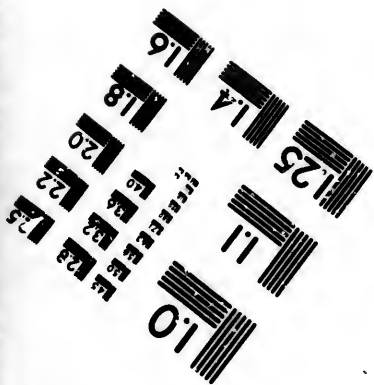
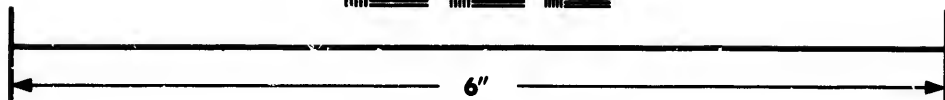
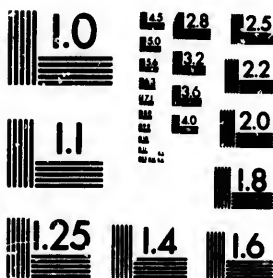


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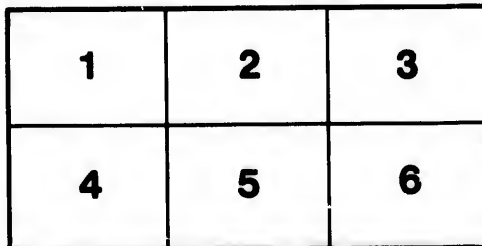
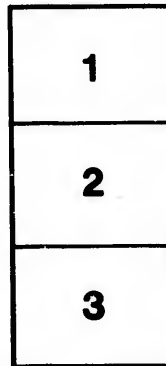
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AN ESSAY

ON

ENTOZOA,

BY

EDWARD VAN CORTLANDT,

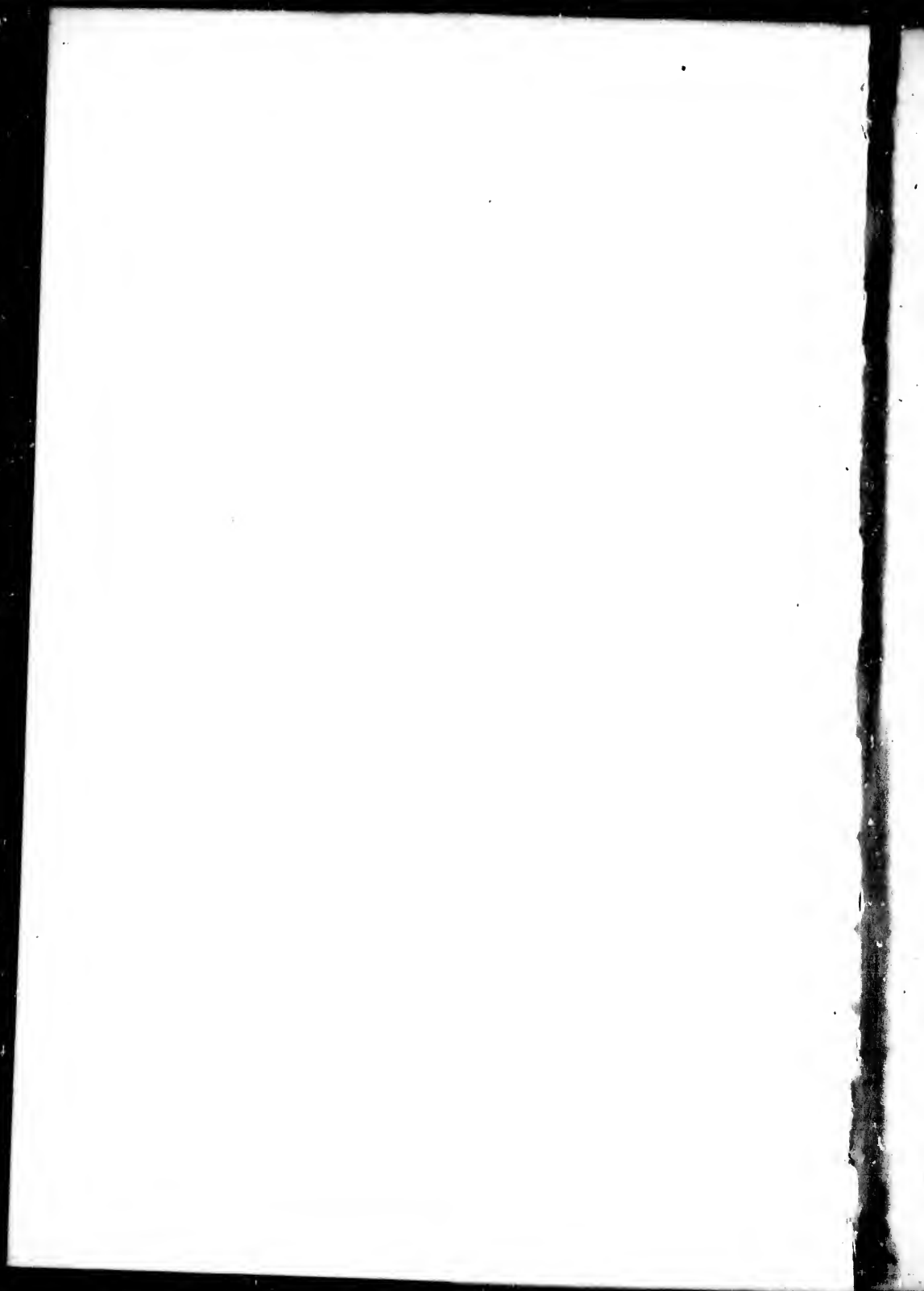
LATE CONSULTING PHYSICIAN TO THE OTTAWA GENERAL HOSPITAL, AND CONSULTING PHYSICIAN
TO THE COUNTY OF CARLETON PROTESTANT HOSPITAL, &c., &c., &c.

