foudroyant cases, in which patients are killed as by a stroke, the last to the cases with complications or sequelæ, which may indeed prolong the disease indefinitely. Gordon's shortest case was one of five hours' duration, and Jewell records a case of death in three hours and a half after seizure. These are, of course, most extreme and exceptional cases. Clymer states that more than one-half the deaths happen as early as from the second to the fifth day. This author quotes also from Parkes, who found the duration of the disease in 66 of 95 cases, five days or less; in 1, eight days; in 28, eight days or over. Abortive forms terminate in resolution in from three to five days, foudroyant forms, with rare exceptions, in death within three days, and intermittent and average forms in one or the other way, barring complications and sequelæ, in from one to three weeks. Relapses are not common. Second attacks are rare, but such cases have been reported by Boudin, North, Warschauer, Hermann, and Kober.

Diagnosis.—In the presence of an epidemic of the disease the diagnosis of cerebro-spinal meningitis is sufficiently easy. The existence of cases in the vicinity prepares the practitioner for new attacks. Cases which are affected with, or more especially quickly succumb to, any disease with predominant nervous symptoms should excite the suspicion of the physician in this direction. Sporadic cases, however isolated in space or time, are likewise readily recognized in the presence, in sufficient number, of the symptoms peculiar to the disease. The sudden seizure, often in the midst of health, with chill, vomiting, and prostration, followed by opisthotonos, hyperæsthesia, herpes, irregular pulse, constipation, constitutes an array of symptoms that belong to no other disease. Unfortunately for the diagnosis many cases deviate from the regular type in essential particulars, more especially in the absence of characteristic signs, to such degree as to make the diagnosis difficult or at times impossible. Foudroyant cases differ most widely by the predominance of the symptoms of blood poisoning which are common to all the grave acute affections. Light is sometimes thrown upon these cases by the consideration of the season of the year, the age of the patient, the existence of other cases more pronounced, or, if equally obscure, by the exclusion of simulating maladies or accidents. Thus a meningitis from trauma, insolation, or otitis should be discovered by the history and inspection of a case; or occurring in the course of scarlatina, pneumonia, septicæmia, it should be eliminated by the presence of signs characteristic of these affections.

The Kernig Sign.—Kernig, of St. Petersburg (1882), reported as characteristic of meningitis that when the hip is flexed, as when the patient is in the sitting posture, contraction of the flexors of the leg prevents full extension of the knee without undue force, so that as a rule the limb may not be extended beyond 135° and sometimes not beyond a right angle. With the hip extended, as when the patient is lying down or standing upright, extension of the knee readily occurs. Kernig's observation has been confirmed by numerous observers, among them Bull, Henoch, Blümm, Friis, Netter, Osler, and the writers. It has been suggested that an explanation of the phenomena may be found in a peculiar irritability of the roots of the nerves, in consequence of inflammation of the meninges, and that the irritability of the sacral roots is increased when these nerves are put upon the stretch by flexion of the hip, so that there occurs reflex contraction of the flexors upon attempting to extend the knee with the hip flexed. But such reflex contraction of the flexors does not take place with the hip in extension. For the production of the Kernig sign, it is necessary that the meningitis involve the spinal membranes. Thus the sign is found in tuberculous and simple meningitis as well as in cerebro-spinal meningitis. Kernig reported finding the sign present in 15 cases of acute meningitis, which included 13 cases of epidemic cerebro-spinal meningitis, 1 of tuberculous meningitis, and 1 of suppurative meningitis. The diagnosis was confirmed by autopsy in 8 cases. Netter found the sign present in 45 cases of meningitis. But the Kernig sign is not always present in meningitis. Thus, Henoch, Friis, and Netter have observed cases of meningitis in which the Kernig sign was absent. In general, the sign is found in about 90 per cent. of cases. Netter found the sign in 45 out of 50 cases; Friis in 53 out of 60 cases. It has generally been held that the sign is present only in meningitis, but one of the writers found the sign well marked in a case of scarlet fever, during the period of invasion, without other evidence of meningitis.

