Olfactory Hallucinations in the Insane. By F. St. John Bullen.

THE olfactory organ in man appears in a rudimentary condition as compared with its highly developed state in certain macrosmatic animals. To comprehend the immense change that has taken place in the smell apparatus, together with the development of the higher brain, and which has attained its climax in man (of those animals still possessing a sense of smell), it is necessary to be acquainted with the anatomy of the limbic lobe in macrosmatic animals, and to follow the transitions occurring until the high mammal type of brain be reached. Moreover, in this process is to be found the only means of discerning in the human cerebrum the rudiments of an important organ and of allocating its present site of functional activity. The researches of Kölliker, and, still later, of Elliot Smith, have largely removed the confusion existing in respect to the true limbic lobe, and the definition of this and its constituent parts may now be safely attempted. The extensive and hardly yet completed work of the latter author, contained in a series of valuable contributions to the *Journal of Anatomy and Physiology*, and in the *Transactions of the Linnean Society, N.S.W.*, has been used by the present writer in giving the following sketch of the constitution of the limbic lobe and the cerebral commissures.

In marsupials the central cortex is fringed from temporal pole to olfactory peduncle by a typical hippocampal formation, which consists of a dorsal limb, and a ventral one or pyriform lobe. Occupying the hilum of this hippocampal arc and embedding its anterior extremities is a ganglionic mass, the pars intermedia; these three parts form the true limbic lobe. In some macrosmatic animals with small pallium this lobe constitutes the main portion of the hemisphere. From the position which the hippocampal formation occupies in Reptilia and Amphibia it seems probable that the primitive and essential site of the hippocampus is on the mesial aspect of the hemisphere adjoining the olfactory lobe. In man the hippocampus forms the margin of the hemisphere only from temporal pole

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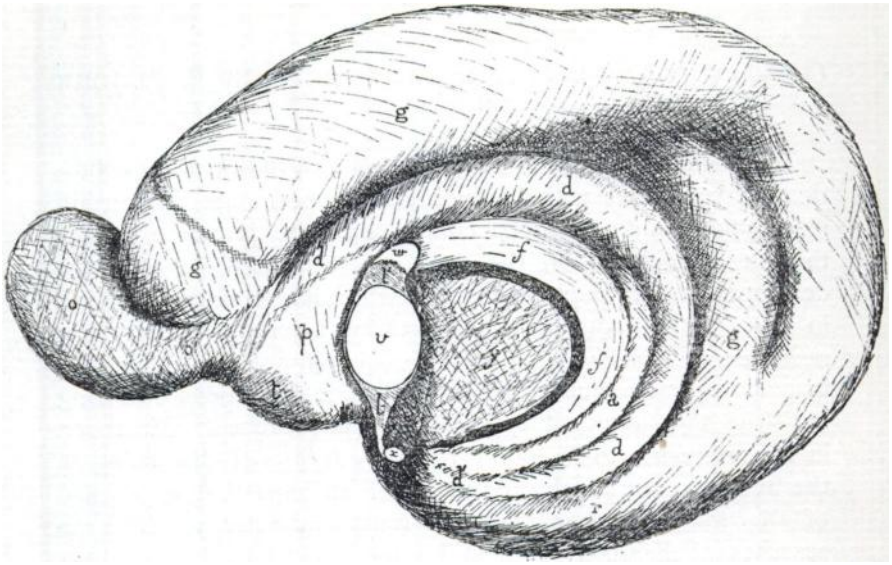


FIG. 1.

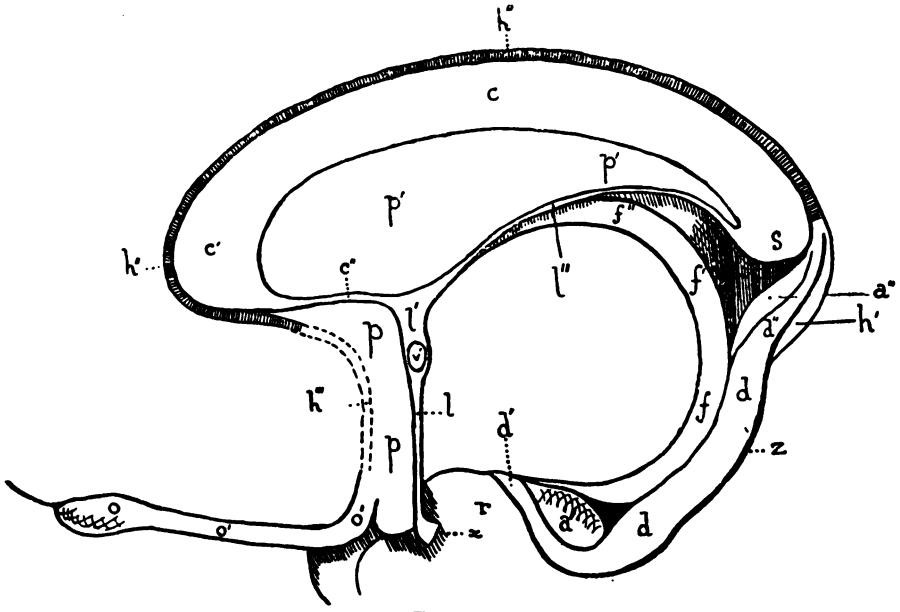


FIG. 2.

