Original Communications.

ARSENICATED WALL-PAPERS.

By JAMES WHITEHEAD, M.D., Manchester.

A PARAGRAPH has recently appeared in several newspapers on the subject of arsenicated wall-papers, containing a statement of which the tendency will be to mislead those who happen not to be well acquainted with the subject.

It appears that the Commissioners of Inland Revenue, having entertained the impression that the green paper with which some of their offices were lined was injurious to health, directed Mr. Phillips, their chemist, to institute an investigation as to whether such papers, as had been alleged by Dr. Halley, were likely to produce a poisonous influence on the system.

"Mr. Phillips's report, which (as the paragraph states) is printed in the *Journal of the Society of Arts*, is perfectly conclusive in solving this question in the *negative*."

Now this statement, correct no doubt in so far as it has reference to the papers which Mr. Phillips examined, may not equally apply to green papers generally.

Mr. Phillips rightly states that the degree of heat which would be necessary to volatilise arsenic would be humanly insupportable, and consequently arsenic is not likely to be liberated by this agency in apartments wherein human beings dwell. It is obviously not by this means, therefore, that arsenicated papers prove deleterious. Mr. Phillips admits that particles may be separated in the process of cleansing by means of brushes where the glazing is imperfect.

In truth, arsenicated papers which are perfectly smooth and properly glazed are probably harmless. But it is altogether different with the tufted or flock papers, and also with the flat papers which are unglazed.

In the autumn and winter of last year, I attended a youth labouring under symptoms of arsenical poisoning, viz., aphthous ulceration of the gums and tonsils, violent frontal headache, great languor, nausea and occasional vomiting, inappetence, diarrhoea, disturbed sleep.

The complaint, mild at its onset, gradually increased in severity, spite of treatment, and at the end of eight or ten weeks, the patient was removed to the country, where he was speedily restored to health. I had repeatedly expressed a suspicion that the symptoms were those of effluvial or other kind of poisoning, and the supply of water and state of the drains were consequently examined; but in these no cause of complaint was found.

On his return home, perfectly well, he was placed in the same apartment; but in the space of four weeks, was worse than before. He had spongy gums, diphtheritis, violent neuralgia of the forehead and face, great languor, occasional diarrhoea, and emaciation. Attention was next directed to a cistern placed against the wall outside his bed-room, which it was thought might possibly have had a share in producing the mischief, and it was therefore subjected to alteration. This measure necessitated a change of apartment for the space of a fortnight, at the end of which period he was the third time located, again in perfect health, in his own room. In the space of three to four weeks after his restoration, the symptoms reappeared in an aggravated degree of severity, and this time it was believed, as had already been several times suggested, that the cause of all the annoyances would be found in the paper with which the apartment was lined. Such being the conviction, both of myself and the family, the paper was replaced, without loss of time, by one of a totally different tint, and was followed by results every way satisfactory. The youth, who has continued to occupy this room from that time until now, remains perfectly well, having had no relapse of symptoms since the removal of the green paper.

The apartment in question, formerly used for other purposes, was converted into a sleeping room in the summer of last year, 1857. Its walls were covered with a rich green tufted or flock paper, which was placed thereon about four years ago; and it was remembered that the workman who was engaged to hang the paper had made use of the expression, during the operation, that he disliked working with that sort of paper, as it always made him ill. During the process of papering, the floor of the room was coated with green dust, and since that

time, whenever the room was cleansed, the dust which rested on the furniture always imparted to the articles used in the process of cleansing a green tinge, showing that particles were constantly being detached from the wall. When used for a few days in succession as a sitting-room, as it had been formerly, the occupants began to feel uncomfortable, and were, from that circumstance, induced to desert it for a period.

Having procured a portion of the detached paper, I scraped off from the raised parts a quantity of green powder, which was submitted to chemical examination. Thirty grains were sent to a chemist, with a request that he would ascertain whether the article contained arsenic, and if so, in what proportion. The remainder was examined by myself. The results were as follows:—

1. Note from the chemist: "I find the quantity of arsenious acid contained in the thirty grains of substance which you forwarded amounts to about eleven grains."

2. A quantity of the green powder thrown upon a hot iron emitted an odour of garlic, characteristic of volatilised arsenic; mixed also with a peculiar metallic flavour.

Four grains, all that remained of the powder, were boiled in four ounces of water in a glass vessel, and submitted, after filtration, to the following tests.

3. Ammoniacal nitrate of silver threw down a pale brownish precipitate.

4. Ammoniacal sulphate of copper gave no result.

5. Sulphuretted hydrogen gave no result.

It is highly probable that the quantity of the green powder used in making the solution for the last three experiments was too small; and moreover, by an unfortunate mistake, the solvent employed was not distilled, but spring water. This would be sufficient probably to render the tests inoperative.

