tains a somewhat granular dark-colored plasma, of a deeper shade toward the receptaculum; its diameter is about 10 to 15 μ; sterigmata 20 to 100 μ in length, of a brown color, larger toward distal extremity, where they apparently subdivide into from three to eight prolongations. Conidia blackish-brown in color, smooth or echinate, and very numerous. The fruit heads of A. glaucus are smaller and narrower than those of A. nigricans (Burnett, *Am. Jour. of Otology*, 1879). The sporangium of A. fumigatus is, according to Bezold, still smaller than these.

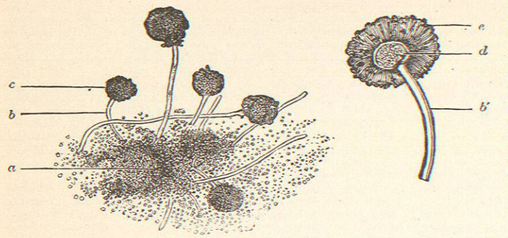

FIG. 1705.—Aspergillus Nigricans. (After Politzer.) *a*, Mycelium covered with numerous fallen spores; *b*, *b'*, hypha; *c*, sporangium, with ripe spores; *d*, receptaculum; *e*, sterigmata, with spores.

If we exclude the *Otomyces Hagani* of Hagen and Hallier, the Graphium penicilloidis of Hassenstein and Hallier, and the Penicillium of Blake, on account of their having been obtained by culture from substances of doubtful nature taken from the ear, there are still four varieties of aural fungi to be mentioned. They are: 1. *Tricothecium roseum* of Steudener (*Arch. f. Ohrenheilk.*, Bd. v., p. 163), and *Mucor mucedo s. fuscus* of Böke (*Hungarian Med. Chirg. Press*, 1868–9, pp. 12, 16, 19), both varieties of doubtful identity. 3. Ascophora elegans of von Troeltsch ("Die Myringomycosis," p. 44). 4. *Otomyces purpureus* of Wreden (*Arch. of Ophth. and Otology*, vol. vi., No. 1, p. 87). The last-named fungus has also been once observed by Burnett (*Arch. of Otology*, vol. x., No. 4, p. 319). In Wreden's case the false membrane also contained spots of Aspergillus nigricans, and he was led to believe that the O. purpureus represented *the ascomycete of the Aspergillus nigricans, that is, the highest form of the specific aural fungus.* Burnett, however, found no evidences of such relationship in his case, and regards the *O. purpureus* as a species *sui generis*.

All the conditions requisite for the growth of aural fungi are not yet fully understood, but since attempts to cultivate the growth in the healthy human ear have uniformly failed, it seems probable that the presence of certain pathological changes, attended with undue moisture or a softened and loosened condition of the epithelial lining of the meatus, are essential to the development and growth of the fungus in the ear. The age and hygienic surroundings of the patient, the climate, and the season of the year are not without influence. The Russians, living as they do in artificially heated and badly ventilated dwellings during the long winter season of that climate, seem especially liable to otomycosis. The poorer classes, who live in damp apartments, are said to be more frequently affected than those whose circumstances are more fortunate. If this be true, the comparative immunity of the English people, notwithstanding the dampness of their climate and the large pauper population, is somewhat remarkable. In Germany and the United States the disease is by no means rare, but in the province of Quebec the writer has met with only one example of aural fungus among thirty-five hundred patients. This case was one of A. nigricans; it occurred in a youth fifteen years of age, the son of a wealthy merchant, and is all the more remarkable because young people are seldom affected in this way. This patient came under notice again about a year later on account of a slight diffuse otitis externa without any recurrence of the fungus.

The disease is prone to occur in ears that are already diseased, but is seldom or never found in the presence of an active purulent otitis. Substances which readily undergo decomposition, such as fats and oils, instilled into the ear, are said to favor the development of Aspergillus. The presence of normal ear wax is unfavorable to its development. There can be little doubt that this affection was formerly often mistaken for impacted cerumen, or for ordinary otitis externa diffusa. The fungus usually originates in the deeper portions of the auditory canal and upon the membrana tympani; hence the name myringomycosis. The irritation which it causes may induce ulceration of the membrana tympani and an extension of the fungus to the tympanic cavity; but when the new growth is met with in this situation an exhausted suppuration, with perforation of the membrane, has usually preceded the development of the fungus.

Symptoms.—Growths of fungus in the external meatus and tympanic cavity may exist for a considerable time without exciting any troublesome irritation; according to Bezold this is especially true of the A. fumigatus. Sooner or later, however, the form of inflammation known as otitis externa parasitica sets in. This results from the fungus having penetrated the epidermis and reached the living tissues (Politzer), or in consequence of irritant qualities of the fermentation products to which the growing fungus gives rise (Siebenmann).

