

edges and no surrounding infiltration, or irregular in outline, with opaque gray or yellowish-gray surface, and steep or excavated edges, and well-marked surrounding zone of infiltration. They may be situated at the extreme corneal margin or may occupy any part of its surface, remain stationary or extend in depth and area, and last only for a few days or become chronic. So long as an ulcer remains small and superficial, without encroaching on the centre of the cornea, it is not likely to be of serious importance. There may be very little pain and irritation, or acute symptoms may characterize the affection from the outset, such as severe pain, great pericorneal injection, intolerance of light, and profuse lachrymation.

Small, deep ulcers at the corneal margin, of a yellow color, and tending to perforate and cause a peripheral prolapse of iris, are not uncommon; they sometimes partake of the character of a strumous keratitis—that is, they originate as phlyctenulae in a strumous subject,—or they may occur in otherwise healthy subjects. The attendant inflammatory symptoms are of an acute character, and soothing treatment will be essential so long as this condition lasts. Catarrhal and purulent affections of the conjunctiva are often attended with ulceration of the cornea. In the former, the ulcers are usually small, and peripherally situated; they do not require any special treatment beyond that adapted for the conjunctivitis, but may necessitate some care in the use of astringent collyria. Solutions of atropine may be used if the eye becomes more than slightly irritable or painful.

Ulceration of the cornea which occurs in the course of a purulent ophthalmia, especially if this be of gonorrhoeal origin, is only too often a disastrous complication, as it frequently causes hopeless destruction of the cornea. The earlier its occurrence in the course of the blennorrhoea the more serious is likely to be the result. The worst form of ulceration is that which makes its appearance about the centre of the cornea as a diffuse gray infiltration, while the conjunctival inflammation is at its height or is still increasing. Such infiltrations rapidly become extensive erosions, and the cornea sometimes melts away, so to speak, in the course of a few days. Furrow-like marginal ulcerations, without much infiltration of their edges, though likely to result in perforation and prolapse of iris, are not nearly so dangerous. In addition to the continuance of energetic treatment suitable for purulent conjunctivitis, warm antiseptic fomentations are required and the conjunctival sac should be frequently filled with vaseline containing three or four per cent. of iodoform or airoil or boric acid, or one-half per cent. of carbolic acid. If perforation is threatened, the instillation of a solution of eserine (1 to 100) every two or three hours, and paracentesis of the chamber through the ulcer, may be found necessary.

A small, transparent, central ulceration is rather common in early life (absorption ulcer). It may occur under the same conditions as phlyctenular keratitis. The ulcer may be overlooked unless a careful examination is made; its symptoms, both subjective and objective, being comparatively trivial. There is some weakness of the eye with slight intolerance of light and lachrymation, especially in the morning. It is a chronic affection, and, after healing, leaves an opacity which, from its central position, may cause permanent impairment of vision. The treatment should be partly soothing and partly stimulating, with measures to strengthen the general health. Somewhat similar small, deep ulcerations, tending to perforate, are met with occasionally in other parts of the cornea in children as well as adults. Such ulcers, when involving pretty much the whole thickness of the cornea, may present a clear, bead-like projection in the centre, caused by protrusion of the unruptured Descemet's membrane into the ulcer. For this condition the term keratocele has been applied. Only after spontaneous rupture, or artificial opening of the part, can such ulcers be brought to heal. They may give rise to a troublesome corneal fistula, especially if allowed to rupture spontaneously.

Crescentic ulcers, forming a deep groove around the

periphery of the cornea, and without infiltration, are occasionally seen in elderly debilitated subjects. They are destructive if allowed to progress so far as to cut off nutrition from the central portions of the cornea, which may then exfoliate. The operation of iridectomy is the most efficient means of arresting the progress of such ulcers.