The lumbar puncture (Quincke) often furnishes much more exact information, in that it may reveal the specific infectious agent causing the meningitis. The puncture is made between the spinous processes of the third and fourth lumbar vertebræ (Quincke) or between the fifth lumbar and the first sacral vertebra (Chipault, Netter), so as to withdraw the cerebro-spinal fluid from the lower cul-de-sac of the dura mater surrounding the cauda equina. The patient is placed upon the side, with the legs flexed upon the body and the body inclined well forward (Quincke), or in the sitting posture inclined forward (Fürbringer, Netter). The fluid may be withdrawn through a fine trocar, aspirating needle, or an ordinary hypodermatic needle. The puncture is made in children in the median line immediately above the spinous process, to a depth of about 2 cm. In adults the puncture is better made at the level of the lower border of the spinous process and 5 to 10 mm. outside of the median line, to avoid the thick ligaments, in a direction from above downward, so as to puncture the membranes in the median line, and to a depth of 5 to 7 cm. The puncture should be made under strict aseptic precautions, and the fluid should be removed slowly. When properly made, the operation is practically without danger, and is of great diagnostic importance since it will in very many cases reveal the specific infectious agent. The cerebro-spinal fluid is cloudy and purulent and contains micro-organisms both intra- and extra-cellular. Albumin is usually present in the cerebro-spinal fluid in a proportion varying from .1 per cent. to .4 per cent. Sometimes no fluid may be obtained upon puncture, and sometimes the fluid that is obtained is perfectly clear and sterile, even in the presence of meningitis, especially in cases that have lasted for some days. A case of tuberculous meningitis may no longer present tubercle bacilli, or only in such small numbers as to be detected with difficulty. Again, such cases may present the meningococcus as the result of a mixed infection. Thus the lumbar puncture is not an absolute criterion in the differentiation between tuberculous and other forms of meningitis.

Examination of the blood has revealed the meningococcus (Netter), and the pneumococcus (Bozzolo, Netter). In making such examinations, .25–.50 c.c. of blood should be used. Rarely the specific infectious agent may be obtained from the urine or sputum.

Of more value is the bacteriological examination of the nasal secretion. Thus Scherer found the Diplococcus intracellularis in eighteen cases of cerebro-spinal meningitis, while in fifty other cases this organism was found only two times. One of these latter cases had a coryza following the disinfection of a room in which a patient died of meningitis; and there was some doubt about the diagnosis of the second case, which may have been one of meningitis but had been treated for typhoid fever complicated by ocular paralysis. However, too much importance should not be ascribed to the result of the examination of the nasal secretion, since the meningococcus has been found in the nasal secretion of healthy individuals by Heubner, and the pneumococcus by Netter and many other observers.

Typhoid fever distinguishes itself by the fact that it usually spares the period of earliest youth, that its onset is insidious, that it is attended with diarrhœa and distention of the abdomen, that it often shows a rose-colored eruption, has a constant high pulse, a typical temperature curve, and a definite duration. Moreover, typhoid fever almost never shows herpes, and almost always