The subjective phenomena of parasitic otitis are itching of the meatus, lancinating pains, and a feeling of fulness in the ear; tinnitus is usually present, vertigo rarely so; the impairment of hearing is often considerable. On examination, the walls of the meatus and the membrana tympani are seen to be partly or completely hidden by a membranous substance of a dull whitish, yellowish, or blackish color. In Otomyces purpureus, the meatus has been found occluded with a red substance resembling blood clot, and in A. flavus it is spoken of as containing a yellow, dust-like substance, like pollen dust. There is often a watery discharge from the ear. When the ear is syringed, shreds of membrane resembling wet paper may be removed; sometimes the aid of forceps is required. The fruit heads of the fungus are visible to the naked eye as black or yellow dots on the surface of the false membrane; the microscope will readily show their peculiarities of structure. When the fungus is removed, the auditory canal is found to be more or less reddened and tender; if no other measures are resorted to, the growth may be reproduced in a few hours.

The *prognosis* is favorable in all varieties of otitis externa parasitica, as there is no difficulty in destroying the growth by the use of suitable remedies and thus effecting a speedy cure. Fresh attacks may occur if the surroundings of the patient remain the same.

Treatment.—Of the many remedies recommended for the destruction of the fungus, alcohol is probably the best. The ordinary spirits of wine may be used. After removal of the casts with a syringe and warm water, the meatus may be filled with warm spirit, which should be allowed to remain in the ear for ten or fifteen minutes. This may be repeated twice daily for several days. The spirit may be diluted if it causes pain, and gradually increased in strength if necessary. Three or four days of this treatment will suffice to effect a cure. To prevent relapses, Politzer advises the occasional use of the spirit for at least a year; this precaution, however, will seldom be necessary.

Many other remedies have been found sufficiently

effective; repeated syringing with warm water would probably suffice, though not so rapidly as when combined with the use of some parasiticide. Wreden extols the use of chlorinated lime (0.07 to 0.15 in 35.0 aq. dest.), Blake and Burnett, the hyposulphite of soda (0.2 in 300). Boracic acid in powder, alone or with an equal quantity of oxide of zinc (Theobald), or in alcoholic solution (1 to 20); permanganate of potassium in one or two per cent. solution (v. Troeltsch *et al.*); carbolic acid in glycerin (3 in 100, Lucæ); salicylic acid in alcoholic solution, two per cent. (Bezold); bichloride of mercury in water (1 to 500), and various other remedies, are mentioned by different observers. Painting the meatus with strong solutions of nitrate of silver is found beneficial if inflammation persists after removal of the fungus (Roosa). If the affection be complicated with middle-ear disease, this too will require appropriate treatment.

Pityriasis alba of the external meatus has been described by Ladreit Lacharrière (*Annales des Maux de l'Oreille*, 1875) as a rare form of mycosis, for which the treatment is extraction of the stiffest hairs and painting the meatus with a one-per-cent. solution of corrosive sublimate.

DIFFUSE INFLAMMATION (*Otitis Externa Diffusa*).—Diffuse inflammation of the external auditory meatus is either acute or chronic, primary or consecutive. The consecutive form occurs in connection with inflammatory affections of the middle ear, and is subordinate to the deeper-seated disease. As a primary affection, diffuse inflammation is rarely of idiopathic origin, but may usually be traced to the instillation of irritating substances, or to mechanical and traumatic causes. The lining of the osseous section of the canal is the part chiefly affected, though the membrana tympani and the outer portion of the meatus may become involved as a complication of, and consecutive to, chronic purulent otitis media. It is by no means uncommon, especially in unhealthy, badly nourished children.

Symptoms.—The acute form of the disease begins with itching sensations in the ear, followed by a feeling of fulness and heat. Pain of moderate or intense severity occurs early, and is always increased by pressure on the ear and by movements of the jaw. Tinnitus and giddiness are sometimes complained of. The impairment of hearing is slight, except when the membrana tympani is considerably swollen and the auditory canal contains a sufficient quantity of secretion and exfoliated epithelium to obstruct its lumen.

The objective signs are a whitish exudation lining the walls of the canal, and consisting mostly of exfoliated epithelium, often of a pasty consistence from admixture with viscid secretion; sometimes it consists of a continuous pouch-like membrane. The real condition of the auditory canal can be seen only after removal of this abundant exfoliated material. After syringing, or careful cleaning with the ordinary cotton-wrapped applicators, the meatus is found to be more or less narrowed from swelling, especially of its deeper parts, and at the same time reddened and sensitive. The line of demarcation between the meatus and membrana tympani, as well as the usual anatomical features of the latter, may be obliterated by the swelling and uniform redness of these parts; occasionally the meatus is so contracted by diffuse swelling that a view of the deeper parts is not obtainable. If the drum membrane is found to be fairly normal, it is fair to assume that the disease is confined to the auditory canal. The writer once observed a case of diffuse otitis externa, occurring in a profoundly hysterical subject, which was characterized by attacks of intense pain followed in a few hours by the formation of large blebs containing serous exudation of a pale yellow color; in this way the entire epidermis of the meatus, and probably of the membrana tympani, was several times thrown off, leaving a moist, not swollen, but reddened and intensely sensitive surface, which speedily became covered after each attack with normal epidermis. With the cessation of the recurring inflammation, complete anæsthesia of the meatus and membrana tympani supervened; there was also sudden and total deafness which lasted for several months and was obviously of a functional character.