Active inflammatory symptoms are present in the vast majority of corneal ulcers; superficial ulcerations being, as a rule, more painful than those which have extended deeply into the cornea, owing to the fact that the terminal filaments of the corneal nerves are at the surface. The asthenic type is, however, not uncommon in simple ulcers; these have a tendency to spread superficially, and are sharply defined with little or no surrounding infiltration. It is to be remembered that ulcers of the cornea, especially when large, may have extended more deeply than appears to be the case, on account of the intra-ocular pressure pushing the thinned base of the ulcer forward. Such a condition always constitutes a serious obstacle to healing, and forms a positive indication for operative interference. Spontaneous perforation should never be permitted if it can be prevented, because it increases the liability to prolapse of iris and permanent anterior synechia (as in Fig. 9, Plate XXIV., where a perforating ulcer has healed with the iris adherent to the cornea, and the pupillary aperture is drawn up to the corneal opacity). Such an eye is always damaged in vision, disfigured, and more liable to deep-seated disease than if healing had occurred without synechia, or prolapse of iris had taken place; it is also liable, even if the perforation be a small one, to deposits of lymph on the lens capsule, or to rupture of this structure, and perhaps to other intra-ocular lesions.

In the treatment of corneal ulcers, their progress and the effect of remedies employed must be scrupulously watched. The use of a compression bandage is generally indicated as a protection from external irritation, and for the purpose of securing rest, so essential to the healing process. The use of atropine instillations is generally indicated. The atropine should be absolutely pure neutral sulphate, and the solution (to be sterilized by boiling once daily) should be of the strength of from two to four grains to the ounce. For allaying irritation and keeping in check iritic complications, which are apt to occur in many corneal inflammations, it is the standard remedy. Cocaine, however, is positively contraindicated in the treatment of most corneal ulcers.

Solutions of eserine are of considerable value in certain cases of corneal ulceration, more particularly those which belong to the asthenic type; if, however, a tendency to, or actual, iritis be present, eserine may act very injuriously. Warm fomentations are, as a rule, beneficial in allaying irritation and promoting the nutrition of the cornea, but in the presence of active irritation they must be employed cautiously, for fear of unduly increasing this condition. If ulceration is associated with conjunctival disease, which requires the use of astringents, the cornea must be carefully protected from their action. When the healing process is well established, especially when the ulcer is becoming vascularized (Fig. 2, Plate XXIV.), and also in some chronic indolent ulcers, stimulation in the form of oxide of mercury ointment, calomel insufflations, or strictly localized applications of nitrate of silver solution (2-4 to 100) may be employed with advantage. Opiates at night, in doses sufficiently large to allay pain, are often of great service. The electric cautery in the form of a small platinum point heated to a cherry red, answers well the purpose of destroying the infection of suppurative keratitis. The end of a knitting needle heated in a spirit lamp, may be used for the same purpose with equally good effect. Without defining the precise limits of its usefulness, we may say that the procedure has gained a substantial reputation in ocular therapeutics. So much of the cornea as shows a yellow infiltration should be cautiously destroyed by the cautery. Excellent results have also been obtained by touching the ulcer, in certain cases of suppurative keratitis, with pure carbolic acid.

Neuroparalytic keratitis in its objective symptoms does not differ materially from ordinary asthenic inflammatory affections of the cornea. It may never pass the stage of infiltration, but is very liable to become suppurative. Photophobia is absent and there is little or no pain in the eye; the circumcorneal congestion is of a dusky, sluggish character; but the characteristic feature is loss of sensibility of the cornea, and with this there may be anaesthesia of other parts supplied by the fifth nerve.

Treatment.—The first essential is thorough cleanliness; a protective bandage may be used with advantage, borated cotton being placed next the eye, which must be cleansed with warm boric acid or other mild antiseptic lotion several times daily. Eserine instillations are strongly recommended by some writers, and if there is paralysis of the fifth nerve, the galvanic current (from six to eight elements) is likely to be of service, the positive pole being placed over the superior cervical ganglion of the same side, and the negative over the brow or eyelids.

