symptoms result from this slow depletion. In the early stage there may only be gastric or gastro-intestinal disturbance, but if the parasites are present in large numbers anæmia is gradually produced and constitutes the characteristic feature of the disease. The Egyptian chlorosis, brick-maker's anæmia, tunnel anæmia, miner's cachexia, and mountain anæmia are due to this cause. The clinical course is variable. In some instances the anæmia develops acutely and reaches a high grade within a short time, causing great shortness of breath and œdema. There is serious disturbance of nutrition, sometimes diarrhœa and colicky pains; but the most pronounced symptom is the pallor and the associated phenomena of chronic anæmia. The lesions of the intestines are those of chronic catarrh, and small hæmorrhages occur in the mucosa. Dilatation and hypertrophy of the heart have been found in many cases.

The diagnosis is not difficult. The ova, which are abundant in the stools, are oval, about ·05 millimetre in length, and possess a thin, transparent shell. There is no operculum, as in the ovum of the oxyuris, and the yolk is unsegmented. The larvæ develop in moist earth and readily get into the drinking water, through which infection occurs.

The systematic use of latrines and the boiling of all water used for drinking purposes are the important prophylactic measures. The treatment should be directed to the destruction of the parasites in the intestine, which may be effected by the male fern or by thymol, which Sonsino recommends highly. It is given in capsules of half a drachm every hour for four doses. A purgative is not necessary.

IV. Filariasis.

Under this term may be considered the morbid conditions induced by the *filaria sanguinis hominis*, or the *filaria Bancrofti*, the name employed to designate the adult worm, which was discovered by Bancroft, of Brisbane. In the adult form the worm lives in the lymphatics. The female is thus described by Patrick Manson, whose studies on this parasite have been so important: "A long, slender, hair-like animal quite three inches in length but only one one hundredth inch in breadth, of an opaline appearance, looking, as it lies in the tissues, like a delicate thread of catgut animated and wriggling. A narrow alimentary canal runs from the simple club-like head to within a short distance of the tail, the remainder of the body being almost entirely occupied by the reproductive organs. The vagina opens about one twenty-fifth of an inch from the head; it is very short, and bifurcates into two uterine horns, which, stuffed with embryos in all stages of development, run backward nearly to the tail." The male worm is much smaller and has only occasionally been found. The female produces an extraordinary number of embryos, which enter the blood current through the lymphatics. Each embryo is within its shell, which is elongated, scarcely perceptible, and in no way impedes the movements.

They are about the ninetieth part of an inch in length and the diameter of a red blood-corpuscle in thickness, so that they readily pass through the capillaries. They move with the greatest activity and form very striking and readily recognized objects in a blood-drop under the microscope. A remarkable feature is the periodicity in the occurrence of the embryos in the blood. In the daytime they are almost or entirely absent, whereas at night, in typical cases, they are present in large numbers. If, however, as Stephen Mackenzie has shown, the patient, reversing his habits, sleeps during the day, the periodicity is reversed. The further development of the embryos appears to be associated with the mosquito, which at night sucks the blood and in this way frees them from the body. Some slight development takes place within the body of the mosquito, and it is probable that the embryos are set free in the water after the death of the host. The further development is not known, but it is probably in drinking water. The filariæ may be present in the body without causing any symptoms. In animals blood filariæ are very common and rarely cause inconvenience. It is only when the adult worms or the ova block the lymph channels that certain definite symptoms occur. Manson suggests that it is the ova (prematurely discharged), which are considerably shorter and thicker than the full-grown embryos, which block the lymph channels and produce the conditions of hæmatochyluria, elephantiasis, and lymph-scrotum.

The parasite is widely distributed, particularly in tropical and subtropical countries. Guitéras has shown that the disease prevails extensively in the Southern States, and since his paper appeared contributions have been made by Matas, of New Orleans, Mastin, of Mobile, and De Saussure, of Charleston.

The effects produced may be described under the above-mentioned conditions.

(*a*) *Hæmatochyluria.*—Without any external manifestations, and in many cases without special disturbance of health, the subject from time to time passes urine of an opaque white, milky appearance, or bloody, or a chylous fluid which on settling shows a slightly reddish clot. The urine may be normal in quantity or increased. The condition is usually intermittent, and the patient may pass normal urine for weeks or months at a time. Microscopically, the chylous urine contains minute molecular fat granules, usually red blood-corpuscles in various amounts. It was in urine of this kind that Wucherer, of Bahia, first detected the filarian embryos. It is remarkable for how long the condition may persist without serious impairment of the health. A patient, sent to me by Dawson, of Charleston, has had hæmatochyluria intermittently for eighteen years. The only inconvenience has been in the passage of the blood-clots which collect in the bladder. At times he has also uneasy sensations in the lumbar region. The embryos are present in his blood at night in large numbers. Chyluria is not always due to the filaria. The non-parasitic form of the disease has already been considered.

