

are almost perfectly powerless; passive movement of the leg causes pain. Sensation not absent, but difficult to estimate on account of the patient's condition. No optic neuritis.

*December 27th.*—Is still very drowsy. Her left side seems to be quite paralysed, but no loss of sensation is made out. To-day Mr. Gunn examined the patient's eyes. The examination was difficult on account of the patient's condition, and from mucus on the cornea. She was asleep when the examination was begun, and her pupils were contracted to a small (normal) size; shortly afterwards she became partially aroused, and then the pupil suddenly dilated to the same size that it had been some hours previously under atropine. It did not contract to light. There was well-marked double optic neuritis; the edge of the right disc was undefined; the outer edge of the left was still determinable; there was not much swelling, and there were no hæmorrhages.

*December 31st.*—After only a gradual worsening, she died to-day at 3 A.M.

*Necropsy, January 2nd, 1888* (thirty-five hours after death). There was a small sub-peritoneal fibroid, about the size of a hen's egg, of the uterus. Beyond this nothing noteworthy was found except in the head. The brain and cord were given to Dr. Beevor for investigation.

## EXAMINATION OF THE BRAIN.

BY DR. BEEVOR.

THE patient, a description of whose case Dr. Hughlings Jackson has just read, first came under my care as an out-patient at the Queen Square Hospital. She there described to me the aura which Dr. Jackson has detailed, the nasty smell followed by a sense of suffocation, and the vision of the little black woman who was very busy about the kitchen. The combination of these two things sounds so fantastic and almost absurd, that I feel pretty sure that one would be very liable to overlook their importance, or to consider them to be merely the utterances of an hysterical patient, if Dr. Jackson had not impressed upon us in his writings the absolute necessity of accurately recording all the details which a patient gives of the warning preceding an epileptic seizure, however trivial they may seem.

It is interesting to note with regard to the co-exist-



ence of the visual aura and the sense of suffocation with this sense of a horrid smell, that Dr. Gowers, in his work on "Epilepsy," p. 62, states, "that the only associations noted (with the olfactory aura) were, with a visual aura (two cases) and with a feeling of suffocation (two cases)."

After the patient had been an out-patient for a few weeks she became worse, and was admitted under Dr. Jackson.

As the case has been so fully described from its clinical aspect by Dr. Jackson, I need not further allude to it.

On examination of the brain, it was seen that the right temporo-sphenoidal lobe was the seat at its most anterior extremity of a tumour of the size of a tangerine orange. The growth was seen to involve the extreme tip of the temporo-sphenoidal lobe, and especially the part of it which is in front of the uncus of the hippocampal or uncinatæ convolution, and which contains the structure known as the nucleus amygdalæ.

This extreme anterior end of the temporo-sphenoidal lobe is called the pyriform or hippocampal lobule, and has been found by Broca to be very much developed in animals with a keen sense of smell, such as cats, dogs and rabbits, and to be quite rudimentary in animals like the dolphin, which have very little powers of smelling.

According to Dr. Ferrier's experiments ("Functions of the Brain," p. 320), he states that the "affections of smell and taste are evidently related to lesions of the hippocampal lobule and the neighbouring regions."

The exact position of the growth will be more clearly shown by describing the appearances seen when frontal (*i.e.*, transverse vertical) sections are made across the brain.

On making a frontal (transverse vertical) section through the brain at the level of the optic chiasma (Fig. 4) the whole of the anterior end of the temporo-sphenoidal lobe of the right side was found to be occupied by a tumour; it involved the nucleus amygdalæ and the central white matter of the temporo-sphenoidal lobe; but it did not affect the grey cortex of the uncinatæ convolution (hippocampal convolution), or of the first temporo-sphenoidal convolution. The



nucleus lenticularis was much compressed and flattened by the growth, and the internal capsule seemed to share in the compression. On making a frontal section of the brain at the level just in front of the pons (Fig. 5), all the central white matter of the right temporo-sphenoidal lobe was seen to be involved. The lesion lay just outside the descending cornu of the right lateral ventricle. The cortex and white matter of the hippocampal and first and second temporo-sphenoidal convolutions were not affected; the cortex of the third temporo-sphenoidal convolution was not involved, but its central white matter was partly invaded by the growth.

