as 94° F. The bowels were obstinately costive. She had violent epistaxis at

After Treatment.

the ages of 21, 31, and 41, and again about a year ago on several occasions. Menstruation did not commence till she was 19.

² *A Manual of Diseases of the Nervous System*, vol. II, p. 796.