PUBLISHED BY REQUEST OF THE
OTTAWA NATURAL HISTORY SOCIETY.

QUICQUID NASCITUR NOTANDUM EST.

PRINTED AT "THE OTTAWA CITIZEN" STEAM PRINTING ESTABLISHMENT,

1865.



TO
THE HONORABLE JUSTICES
JOHN DUVAL, C. J.;
HENRY BLACK, C. B.,
—AND—
THOMAS CUSHING AYLWIN

WHO HAVE ALIKE DISTINGUISHED THEMSELVES BY THEIR PRE-EMINENT TALENT, TOGETHER
WITH ALL HIS OTHER SURVIVING CONTEMPORARIES,

“WILKIE’S SCHOLARS,”

THIS HUMBLE BROCHURE IS DEDICATED BY THEIR OLD SCHOOL-FELLOW,

THE AUTHOR.

TO

THE HONORABLE SENATE

JOHN DEWEY, C. S. J.

HENRY BLACK, C. S. J.

THOMAS CUSHING TAYLOR

AND THE HONORABLE SENATE

OF

WILKINS P. HOBBS

THE HONORABLE SENATE

THE AUTHOR

ENTOZOA.

BEING AN ESSAY READ BEFORE THE OTTAWA NATURAL HISTORY SOCIETY, ON FRIDAY, 24TH FEBRUARY, 1865. BY EDWARD VAN CORTLANDT.

The heaven of poisonous power to us
First moves remote, its hostile effluence creeps
Slow, like a mist or vapour; all around
Transforming as it passes, till at length,
Teach'd our own region, it the total scene
Taints, and assimilates, and loads with death.
[J. M. Good's translation of Lucretius.]

It is not many months since the whole of civilized Europe was startled from its propriety, on learning the sad tidings consequent upon a festive banquet which took place at Hettstadt, a small country town near the Hartz mountains in Germany. The following is an abridged account of its very "strange and eventful history":—