At the level of a frontal section through the middle of the pons (Fig. 6), the lesion is seen about the size of a threepenny piece just outside and below the descending cornu of the lateral ventricle and the cornu ammonis; it involves the inferior part of the central white matter of the temporo-sphenoidal lobe, but it does not extend to the convolutions or their central white matter.

Behind this point the lesion rapidly diminished in size and was hardly visible in the next section, which was made about half an inch behind the preceding one.

On microscopic examination by Dr. Colman, the resident medical officer to the hospital, the growth was found to be a small round-celled sarcoma.

It will thus be seen that we have here a tumour which is localised in one spot, namely, the extreme anterior end of the right temporo-sphenoidal lobe, the part which is called the hippocampal lobule and which contains the nucleus amygdalæ. This region is largely developed in animals with a keen sense of smell, and in his experiments Dr. Ferrier has found in monkeys that this part of the brain is associated with the sense of smell. I think we are therefore justified in thinking that the sensation which the patient complained of, viz., "the horrid smell," was produced by the irritation of the grey matter of the olfactory centre in the right hippocampal lobule, and it is interesting to note that this centre was probably not entirely destroyed, as is shown by the fact that the sense of smell was not abolished on that side, and that had the whole olfactory centre



been destroyed, there would not have been any cells remaining to register the irritation caused by the growth, and to produce in the mind of the patient the sensation of a "horrid smell."

The growth had also pressed upwards upon the right lenticular nucleus and the internal capsule of the same side, and this would account for the weakness of the left side of the tongue and the protrusion of this organ to the left, and also for the drooping of the left side of the face—symptoms which were noticed on the patient's admission. It is important to note that although on admission there was no absolute paralysis of the left arm and leg, they subsequently became completely paralysed, due, no doubt, to the gradual growth of the tumour. The fibres in the internal capsule which pass down from the cortex for the face and tongue are more anterior in the horizontal line than those for the limbs, and this would perhaps account for the face being affected before the limbs.

*Remarks by Dr. Hughlings Jackson.*—This case interests me especially as presenting epileptic fits with what I call the "dreamy state" (commonly called "intellectual aura"), in association with a crude sensation of smell. It is one of a group of epilepsies on which I remarked in a paper in 'BRAIN,' July, 1888 ("On a Particular Variety of Epilepsy: Intellectual Aura"). The case is referred to in a foot-note on the first page of that article.

The case is of great value as evidence bearing on localisation in the cortex of the anatomical basis of the sense of smell; it confirms Ferrier's researches. I leave this aspect of the case for my colleague, Dr. Beevor, to comment on. I would, however, remark, that had there been no crude sensation of smell (physically no paroxysmal discharge of olfactory nerve elements) the case might have been thought of as discountenancing Ferrier's localisation. But the case shews that not only the effects of destructive lesions, but those of discharging lesions also have to be considered with regard to sensory localisation, just as both are considered with regard to motor localisation.

I refer to my paper in 'BRAIN,' July, 1888, for further



remarks on the variety of epilepsy, of which this case is one example. I once more draw attention to Dr. James Anderson's report of the case of one of his patients, who had this variety of epilepsy and a crude sensation of taste—'BRAIN,' October, 1888.

*Remarks by Dr. Beevor.*—Besides the case reported by Dr. James Anderson, to which reference has already been made, Dr. Ferrier has referred us to two cases in which there were olfactory symptoms during life due to intracranial growths. The first case is one by Sander,<sup>1</sup> described as "Epileptische Anfälle mit subjectiven Geruchs Empfindungen bei Zerstörung des linken Tractus olfactorius durch einen Tumor." Here the patient had fits which were preceded by the warning of a "dreadful disagreeable smell," and he then had chewing movements of the jaws and spitting of saliva,<sup>2</sup> and later on he had convulsions about the face but not in the limbs. The patient became blind, and his mental condition very obtuse, so that it was never possible to test his sense of smell on the two sides. On post-mortem examination there was found, in the middle fossa of the skull, a tumour (glioma) the size of half a large apple, situated on the under surface of the brain, at the border of the left frontal and temporal convolutions. Half the growth involved the anterior part of the temporo-sphenoidal lobe, the other part reached anteriorly across the fissure of Sylvius, so as to involve completely two gyri of the frontal lobe (which two gyri is not stated); inwards the growth reached the middle line. The important point was that the left tractus olfactorius was intact only at its anterior part, but posteriorly it was involved in the growth with the left optic nerve and tract. Part of the growth affected the base of the left temporal lobe and grew into the brain substance below the lenticular nucleus, and another part on the inner surface of the lateral ventricle involved the left ammon's horn.