The acute form of otitis externa diffusa usually subsides under proper treatment in the course of a few days; in less favorable cases there may be relapses of the inflammation, ulceration of the meatus or membrana tympani, and the formation of polypoid growths.

In chronic diffuse inflammation there is little or no pain, but more or less itchiness with scanty discharge; its duration will depend largely upon the presence or absence of complications, such as purulent disease of the middle ear. If the discharge is distinctly of a fœtid character, careful examination should be made for other evidences of chronic mastoid disease or of bone caries involving the ossicles or tympanic walls. Suspicious-looking flakes or casts should be examined for fungous growths.

The possible consecutive nature of the disease should always be held in view, and the diagnosis not considered complete until proper steps have been taken to prove the non-existence of deeper-seated disease.

The *prognosis* of uncomplicated otitis externa is favorable in all its forms.

Treatment.—While the acute symptoms last, leeches, anodynes, scarification of the inflamed parts, and warm-water irrigation are in order. If the disease be of traumatic origin, continuous applications of cold compresses, or of Leiter's coil, to the region of the ear are serviceable. Leeches when applied should be placed in front of the tragus; an artificial leech specially adapted for abstraction of blood in the vicinity of the ear may be used with advantage and is free from the objectionable qualities of the Hirudo officinalis. In this affection it is claimed that the best results from the use of the artificial leech are obtained when it is applied to the mastoid region (Dench). Scarifications are to be made only in the early stage, before exudation has occurred. The incisions should be three-fourths of an inch long in the walls of the canal (Gruber). For warm-water irrigation, the fountain syringe, or some form of continuous aural douche, may be employed. Anodyne instillations of solutions of morphine or atropine may be used; in childhood the latter cannot be used with too much caution, especially if the drum membrane is perforated.

Poultices, if used at all, should not be applied for more than two or three hours consecutively, not only on account of their tendency to promote the formation of polypoid growths, but because in painful affections of the ears they may—when used to an excess, as is often done by the laity—prove to be veritable incubators for the nurture of innumerable disease germs. In this way they may, in effect, aggravate the disease which they are designed to cure.

In all chronic cases, repeated cleansing of the ear with some mild antiseptic irrigation is indispensable. Insufflations of boric acid powder, after the canal has been cleansed, often act like a charm, and may be employed even in acute cases, when discharge has set in. This may be repeated whenever the powder has become moist. Strong solutions of nitrate of silver are often very useful, but must be avoided so long as there is pain. In some chronic cases the insertion of a plug of cotton wool, smeared with diachylon ointment, effects a speedy cure (Buck, Roosa). In these cases the disease has probably been of an eczematous character.

ACUTE CIRCUMSCRIBED INFLAMMATION (*Follicular Inflammation, Furuncles, Boils, Otitis Externa Circumscripta*).—This form of inflammation seems to have a special predilection for the external auditory canal, having its seat almost exclusively in the cartilaginous portion. The disease is quite common in adults, rare in childhood, and seldom or never met with in infancy. It is said to occur with special frequency in spring and autumn, sometimes as an epidemic, and sometimes associated with a more general furunculosis. Anæmia, gout, disorders of menstruation, diabetes mellitus, and change of life are said to predispose to auditory furuncles. Strong and otherwise healthy persons are by no means

exempt from it, but debility induced by an unhealthy mode of life, or by living in badly ventilated houses, seems to exert a predisposing influence.

As local causes may be mentioned: chronic discharges from the ear; chronic eczema of the meatus; mechanical irritation, such as may be caused by the presence of foreign bodies; frequent syringing; scratching the meatus with hard instruments, such as hairpins and tooth-picks; irritating medicinal applications, and the use of alum lotions. The sebaceous and ceruminous follicles are probably the starting-point of the inflammation; occasionally it originates more deeply, in the perichondrium, or in the substance of the cartilage (Buck).

The pus of aural furuncles has been found loaded with micrococci (Löwenberg), and it is not unreasonable to suppose that furuncular inflammation may originate from these having found their way into the glandular follicles from the air, or from the water used in syringing; in any case, moisture would favor their rapid development, and this may be the reason that syringing the ear is apt to excite furuncular inflammation. Although slight local lesions, such as would favor the introduction of pus-producing disease germs, commonly initiate otitis externa circumscripta, the affection cannot always be shown to originate in this way. Trophic disturbances of the parts, possibly of a reflex nature, are alleged to be the active causative agents in this case.