The large number of one hundred and three persons, chiefly peasants, sat down to a sumptuous dinner. They were all in good health and vigor. After having enjoyed themselves *more majorem*, to use the words of the chroniclers of the frightful fact, they separated and went to their homes. Of this number, within a few weeks, eighty three men were in their graves. They had all partaken of a poison, not a poison administered either by design or negligence, but a poison unknown to all concerned, which was eaten with the meat in which it was contained, and of which it formed a living constituent. As is usual in these parts of Germany, the third course consisted of *Rostewurst und Gemuse*. The former was therefore ordered the necessary number of days beforehand, in order to allow of its being properly *smoked*! On this occasion a measly pig was sold to the butcher—killed and worked up into Sausages. On the day after the festival, several persons who had participated of the dinner, were attacked with irritation of the intestines, loss of appetite, great prostration and fever. The number of persons attacked rapidly increased,

and poisoning was suspected. Every article of food and material was subjected to a most rigid examination, without any result in the first instance; but when the symptoms in some of the cases invaded the muscles of the leg, particularly the calves of some of the sufferers, the description which Zenker had given of the fatal case of *trichinous* disease was remembered. The remnants of sausages and of pork, employed in its manufacture in the Hettstadt case, were examined with the microscope, and found to be literally swarming with encapsuled trichina, in all stages of development. It could not be doubted any longer that as many of the one hundred and three as had partaken of *Rostewurst* had been infected with trichinous disease, by eating of trichinous pork.

Since the occurrence of the above tragical event, this disease has been met with on this continent. Several fatal cases have been recorded of its development at New York and Buffalo. To the above facts are referable the circumstances which led to the reading of this Essay, of which the following is a summary:

Were there no other more inviting associations in connection with the Entozoa than the nature of their habitations, the study of their history would not be likely to be prosecuted with much ardor. But when we reflect upon the very direful effects which follow in the wake of some of them, when they have become the inmates, whether of our own bodies or of the carcasses of our domestic animals, and consider the great and lamentable uncertainty and even entire ignorance which in many instances still exists in relation to them and their natural history—an ignorance and uncertainty of all vital moment in the economy of Man—we cannot

wonder that the researches of some of our most eminent physiologists have been directed towards the elucidation of this obscure but all important subject, and whilst we are prepared to extend the highest meed of praise to the memory of the late Adolph Wilhelm Otto, the pre-eminently great Silesian Human and Comparative Anatomist, and Pathologist for his researches in this peculiar branch of science, and for the records of very many cases and facts connected with *Ento parasites*, (and especially amongst others, of the fact that the Entozoa known in the Cystic form as the *Cysticercus cellulosæ*, was peculiar to the Pig, whilst at the same time that animal constituted an exception to the presence of the parasite in its perfect form as a Tape-worm) it is a curious fact in connection with our subject that, up to the year 1806, and even for some years later nothing definite was known respecting the cause of *Trichina* disease.

"The symptoms caused by the sausage poison are very slow in appearing. They partake of the narcotico-irritant character. In the *Medical Gazette* for November, 1842, there is an account of the cases of three persons who had died from the effects of liver sausages which had been made from an apparently healthy pig, slaughtered only a week before. The inspection of the bodies after death threw no light on the cause of death. "The poisonous effect is supposed to depend on a partial decomposition of the fatty parts of the sausages! What the nature of the poison was we are quite unable to determine." (*Vid.* Taylor's Jurisprudence, by Edward Hartsborne, Philadelphia, 1856.")

Supposing always as we proceed that the animal known as the *Cysticercus Cellulosæ* is only the humble progenitor either of an *Entozoon* known as the *Trichina Spiralis* of Owen, or subsequently (but now has not been clearly and satisfactorily explained) to develop itself in its entirety as a Tape-worm

The word *Entozoa* derived from two Greek words *entos* within, and *zoas* an animal, was first applied by Rudolphi to those ento-parasites which inhabit permanently the internal parts of other animals, and exclude, inter-alia, the larvae of insects, which not unfrequently take up a temporary abode in various parts of the bodies of sundry animals, and where they undergo a portion only of their metamorphosis. The different sorts of *Bot* known in the horse, in cattle, and in the frontal sinuses of sheep and deer, are familiar instances, and from which they are either voided, per anum, or escape otherwise from their temporary abodes, in due season to perfect their existence under different circumstances and in different situations.