Opportunities for studying the anatomical condition of these cases rarely occur. In the case described by Stephen Mackenzie the renal and peritoneal lymph plexuses were enormously enlarged, extending from the diaphragm to the pelvis. The thoracic duct above the diaphragm was impervious.

(*b*) *Lymph-scrotum* and certain forms of *elephantiasis* are sometimes caused by the filaria. In the former the tissues of the scrotum are enormously thickened and the distended lymph-vessels may be plainly seen. A clear, sometimes a turbid, fluid follows puncture of the skin. The parasites are not always to be found. I have examined two typical cases without finding filaria in the exuded fluids or in the blood at night. So also the majority of cases of elephantiasis which occur in this country are non-parasitic. In China it is stated that the parasites occur in all these cases.*

V. Dracontiasis (*Guinea-worm Disease*).

The *Filaria* or *Dracunculus medinensis* is a widely spread parasite in parts of Africa and the East Indies. In the United States cases occasionally occur. Jarvis reports a case in a post chaplain who had lived at Fortress Monroe, Va., for thirty years. Van Harlingen's patient, a man aged forty-seven, had never lived out of Philadelphia, so that the worm must be included among the parasites of this country. A majority of the cases reported in American journals have been imported.

Only the female is known. It develops in the subcutaneous and intermuscular connective tissues and produces vesicles and abscesses. In the large majority of the cases the parasite is found in the leg. Of 181 cases, in 124 the worm was found in the feet, 33 times in the leg, and 11 times in the thigh. The worm is usually solitary, though there are cases on record in which six or more have been present. It is cylindrical in form, about two millimetres in diameter, and from fifty to eighty centimetres in length.

The worm gains entrance to the system through the stomach, not through the skin, as was formerly supposed. It is probable that both male and female are ingested; but the former dies and is discharged, while the latter after impregnation penetrates the intestine and attains its full development in the subcutaneous tissues, where it may remain quiescent for a long time and can be felt beneath the skin like a bundle of string. Suppuration is after a time excited, and when the abscesses are opened or burst the worm appears and is sometimes discharged entire. The worm contains an enormous number of living embryos, which escape into the water and develop in the cyclops—a small crustacean—and it seems likely that man is infected by drinking the water containing these developed larvæ.

* For full consideration of the subject of congenital occlusion and dilatation of lymph channels, see work on this subject by Samuel C. Busey, New York, 1878.

The *treatment* consists in promoting the suppuration, and when the worm is seen the common procedure is to roll it round a portion of smooth wood, and in this way prevent the retraction, and each day wind a little more until the entire worm is withdrawn. It is stated that special care must be taken to prevent tearing of the worm, as disastrous consequences sometimes follow, probably from the irritation caused by the migration of the embryos. It is stated that the leaves of the plant called *amarpattee* are almost a specific in the disease. Asafœtida in full doses is said to kill the worm.

VI. Other Nematodes.

(*a*) Among less important filarian worms parasitic in man the following may be mentioned: *filaria loa*, which is a cylindrical worm of about three centimetres in length and whose habitat is beneath the conjunctiva. It has been found on the West African coast, in Brazil, and in the West Indies. *Filaria lentis*, which has been found in a cataract. Three specimens have been found together. *Filaria labialis*, which has been found in a pustule in the upper lip *Filaria hominis oris*, which was described by Leidy, from the mouth of a child. *Filaria bronchialis*, which has been found occasionally in the trachea and bronchi. This parasite has been seen in a few cases in the bronchioles and in the lungs. There is no evidence that it ever produces an extensive verminous bronchitis similar to that which I have described in dogs. *Filaria imitis*, of which Bowlby has described two cases. In one case with hæmaturia female worms were found in the portal vein, and the ova were present in the thickened bladder wall and in the ureters.

(*b*) *Trichocephalus Dispar* (*Whip-worm*).—This parasite is not infrequently found in the cæcum and large intestine of man. It measures from four to five centimetres in length, the male being somewhat shorter than the female The worm is readily recognized by the remarkable difference between the anterior and posterior portions. The former, which is at least three fifths of the body, is extremely thin and hair-like in contrast to the thick hinder portion of the body, which in the female is conical and pointed, and in the male more obtuse and usually rolled like a spring. The ova are, oval, lemon-shaped, ·05 millimetre in length, and each is provided with a button-like projection.

The number of the worms found is variable, as many as a thousand having been counted. It is a widely spread parasite. In parts of Europe it occurs in from ten to thirty per cent of all bodies examined, but in this country it is not so common. The trichocephalus rarely causes symptoms. It has been thought by certain physicians in the East to be the cause of beri-beri. Several cases have been reported recently in which profound anæmia has occurred in connection with this parasite, usually with diarrhœa. Enormous numbers may occur, as in Rudolphi's case, without producing any symptoms.