shows enlargement of the spleen. The diazo reaction, commonly present in typhoid fever, is absent in meningitis. The presence of the reaction in meningitis indicates an unfavorable prognosis. The Widal test is positive in typhoid fever, and negative in meningitis, except when the meningitis is due to infection by the typhoid bacillus. Further evidence would be furnished by the Kernig sign, which is present in meningitis and absent in typhoid fever, and by lumbar puncture. Malarial fever is marked by its preference for certain regions and certain seasons of the year. Periodicity is the criterion of malaria, and though this factor is simulated in the intermittent cases of meningitis it is never so precise. Reeve says the early vomiting was the key to the diagnosis of his first cases of meningitis. Whatever doubt may exist at first is quickly dissipated by finding the plasmodium malariæ in the blood or by the administration of quinine in sufficient dose. Tetanus is eliminated by its trismus, and hydrophobia by its characteristic paroxysms of inspiratory spasm. Tuberculous meningitis rarely shows symptoms on the part of the spinal cord, though opisthotonos and hyperæsthesia are not uncommon in this disease. Tuberculous meningitis is nearly confined to childhood. In the great majority of cases its victims are of tuberculous parentage or stock. It is not affected by the season of the year. It distinguishes itself especially by its long prodromal stage, by its periods of reduction of temperature and retardation of pulse, by the occasional signs of tuberculosis elsewhere, in the lungs or intestines, externally (scrofulosis) upon the skin, or possibly in the bottom of the eye. Netter believes that confusion has often arisen in the differentiation from influenza, and that many cases of "grippal meningitis" are really cases of cerebro-spinal meningitis.

Prognosis and Mortality.—The prognosis of this disease is always grave. The factor of most importance in its determination is the type of the disease. Foudroyant cases perish with very rare exceptions; abortive forms recover with few exceptions, and average cases survive and succumb in about equal number. The character of the epidemic is the next consideration. Certain outbreaks are distinguished by their mildness, as are others by malignancy. Thus Lowe and Wooley (London *Lancet*, June 26th and August 3d, 1867) report that not a single case died in the outbreak at Bardney, in Lincolnshire, England, in January and February, 1867, though the disease was characterized by "severe rigors, tetanic convulsions, intense neuralgic pain in the head and upper part of the trunk, increased sensitiveness of the surface, obstinate vomiting, restlessness, and in one instance, at least, by a dark purple eruption" (Hartshorne's "Reynolds," vol. i., p. 308). On the other hand, Wunderlich, Stonone, and others, give instances in which not a single case recovered. Young reports of the attack at Granada, Miss., that every one of the 35 cases perished, and the same fatality attended the first outbreak of the disease at Memphis, Tenn. Between these extremes is every grade of gravity in different attacks. It is also true of this, as of most of the acute affections, that the first cases are most severe. The epidemic grows feebler, as a rule, with the gradual exhaustion of its most fertile soil. Individual considerations follow next. The prognosis is more grave in infancy and childhood than in adolescence and maturity. The ratio of mortality falls from 75 per cent. in children under one year of age to 53.5 per cent. in later childhood, and 35 per cent. in adolescence. Not to burden this section with a useless array of figures from different epidemics—useless because inapplicable to individual cases—the general statement of Hirsch may be given as indicating the average mortality of this disease. Of 15,632 cases analyzed by this indefatigable statistician, 5,734 terminated fatally. Thus the average ratio of mortality of this disease, under all conditions, is given at 37 per cent. The influence of "bad hygiene" in aggravating the prognosis is too patent to require mention. Of more importance are the signs which prognosticate the result in individual cases. It may be stated, as a rule of this, as of all the acute infections, that a severe onset indicates a grave case. Thus a high fever at the start, obstinate vomiting, marked opisthotonos, early convulsions, are signs of ominous import. As one-half the deaths happen before the fifth day (Clymer), a case which survives the first week has a more favorable outlook. The first three or four days are attended with the greatest anxiety. "Every day passed after the seventh day renders recovery more and more probable" (Loomis). Typhoid symptoms at any stage of the disease imprint upon it an unfavorable prognosis. Arching of the great fontanel, as indicative of intracranial œdema and exudation, is a very bad sign. Almost all such cases end fatally (Maurer). A return of headache and vertigo which has disappeared, especially if associated with vomiting and convulsions, evidences of consecutive hydrocephalus, is likewise ominous (Ziemssen). Yet secondary hydrocephalus is not absolutely hopeless, as Ziemssen saw "some cases in which a complete, and others in which an incomplete, recovery took place." Profuse sweats, with cold surface, are characteristic of a fatal issue (Hirsch). The persistence, after recovery from the disease, of anorexia, debility, and emaciation, perhaps with diarrhœa, gives a poor outlook, especially for children (Emminghaus). A sudden high elevation of temperature, or hyperpyrexia, after a chill in a previously apyretic case, means a complication, and not a fatal issue, but a hyperpyrexia without chill, and with a profuse sweat, is pre-agonic (Immermann.)