In their cases the eggs or ova are either deposited where they undergo their first change, or, as in the *Æstrum equi*, the horse-bot, are licked off the legs by the tongue of the animal and conveyed into the stomach, where they undergo their larva transformation, and are ultimately passed by the bowels, completing their metamorphosis in the ground

Although the Vermes or worms have acquired the highest position amongst the *Entozoons*, withal it is a curious fact that some of the higher animals, even sundry of the Vertebrata, assume the positions and characters commonly allotted to the true Entozoa. Thus a fish of the genus *Fierasfir* is often found occupying the respiratory apparatus of the *Holothuria* or sea cucumbers, and others have been found taking undisputed possession of the central cavity of the *Asterias, discoides*. *Crustaceans* are also sometimes found enjoying a parasitic existence, as many of us must have seen in the crab occupying the mussel and oyster. Amongst the *Entomozoa* many of the *Larvæ* are constantly found fixed to the gills, mouths and throats of various fishes, whether natives of salt or of fresh water, sundry of them moreover being peculiar to our own inland fresh water seas, whilst some of the *Lingualia* frequently occupy the nasal and frontal sinuses, as well as the lungs larynx, together with the peritoneal cavities of mammals, reptiles and fishes. Although *Mollusca* are more rarely met with in such unnatural positions, yet sundry of the *Gasteropoda* inhabit the bodies of *Echinoderms, Holothuria* and *Comatulas*; and in fossil Zoology are to be met with in the siphuncles of *Orthocerotites* and imbedded in *Receptaculites*, whilst the *Mytilus* and *Modiolaria*, amongst the *Lammellibranchia* infest the bodies of *Ascidians*. With the *Polyps* and *Protozoa* which are sometimes met with in animal fluids and the morbid evacuations of man, which belong to the family of *Homatozoa* and whose structure is so extremely minute that no internal organization can be detected we have nothing to do here.

As might readily be supposed aquatic animals are, as a class, most infested with Entozoa. A low degree of organization and a tardy digestion favors their production; whilst the external coverings, in the form of hair feathers, &c., which characterize terrestrial animals, renders them most liable to the visitations of *ecto*, or outside parasites.

The *Entozoons* again are much more frequently met with amongst herbivorous than carnivorous animals, at the same time that some of the latter have their own peculiar attendants, as the dog, fox and wolf, and which in their case is a very small tape-worm

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known in scientific language as the *Toenia echinococcus*. In its more pristine form as a cystic worm or *hydatid*, it is commonly found and constantly proves fatal, when it takes up its abode in the internal organs of man, where it is introduced by our partaking of either water or food containing the ova of the entozoon. In its new abode it speedily undergoes its first transformation, from that of a *hydatid*, and immediately begins its fatally destructive operations upon the liver and other important viscera of its recently selected victim, afterwards to undergo its final and complete transformation in the carcasses of the animals above mentioned, take a rank considerably higher on the scale of nature, and de novo to begin the work of *alternation of generation*.

"That the hydated disease arises from the tenie, observes Doctor Cobbold, accounts for the great prevalence of the disease in Iceland, and wherever large numbers of dogs are kept. The disease is much more prevalent in women than in men; the explanation of which must be sought for the difference of the habits of life. No doubt the water used as drink by the women is constantly obtained from supplies in the immediate neighborhood of their dwellings and in localities, to which dogs have continued access. Moreover, the women in Iceland probably obey more implicitly the dictates of the quacks who supply them with filthy medicine in the form of dogs urine and fresh dogs excrements!"

At the meeting of the British Association at Bath, Sept., 1864, where Dr. Cobbold read an essay on the Entozoa, Dr. Crisp remarked that the *Echino cocci hydatids* have been found to infest the bodies of porpoises to a swarming extent, and yet the animals were apparently in as good condition and yielded as much oil and of as pure a quality as did their congeners who were wanting in the parasites.

As far as is known of them, the *Entozoa* are in the first instance introduced into the bodies of their fosterers, in the *Egg* or *Ova* form and *always from without*. Steenstrup has proved to demonstration that the *Trematode* or *flat Entozoa*, (of which the Fluke is an illustration) undergo various transformations, amongst others that one of the *Distomata* can be plainly traced back to the parent stock in the form of an infusorial animal (the *Cercaria*). Mr. Busk has also shewn that at least one of the *Nematoid* (or Round Worms. *Filivaria Melensis*, familiarly known as the *Guinea Worm*), undergoes sundry changes before it penetrates the human body where it assumes the complete and perfect form, and again the Eggs of one of the *Botriocephala*, a family of worms closely allied to the *Tape*

Worm, are constantly met with in wading and other fish eating birds, never, attain their perfect form unless they have been swallowed by the *Sickleback* and which afterwards becomes the prey of the bird, and in whose body the *Entozoon* attains the form fitting to be conveyed to the human subject. The *Gordius* or Hair Worm deposits its eggs on water where they are swallowed by insects in whose bodies they are hatched, producing the perfect animal, which when duly impregnated is ejected from the body of the insect, to undergo a similar generative alternation.