Symptoms.—The first perverted sensation is a feeling of fulness and discomfort, soon followed by slight lancinating pains or by itchiness. If the inflammation is superficially situated, the pain is usually slight; if it is deep-seated, the pain may be very severe, of a tearing or beating character, and radiating to other parts of the head and neck. It is intensified by pressure, by traction of the auricle, and by movements of the jaw. Hardness of hearing, a feeling of fulness, and tinnitus are complained of in some instances, especially when the meatus is much obstructed by the swelling, which always involves the cartilaginous portion of the meatus, and is most marked in that part of the canal which happens to be the seat of the inflammatory focus. According to Dench the inferior, posterior, and superior walls are more frequently affected than is the anterior. Infiltration and induration of the adjacent lymphatic glands are by no means infrequent changes, and occasionally the parotid becomes involved. A large and deep furuncular abscess in the posterior wall may be mistaken for mastoid disease, but the absence of tenderness, except when pressure is so directed as to move the wall of the meatus, differentiates the two conditions. Sometimes the tissues behind or in front of the ear are swollen and the skin is reddened.

Superficial furuncles appear more or less red from the outset; when they are deep-seated, the redness is not present until the abscess approaches the surface. Febrile symptoms may be present in the severer cases. Tenderness over the inflamed centre is a constant symptom; several furuncles may occur at the same time, or follow each other in rapid succession. Repeated attacks are not uncommon.

Resolution of the inflammation without suppuration seldom occurs. If the disease is left to nature, rupture of the abscess will take place sooner or later, often not for many days if the disease is deep-seated. After rupture of the abscess the swelling and pain quickly subside. Polypoid granulations requiring removal may develop from the point of rupture. The locality of the swelling and the tenderness, together with the absence of symptoms indicative of deep-seated disease, render the diagnosis a matter of no difficulty. The presence of an exostosis covered with inflamed cutis, or bulging of the posterior wall of the meatus from mastoid disease, might be mistaken for furuncular inflammation, but neither of these conditions could deceive a careful observer. Inflammation of the deeper portions of the meatus in which glandular elements are wanting, is probably not furuncular.

Treatment.—Measures must be employed to allay pain, to shorten the duration of the disease, and to prevent relapses. If the case is seen sufficiently early an effort may be made to abort the attack. Some aurists recommend local depletion by leeching or by means of the artificial leech; others have no confidence in this procedure, but rely upon the topical application of strong antiseptics such as a saturated solution of boric acid in alcohol frequently applied, or alcoholic solutions of menthol, carbolic acid, creosote, eucalyptol, etc., these latter being sedative in their action as well as antiseptic. They may be applied in solutions varying in strength from five to ten per cent., on pledgets of cotton wool, and they have the further advantage of tending to prevent the formation of fresh foci of inflammation. Of all these menthol is probably the best.

If a fair trial of such measures does not afford relief, the local application of some form of dry heat will have a soothing effect, and, by softening the tissues, will assist nature in bringing the suppurating area nearer the surface; at the same time syringing the ear every few hours with some warm antiseptic solution is recommended. Most otologists are agreed in recommending an early incision of the swollen parts at the point of greatest tenderness, which may be ascertained by the use of a cotton-guarded probe. The incision should be sufficiently deep and long thoroughly to divide and relieve tension of the inflamed area; a short strong and very sharp bistoury should be used. General anæsthesia is hardly necessary, but the writer can from his own experience confidently recommend the administration of ether up to the point of producing the first stage of anæsthesia, the patient sitting upright in a chair and taking the anæsthetic himself. When the proper moment arrives, an instantaneous incision can be made without inflicting pain. After the incision has been made syringing with warm bichloride, 1 to 6,000 or 8,000, is in order. This cleansing may be repeated several times daily and supplemented by the use of a dilute solution of boric acid in alcohol, to be instilled after syringing, until the discharge ceases. Should granulations or polypoid excrescences spring from the wound, their removal with the cold snare, by curetting, or by caustic applications will be indicated.

The sulphide of calcium, Fowler's solution of arsenic, iodide of potassium, and other remedies given internally, have been recommended by several otologists of repute, but their actual value has not been sufficiently established to warrant more than a passing mention. Anæmia, constipation, etc., must be corrected by suitable therapeutic measures. Change of air may be advisable if the disease is protracted by repeated formation of furuncles, and if the patient's sanitary surroundings are obviously insalubrious. Errors of diet and all the recognized exciting causes should, as far as possible, be avoided.

A mild form of membranous otitis externa is seen as a rare affection, the membrane being detachable without exposing a bleeding or ulcerated surface, and belonging to the type of so-called croupous exudation.

Eczema.—To avoid repetition it has been thought best to consider the subject of eczema of the auricle and of the external meatus in the same section, and, for the same reason, the sections relating to pathology, causation, and general principles of treatment will be omitted; the reader being referred, for information in regard to these subjects, to the general article on *Eczema*. We have, therefore, to consider the subject only from the standpoint of the otologist, which means an attention to certain details, chiefly in the matter of local signs, diagnosis, and treatment, not likely to be found in the text books on dermatology or in the article above mentioned.