Prophylaxis.—Occasional instances are reported which would seem to prove the possibility of cerebro-spinal meningitis being a contagious infection, as by Niemeyer, Fraentzel, Hirsch, Stokes, Simon, and Ziemssen. Cases should be treated as if contagion were possible. Flint suggests that the "removal of persons from without the area in which the disease prevails is desirable." Inasmuch as certain barracks, asylums, tenement-houses, schools, etc., become at times centres or depots of the disease, these institutions should be thoroughly cleansed and ventilated, or, what is better still, vacated or closed. For while it is admitted that "crowd-poisoning," with all the defective hygiene the term implies, cannot develop the disease, it is as fully acknowledged that these circumstances eminently favor its spread. At least this was the condition, in aggravated degree, which attended its most extensive outbreak in Dantzic in 1865, when the disease prevailed, according to Hirsch, "exactly in that season of the year in which, on account of inclement weather, many individuals were crowded together into small and dirty rooms, kept constantly closed by their occupants, and from which all ventilation was excluded, and in which the before-mentioned unfavorable hygienic conditions (dampness, great filth, and an atmosphere loaded with putrid emanations) were extremely perceptible." While it is not necessary that the physicians and attendants shall take the same precautions with their own *personnel* as in many of the contagious diseases, yet in the light of existing knowledge full disinfection should follow post-mortem examinations, and short and limited contact should be had with the bodies of the dead. During the prevalence of an epidemic caution should be enjoined against excessive muscular effort, the unrestrained excesses of childhood, for example, against exposure to cold and wet, or excessive mental labor.

Therapy.—A patient affected with this disease should lie upon a comfortable bed, not too hot, in a spacious, continuously ventilated room, the windows of which can be darkened if necessary while they still admit the air, as remote from the street with its offensive sounds as may be. The temperature of the room should be regulated, with a thermometer near the head of the bed, at 65° F., by an open fire, preferably in a grate. The physician and the necessary attendants should be the sole visitors. Quiet should reign supreme. In no other disease is continuous or officious ministration so meddlesome and mischievous. Even cleanliness or a more comfortable posture must

be sacrificed at times to peace of mind. The diet is to be simple and light at first, but as nutritious as possible with returning health: beef-tea palatably made, soups of any kind, milk if it does not increase constipation, scraped raw meat, with a little salt, and gruels, if not distasteful. Plain water, seltzer water, Apollinaris, or any simple carbonated drink, should be proffered at proper intervals, without over-solicitation or any anxiety should everything be refused. With the beginning subsidence of the disease an egg may be dropped into the soup, or sweetbreads, fish, the white meat of fowl may for a few days preface the more solid meats.

Especial attention is to be paid to the bladder. The soft catheter, thoroughly cleansed, warmed above the heat of the body, and greased with pure vaseline, brings this organ, when refractory, under control. Constipation is overcome with calomel, two to ten grains, or castor oil, in preference to an enema, which causes too much disturbance.