The fragment of paper from which the green powder was obtained measured less than a square foot in extent, and the ascertained superficies of wall covered by the paper was 350 square feet. Allowing, therefore, that eleven grains were held by the portion experimented upon, it follows that the quantity of arsenious acid remaining on the wall-paper, after four years usage, would amount to at least 3,850 grains.

Although the tests Nos. 4 and 5 gave no indication of arsenic, I cannot doubt that arsenious acid, and probably arseniuret of copper, formed the deleterious agents in this paper.

HYSTERIC HYDROPHOBIA, WITH DELIRIUM TREMENS.

By JOHN WHEATCROFT, Esq., Cannock.

MR. G. H. S., aged 29, presented himself at my surgery July 25th. He was in a state of great nervous excitement, stating that he had been bitten by a dog three weeks previously. "I have been a medical student," said he, "although I am now travelling for a wine and spirit house. I feel dreadfully alarmed lest I should become hydrophobic. I was bitten by a dog whilst fighting. I applied nitrate of silver to the wound; but my limbs feel very stiff; my jaw feels queer; my salivary glands act abundantly; I cannot sleep. I have ceaseless dread of rabies."

I examined the wound, which was in the right popliteal space. There were teeth-marks, looking rather sloughy, with evidences around of the application of the nitrate of silver. On inquiry, I found my patient had been drinking to excess. There was tremor of the hands and tongue, a wild appearance of the countenance, commingled with an expression of intense anxiety. I endeavoured to soothe his terrors, and ordered a mixture of carbonate of ammonia with tincture of opium, ten drops to the dose. Whilst I was so engaged, he fell on the surgery floor, in a fit, evidently epileptic. The convulsive struggles were very protracted; the face became livid; the tongue bitten; large quantities of foam issued from the mouth. Perfect intellectuality was never re-established. In three hours, the fit was repeated. On my visiting him half an hour afterwards, he was somewhat sensible, and answered questions intelligibly; but still there were the wildness of countenance and loss of memory. He complained of a choking sensation about the larynx. I offered a glass of water. The patient took the vessel eagerly; but, the moment the glass neared his mouth, there came on laryngeal spasm, and a shudder, a scream, and choking. This occurred four several times on my presenting the fluid: the patient looked piteously at me, and, with difficult articulation, said, "Mad, mad! Hydrocyanic acid give me, give me. Don't let me go quite mad; poison me

as a—as a favour.” I endeavoured to quieten his apprehensions, demanded an immediate consultation, and administered four grains of opium, which was swallowed with difficulty. In half an hour, all hydrophobic symptoms had disappeared, and the case became one of pure delirium tremens, terminating fatally in three days.

Post mortem examination of the head revealed extensive congestion of the superficial cerebral veins. The substance of the brain itself was uninjected, but universally as soft as butter. The lateral ventricles were distended with serum. A small coagulum was found on the petrous portion of the right temporal bone.

The case appears to me interesting, from the fact that hysteria can assume any form of disease.

Periscope.

ANATOMY AND PHYSIOLOGY.

GROWTH OF THE CRYSTALLINE LENS.

MR. J. W. HULKE has investigated some points connected with the structure and growth of the crystalline lens, and has published the result of his researches in the *Ophthalmic Hospital Reports* for July 1858.

The crystalline lens, Mr. Hulke observes, is contained within a highly elastic and perfectly transparent capsule, which forms a shut sac, everywhere continuous, although, on account of certain peculiarities, the anterior and posterior hemispheres are, by a loose way of speaking, often called the anterior and posterior capsules, as if they were distinct structures. The capsule of the human lens is perfectly homogeneous and glassy, without any traces of structure, but the torn edges of the thicker capsules of the larger ruminants sometimes display parallel lines suggestive of lamination. There are, also, upon the human capsule certain marks, which some persons have considered indicative of its anatomical construction, but these marks do not really bear this interpretation. The delicate converging lines which stretch from the attachment of the suspensory ligament for some distance, towards the anterior pole, and the similar but fainter lines upon the outer surface of the posterior half of the capsule, are due to the peculiar arrangement of the fibrous cordage of the suspensory ligament.

It is commonly stated in anatomical works that the capsule of the crystalline lens is lined by a delicate layer of pavement epithelium, which forms the medium of that adhesion which naturally exists between the healthy lens and its capsule. The capsule being a perfectly closed sac, the nutrition of the lens is effected by osmotic currents through the delicate membrane, and the nucleated epithelial cells appear to take an important part in the elaboration of the nutritive matter; the lenticular fibres are also developed from these cells,—a fact which, Mr. Hulke believes, was first taught by Mr. Bowman in his lectures on the eye, delivered at the Moorfields Hospital in 1847, and which has since been confirmed by Kölliker, who has described at great length the structure of the lens, and the development of its fibres. Having enjoyed peculiar opportunities of obtaining recent healthy and morbid lenses for examination, Mr. Hulke has been enabled to follow with some minuteness the various stages of the process.