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to inferior aspect of splenium corporis callosi. From this point to the lamina terminalis its place is taken by the fimbria. It must be noted that in Elliot Smith's opinion the true limbic lobe does not embrace the gyrus fornicatus nor the subiculum cornu Ammonis (the so-called gyrus hippocampi). The intermediate grey mass on each side consists of the pre-commissural body, lamina terminalis, and tuber olfactorium, which are represented in the human brain by the gyrus subcallosus (or peduncle of the corpus callosum, as it has been erroneously termed), the septum lucidum and anterior perforated space.

This grey region of the brain is, phylogenetically, the most ancient part of the cortex cerebri; the hippocampal formation developing later in phylogeny, and the pyriform lobe even yet later. Corresponding to its early perfection of development, the hippocampal formation grows precociously in the human fœtus, and is fully developed at a time when the pallium is still extending.

The two hippocampal bodies, extending in marsupials from temporal pole to olfactory peduncle, have a system of commissural, association, and projection fibres called the fornix, this system comprising all the fibres which arise or end in the hippocampi and form constituents of the fimbria. The transverse strands of the fornix (*psalterium homo*) are derived from the dorsal and ventral limbs of the hippocampal arc, and the commissure, from accession of fresh fibres, assumes a curved shape, somewhat like that of the hippocampus. It thus possesses dorsal and ventral segments, each of which derives its main supply of fibres from the corresponding portions of the limbic arc. At this stage of development the interhemispheral connections of the pallium are made through the ventral commissure (*anterior homo*), which they reach by way of the external capsule. This commissure is therefore the homologue of the corpus callosum; some strands from the pyriform lobe are collected in its formation.

Very little of any association system between hippocampus and pallium is found until the corpus callosum begins to form; then strands from the corona radiata sweep through the alveus of the hippocampus, intermingling with the fibres proper to that region, and constituting the so-called false alveus. In consequence of this invasion by pallial commissural fibres of the dorsal limb of the hippocampal commissure,

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it gradually disappears, whilst the pallium and its corpus callosum increase, till, with the full growth of these, the

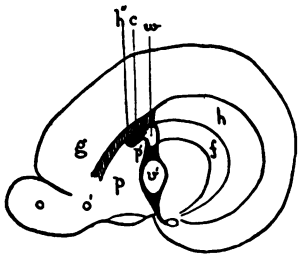


FIG. 3.

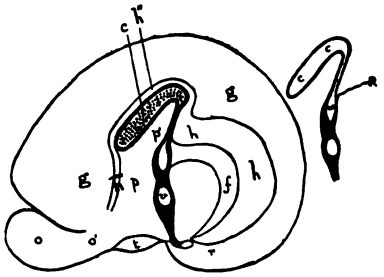


FIG. 4.

dorsal segment of the hippocampal formation is represented only in the striæ Lancisii, mediales and laterales, and gyri geniculi proceeding towards the olfactory lobe. The anterior and inferior portion of the limbic lobe, or pyriform body, does not undergo so marked a shrinkage as does the dorsal limb, and the atrophic process takes place mainly at the anterior pole, adjoining the olfactory bulb. Its vestigiæ are found in man represented in the outer part of the locus perforatus anticus and vallecula Sylvii, and in the lateral root of olfactory tract, which is in man the only obvious one. The pyriform lobe in human anatomy consists of the uncus, together with the extremity of the inverted hippocampus and fascia dentata (or band of Giacomini). Thus the uncus belongs to the true hippocampal region, or pyriform lobe, whilst the uncinate gyrus is a part of the pallium.

The ganglionic mass of the pars intermedia consists, as already stated, of pre-commissural bodies—lamina terminalis and tubera olfactoria. The lamina and bodies form one mass of grey matter, the latter occupying the interval between the dorsal and ventral limbs of the hippocampal arc, extending on each side of the median hemispheral fissure from the olfactory bulbs in front to the lamina terminalis behind. This last, which bridges the median fissure and joins posteriorly the pre-commissural bodies, was originally, in reptiles, a thin layer of grey substance, becoming thickened in mammals by ingrowth from the pre-commissural bodies, to form a mass which appears to fuse their hinder ends. In this enlarged lamina is embedded

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the hippocampal commissure above, the ventral commissure beneath, whilst it is traversed by a number of uncrossed fibres of the fornix system. Hence it has been called by Elliot Smith the "commissure-bed." From the ventral to the optic chiasma extends its terminal prolongation, the lamina cinerea. Its upper extremity, superior to the dorsal commissure, remains in man as the indusium verum.

The anatomical boundaries of each pre-commissural body are as follows:—Above is the fascia dentata; below and laterally, beneath the lateral ventricle, it becomes continuous with the special cortex of the head of the corpus striatum, which corresponds to the tuber olfactorium. Anteriorly it is connected with the peduncle of olfactory bulb; mesially is the longitudinal fissure. This latter and free aspect of the body is called the pre-commissural area. The tuber olfactorium, corresponding to the special cortex above mentioned, receives olfactory radiations, and varies in size with the degree of macrosmatism; it is, moreover, absent in anosmatic Cetacea. Out of the pre-commissural bodies the leaves of the septum pellucidum of man are formed in the following manner:—The dorsal commissure growing backwards and forwards stretches the matrix in which it lies, and which does not develop correspondingly, until the sheet of each pre-commissural body filling up the angle between dorsal and ventral limbs of the hippocampal commissure forms a leaf of the septum pellucidum. The callosal commissure, in its extension forwards, roofs in a part of the longitudinal fissure between the pre-commissural areas, and the space thus enclosed and bounded posteriorly by the ventral commissure is the cavum septi pellucidi.