The treatment proper is purely symptomatic, and has reference to the two sets of symptoms, general and local. Of these the symptoms produced by the local lesions—pain, opisthotonos, hyperæsthesia—assume prominence in the great majority of cases. For the relief of these symptoms no remedy equals in value opium. Opium is the "sheet-anchor" in the treatment of cerebro-spinal meningitis. It acts solely by its anodyne influence. It protects, by obtunding, the nervous system until the force of the poison is spent. Surprising amounts of the drug may be given in this disease without narcotic effects. Thus Steiner often gave ten grains at a dose in cases of severe convulsions without producing stupor; Chauffard, three to fifteen grains; and Boudin, seven to fifteen grains at first, and later, one to two grains every hour before soporific effects were produced. Stillé was in the habit, he says, of prescribing one grain every hour in very severe, and every two hours in moderately severe cases, without inducing even an approach to narcotism in any case. "Under the influence of the medicine the pain and spasms subsided, the skin grew warmer and the pulse fuller, and the entire condition of the patient more hopeful." When quick effects are to be had, or when the drug is rejected by the stomach, resort will be had, of course, to the hypodermatic use of morphine. Ziemssen gives expression to an experience made by every practitioner with this disease when he says that morphine is, without doubt, "indispensable" in its treatment. But "*medicus systematicus periculosissimus vir*"; that would be indeed a routine physician who would prescribe opium indiscriminately in every case.

The use of the warm bath in cerebro-spinal meningitis was introduced by Aufrecht, of Magdeburg (1894), with the report of a single case cured by daily warm baths. Voroshilsky, of Odessa (1895), employed the warm baths three times a day in sessions of ten minutes at a temperature of 104° F. with good results in two cases. These observations were confirmed by Borling and Kellmeyer, of St. Petersburg, and Steckel, of Vienna, and more recently by Netter, who reports six cases treated with warm baths repeated every three or four hours, with no mortality. This experience leads Netter to declare that the warm bath is "a specific method of treatment of cerebro-spinal meningitis."

Venesection in this disease belongs to history, or is only at most to be practised in relief of intracranial pressure, as in apoplexy, in the most sthenic cases, and in these cases the same results may often be effected by milder means, as by purgatives, calomel, and jalap. But local blood-letting by cups along the spine, or by leeches behind the ears, may often relieve the headache and unrest. Cold in the form of bags of ice to the head or along the spine is of great value when the period of excitability, hyperæsthesia, and jactitation may have given place to the state of sopor and indifference. Radcliffe claims that "the application of cold to the head and spine either by means of ice or a freezing mixture in Esmarch's (or Chapman's) india-rubber bags, has furnished by far the most satisfactory results of all direct treatment."

Vomiting is best relieved by ice, champagne, effervescent drinks, milk and lime water, bismuth, soda, carbolic acid, or creosote. No drug equals in efficacy sips of water excessively hot.

Hiccough is often brought under control by the same means prescribed for vomiting, by the administration of a few drops of the oil of cajeput, or by clysters of sodium bromide. More obstinate cases of either vomiting or singultus call for the subcutaneous use of morphine.

The hypodermatic injection of an aqueous solution of corrosive sublimate along the spinal column has been recommended by Angyan in daily doses of 1. cgm. for adults and .5 cgm. for children, continued until the rigidity disappears. Angyan reports thirty cases treated in this way with twenty-one recoveries.

Kay lauds the virtue of permanganate of potassium in grain-to-the-ounce solution, a tablespoonful every hour, and reports four cases with three recoveries.

It is useless to encumber space in a work of this kind with more than a mention of other remedies lauded in the treatment of this disease. As to quinine, which was recommended by the committee of the American Medical Association, it is now admitted to be of no avail whatever, except in antipyresis, a call which is seldom made in this disease. But in the exceptional cases, in which high fever does occur, quinine in scruple dose, salicylic acid or antipyrin in double the quantity, are more valuable than the cold bath, because of the commotion created by the bath. Blisters, moxa, ferrum candens, are brutal assaults in the height of the disease, but may be justifiable in the treatment of sequelæ. The same remarks apply to the use of electricity. Ergot, iodine, physostigma, mercury, the benzoates, the bromides (which may be substituted for opium in a very mild case), other anodynes, belladonna, with a host of other remedies, have been recommended on theoretical grounds, or praised as specifics by practitioners of the "experience" school, who for the most part remain untrained to eliminate "the personal equation," but none of them stands the test of time.

Lumbar puncture has been recommended in treatment, but is not at the present time believed to be curative, although after the withdrawal of a small amount of fluid there is often marked improvement of the symptoms.