Lastly, the eggs of a species of a Tape Worm when swallowed by the Rat or Mouse, will not produce perfect Tape Worms in the inside of their devourers, in the livers of which they are constantly met with as Cystic Worms or Hydatids. But if, again, either of these troublesome rodent's constitutes a casual repast for a dog or cat, then we may, without any fear of contradiction, count upon a genuine Tape Worm being the result of the treacherous meal. In short, the first conclusive experiments are referable to the Hydatids locating these organs. Since then the Cystic worms have been taken from the bodies of herbivorous and transported into those of carnivorous animals when tape worms of one description or the other were the invariable result. Segments also of mature tape worms when administered to herbivorous animals were found to produce the animal in its Cystic form. Pallas transposed the ova of the tape worm from one dog to the peritoneal cavity of another, and a month afterwards detected young tape worms as the result of the experiment. *Entoparasites* have been found in all the mammals from Man down to the *Cetacea*, as well as in all the other Vertebrate animals, more of them even in Birds, Reptiles and Fishes, than other animals. Nor this alone, since they are met with perpetually in the invertebrata and even the articulata as many of the insect tribe are infested with them. The owners of Apiaries have constant opportunities of witnessing this fact from the great destruction committed on their hives by the insect known as the Miller Moth.

The domestic Fly again constantly falls a victim to the insidious operations of the *Boda* family, one of the flesh-eating insects, the *Papalus* as well as one of the *Myriopoda*. The *Julus* are well known by Zoologists to be constantly the subject of a fatal *entozoic* disease. As far as their history is known, it would appear that twenty different species of the *Entozoa* infest man, fourteen Dogs, fifteen Horses and eleven Domestic Fowls. (COBBOLD.)

Zeder, a German Naturalist, was the first who established anything like a good classification of the *Entozoa*, dividing them (at the instance of Rudolphi, however,) into families, which again were subdivided into sundry *genera* and species, and as this arrangement constitutes the accepted one of the present day, we cannot do better than adopt it on this occasion. According to this classification, the *Entozoa* are divided into five different families or orders, viz.:—The *Nematodea* or Round Worms, *Acanthocephala* or Hooked Worms, *Trematoda* or Fluke Worms, *Cestoidea* or Tape Worms, and *Cystica* or *Hydatids*.

We shall endeavour now to give a few of the striking characteristics of each group, and thus, as far as may be, describe the subject of the Essay which I have the high honor of submitting to the Natural History Society for full discussion and farther elucidation.

I. *Nematodea* or Round Worms. This family constitutes the most highly organized group of all the *Entozoe*, contains a greater number of *genera*, and comprises more species which are occupants of the human body than any of the other families.

Amongst them the *Filaria* or Guinea Worms which burrow under the skin; have been known to attain a length of twelve feet in the human subject, and infest all classes of animals from Man to insects. Amongst other strange situations they have been found in, is the human eye; and recent rese arches have detected them in the blood of some animals. Thus the number of Microscopic *Filaria*, inhabiting the blood of dogs, have reached in 20 specimens the enormous number of 20,000.

Some years since it was spoken of by M. Chapotin as abounding at Bombay during the rainy season, and as being most common amongst the negroes. And it is stated that the dogs which were kept at the hospital and fed with the poultices which had been applied to the patients who were suffering from the flesh worm, became also infested with them.

It is well-known that the Red Gurnard (*Trigla Pini*), a fish familiarly known on the western coast of England, is constantly found containing entozoons allied to the Guinea Worm, in countless numbers, which completely permeate the muscular structure of the fish, and yet no external indication of disease is perceptible, or the lightest difference discernable between its and its more favored allies.