Corneal opacities are commonly the result of some one or more of the morbid conditions already described. When they are the result of perforating ulcers of the cornea, anterior synechia (adhesion of the iris to the cornea) is often present. They tend to grow less marked with the lapse of time, but whatever opacity remains at the end of a year or two after the cessation of the inflammatory process which caused them, may be considered permanent. The effect on vision varies with the degree and extent of the opacity, although slight, almost invisible central clouding may seriously impair vision by causing dispersion of light and irregular astigmatism. The extreme degree of opacity indicated in Fig. 4, Plate XXIV., represents a large central leucoma adhaerens, which has become vascularized, the pupil being completely obliterated, and the anterior chamber rendered very shallow. For large opacities encroaching on the pupil an iridectomy, by bringing the pupillary aperture opposite a clear portion of the cornea, may improve vision very considerably, provided the parts beyond are in a fairly normal condition.

The appearance of the eye may likewise be greatly improved by the operation of tattooing with India ink any dense cicatricial opacity. For this purpose a group consisting of several fine needles set in a handle are to be smeared with a thin paste of the ink, and the white tissue of the cornea punctured obliquely until it retains a sufficient amount of the pigment to hide the opacity. While a single sitting often suffices, in other cases several may be necessary. The operation can be rendered painless by the use of cocaine, and is seldom followed by any considerable reaction. The local use of medicinal agents is of problematical value in clearing up cicatricial opacities of the cornea. Other things being equal, the younger the subject the greater is the power of repair in this respect. A large loss of substance in the cornea of an infant will often disappear almost entirely, though the same amount of destruction in an adult would leave a conspicuous permanent opacity.

The stimulating remedies already mentioned are generally conceded to assist in clearing up recent opacities, by temporarily increasing the blood supply in the circumcorneal vessels and thus promoting the functions of nutrition and absorption in the corneal tissue. Of these remedies the most efficient is the oxide of mercuric ointment, gr. i. to ʒ. ad ʒ. i., a small portion of which is to be introduced beneath the upper eyelid once daily. The constant current of electricity, the negative pole being applied to the cornea by a specially constructed electrophore, has been used with some success. The application is decidedly painful even when cocaine is used and care must be taken to employ only a weak current. When the cornea has been entirely replaced by opaque tissue, vision is of course destroyed under these circumstances. Attempts to restore vision by transplantation of transparent cornea to replace the opaque tissue have met with only limited success (Wolfe, *Medical Times and Gazette*, November 22, 1879).

Transverse opacity of the cornea (Fig. 10, Plate XXIV., after Haab) in the form of an opaque band of a gray or yellowish color, 2 or 3 mm. in width and corresponding in position to the palpebral fissure, is sometimes seen in elderly or prematurely senile persons, or in eyes affected with chronic deep-seated disease, and having a tendency to glaucoma (von Graefe.) In the latter form the opacity is made up of minute specks situated deeply in the cornea. The transverse opacity observed in elderly people is due, according to Nettleship, to minute calcareous crystals lodged beneath the epithelium.

Lead stains often occur, in the form of dense white, sharply defined opacities, after the use of lead lotions in abrasions or ulcerations of the cornea; they may be cut away with a thin sharp knife, or scraped off with a small sharp scoop. Collyria containing lead, if used at all in ophthalmic practice, should never be entrusted to the patient for use at home.

Fine punctate opacities, looking, under a strong magnifying glass, like minute drops of tallow, and arranged in the form of a pyramid with its base at the lower corneal margin (Fig. 7, Plate XXIV.), are characteristic of the so-called serous iritis which occurs quite frequently as an idiopathic affection, and occasionally as the serous form of sympathetic ophthalmia. With these are associated more or less turbidity of the aqueous humor, discoloration of the iris, circumcorneal injection, and sometimes posterior synechia; larger opacities (infiltrations) may also develop in the substance of the cornea. Vision is apt to be considerably impaired in these cases. The fundamental lesion appears to be a serous irido-choroiditis, which, by extending along the lymph channels, may involve the endothelium of the entire uveal tract and the sheath of the optic nerve, as well as that of the cornea.