The anterior portion of the pre-commissural body remains in the higher mammalian brain as the gyrus subcallosus of Zuckerkandl. From a supposed connection with the corpus callosum it has been called the peduncle of that body; the real connection is, however, with the striæ Lancisii. The formation is as follows:—The callosal commissure, which is originally embedded in grey matrix, and even at its highest development retains a fine sheath of this, with the growth of pallium forwards, bends downwards and backwards at its anterior end, and its grey investment blends with the commissure bed still surrounding the ventral commissure. Thus a portion of the pre-commissural body is cut off from the rest of the grey mass, and this is the gyrus

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subcallosus. The base of this remnant in man is to be found immediately in front of anterior commissure and lamina cinerea, forming a part of the locus perforatus anticus.

The pre-commissural body, which varies in size with the degree of macrosmatism, becomes encroached upon by the downward growth of pallium, and its anterior part is ultimately reduced to a ribbon-like band, or a mere filament as the internal olfactory root.

The longitudinal or uncrossed fibres of the fornix system have now to be described, as amongst them are certain strands, the function of which may be indicated as possibly olfactory.

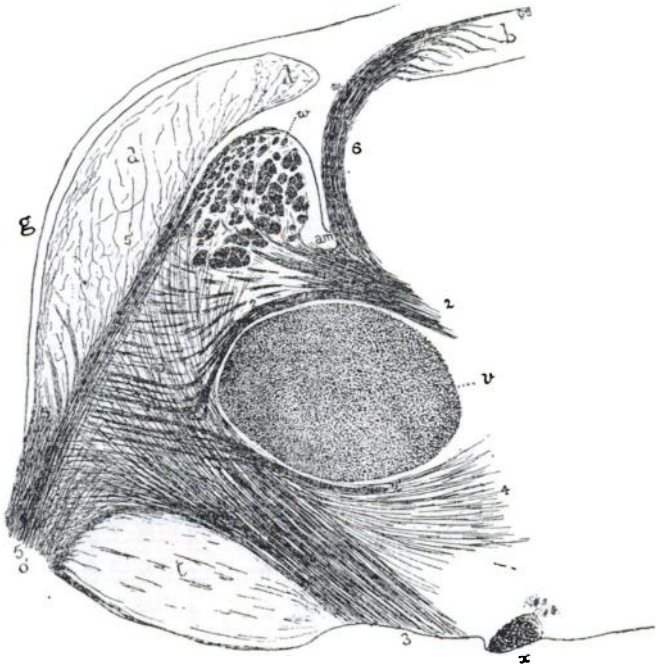


FIG. 5.

One series, the columna fornicis or post-commissural fasciculus, is derived from the fimbria of the undegenerate hippocampus, but receives a few fibres of the vestigial hippocampus, which perforate the corpus callosum, or curve round its anterior border. In animals, with or without a corpus callosum, the columna arches downwards and backwards in the septum pellucidum,

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behind the ventral commissure, intermingling with fibres passing to ganglion habenulæ, and on reaching the corpus mammillare is carried on, by arborisation, to the anterior tubercle of the optic thalamus.

Another group of fibres called pre-commissural originates as the foregoing. The largest bundle of this group, termed by Elliot Smith the "hippocampo-basal," passes between all parts of the hippocampus and the basal ganglion of Ganser (Kölliker), which is a grey mass lying between the optic chiasma and cortex of tuber olfactorium. Another termination to this bundle is in the cortex of the tuber itself; and this tract, Elliot Smith considers, is probably of significance physiologically as a path for olfactory impulses to the hippocampus. Yet another and very important set of fornix fibres has been described by this author in ornithorhynchus (probably present in all monotremes and marsupials) under the name of fasciculus marginalis. This may be traced from the mesial surface of the olfactory peduncle into the molecular layer of fascia dentata, and finally to distant parts of the hippocampus. It lies along the line of junction of the fascia dentata and pre-commissural body, and will constitute a portion of the striæ Lancisii. In man, cat, and hedgehog, as other animals, fine medullated fibres are traceable from the striæ posteriorly into the molecular layer of the fascia dentata, and anteriorly through the gyrus subcallosus to the neighbourhood of olfactory peduncle. Elliot Smith, therefore, considers it justifiable to assume in these animals that a fasciculus marginalis exists, to which he ascribes the probable function of an olfactory path.

Some fibres arise in the multipolar cells of the gyrus subcallosus and septum pellucidum, and many of them can be traced to the neighbourhood of the nucleus amygdalæ, which is in man the homologue of the ventral part of the nucleus lenticularis.

It is in the highest degree probable, according to Elliot Smith, that the anatomical link between hippocampus and olfactory bulb will be found in the fibres of the pre-commissural body.

This author points out that "the aquatic mode of life accounts for the relative smallness of the olfactory bulb and pyriform lobe in ornithorhynchus, and the dominant influence of the sense of smell in a terrestrial, insect-eating mammal sufficiently explains the immense size of the olfactory bulb and

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lobus pyriformis in Echidna (ant-eater)." The hippocampal lobe is relatively large in macrosmatic animals, but is yet well developed in anosmatic ones; it is, moreover, associated with other parts by non-olfactory fibres, hence it can be only partly olfactory in function. Its highly specialised cortex, the fascia dentata, varies, however, almost directly with the degree of osmatism, and nearly completely disappears in anosmatic animals; thus it may be assumed that the dentate fascia is almost wholly olfactory in function.

The preceding is a digest of Dr. Elliot Smith's work so far as it bears upon the olfactory region.

We can now summarise the most marked changes shown between the brains of some highly osmatic animals and the brain of lowly osmatic man.

The dorsal limb of limbic lobe is represented in man by the striæ Lancisii and gyri geniculi, continuous behind with the fascia dentata and hippocampus ventralis.