The intracapsular epithelium does not line the whole inner surface of the capsule, as was formerly thought to be the case, but it has been ascertained by Kölliker that its presence is confined to the anterior hemisphere, in different parts of which it presents very different appearances. For convenience of description, Mr. Hulke divides the anterior hemisphere of the capsule into a central region, the area immediately around the pole, and a marginal region, the zone stretching from the central region to the edge of the lens.

In the central region, the epithelium is a delicate pavement formed by a single layer of large polygonal cells joined edge to edge; the cells are conspicuous for their sharp outlines, and each contains a large circular nucleus, which in turn encloses two or three small dark dots or nucleoli. The nuclei are remarkable for their uniform size and regular circular outline; they occupy the centre of the cells, and each nucleus is separated from the neighbouring ones by a space about equal to its own diameter.

In the marginal region, the epithelial cells are much

smaller and much more closely packed together. The nuclei are smaller; they have a less regular outline, and are separated by extremely minute intervals,—indeed, they are sometimes almost in contact, and the walls of their containing cells can hardly be made out. The epithelium in this region is not arranged as a simple pavement, but rather in the form of a bed, in which the cells are crowded in superimposed layers: the bed is not prolonged beyond the edge of the lens, and the inner surface of the posterior hemisphere of the capsule is void of epithelial lining. The transition from the large polygonal cells of the central region to the small crowded ones of the margin is not abrupt,—every possible gradation occurs between these extreme forms. This epithelial bed at the margin of the anterior half of the capsule is the matrix of the lens; in the young it contains free nuclei, and it is the growing part in which the lenticular fibres are formed by the growth and metamorphosis of the cells. Young subjects furnish the best objects for the study of these changes.

In the growing lens the cells of the matrix become elongated in opposite directions, and this lengthening proceeds until, at last, the epithelial cell has become a flattened band, which ultimately assumes the form of the perfect lenticular fibre.

As the cells of different layers become elongated, an imbricated arrangement takes place, and the growing fibres are disposed in different layers, in which those of one layer alternate with those of the other layers immediately in contact with it.

The position of the matrix at the equator accounts for the extension of the lens in this direction, and explains to us how the spherical lens of the infant in the process of growth becomes flattened and expanded, until it finally assumes the biconvex discoid shape of the adult organ. The arrangement of the mesial planes of the lens in man and in the lower animals was several years ago described by Mr. Bowman, who contrasted the simple tripartite plan, which obtains in the human fetus with the highly complex arrangement which the adult lens presents, and inferred that the multiplication of the mesial planes outwards is a process necessary to the expansion and flattening of the organ, and that this takes place by a deposition of new fibres on the old.

It will have been seen that this account of the development of the fibres of the lens coincides with that given by Mr. Bowman and by Kölliker. These views differ very widely from those held by several other observers, amongst the more recent of whom may be mentioned Testelin, who, in several late numbers of the *Annales d'Oculistique*, has described with great minuteness the structure of the lens and the evolution of its fibres. He describes six kinds of cells and fibres differing from each other and occupying different planes; but whilst Mr. Hulke admits that fibres taken from the superficial parts, and from the centre of the lens respectively, possess certain peculiarities, there is really no abrupt transition from the one to the other set of fibres, and he cannot help thinking that Testelin has made a needless subdivision; moreover, some of his illustrations lead to the suspicion that he has depicted as natural conditions appearances which have been produced artificially. Testelin describes a layer of cells, the corpuscles of Morgagni, distinct from intracapsular epithelium; these Morgagnian corpuscles are transformed into a second set of cells, the embryonic vesicles, within which the evolution of the lenticular fibres takes place. Each embryonic vesicle contains one or more elementary corpuscles, the germs of the lenticular fibres, the corpuscles enlarge, undergo a spiral cleavage, and are thus changed into ribbon-like bands, spirally coiled within the parent cells. At a subsequent stage the parent cells are ruptured, and the spiral bands set free immediately uncoil themselves, and so come to resemble perfect lens fibres. According to this view, the development of the fibres of the lens takes place in an endogenous manner, and the intracapsular epithelium has no share in the process. But how are we to explain the appearances which M. Testelin describes? The cells and globules which are commonly found on the surface of the lens are in part altered, swollen intracapsular epithelium, and in part albuminous globules, which have oozed from the interior of the lenticular fibres, the softer nature of the superficial fibres rendering this exudation more easy. The peculiar junction of the fibres of the lens by the interlocking of the serrations along their edges is so close a mode of union that absolutely no interval is left between the adjacent fibres in any one plane, and the alternating arrangement of the fibres in planes which