Sclerosing opacities in the peripheral portions of the cornea sometimes occur without inflammatory symptoms, or as the result of localized scleritis passing over to the adjacent parts of the cornea.

Arcus senilis (gerontoxon), a peculiar marginal opacity, has been considered in Volume I.

Pterygium has also been considered under the heading of *Conjunctival Diseases*.

Fistula of the Cornea.—Penetrating wounds and ulcers which have perforated the cornea occasionally fail to heal, and consequently there remains a small aperture through which the aqueous humor constantly leaks away, or, if temporarily retained, is repeatedly evacuated by rupture of the thin retaining membrane. Such eyes are always more or less irritable, and liable to attacks of inflammation, which sometimes results in panophthalmitis. According to de Wecker (*Annales d'oculistique*, lvi., 305), the fistula is due to an eversion of the membrane of Descemet, which thus comes to serve as a lining to the walls of the fistulous track, and he recommends that it be lacerated with a fine pair of forceps, or that the aperture be converted into a crucial incision by means of delicate, smooth-pointed scissors. After either of these manipulations, which demand strict antiseptic precautions, atropine instillations and a compression bandage will be required until the part shall have healed firmly. The prolonged use of eserine and the compression bandage has also been found beneficial.

MALFORMATIONS OF THE CORNEA, CONGENITAL AND ACQUIRED.—Congenital defects of the cornea present deviations from the normal in regard to size, shape, and transparency. The cornea may be smaller than normal, as in *C. microphthalmos*, or larger, as in *C. megalophthalmos*. Important structural abnormalities in the interior of the eye are present in both these conditions, in all or nearly all such cases (Manz: "Handb. d. gesamt. Augenheilkunde," Graefe u. Saemisch, Band ii., 131).

The cornea of *microphthalmos* is small and may be flattened, or its curvature may be the same as that of the sclerotic. The latter structure often encroaches upon the cornea; their mutual relations as to size present considerable variations. In outline the cornea may be nearly circular, distinctly oval, or quite irregular. In congenital *megalophthalmos* the cornea is actually and relatively too

large, but at the same time thinner than normal. This thinning involves also the anterior portion of the sclerotic, which thus acquires a bluish appearance, and the anterior chamber is increased in depth and width (hydrophthalmos anterior). Diffuse or circumscribed opacities of such corneae are often present. The condition just described does not, as a rule, remain stationary, but goes on slowly increasing after birth, and the entire eyeball often becomes enormously enlarged.

Congenital faults in the curvature of the cornea, without anomalies as to size or structure of the eyeball, are of frequent occurrence, and account for a large proportion of the errors of refraction known as astigmatism.

Congenital opacity of the cornea may be partial or complete, apart from the congenital opacities of microphthalmos and megalophthalmos. A condition resembling arcus senilis is sometimes seen at birth (embryotoxon) (Manz, *loc. cit.*). A form of opacity so complete as to give the impression that the cornea is entirely absent has also been observed.

Dermoid cysts involving the cornea are always congenital (see, further on, the section relating to Tumors of the Cornea).

The progress of hydrophthalmos anterior may sometimes be arrested by the operation of iridectomy. If vision is destroyed and the enlarged eyeball is the source of disfigurement and annoyance, a staphyloma operation may be advisable or the Weeks operation of evisceration and insertion of an artificial vitreous may yield an excellent cosmetic result.