The pyriform lobe has, as its homologue, the uncus, the lateral root of olfactory bulb and the vallecula Sylvii where crossed by it.

The pre-commissural body, lamina terminalis or commissure bed, and tuber olfactorium, are replaced by gyrus subcallosus, septum pellucidum, locus perforatus anticus, and gyrus infracallosus. With these changes is associated the disappearance of the dorsal hippocampal commissure and its replacement by the interpallial or callosal commissure, and physiologically a great depreciation in the olfactory sense.

The remainder of the hippocampal lobe in man may represent other functions than that of smell, but such cortical representation as this sense has is most probably located in the uncus, this receiving the only important root of the olfactory bulb in man. Gudden's experiments showed the "gyrus uncinatus" to degenerate after removal of the olfactory lobe of the same side. The peripheral olfactory apparatus in man is rudimentary like its central representation.

The olfactory nerves are distributed over but a small area of the nasal mucous membrane; the depth of pigmentation, which seems to bear some relation to the keenness of smell, is less marked than in more osmatic animals, and even than in certain coloured and savage races of man; the olfactory mucous membrane is but one half or less the thickness of that of a macros-

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matic animal, and the organ of Jacobson is atrophied, and its functions probably extinct.

Notwithstanding the subjection of this sense as a whole in civilised man, it is still capable of much cultivation in some individuals, and the superior intellectual equipment of man enables the remnant of the sense to be used with greater discrimination, appreciation of its associations, and refinements in its application than in the case of the lower animal possessing a keener olfactory perception, but one more limited in its relations. Instances are on record of the yet more remarkable educability of the smell function in those deprived of the other special senses. But the original purposes for which the sense is used in macrosmatic animals, namely, the arousal of sexual appetite, selection of food, pursuit of prey, and avoidance of enemies, no longer exist to any extent in man. Particularly is the relation between certain odorous emanations and sexual excitement marked in animals, whose fine perception of scent probably renders smell an organ the most effectual for distinguishing individuals of the opposite sex at a distance.

Some animals, notably the civet-cat, musk-deer, and beaver, during the rutting season secrete strongly odorous matter which has powerfully excitant effects. But although this particular association of smell is common in animals there is hardly credible evidence of such in civilised man; indeed, the rudimentary cortical representation and associations of smell render it little likely that so vague an impression as that of an odour should be capable of arousing a passion so potent and yet controlled as the sexual. The suggestion has been offered that scents are plentifully used by prostitutes with the object of re-establishing this latent association; this is very questionable.

Whether, however, a relationship of the kind above mentioned is latent, and is revealed under pathological conditions, must be considered later on. Normally, the really active agents in the production of sexual desire in man are the senses of sight and touch.

There is frequently observed amongst animals of the same sex, who are temporarily isolated from those of the opposite, a tendency to sexual relations with each other. Havelock Ellis points out that this does not indicate any inversion, but an accidental turning of sexual instinct into an abnormal channel, the instinct being called forth by an appropriate substitute or

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diffused emotional excitement in absence of the normal object. When the sexes are again mixed normal conditions are restored, and the males cease from the frequent attempts to gratify any unregulated sexual excitement.

Some specific odour from the sexual organs probably serves as the especial determinant of normal sex selection in many animals in which the generative organ, from its exposure to view, may not exercise through the medium of vision any salacious influence. In civilised human beings clothing, by concealing those parts which are visually familiar between animals, may be largely responsible for an increased imagery in visual and tactile spheres, which, with arousal of the "nisus generationis," can completely supply the determinant effect of a directly exciting sense such as smell. On the other hand, it cannot be correct to assume any general connection between olfactory impressions and sexual excitement, since there are many animals besides man in whom the sense of smell is rudimentary, even to practical extinction.

Man uses smell but little for the selection of food; it does not enable him to distinguish instinctively the odours of substances prejudicial to him, only those which are offensive to him repel with certainty. According to Haycraft, qualitative as well as quantitative perceptions exist in smell, as with sight and hearing; that is to say, smell has properties bearing a relation to the arrangement and grouping of molecules, and not only to their vibratory activity; such a relation as form and colour present in the case of vision. The education of the olfactory function in man is probably in the direction of qualitative discrimination. The indefinite character of most odours and the absence of comparative standards, which are obtainable in the cases of vision and hearing, have resulted in a defective nomenclature wherewith to chronicle impressions of smell. From this obscurity it is usually found most difficult to express the nature or character of the impression, so that odours are generally described, perforce, as those of the substances producing them. This poverty of symbolism indicates a feeble and vague ideation. Dream images are with the greatest rarity of olfactory kind, and dreaming is not even influenced by the application of odorous stimuli, except in so far as symptoms of discomfort appear. According to Bevan Lewis, the senses of smell and taste, together with the still

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more vague sensations of organic and visceral life, are the least discriminating and most subjective, have the least intellectual element, and are especially characterised by their slight ideal recoverability.

The relation between the senses of smell and taste is an intimate one, and their mutual excitability results in a frequent association. The sense of taste, although properly confined to the appreciation of sweet, bitter, acid, and alkaline reactions, is generally made to comprehend olfactory and tactile sensations. Aromas and flavours belong, however, to the province of smell. This common association between impressions of smell and taste renders isolation of the corresponding hallucinations often embarrassing. In the case of so vague an hallucination as that of smell, the difficulty of settling its relation, pre-existing or secondary to the delusion *en rapport* is considerable in even recent cases, and in those of old standing is often insuperable. The exclusion of purely illusory conditions is another perplexing task. The following considerations occur naturally to one in attempting it: the stability of the hallucination, the correct appreciation of ordinary tastes and odours, the transient nature of the supposed basis for illusion, and the permanence of the hallucination or the reverse, and the absence of any ascertainable basis for illusion. Each case has to be judged, however, on its merits, and it is well to hold in mind that peripheral excitations of a sense do not of necessity exclude an independent hallucination.