The various symptoms presented in the course of the disease are treated precisely as are the same symptoms in any acute infection, after methods mentioned in detail in this work in the history of diseases in which these symptoms assume especial prominence.

James T. Whittaker.
George E. Malsbary.

CERIUM.—A single salt, only, of cerium is official in the United States Pharmacopœia, namely, *cerous oxalate*, entitled *Cerii Oxalas*, Cerium Oxalate: formula, $Ce_2(C_2O_4)_3$, $9H_2O$. This salt is "a white, granular powder, without odor or taste, and permanent in the air. Insoluble in water, alcohol, ether, or in solutions of potassium or sodium hydrate; soluble in diluted sulphuric or hydrochloric acid" (U. S. P.). In effect cerous oxalate most nearly resembles the insoluble bismuth compounds, being, from its insolubility, devoid of active properties, but yet like many other insoluble metallic powders, having a power to allay local nervous irritability. This influence is utilized to combat reflex nausea and vomiting, especially the vomiting of pregnancy, and also to repress irritative dry coughs. In this latter application, when successful, the present drug has the advantage over the ordinary run of cough medicines of not disordering the stomach, but, on the contrary, of tending to quell any irritation of that organ. The oxalate may be given in doses of from .30 to .65 gm. (gr. v. to x.) several times a day, best taken dry upon the tongue. Such doses may be kept up for a number of days in succession with no other effect than causing, at first, a little dryness of the mouth. For cough, the medicine should be persisted in even if, as

may happen, there be no benefit for the first two or three days; and especially should doses be given on the empty stomach early in the morning and late at night.*

Edward Curtis.

CERVICAL FISTULA. See *Teratology*.

CERVICO-BRACHIAL NEURALGIA. See *Neuralgia*.

CERVICO-OCCIPITAL NEURALGIA. See *Neuralgia*.

CESTODA.†—The branch or Phylum Platyhelminthes, commonly known as the Flat Worms, is characterized by a bilaterally symmetrical body somewhat flattened dorso-ventrally and usually elongate, by the mass of parenchymatous tissue which fills all the spaces of the body, by the absence of any true body cavity, by a protonephridial excretory system, and by the complicated sexual apparatus which with rare exceptions is hermaphroditic, and which produces so called compound eggs. Among the most prominent orders of the branch are the Trematoda or Flukes (*q. v.*) and the Cestoda or Tapeworms to be considered here.

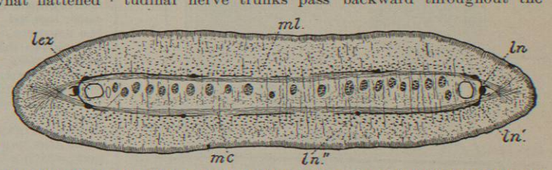

Fig. 1204.—Transection of Proglottis of *Tænia solium*, Somewhat Diagrammatic. *ln*, Main lateral nerve; *ln'*, accessory lateral nerve; *ln''*, ventral longitudinal nerve; *lex*, longitudinal excretory canal; *ml*, longitudinal body muscles; *mc*, transverse body muscles. The section is represented as having cut one of the ring commissures throughout nearly its entire extent. (Original.)

The order Cestoda includes a large number of forms which manifest considerable differences in anatomical detail, but are comparatively uniform in general appearance and structure. The small group of Cestodaria, or Monozoa, which differ from all others in possessing but a single set of reproductive organs, and consequently but a single segment in the body, is included by some investigators in the order under consideration, but by others placed intermediate between the trematodes and the cestodes, forming as it undoubtedly does a group transitional from the one order to the other. The species of Cestodaria are, however, rare and infest the lower animals, so that they will not be discussed here.