Conical cornea (transparent anterior staphyloma) (see Fig. 8, Plate XXIV.) is a somewhat rare condition, which is said to develop, as a rule, about the age of puberty, or a little later, and more often in the female than in the male sex. Nothing definite is yet known in regard to its causation. Without any other pathological manifestations the cornea gradually becomes thinner at its central part and assumes a more or less conical shape, and, though usually retaining its normal transparency, in high degrees of conicity the apex occasionally becomes clouded. In slight degrees the diagnosis is readily made by means of the modern test (skiascopy) or by the aid of Placido's disc. At first the eye may become somewhat short-sighted, but vision remains subnormal, even when the error of refraction has been as far as possible corrected with concave and cylindrical glasses. In advanced conditions a profile view of the cornea at once determines the nature of the difficulty. By mirror illumination the optic nerve and retinal blood-vessels appear distorted, rapidly changing in apparent size and shape with every movement of the mirror. Vision is commonly impaired in proportion to the corneal alteration: sometimes to such an extent that only large print can be deciphered.

Treatment. If vision can be materially improved by any combination of glasses, these may be used; not infrequently quite strong cylindrical glasses will be accepted. But if such optical means fail to improve vision, and if the latter be so defective as to justify surgical interference, the apex of the cone may be cauterized with a fine electro-cautery point, thus destroying a limited central area of corneal tissue down to Descemet's membrane. When the central ulcer thus produced has healed, under suitable treatment (see Suppurative Keratitis), the cornea will have acquired a more normal curvature. An iridectomy may be required after this operation. Lateral displacement of the pupil by iridodesis, as recommended by G. Critchett, has not met with much favor on account of the danger of sympathetic mischief which it involves.

Staphyloma of the cornea (opaque anterior staphyloma) (Fig. 5, Plate XXIV.), as already stated, results from ulceration of the cornea with perforation. The perforation must have been of considerable size to be followed by the bulging forward of new scar tissue, which constitutes staphyloma. According to Saemisch, an aperture in the cornea of less than 2 mm. is not likely to cause staphyloma. Narrow perforations are less likely to give rise to this condition than when the aperture is rounded. Corneal staphyloma may be partial or total. When a large

perforation occurs, the aqueous humor escapes, and the iris comes in contact with the opening and may protrude. Thus exposed, it speedily inflames and becomes covered with lymph which undergoes organization, and a weak cicatrix is formed which yields before the intra-ocular pressure, thus increasing the degree of protrusion.

The cornea at the circumference of the aperture, softened by the inflammatory process, also yields to the pressure from within, and becomes involved in the staphyloma, which, at first of small size, may gradually involve a large part of the cornea if measures are not taken to arrest its development.

In other cases extensive destruction of the cornea gives rise to a bulging cicatricial formation, which from the outset involves the greater part of the corneal area. Very large perforations are, however, apt to lead to extrusion of the lens and shrinking of the anterior part of the eyeball (phthisis anterior). The new-formed tissue which constitutes the front wall of the staphyloma becomes densely opaque, and is often considerably thicker than the original cornea, or thicker in some parts and thinner in others (see Fig. 1517). Its surface is covered with an irregular layer of epithelium, while the disorganized and attenuated iris, often reduced to a few shreds of pigmented tissue, imperfectly lines it internally. The lens becomes dislocated forward (Fig. 1518) and opaque, and often undergoes partial absorption. When very large the staphyloma leads to stretching of the anterior portion of the sclerotic, obliteration of the pericorneal sulcus, and elongation with thinning of the ciliary processes (see Fig. 1519). Disturbance in the normal relation between the functions of secretion and absorption of intra-ocular fluids, with a tendency to glaucomatous tension, is a constant result of staphyloma. A form of consecutive glaucoma sets in, and secondary changes in the choroid, retina, and optic nerve finally reduce vision to quantitative perception of light, or destroy it entirely. This is likely to be the result even when the staphyloma involves only a small portion of the cornea.

Treatment. To prevent the formation of staphyloma, prolapsed iris should be removed; instillations of eserine, with the use of a firm compression bandage, are then in order until cicatrization is completed. If this fails, or if healing has already taken place, with the formation of a partial staphyloma, the question of performing an iridectomy is always to be considered, and a decision in favor of the operation is to be given when there is sufficient clear cornea to permit of its performance, when there is evidence that the trouble is progressing, and when there is increased tension of the eyeball. Under these circumstances a broad iridectomy may be of great optical advantage, and will usually arrest the progressive and destructive tendencies of the disease.