Hallucinations of smell exist much less frequently than those of touch, sight, and hearing, and they are possibly often overlooked, both when simple and associated with more prominent hallucinations. Research was made by Macario, in 1845, into their relative frequency. Of eighty-five patients having various hallucinations, the olfactory sense was found affected singly in three cases, combined with other hallucinations in eleven cases. Brierre de Boismont, somewhat later, examined several hundred cases of insanity for hallucinations of the senses. He groups, however, in some of his tables, illusions with hallucinations. In twenty-five cases of acute delirium having hallucinations two had the olfactory sense involved, but not singly. In 178 cases of mania with hallucinations and illusions the olfactory was not the implicated sense where only one was affected, but was found conjoined with other sense

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perversions, hallucinations, or illusions in twenty-nine cases out of sixty-four. In ninety-five cases of melancholia, with hallucinations of but one sense, the olfactory was not affected. De Boismont considered the hallucinations of this sense rare, and even its illusions far from common.

Griesinger considered the occurrence of olfactory hallucinations infrequent, and generally allied to the early stages of insanity. Schlager, who investigated 600 cases of mental disease, found twenty-seven apparent instances of the hallucination, but of these he was only able to decide upon five as certainly not illusory. Dr. Savage has stated that he finds smell hallucinations more common than is generally supposed. Krafft-Ebing believes them rare where a sexual element is wanting in the case. Dr. Urquhart has furnished me with particulars of hallucinations of smell in about 300 admissions into James Murray's Royal Asylum. They were met with in thirteen cases. This adds further evidence as to their relative infrequency. The close association between the senses of smell and taste, and the visceral and organic sensations, has received allusion ; hence one might expect, in cases where the latter are brought into prominence by hyper-activity or disruption, to find the former two involved early in the widening disturbance in sensory spheres. The hallucinatory and illusory states arising in connection with a perverted activity of the reproductive system, or with the lapse in the sum of organic sensations effected by the climacteric, may accordingly be regarded as likely to be associated more particularly with disturbances of the senses the nearest in kin. Many writers seem to find a revelation of man's latent animalism in the supposed connection between smell hallucinations and sexual derangements, and fairly numerous cases are recorded illustrative, it is supposed, of this mutual relationship. Attempts have been made to show in man an intimate physiological association between nasal and reproductive apparatus, even to the mapping out of uterine areas in the nose! It would be premature to entertain these theories seriously with the evidence yet existing. Amongst authorities who hold to the connection between olfactory impressions and sexual excitation are Krafft-Ebing and G. W. Savage. The former believes it to be clearly defined, and states that in the psychoses of both sexes dependent upon masturbation, as well as in insanity due to disorder of the sexual organs

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of the female, or during the climacteric, olfactory hallucinations are frequent, whilst in cases where a sexual cause is wanting they are infrequent. Dr. Savage holds somewhat similar views. He thinks that hallucinations of smell, besides being generally more frequent than is accepted, are often encountered in climacteric insanity and with disorders of the reproductive organs. He investigated fifty-four cases of insanity at the menopause, and of those having hallucinations 20 per cent. were of olfactory sense, 25 per cent. tactile, and 38 per cent. gustatory.

Drs. Goodall and Craig, in a paper on climacteric insanity (*Journal of Mental Science*, April, 1894), give statistics as to the occurrence of hallucinations of smell in this condition. Of seventy-one cases with hallucinations (Bethlem) 26·7 per cent. were olfactory; of eighty-one cases at Wakefield 11·1 per cent. They quote Matusch, who considers smell hallucinations as rare at the climacteric, but when present connected with uterine trouble and sexual craving; he also finds them more common in young women, and this statement the authors of the paper interpret as indicating an association between smell hallucination and healthy florid ovaries rather than atrophic organs.

Schlager has denied any necessary connection between smell hallucinations and coincident sexual excitement; he considers this as a chance occurrence, or one dependent on general nervous excitement.

Whether these hallucinations be viewed as indicative of the revival of a long-submerged association during the evolution of sexual instinct, or of the tumult in the centres of organic sensation attending the rapid involution of the reproductive system, their influence on prognosis must be regarded as grave. Bevan Lewis considers them of ominous import, and as frequently associated with irreparable alcoholic brain disease, epileptic states, and traumatic forms of insanity. I cannot find that this author makes mention of them as especially associated with evolutional or involutional forms of insanity. Apart from insanity, olfactory hallucinations have been observed in epilepsy; they constitute the rarest form of aura met with in this disorder. Dr. Hughes Bennett examined into 500 consecutive cases of epilepsy, and found olfactory auræ in but four. Pierce Clark discovered only one case amongst 241 epileptics admitted to Craig Colony. The researches of Gowers, Sömmer, and others show the rarity of this particular hallucination. Dr. Hughlings

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Jackson has recorded a few cases of *petit mal* with an aura of foul odour. He has dealt with a group of epileptics under the title of "uncinate," embracing crude sensations of smell and taste, lip-smacking, and dreamy, slightly asphyxial state. Some of these cases had an epigastric aura. Different varieties of this group, Dr. Jackson supposes, are dependent upon discharge lesions of different parts of the uncinate gyrus, or of convolutions in its close neighbourhood. It is suggested that in this cortical region are the physical bases of some systemic sensations, especially those of the digestive system. McLane Hamilton, Anderson, and C. K. Mills have also recorded cases of epilepsy with olfactory auræ.