In the above case, although the anterior end of the

<sup>1</sup> Archiv. f. Psych., 1874, vol. iv., p. 234.

<sup>2</sup> Dr. Hughlings Jackson has frequently drawn attention to the occurrence of the "dreamy state" with chewing movements and with spitting. In Lander's patient, and in the other cases referred to in my remarks in the text there is no mention of a "dreamy state" (intellectual aura).



temporo-sphenoidal lobe seemed to have been involved, the growth was so large as to have destroyed the left olfactory tract, so that it would be impossible to say whether the attacks were not caused by pressure of the growth on this tract; it was also impossible to ascertain whether the sense of smell was intact on the two sides.

Sander refers to other cases by Lockemann,<sup>1</sup> Westphal,<sup>2</sup> Schlager,<sup>3</sup> in which olfactory auræ preceded the fits, but in all these cases the olfactory bulb or tract was affected either by tumours growing either in them or from the overlying frontal lobes.

In none of these cases did the lesion occur in the temporo-sphenoidal lobe without involving the olfactory nerves, and they do not afford any direct evidence of the localisation of the olfactory centre in the tip of the temporo-sphenoidal lobe.

The second case referred to by Dr. Ferrier is one by Dr. McLane Hamilton—"On Cortical Sensory Discharging Lesions (sensory epilepsy)."<sup>4</sup> Here a woman, aged forty, had attacks dating from her tenth year, when she had a fall on to her head. In the attacks she frothed at the mouth, became livid and was convulsed for a great time, but before the fits she nearly always had a peculiar aura: "She suddenly perceived a disagreeable odour, sometimes of smoke, sometimes of a foetid character, and quite uncomplicated by other sensory warnings. She compared it to the smell of burning rags or the smell of a match, and 'it sometimes rose up her head and choked her.'" Two years later she died from phthisis, and in the brain a low-grade form of hæmorrhagic pachy-meningitis was found about the base of the brain. The most marked changes were found in the lower part of the right temporo-sphenoidal lobe, where a decided shrinkage of tissue was seen, with depression and adhesion of the pia mater, the induration involving the uncinate gyrus and parts of the adjacent convolutions. The olfactory nerves were not involved, nor was the third frontal convolution. From the sketch of the brain

<sup>1</sup> *Zeitschr. f. ration. Med.*, Vol. XII., p. 340.

<sup>2</sup> *Allg. Zeitschr. f. Psych.* Vol. XX, p. 485.

<sup>3</sup> *Zeitschr. der Gesellsch. d. Aerzte zu Wien*, 1858, Nos. 19-20.

<sup>4</sup> *New York Medical Journal*, 1882, Vol. XXXV., p. 575.



given in this paper, the lesion seems to have involved the inferior surface of the temporo-sphenoidal convolution extending to the anterior end, and affecting especially the third temporo-sphenoidal and the uncinate convolutions; but to what extent this latter was involved is not mentioned, nor is it stated whether the disease involved the uncus itself, the cornu ammonis, the hippocampal lobule, or the inner surface of the temporo-sphenoidal lobe.

The last case is exceedingly good for the purposes of localisation, as the lesion, as far as it is described, was very definite, and the olfactory nerves were found to be intact. Unfortunately, however, there is no mention as to the condition of the sense of smell on the two sides during life.