In other cases of incomplete staphyloma there may be no hope of improving vision by an iridectomy, but the deformity may be so considerable as to render an operation desirable for its cosmetic effect. Under these circumstances an elliptical piece may be removed from the projection, the lens if present evacuated, and the edges of the wound brought together with two or three fine sutures. Or a compression bandage

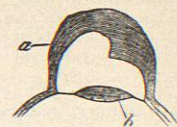


Fig. 1517.—Corneal Staphyloma, natural size. (After Saemisch) a, Cicatricial tissue; b, crystalline lens.

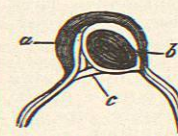


Fig. 1518.—Corneal Staphyloma, natural size. a, Cicatricial tissue; b, dislocated lens. (After Saemisch.)



Fig. 1519.—Posterior View of a Corneal Staphyloma, natural size. a, Elongated ciliary processes; b, remains of the iris; c, dislocated lens.

without sutures may be used until the wound has healed.

For total staphyloma, abscission of the entire projection, or evisceration or enucleation of the eyeball, with or without the insertion of an artificial vitreous, is the best means of doing away with the deformity, trouble, and annoyance which it causes. The first is to be recommended when the eyeball is otherwise fairly healthy. Various methods of performing the operation have been devised. In any case, the lens must not be allowed to remain in the eye after removal of the staphyloma.

Critchett's operation of carrying several curved needles armed with sutures through the ciliary region before abscinding the staphyloma, is objectionable on account of the danger of injuring some of the ciliary nerves, and thus exciting sympathetic inflammation; and also because it is liable to be followed by suppuration of the remaining portion of the eyeball.

A less objectionable method is that of Dr. H. Knapp (*Arch. f. Ophth.*, Bd. xiv., 273). Before abscission is performed, the conjunctiva is dissected back for some distance around the base of the staphyloma, and a sufficient number of sutures are inserted to bring the edges of the conjunctiva together over the opening. Evisceration or enucleation is to be recommended in old and large staphylomata with considerable distention and thinning of the adjacent sclerotic, as in such cases abscission is almost sure to be followed by hemorrhage or deep inflammation.

TUMORS OF THE CORNEA seldom, if ever, take their origin in the cornea itself, but extend to this structure from adjacent parts, usually the episcleral tissue around the cornea. Dermoid tumors, probably always congenital, are situated partly on the sclerotic and partly over the cornea. Such a growth is smooth or slightly lobulated, pale or yellowish white in color, more or less prominent, and usually, though not always, remains stationary. Its dermoid character is assured if one or more hairs are found growing from the surface. When removed, dermoid growths are not likely to recur. If large enough to cause conspicuous disfigurement, excision of the growth is advisable, care being taken not to penetrate the cornea or sclerotic.

Sarcoma, usually pigmented and consequently of a dark color, may develop from the ciliary portion of the sclerotic and extend to the cornea. The growth is more likely to extend deeply into the sclerotic than into the cornea.

Melano-carcinoma sometimes grows from the same region and covers the cornea, spreading beneath the epithelium. The mass is of a dark color, soft, and vascular.

Epithelioma, commencing at the limbus as a small nodule resembling a phlyctenula in this situation, may remain for a long time inactive, but sooner or later it begins to grow rapidly. The age of the subject and the persistence of the nodule in its early stage are of diagnostic importance. Tumors, such as these involving the cornea, should always be removed with as little delay and as thoroughly as possible. If the operation involves penetration of the eyeball, enucleation will probably have to be resorted to; and this is also necessary when the growth recurs and cannot be removed again completely.

Frank Buller.