This form of dermatitis may, and as a matter of fact often does, invade the auricle and meatus as a part of a more extensive affection, and the patient will then, as a rule, not come under the observation of the otologist at all. There are, however, a considerable number of cases in which the aural disturbances appear to be the more important, and the subjects thereof naturally seek the advice of an otologist, if such can conveniently be obtained, before going elsewhere. It is then to this local manifestation of eczema that we purpose calling the

reader's attention. As in eczema of other parts, the morbid condition of the integument of the meatus, auricle, and adjacent parts presents itself under two forms, acute and chronic.

Acute Eczema of the Auricle.—In typical cases of this disease the eruption is seldom confined strictly to the integument covering this structure, but involves to some extent that of the meatus and also the adjacent hairy scalp; nevertheless the red, swollen, and inflamed auricle is the chief feature of the disease and becomes the source of no little distress and anxiety to the patient. Here, as in eczema generally, the predisposing cause seems to be some constitutional diathesis or fault in nutrition, as gout, rheumatism, or scrofulosis, of which there may be no signs until some further disturbing influence is brought into play, such as disorders of digestion, unsuitable articles of diet, perverted habits of life, or anything which interferes with the proper balance between assimilation of food and excretion. This will account for most of the apparently spontaneous attacks of eczema; but there are many cases which seem to come on as the result of some local irritation, reflex, mechanical, or thermic in character, or as a secondary manifestation, following some ichorous discharge from the middle ear and meatus. In these, also, some of the above-mentioned underlying causes doubtless play a part; children and members of certain religious communities whose ears are kept closely hooded in warm weather are particularly liable to eczema about the auricle, which often appears to commence as an intertrigo between this part and the skin behind it.

An acute eczema of the auricle begins with a sensation of heat and tension (which, later on, gives place to an intense pruritus); thus there is much swelling and redness. The ear now appears to project unduly from the side of the head, and the clinical picture strongly resembles that of erysipelas, but lacks the peculiar œdema, the mode of extension, and the severe constitutional disturbance of this disease; the last mentioned being absent or comparatively slight in acute eczema.

An exudation of fluid occurs beneath the epidermis, and this manifests itself in one of two ways: either there is a multitude of fine vesicles or else the superficial epithelium may simply be cast off by the exudation, without distinct vesiculation. In either case there is an exudation, from the surface, of a copious yellowish or sanguinolent, sticky fluid, and the skin appears raw and inflamed. Pus also now appears upon the surface, and the discharge, in drying, forms crusts or scabs over the affected part. If these are removed, a raw, sometimes bleeding, surface will be found underneath.

After this stage has been reached, if the disease attacks the hairy scalp, as it is especially apt to do in strumous children, the lymphatics become affected, as shown by enlargement of cervical glands. The skin lining the auditory canal may be involved to such an extent that tinnitus and partial deafness occur. If left untreated, the disease readily becomes chronic, with thickening and induration of the deeper layers of the skin.

If a local irritation, such as chronic discharge from the ear, is the chief factor in bringing on an attack, it often remains unilateral; but when the affection is due solely to constitutional causes both ears are generally affected at the same time. When an acute eczema is limited to the auricle and canal, it is scarcely possible to differentiate it from a diffuse otitis externa due to any other cause.

Chronic eczema is not necessarily or indeed often traceable to an acute attack, and is by far the more common form. It occurs as an extension from the hairy scalp, or as the result of some local irritation, or from a constitutional tendency which may give rise to a localized eczema at any part of the general integument. It often remains localized at some particular part of the ear for an indefinite period. The localities most often affected are: the meatus or the lobule, as a result of chronic otorrhœa or from wearing faulty earrings; the posterior attachment of the auricle to the head, especially in children; the fossa of the helix; the antihelix; the concha; and, lastly, the entire auricle. A slight scaly irritation of the outer half of the external auditory canal, attended with pruritus, represents a very common and mild form of the disease. This condition in a more pronounced form is often met with in women suffering from the debility which belongs to various pelvic disorders and their attendant digestive disturbances.

Thickening of the entire integument is characteristic of chronic eczema; it sometimes amounts to a veritable hypertrophy of the affected part, and may occlude the external meatus so much as to interfere with audition. The skin usually feels hard, leathery, and thick. Its appearance is not always the same, but varies somewhat from time to time even in the same case. A dull pinkish color is often present; sometimes the skin is smooth and glossy, as if it were tightly stretched, or, if the epithelium is cast off rapidly, it will be covered with whitish scales and will present a more or less rough surface. Efforts to relieve the pruritus may lead to abrasions and perhaps bleeding; hence blood-stained crusts or scabs are often seen, and a temporary increase of the local inflammation may ensue from the same cause.

Pruritus is a constant symptom of chronic eczema and is sometimes exceedingly annoying. Wherever the skin is much thickened, the surface is apt to present fissures extending into the corium. These are particularly noticeable about the entrance of the auditory canal wherever the meatus has long been the seat of a chronic eczema.