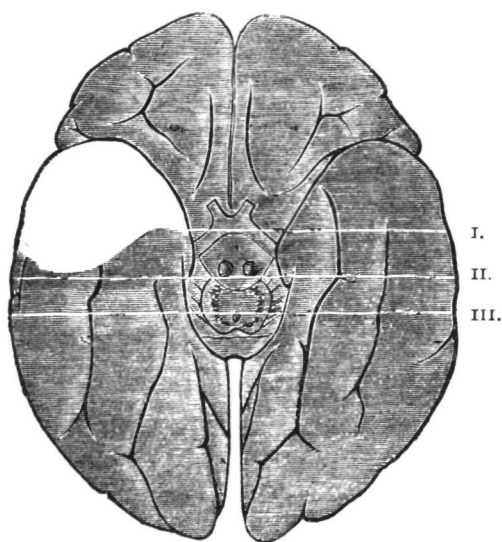


FIG. 1.



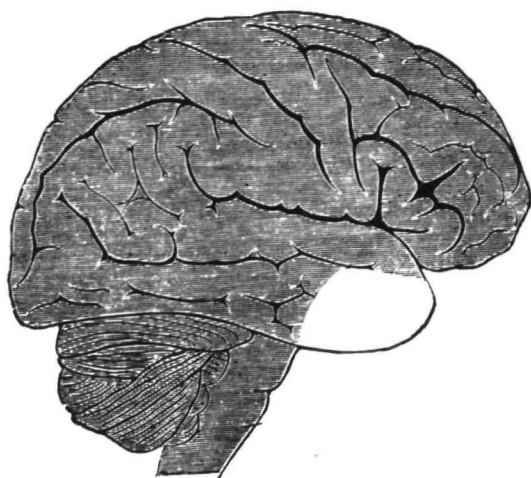


FIG. 2.

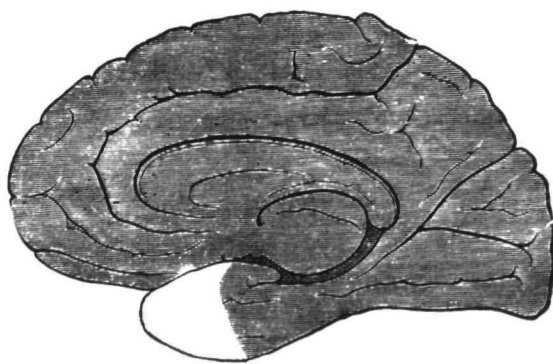


FIG. 3.



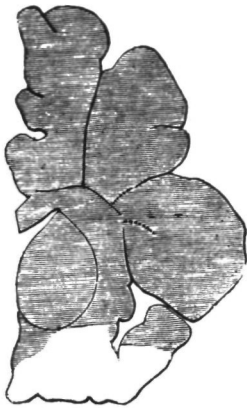


FIG. 4.

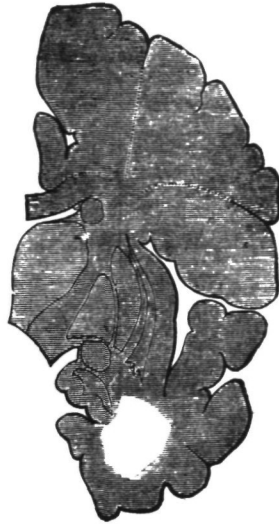


FIG. 5.

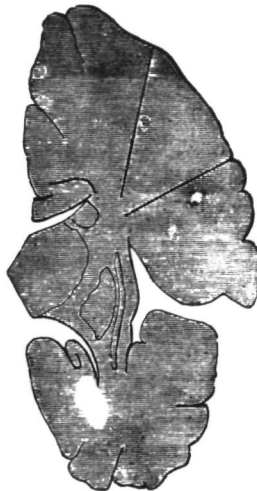


FIG. 6.

#### EXPLANATION OF THE FIGURES.

The part occupied by the tumour is shown as it appeared on the surface of the brain, and also in frontal sections.

The horizontal transverse lines ruled across Fig. 1 indicates the levels at which the frontal sections, shewn by Figs. 4, 5 and 6, were made.