CORNIFICATION.—The process of cornification is a physiological change by which the superficial cells of the epidermis acquire a horn-like character. It is also found normally in the corpuscles of the thymus. The albumin of the squamous cells of the deeper layers of the epidermis gradually becomes changed, as the cells approach the surface, into a resistant modified albuminous body which possesses a hyaline homogeneous composition resembling that of bone. To this horny substance the name of keratin has been given. Under normal conditions the horny change first appears in the stratum granulosum, involving first the periphery of the cells and the prickle processes. As the change advances the cell protoplasm and the nuclei shrink until the cell bodies become thin and flattened horny scales. The nuclei at the same time gradually lose their staining power, and

the entire process assumes the character of a mummification necrosis, the water of the cells being almost entirely lost. Keratin resists digestion by both stomach and pancreatic juices.

In association with the formation of keratin small bodies of a hyaline nature appear in the prickle cells. These granules stain deeply with nuclear stains. In all portions of the epidermis where the stratum corneum is well developed the cells containing these granules form a definite layer known as the stratum granulosum. The substance of the granules has received the name of keratohyaline, and is believed to be derived from the nucleus. As the nucleus disappears with the formation of the granules, the latter may be supposed to be degeneration products of the nuclear chromatin. The chemical nature of cornification and of the two substances, keratin and keratohyalin, is not as yet clearly understood. By some the change is believed to be of the nature of a reduction, and not an oxidation process; but all theories and explanations are as yet unsatisfactory.

Cornification occurs pathologically in a great variety of conditions and under many forms. A hyperplasia of the horny layer of the entire body or of smaller areas frequently takes place (hyperkeratosis). This may be the result of external influences, as mechanical injury, infection, inflammations, etc. (corns, ichthyotic warts, callosities, etc.), or the change may be of intrinsic origin due to some congenital predisposition (ichthyosis). Disturbances of the normal processes of cornification may also take place (parakeratosis), such as scaly or plate-like desquamation which may occur in connection with infections or inflammations of the skin, or rarely without any apparent cause. In such cases the formation of keratin and keratohyalin appears to be unchanged. Pathological cornification also occurs in parts of the body where under normal conditions the horny change takes place only to a very slight extent or not at all. The epithelium of the skin glands may be involved in the hyperkeratosis of ichthyosis. Also in the mucous membranes of the mouth, tongue (hairy tongue), larynx, trachea, bronchi, middle ear, mastoid cells, pelvis of kidney, ureters, bladder, urethra, vagina, and cervix uteri a pathological cornification may occasionally take place. The epithelium of the vaginal portion of the cervix may acquire a very thick horny layer in prolapse of the uterus, when the cervix protrudes beyond the external genitals.

In cholesteatomata, teratomata, and dermoid cysts pathological cornification may take place on a very large scale. The so-called "pearly bodies" are for the greater part made up of keratin. Horny change also occurs extensively in epitheliomata of the skin ("epithelial pearls"), forming large laminated masses in which calcification not infrequently takes place. Similar bodies are found in cholesteatomata of the brain and meninges, and horny change has been reported to occur very rarely in carcinomata of the internal organs. Changes similar to cornification have also been observed in endotheliomata of various organs, especially those primary in lymph glands; but the chemical identity of these changes with the cornification of epithelial structures is not settled.

Aldred Scott Warthin.

CORN-SILK.—*ZEA. Stigmata Maidis.* "The styles and stigmas of *Zea Mays* L. (fam. *Graminaceae*)" (U. S. P.). Corn-silk should be collected soon after flowering, while still green and succulent, and preparations are believed to be better when made from it without previous drying. The important constituent is believed to be *malzenic acid*, which exists in the proportion of about two per cent. and is soluble in both water and alcohol. There are also fixed oil, resin, sugar, and gum. Of the physiological action of corn-silk, nothing is definitely known except that it is a direct stimulant of the renal secretion. With this action, it commonly produces a soothing effect when irritation of the genito-urinary tract exists. This appears to be due, at least in great part, to the cleansing effected. Its use is almost exactly like that of *Triticum*