Treatment.—In both varieties of eczema the constitutional aspect of the disease should first be considered, and suitable treatment for this must be adopted. Habitual errors of diet, etc., must be corrected. The internal administration of various alkaline and laxative remedies—such as Rochelle salts, the neutral tartrate of potash, bicarbonate, acetate or citrate of sodium, in rather large doses—materially aids local treatment in bringing about a cure. Local exciting causes, if present, must of course be eliminated.

In the acute form the subjective symptoms require special measures for their relief. Cold evaporating lotions tend to allay the heat and itching, often so distressing to the patient. Pledgets of lint laid over the part and kept moist with a solution containing liquor plumbi acetatis 3 parts, glycerin 6 parts, and water 100 parts, will be found to answer the purpose very well. One per cent. of bismuth subnitrate and a small quantity of morphine may be added to this to increase its soothing effect. In the presence of a profuse discharge from the inflamed surface a drying powder, containing combinations of starch, lycopodium, oxide of zinc, stearate of zinc, bismuth, etc., in varied proportions, may be found preferable to the moist dressing; but if the burning sensation in the skin is intense, some form of ointment is indicated. One or more of the four last-mentioned drugs (with or without boric acid, or morphine), combined with vaseline, make an excellent dressing. The unguentum diachylii or an ointment containing two per cent. of creolin, smeared on pieces of soft rag, may be applied constantly.

It is not at any time desirable to irritate the inflamed surface mechanically; hence, when crusts have formed, they must be softened with olive oil or vaseline until they can easily be removed, after which the surface should be treated with some soothing protective powder, or with one of the ointments already mentioned. Washing the affected parts with water is always to be avoided, but cleansing occasionally with a solution of subacetate of lead may be practised with benefit.

Chronic eczema of the ear is apt to run a protracted course, even under the most favorable circumstances, and especially so if suitable treatment be not persistently carried on, or if it be omitted too soon.

The local applications employed will require to be varied from time to time in most chronic cases. In a general way applications of an astringent and stimulating character are to be employed, but in the presence of an acute exacerbation it may be necessary to resort to more soothing remedies. A light covering to protect the auricle may often be used with advantage, but not to the

extent of causing undue heat and moisture of the skin, a circumstance which, as already mentioned, may bring on eczema in certain persons.

There are many formulæ for mild stimulating and astringent ointments, such as diachylon ointment; oil of cade in vaseline, three per cent.; benzoated lard, with or without oxide of zinc or bismuth; boric acid in vaseline, four per cent., etc. All of these act beneficially, in part at least, by excluding the air from the inflamed skin. Olive oil or vaseline should be used freely to soften scales and crusts, so that they can be wiped away; some warm emollient poultice is a useful adjuvant to these, if the softening effect of the oil is insufficient. When the skin is greatly thickened, indurated, and covered with dry, exfoliating epidermis, stronger stimulation is indicated. Under these circumstances one of the following ointments may advantageously be employed: an ointment containing tar or ammonio-chloride of mercury; a mixture of equal portions of ung. picis liq. and zinc ointment; simple benzoinated lard, or the latter with four or five per cent. of the ammonio-chloride; and, finally, ichthyol and benzoinated lard. Acetum cantharidis, which is a still stronger stimulant, has been found to act better than any other remedy in allaying the itching and reducing the brawny infiltration of the skin. This effect is due to the free serous transudation which it induces. It may be painted over the affected part with a cotton-wool swab once every twenty-four hours, until the proper effect is obtained—that is, exfoliation of all thickened epidermis and softening of the skin, which then becomes covered with a thinner and more normal epithelium. Should the reaction be excessive, some soothing ointment will allay all discomfort in a few hours. The process may be repeated every few days until all thickening has disappeared. Many authorities highly recommend nitrate of silver—in solutions of from two to four per cent. or even greater strength—as a local application in chronic eczema. Painted over the surface after all scales have been removed, it stimulates the epithelium to a more healthy growth, especially after the thickening of the skin has been reduced by the use of the remedies already mentioned. For the relief of fissures in the skin of the meatus the writer has found repeated painting with a strong (ten to twenty per cent.) solution of silver nitrate most efficient. Practitioners who are in the habit of prescribing arsenic in all cases of chronic eczema will do well to remember that this treatment has not found much favor with dermatologists of the present time; its effects, although sometimes favorable, have on the other hand often been found decidedly injurious.

True Diphtheritic Otitis Externa does sometimes occur, but very rarely, and then almost always as a complication of scarlatinous diphtheritis of the throat and middle ear (Politzer). Primary diphtheritis of the meatus has been observed during epidemics of diphtheritis; but in these few instances there already existed an inflammation or excoriation of the meatus, and it was in this favorable soil that the accidental infection occurred. This primary form is said not to be attended with constitutional disturbance and readily yields to treatment.