It has already been mentioned that the probable locality of olfactory function in man is the uncus. The results of various experiments upon living animals have been described, but in many the sites of lesion are not well limited. Ferrier has found stimulation of the tip of the temporo-sphenoidal lobe to produce sniffing movements; Munk observed in a dog, whose sense of smell seemed to have disappeared, both hippocampal gyri converted into cysts; Luciani has noted that extensive decortication of the gyrus hippocampi and partial ablation of the cornu Ammonis resulted at first in almost complete anosmia. Autopsies in cases of anosmia and olfactory hallucinations have disclosed softenings, recent or old, or growths involving the tip of the temporo-sphenoidal lobe, nucleus amygdalæ, uncus, or some of the preceding parts with involvement of the olfactory tracts; whilst Luys has reported four cases of hallucination due to lesion in the optic thalamus; Féré, one due to softening in posterior part of internal capsule. Olfactory hallucinations have been met with in cases of tabes dorsalis, in hysteria and neurasthenia, traumatic neuroses, &c.

Tilley and W. S. Colman have reported cases amongst the sane, and the present writer has notes of some well-marked instances. Dr. Head has found hallucinations of smell associated with "visceral states in the sane" with considerable frequency. He says, "These hallucinations differ from smells depending on an objective cause in that they are almost always associated with nausea, and occasionally followed by vomiting."

Almost the only record of smell hallucinations of pleasant kind which the writer has come across is one by Svikozski of a psychopathic epidemic amongst Russian patients. These pre-

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sented symptoms of elation of spirits, belief in their leader as Christ; 80 per cent. had sensory illusions, and most of them had hallucinations of smell, perceiving extremely agreeable odours. Brierre de Boismont alludes to such pleasurable hallucinations as being rare, and connected with ecstatic religious states.

I have examined into ninety-five cases of patients in whom olfactory hallucinations were presumed to be present; this number was collected from asylums containing in the aggregate some thousands of inmates, but for obvious reasons no attempt can be made by me to estimate any proportion these cases may bear to insane persons as a whole. In several instances it is impossible to decide whether the complaint of smell is in nature illusory or hallucinatory. There are many cases in which one can assume a basis of illusion, but in some this is transient whilst the complaint of smell remains permanent, in others there is constant basis for illusion, but only occasional complaint of smell; sometimes the smell and taste hallucinations coincide, at others they are isolated, whilst one has also to bear in mind the great number of cases in which, although there is plenteous ground for illusion of smell, no odour is acknowledged. It must be admitted, however, that the class of cases amongst which hallucinations (or illusions) of smell seem mostly found are of the type most favourable for the discovery, if not manufacture, of false perceptions. In other words, in the chronic delusional forms of psychosis there is the constant tendency to weave fresh evidence of persecution, and it is precisely from this tendency that the extreme difficulty arises of distinguishing real hallucinations, especially of olfactory kind, from the voluntary "projections" of the patient. I do not think that many instances of purely illusory kind are included in these ninety-five cases. In nine there are certainly good grounds for believing the condition peripherally excited, in several others it is uncertain, but the great number I believe to be genuine hallucinations. By reason, however, of the difficulties just mentioned, and from those encountered in the observation of many of the cases, I prefer not to attempt any strict limitation of cases to those of pure hallucinatory kind.

Almost of necessity from the method of collection of these cases, the occasionally short time available for examination, and the impracticability of obtaining all needful details, I claim only

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to show some general features of olfactory hallucinations which may or may not present anything new or interesting. No asylum except one in which thorough investigation of such rare hallucinations as these has proceeded systematically for years (and where there is a free change of inmates) can afford really valuable material. Olfactory hallucinations occur almost always in association with those of other senses. In three cases only out of the ninety-five do they appear singly. They are conjoined most often to auditory hallucinations, next often to gustatory, then tactile, and least frequently to visual. Their character is nearly invariably unpleasant; "foul, filthy, putrefying, deathly, or corpse-like," are general descriptions given in the majority of instances; seldom any more definite characterisation is attempted. Less often, smells of burning sulphur, gas, blood, poison, are complained of. The nomenclature seems to have far more relation to the prominent delusion than to any specific character in the hallucination. Four cases described the odours as pleasant, but in two of these there were alternations with unpleasant smells. Generally the smell is said to come in puffs or gusts, occasionally to be diffusive or general. Nearly all patients regard the odour as coming from their surroundings, in only six cases does it seem to emanate from themselves; in a like number both self and surroundings were accused. It is seldom that any variation in the nature of the odour is described; usually associated with confirmed delusion, its interpretation is, when decided upon, retained. Like other hallucinations, that of smell appears especially frequent and troublesome at night. I have not attempted to test the relative degree of anosmia, for which graduated solutions are necessary, but have in over half of the cases attempted to satisfy myself that no serious loss or perversion of smell function was present, using for this purpose familiar odoriferous substances, such as camphor, peppermint, lavender water, turpentine, cloves. In but very few is found anything more than imperfect recognition of the odour or its title, and this is hardly surprising when the probable lapse of time since a previous experience of the particular smell is considered. The recurrence of the hallucination varies much. In nearly a fifth of the cases the smell is said to be almost or quite constant, in the rest intermittent to the extent of occurring once in two or three days up to several times each day and night.