The *Strongylus gigas* another nematoid Entozoon is frequently met with in the kidneys and bladder of man. It

has been found in the human kidneys three feet long and a half an inch in diameter, its ordinary length, however, being fifteen inches. Its colour is blood-red, owing to the fact of its obtaining its nourishment from the Renal vessels. It is more frequently met with in the kidneys and bladder of the horse and dog than man.

Ascaris Vermicularis, (Thread-worm or Maw-worm. Constantly met with in large quantities in the rectum of children, from which they frequently crawl spontaneously in great numbers; and although they are looked upon as proper to the large intestines, they have occasionally been met with in the stomach, and even the œsophagus sometimes, enclosed in a cyst. As many as a thousand have been passed from the human bladder.

Tricocephalus dispar (Long Thread-worm.) Although to a casual observer this worm appears identical with the foregoing, it is nevertheless a different species, being considerably larger and longer. Like its congener, however, the sexes are distinct and separate. As a general, but by no means universal rule they are met with in the human cœcum; and in the Museum of the Royal College of Surgeons in London, there is a wet preparation showing the cœcum perforated as with pin-holes by this worm.

Acaris Lambri cordes or common round Worm. This Entozoon is too well known as a human parasite to require a lengthened notice. It is a curious fact that it has never been detected in man in its young state.

From well-authenticated cases, the numbers which have infested the human subject at the same time has been very great, as many as from three to four hundred have been vomited up within the space of a few days, and from 50 to 80 have been voided from the bowels at the same time.

Many members of this family infest the Pig and sundry other animals as well as the human subject. One remarkable circumstance in connection with them is, that they, under some circumstances, have been known to pierce the intestinal canal, and they are sometimes met with within the Peritoneal cavity, and outside of the intestine. I can bear testimony to one having been found in this situation in a Wolf which was poisoned by Strychnine some twenty years ago, on the farm of Mr. Bradley: it measured 22 inches. Unfortunately for the cause of science and the Ottawa Natural History Society, it has been lost. They are not unfrequently found to attend scrophula in man and glanders in the horse.

II. *Acanthocephala*, or Hooked Worms, are

never found in man: The family contains only one genus. They are met with in the intestinal canal, fixed between its membranes, and occasionally in the Peritoneal cavity of sundry animals. Its history is uninteresting.

III. *Trematoda*, or Fluke Worms, consists of six genera, and several species. One of them, the *Distoma Hepaticum*, or Liver Fluke is proper to the liver of the human subject, sheep and other animals as well as birds and fishes. It is a generally accepted fact that sheep when infested with flukes, obtain them by eating a small amphibious snail, which is to be met with in low and moist situations attached to blades of the grass on which the animals feed. It has been found in the hepatic ducts of the foetus of that animal. They are also constant attendants upon the disease known as the Rot in sheep, and in these cases are frequently vomited by the animal in considerable numbers. *Distoma ophthalmium* has been found in the eye. The *Trematoda* are higher in organization than the Cestoid worms. They are generally about an inch in length, assuming a liver colour, they have no eyes or other organs of special sense, they are androgynous animals occupying the Hepatic ducts and gall bladder and living on their secretions and contents. They are found in immense numbers in the liver of the sheep, but recent investigations do however, not confirm the belief once entertained that they multiply in this organ. True, indeed, it is that the ova are exuded from the parent in that situation, but only to find their way thence to undergo transformation in different situations, and under circumstances which as yet in their entirety, have not been definitely ascertained. One species, the *Distoma Homotobium* is very common in Egypt, infesting not only the liver but as well the bladder in the human subject and producing general disease. This species is remarkable in differing from the others sexually, it not being an hermaphrodite. Prominently peculiar both in appearance and organization amongst the members of this family is the *Fasciola Trachealis*.—It is generally about an inch long, and presents the semblance of a bifurcated or two headed animal, but one of the bifurcations is in reality only a suctorial disk by which it adheres to the inside of the windpipe of sundry gallinaceous birds, the other free division terminates in the mouth of the animal, it is generally found in considerable numbers in the tracheæ of young pheasants, partridges and domestic chickens where it produces the disease, known as Gapes, and is a source of great mortality amongst the young broods.