A false membrane of a dirty white color and firmly adherent to the walls of the meatus is characteristic of diphtheritic otitis externa. When the membrane is forcibly removed, the exposed parts are found tender to the touch, excoriated, ulcerated, and bleeding. Severe pain, a feeling of fulness, tinnitus, and deafness only occur in the primary form of this disease; when it is associated with diphtheritis of the throat and middle ear, there is little or no pain, but there may be anæsthesia of the parts around the ear (Wreden, Wendt, Blau). Primary diphtheritic otitis externa usually terminates in recovery without injury to the ear. The consecutive form (in reality a diffuse otitis externa) is apt to result in destructive ulceration of the membrana tympani, exfoliation of the ossicles, and more or less extensive caries of the temporal bone. Such destructive changes depend upon the severity of the original disease—diphtheritic inflammation of the fauces, or the angina of scarlatina with tympanic complications.

The *treatment* of diphtheritic otitis externa should be antiseptic. Lime-water instillation, followed by syringing with a solution of boric acid, will favor separation of the membrane (Burkhardt-Merian). After syringing, the meatus may be filled with powdered boric acid. Carbolic glycerin (1 to 15), carbolic spirit (1 to 20), or a solution of boric acid in spirit (1 to 20), may be painted over the affected parts if the membrane, after being once detached, tends to form again. Forcible detachment of the membrane is injurious and likely to be followed by fresh infection of the denuded surface and an aggravation of the local condition. The treatment with antitoxin and the employment of constitutional remedies are indicated in this as in other forms of diphtheria.

Syphilitic Affections of the Meatus are discussed in one of the later articles of this series, and the reader is therefore referred to this for information upon the subject.

Exostoses and Hyperostoses of the external auditory canal are not of infrequent occurrence. They are congenital or acquired, and may be single or multiple, spongy or eburnated, pedunculated or with broad base. Their favorite situations are at the outer portion of the osseous meatus, or at its inner extremity, close to the membrana tympani. Occasionally they entirely close the lumen of the canal, but only in this event, or when the already narrowed meatus becomes blocked with secretion, do they cause much disturbance of hearing. This is the more likely to occur because the presence of these tumors favors inflammation of the cutaneous lining of the meatus. Exostoses are often bilateral, and they are much more frequent in the male than in the female sex. The causes of acquired exostoses have not been determined with certainty. Rheumatism, arthritis, and syphilis are spoken of as constitutional causes, but these tumors are often hereditary and unassociated with any of these diseases. Among the aborigines of America and the natives of the Sandwich Islands, they seem to occur with special frequency; in the latter, excessive indulgence in sea bathing, with the consequent irritation of the auditory canals by salt water, is alleged to be the cause of this development. Local processes involving chronic hyperæmia of the auditory canal seem to predispose to overgrowth of the adjacent bone, sometimes in the form of diffuse hyperostoses but more often as circumscribed outgrowths or exostoses. When they coexist with chronic suppuration of the middle ear, their presence forms an additional source of danger by favoring retention of pus. Fig. 1706 gives a good idea of the appearance presented by multiple exostoses. They usually appear as white or yellowish, smooth prominences, and when examined with a probe are found to be exceedingly firm to the touch. This feature serves to distinguish them from all other pathological formations in the meatus, even when the skin covering them is red and inflamed.

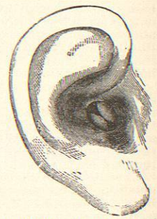

Fig. 1706.—Two Exostoses of the External Auditory Canal, in Contact Internally. (After Toynbee.)

Small exostoses may last a lifetime without detriment to the subject, but larger osseous growths are apt to give trouble by favoring the accumulation of cerumen, epidermis, etc.

Treatment.—Medication, local or general, with a view to procuring absorption, is useless. When the exostoses are of small size and present no evidences of irritation, they should not be interfered with. If chronic suppurative disease of the tympanum is present it should, if possible, be healed; if this is impracticable, the auditory canal must be kept scrupulously clean. An accumulation of secretion beyond the growths may, with care, be removed, even through a small aperture. The offending substance may, if necessary, first be softened by injecting a few drops of warm solution of carbonate of soda (1 to 20) through a suitable cannula, the point of which is pushed into the aperture; then, on the following day, a free injection of warm water through the same instrument will probably bring the accumulation away. When the narrowing of the canal is too great to admit of such cleansing measures, and there are great deafness and deep-seated pain, indicating pressure from retained secretion, surgical removal of the exostosis may become imperative, or a counter-opening, extending down to the antrum, may be established in the mastoid process. The operative procedure to be chosen will depend chiefly on the particular characters of the case. If the growth is obviously pedunculate and can be surrounded by a suitable steel snare wire, it may be removed in this way, or the peduncle may be broken by a few taps with chisel and mallet. As a rule, however, growths of this kind requiring operative interference are of a more sessile kind and must be chiselled away piecemeal or drilled through at their bases and then detached with chisel and mallet. Formerly, operations of this kind were done through the external meatus, but the difficulties encountered were such as to make some easier method desirable. This has been attained by first detaching the auricle from behind, throwing it forward, and so exposing the comparatively short bony canal—a procedure which has been found greatly to facilitate removal of the growth, especially if it springs from the inner portion of the canal.