In the Cestoda *s. str.* the body is characteristically ribbon-like and divided into "links," segments, or proglottides. In most cases, including all the tapeworms of man, the segmentation is evident externally. At the posterior end of the chain the proglottides are larger and more distinct, and often so loosely attached as to separate from the series under the slightest disturbance. In fact such separation takes place normally as the segments become ripe. Toward the other end of the chain the proglottides grow gradually smaller and less distinct until near the anterior end it is usual to find a short region, the neck, in which no trace of segmentation is visible. The anterior end has the form of a bulbous swelling, known as the head or scolex (Fig. 1203), on which are borne the organs of fixation. The latter are either suckers, hooks, or both, and the suckers may be either elongate grooves or bothridia, cup-shaped hollows or acetabula, or, as in some marine tapeworms, of a folded form which is much more complicated.

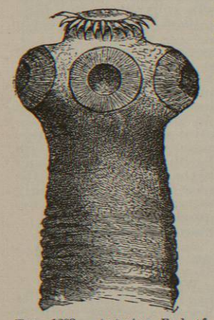

Fig. 1203.—Anterior End of *Tænia solium*, Showing Scolex, Suckers, Rostellum with Hooks, and Neck. × 45.

At the apex of the head is found in the Tæniadæ a muscular organ, the rostellum which bears the hooks, usually in one or more annular rows. In form and degree of development the rostellum is a very variable organ; at the one extreme in *Tænia saginata* it is reduced to a small muscular sucking apparatus, often spoken of as the apical or fifth sucker of that species, while in other forms it is powerfully developed and capable of extension or retraction into a pocket at the apex of the scolex. It is a valuable feature in the distinction of various species.

In the head one finds the central nervous system in the form of a bilateral ganglionic mass with one or two ring-like commissures from which nerves are given off directly to the suckers and rostellum, and from which the longitudinal nerve trunks pass backward throughout the length of the chain. Three of these trunks, the main lateral nerve (Fig. 1204, *ln*) and two minor (*ln'*) are grouped together on each side of the proglottis, while the two dorsal and the two ventral longitudinal nerves (*ln''*) are located nearer the median line. The various longitudinal trunks are connected by commissures which at stated intervals pass around the proglottis; they also give off branches by which the various organs are innervated.

Near the lateral nerve trunks are located the main longitudinal canals (*lex*) of the excretory system which originate in an irregular network in the head and from which are given off numerous branches often in the form of a network of fine vessels in each proglottis. In many forms a prominent transverse canal near the posterior margin of each proglottis joins the longitudinal canals (*cf.* Fig. 1205, *C*). Terminating the finer canals of this system are found the characteristic flame cells which are peculiar to this type of excretory system.

A cross section of a proglottis (Fig. 1204) shows the various layers of which it is composed. Externally the cuticula, a resistant, elastic membrane, covers the body and is reflected a short distance inward at the various external orifices. The older view, by virtue of which an epithelium is wanting in cestodes and the outer layer represents a basement membrane, has been definitely set aside by the recent investigations of Blochmann; the cuticula is really the product of the subcuticular cells, though they are apparently separated from it by a considerable interval. Immediately beneath it occurs a delicate double layer of dermal muscles, having externally circular, and internally longitudinal fibres, the myoblasts of which lie deeper in the body. Between these fibres the bases of the subcuticular cells extend from the cuticula to the deeper lying bodies of the cells; the remaining space of the body between the various organs is filled with parenchymatous tissue. Within the parenchyma occur usually large numbers of calcareous bodies, highly refractive spherical or oval masses of small size, the function of which is yet uncertain. They are, however, characteristic features of cestode structure.

The cross section is divided by the parenchyme or body musculature into two regions, an external cortical layer and the median area or medullary region. In the latter are found most of the reproductive organs, although in the Bothriocephalidæ the vitellaria lie in the cortical layer. The body muscles are of three sets, longitudinal, transverse, and dorso-ventral or sagittal. The longitudinal

* Report to New York Therapeutical Society; the Medical Record, June 12th, 1880.

†A general discussion of parasitism and its effects will be found under the heading *Parasites*.