IV. *Cestoides* or Tape Worms. The members

of this family evince no trace of intestinal canal, and are androgynous. Considering the researches of Siebold Van Beneden and other modern Physiologists, are conclusive, we must arrive at the extraordinary inference that the *Cystic Entozoa*, viz., *Cysticerci Echinococci* and *Cœnuri*, are partially developed *Cestoides*, and that the same embryos may evolve themselves either into the *Cystic* or the *Cestoid* form according to the circumstances under which they are placed, for when lodged in the parenchyma of organs, such as the Brain or the Liver, they take the *Cystic* form, when they on the other hand pass into the intestinal canal, their generative sections are developed, and they become *Cestoids*, but an immense amount of doubt still remains to be cleared up in connection with their history.

The *Tœnia Solium* or common tape worm often attains a length of twenty feet, but owing to the fabulous statements which, from the time of Pliny, who makes mention of one three hundred cubits long, down to our own times, nothing definite is known of its extreme dimensions, from what would appear to be creditable testimony, however, they have been known to attain great lengths. Thus there is one spoken of in the Copenhagen transactions which measured eight hundred ells. Van Doeveren tells us of one one hundred and fifty feet long. It is questionable, however, if these were not portions of more than a single worm, since, in the bodies of dogs at least, more than upwards of sixty different tape worms have been found to exist at the same time. On the other hand, Goeze detected a Tape Worm in a sucking lamb which measured fifty-one ells.

Notwithstanding the generally accepted opinion that the *Tœnia* have an external origin, some doubt has been thrown in the way by their having been met with in the alimentary canal of the human foetus. It is stated on very good authority that they will live in water after expulsion per *vias naturales* for several days, and many authors, even at the present day believe that the *Tœnia* as well as their congeners are only an accompaniment of, and not the cause of disease since like them they have been found to exist of great dimensions without any apparent indisposition or even inconvenience to their fosterers.

Pallas generated the Tape Worm by transposition 100 years ago, but it was left for Dr. Cobbold to carry out the operation to greater or less perfection, and this he did effectually. His experiments consisted in imparting either the proglottides, the scolices or the perfect Entozoons of Flukes, Tape Worms or Round Worms, whilst the animals invited to partake of these dainties, were dogs, horses, goats, monkeys, rabbits, frogs, fishes and cockroaches. Of late the com-

mon earth worm has been found infested with trichina, a possible source of the disease in swine.

Botrioccephalus latus. Although this worm bears a sufficiently great general resemblance to the foregoing, it is remarkable for several important, different and distinct characters which show that it not only is a different species but as well a different *genus*. The great distinctive mark consists in its not being armed with the hook-like processes which exist with its humulated congeners. Like them, however, it attains on many occasions a great length. Goetze had one in his possession sixty ells long, whilst Boerhaave speaks of a specimen which was obtained from a Russian, and which measured 100 ells. From investigation made by parties, entitled to the very highest consideration, it would appear that the *Tonia Solium*, *Common Tape worm*, infests the poor; whilst this Entozoon, or the hookless tape worm, is more frequently met with amongst the rich and luxurious—a fact supposed to be referable to the former living chiefly upon pork, whilst their more fortunate brethren dine upon *mutton*, *veal*, and *underdone roast beef*. It is also supposed to be imparted to man, by his eating salads, water-cresses, and other

crude vegetables, which either grow on the borders of streams, or are watered from stagnant ponds containing their ova.

V. *Cystica* or *Hydatids*.—Although to common observance the members of this family of Entozoons only present the appearance of an inanimate bladder like cyst filled with a pellucid fluid; withal, by the researches of modern physiologists, it has been clearly proved that they really constitute living organisms, and in sundry instances, as that of the *Cysticercus* and *Cœnurus*, already alluded to, that they are the young of Cestod worms. It is the former of them which produces the Trichinina disease in man before spoken of, and the latter which leads to the fatal disease known as staggers, when it finds its way to the brain of sheep. It has sometimes, though more rarely than its congener, been found in the general muscular structure of man, as well as in the heart, brain and eye; and although in some cases it may die and become absorbed, its presence is very often attended by fatal consequences. The cysts of some of this family sometimes grow as large as a child's head, especially in the livers of some of the lower animals, and lead to the inevitable death of the animal.

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