Absence of the Meatus.—Occasionally the meatus is found terminating as a smooth, cutaneous cul-de-sac, without any appearance of a tympanic membrane; the canal, under these circumstances, being smooth, pale, and shorter than normal. This condition results from ulcerative inflammation of the meatus, with immediate contact and union of its walls, or the union may take place through the intervention of granulation tissue. The atresia may be formed by osseous or fibrous tissue, or it may consist of only a thin septum. If the obstructing tissue does not consist of bone, the fundus of the cul-de-sac will be found to be yielding and elastic. If, under these circumstances, bone conduction shows a normal condition of the internal ear, the septum may be divided or partially excised, and a permanent opening secured by the introduction of leaden pegs, or, better still, a smooth glass plug conical in shape may be retained in the canal until healing has taken place. Politzer relates a case of this kind in which he obtained great and permanent improvement in the hearing. The writer, too, has had excellent results through the use of a perfectly smooth glass cone instead of the leaden plug.

Polypi.—The development of pedunculated connective-tissue growths in the meatus is a common sequence of neglected chronic suppuration of the middle ear. Those which grow from some part of the tympanic mucous membrane will receive due consideration in the article which treats of the latter subject. Polypi may also develop from the lining of the meatus, their point of attachment commonly being the posterior or superior wall, near the membrana tympani, while only rarely do they originate from a more external part of the auditory canal. In the case of those growths which spring from the meatus, it is said that they often result from prolonged and injudicious poulticing.

Aural polypi are usually single; several may, however, grow simultaneously in one ear. Their surface is smooth or finely lobulated, and they are always covered with epithelium. They are sometimes large enough to fill the meatus, and they may even project for a short distance beyond the external orifice; others, again, do not exceed the size of a pea and present no external evidence of their presence. When they are small but yet large enough to be moulded by the meatus, their shape is globular, pear-shaped, or elongated. Those which project beyond the external meatus are of a pale color and have a surface covered with epithelium not unlike that of the adjacent integument.

The diagnosis of polypi presents no difficulties. Simple inspection will suffice to determine their presence. Malignant new formations, springing from the same parts, may possibly lead to an erroneous diagnosis. Careful exploration of the meatus with a blunt probe will generally enable the surgeon to determine the point of attachment of the polypus. According to Politzer, pale-red or pearl-gray polypi, with a smooth or moderately rough surface, spring usually from the meatus; while the sodden, red, vascular, raspberry-shaped growths with villiform papillated surfaces, most frequently arise in the tympanic cavity.

The *prognosis* is generally favorable, especially in the case of polypi which spring from the meatus, their thorough eradication being less difficult than when the growth originates in the less accessible tympanum. Large polypi, of course, always act as mechanical impediments to hearing, and their removal may be followed by great improvement in the hearing power; the prognosis, however, must be guarded in this respect, even when there is reason to believe that the condition of the internal ear is normal, since the physical conditions in the middle ear (subject as it has been to the pathological changes incident to a long period of chronic suppurative inflammation) may render a restoration of the hearing impossible.

Treatment.—Removal of polypoid growths is always advisable; it may be accomplished in various ways. When the fact can be established that the growth springs from the walls of the meatus, its extraction by means of Wilde's or Blake's snare may be undertaken. The loop of the snare should be tightened around the pedicle of the growth, close to its insertion, and the operation completed by traction; or, if a moderate amount of traction will not suffice, ligature of the polypus may be effected by rotating the instrument on its long axis until a greater resistance is felt; whereupon the wire is cut loose from the cross bar and the instrument removed, leaving the twisted wire loop around the pedicle. This causes strangulation and death of the growth.

If there is a probability that the growth springs from the membrana tympani or from the tympanic cavity, it should be snared off as deeply as possible, traction not being admissible on account of the damage that might accrue to the drum membrane. Politzer's annular knife is also a valuable instrument for the excision of polypi. Small pedunculated growths may sometimes be crushed, or removed with suitable forceps, or with one of Buck's loop curettes. In most cases, after removal of the mass, the root will require to be touched at intervals of three or four days with chromic acid, applied very carefully, under good illumination, by means of a cotton-tipped probe.

The galvano-cautery may be used with advantage for the removal of large, firmly attached fibroid polypi, and also for cauterizing granulations and the remnants of polypi. Its use is said to be followed by less inflammatory reaction than is observed after the employment of caustics.

As the subject of benign growths in the external auditory canal is fully discussed by the writer of the article on chronic suppurative inflammation of the middle ear, and inasmuch as there are to be special articles devoted to malignant new growths and to injuries of the ear respectively, the present writer considers himself at liberty to omit all further mention of these subjects in this article.

Frank Buller.

EAR DISEASES: ALTERATIONS IN THE TYMPANIC MEMBRANE AND ADJACENT BONY WALLS DUE TO FORMER DISEASE.—Inasmuch as the active or current changes of the drumhead and adjacent walls incident to the various diseases are to be dealt with in the more clinical articles, it is here designed to present the sequent and more persistent changes and, in any overlapping of fields, to take the standpoint of the morbid anatomy and the general processes producing them. My topic does