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There is no interest in recounting the different delusions which arise from, or have given colour to, the hallucination. They depend upon the supposed source or vehicle of the smell, or on other existing delusions and hallucinations. No marked history of alcohol is found; in seven cases it is certain, but probably this is an under-estimate. Syphilis existed in three. Heredity is frequent.

It will be seen that olfactory hallucinations are of bad omen from the class of mental disorder in which they are mostly found. They are evidently intimations of grave fundamental disturbance of mind; only seven of the cases recovered, or are considered recoverable. Amongst the climacteric cases they are found mainly in the chronic residue. The greater proportion of the patients are females—sixty-four. Of this number, sixteen were climacteric, and thirty-three of chronic delusional type. Of the thirty-one male patients, twenty-two were of the latter class; the remainder, in both sexes, consisted of mania, chronic mania, senile melancholia, and chronic alcoholic mania. In but three of the climacteric cases were sexual hallucinations or delusions present. Fourteen other women had sexual delusions, and these were nearly all instances of chronic delusional insanity. Taking male and female patients together, ninety-five in number, no less than thirty-one had sexual delusions. This large proportion may be viewed as indicating the association advocated by Krafft-Ebing, Savage, and others, or as denoting that in certain forms of insanity both sexual and olfactory functions are especially but independently in evidence. I have not had, in the collection of the present cases, the needful opportunity for observation of recent and acute insanities, nor have I sufficient experience of neurotic females with disorder or disease of their sexual organs to be able to allude to olfactory hallucinations in association therewith; my patients have been found almost entirely amongst the chronic inmates. But from the recollection of careful examination pursued in many hundreds of cases I have the impression that amongst pauper patients olfactory hallucinations in recent cases were rarely observable. This we may assume, that the more general the sensory implication, the more fundamental the disorganisation of mind, the more will the remoter sensations be brought into prominence. Especially with the great rise of subject-consciousness occurring in chronic delusional forms are we to expect

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projection of every aroused sensation in the condition of hallucination. In the introspective analytical efforts of chronic persecutory insanity the sexual feelings will often receive notice, and no less even so deep-seated a sense as the olfactory. All the cases in which sexual delusions appeared being grouped together, the sensory disturbance is seen to be diffused. Thus, in seventeen women, a total of forty hallucinations is found apart from the olfactory. In fourteen men thirty-seven hallucinations, still excluding the olfactory. After calculating the average number of hallucinations associated with those of smell in these last cases, and comparing it with the total average, I find the percentage to be notably higher in the sexual cases. Thus it would appear that both sexual and olfactory delusions are connected with psychoses, the most wide-spread and fundamental in nature. In an attempt to observe some more direct relationship between sexual perversion and olfactory impressions I examined fifteen cases of insane and confirmed masturbators, not including any instance of chronic delusional insanity. I did not find evidence or admission of hallucinations of smell amongst these.

Thus, from the material collected by me, I am by no means inclined to support the view that there exists any direct connection between the reproductive system and the sense of smell; an apparent association is, it is true, provided by their frequent joint occurrence in fundamental disturbances of the mind. A relationship due to former intimate co-operation in animal life can have, at any rate, far from invariable influence; for we all, on the one hand, must recognise the number of cases with prominent and morbid sexuality in whom no olfactory hallucinations have existed, and on the other, cases of smell hallucinations in which no anomaly of the sexual life appears.

Dr. Urquhart has very kindly sent me particulars of thirteen cases having olfactory hallucinations. As they do not possess all the necessary details I have not incorporated them in my tables, but I quote them separately, as they have certain features of considerable interest. Six were males, seven females. Heredity was ascertained in eight cases, neurotic history in three, two were climacteric, masturbatic habits were present in eight cases. The mental disorder in five patients was chronic persecutory insanity, in two delusional insanity, in the remainder chronic mania and melancholia, relapsing mania and dementia.

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One, perhaps two, of these only had a chance, and that doubtful, of permanent recovery. Other points of interest were—one climacteric case with masturbatic habits, constantly complained of nasal irritation; a case of dementia picked at her nose whilst masturbating, a third case of chronic mania and masturbation picked at her nose when excited. One patient was alcoholic, another syphilitic. Other hallucinations are not mentioned. I have not had the opportunity of observing any number of cases of general paralysis in a sufficiently early stage to obtain evidence of olfactory hallucinations. Dr. Mickle has found them present in 20 per cent. of those patients having hallucinations; he, however, includes illusions in this number.

All observers are agreed that olfactory hallucinations are very seldom met with, and particularly rarely occur singly. The diversity of opinion is rather concerned with the especial circumstances under which they are encountered. There seems no difficulty in advancing reasons for the relative scarcity of the hallucination. Smell, as has been indicated, takes but little part in the *rôle* played by the senses; in civilised man its impressions are both few and little varied, are exceedingly difficult of recall, have few æsthetic associations. Aroused, too, as the function is mainly in connection with taste, its sensitiveness is very generally dulled by coarse and pungent foods and liquors. From these and some other considerations the sense receives but little intellectual recognition. (It seems possible that the rapid education of the sense and its associations, not usually cultivated, may account for the exhausting and early deleterious effects noted in tea-tasters.) Smell has, in short, practically no office to hold in the relation of civilised man to man, and one but slight and vague in that of man to his surroundings. Considering, then, how subordinate in both structure and function this potentially important sense has become in civilised beings, it can be but tardily implicated in the dissolution processes of insanity. Consequently its hallucination can only be looked for when some close and oft-excited association is aroused, such as that of taste, or when some general implication of the senses, of a fundamental kind, exists. Much evidence must be required to show that an hallucination of the olfactory sense when occurring singly is directly related to a morbid condition of the reproductive system; but when a connection is affirmed in the presence of several hallucinations,

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i. e. of a general sensory disturbance, there must be a danger of overlooking other factors in the case. It is not possible, however, to write except as to the possibilities in this subject, for the authors who have laid stress upon an olfactory-sexual nexus may have had the very instances in support of their views that the present writer has failed to secure. Such an association would show much more distinctly when met with in early cases of insanity and amongst the more educated class, whose sensations are better observed, and in whom the function of smell has been enlarged by more varied and numerous experiences than have fallen to the lot of the pauper inmates of asylums.

I must here express my indebtedness to various gentlemen who have placed both patients and case records at my disposal. The majority of cases have been taken from the Bristol City Asylum, the London County Asylums at Banstead and Hanwell, St. Luke's Hospital, and Barnwood House. By the courtesy of Dr. Elliot Smith I have been able to reproduce some of his illustrations.

[Since this article went to press, Dr. Conolly Norman has very kindly sent me an interesting communication on the subject of olfactory hallucinations, a brief abstract of which I here append. Dr. Norman regards these hallucinations as very infrequent under any circumstances, and especially rarely met with singly; as generally associated with gustatory hallucinations, but also found co-existent with those of all or any of the senses. They are always, however, less marked than either auditory or tactile hallucinations. The greater number are described as disagreeable, gusty, and due to external agency. He believes in a distinct and frequent association between olfactory hallucinations and sexual disturbance, *i. e.* masturbation, sexual excess, climacteric, &c.; in the case of the first two the patient being apt to conceive the smell as proceeding from himself. Delusions connected with the reproductive organs are frequently associated with olfactory hallucinations. Both are commoner in the female sex.]

Illustrations.

1.—Mesial surface of the cerebral hemisphere of *Phascolarctos*.
2.—Scheme of cerebral commissures and margin of cortex of human brain.

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3.—Scheme showing the relation of a primitive type of corpus callosum to the hippocampus. The degenerated part of hippocampal arch is shaded (*h''*).

4.—Scheme to indicate the growth of the corpus callosum, and the indentation of the hippocampal arc and stretching of the precommissural body produced by this.

5.—Sagittal section of the commissural and precommissural regions of the hemisphere of *Ornithorhynchus*. 2. Columna fornicis. 2'. To columna fornicis. 3. Hippocampal basal bundle. 4. Subthalamic. 5. Fasc. marginalis. 6. Stria. med. thalami.

Explanation of Reference Letters.

a, *a'*, *a''*. Extra-ventricular alveus. *b*. Ganglion habenulæ. *c*. Corpus callosum. *d*, *d'*, *d''*. Fascia dentata. *f*, *f'*, *f''*. Fimbria. *g*. Pallium. *h*, *h'*, *h''*, *h'''*. Hippocampus. *l*, *l'*, *l''*. Lamina terminalis. *o*, *o'*. Olfactory bulb and peduncle. *p*. Corpus precommissurale, gyrus subcallosus. *p'*. Septum pellucidum. *r*. Pyriform lobe. *s*. Splenium. *t*. Tuberculum olfactorium. *v*. Ventral commissure. *w*, *w'*. Hippocampal commissure. *x*. Optic chiasma. *z*. Hippocampal fissure.

Discussion.

At Spring Meeting, S.W. Division, 1899.

The Chairman remarked that they were much indebted to Dr. Bullen for his very thorough and scientific paper. It had evidently cost him a great deal of labour, and was one they could more readily appreciate in print. As far as his own experience went in regard to olfactory hallucinations, they were not very common. Very frequently the complaints as to the quality of food supplied probably had their origin in hallucinations of smell. He had a patient many years ago who was constantly complaining of his food, and used to hide it away till such time as the magistrates or commissioners arrived, and till it really did smell. In this case, however, the patient did not complain of a mere putrefactive smell, but attached some peculiar kind of smell to the food supplied.

Dr. Macdonald said when Dr. Bullen wrote to him asking for cases, curiously enough he was able to write respecting one very interesting case, interesting not only because of the hallucination of smell during life, but from the condition found at the post-mortem. It was the case of an old woman—one of the chronic cases which was alluded to,—and she had in her younger life suffered from an injury to the head. How it happened she was never quite able to tell them. There was a depression about the size of the point of the thumb on the forehead, and at the post-mortem they found pressing on the olfactory bulb an exostosis which looked as if a piece had become detached when the cranial injury happened. There was also a man under their care at the present time who every now and again refused to take any dinner. He was in very good health, quite stout, and apparently did not suffer much. When pressed as to why he did not eat his dinner, he would say, "It's poxed." When they pressed him further he, with oaths, held it up before them, saying, "Can't you smell?" He could not speak personally of any other cases which had come under his observation where there were instances of olfactory perversion with the other special senses intact. The really interesting cases were those of olfactory perversion without any of the other special senses being affected. When they found this hallucination mixed up with others it was a very difficult matter to draw a line. He wished on his own behalf to thank Dr. Bullen very heartily for his able contribution to their proceedings.

Dr. Benham said he was in general agreement with what Dr. Bullen had said, and he thought the remarks Dr. Macdonald had addressed to them were especially interesting. For his own part he might say that at present he believed they had no case in his asylum in which hallucinations of smell existed apart from other ones, and from his own experience he believed them to be very rare. The two cases Dr. Macdonald had named were therefore interesting. They were very thankful to Dr. Bullen for working on this subject, and hoped they would have an opportunity of reading his remarks *in extenso* in the Journal.

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