TRICHINA SPIRALIS.

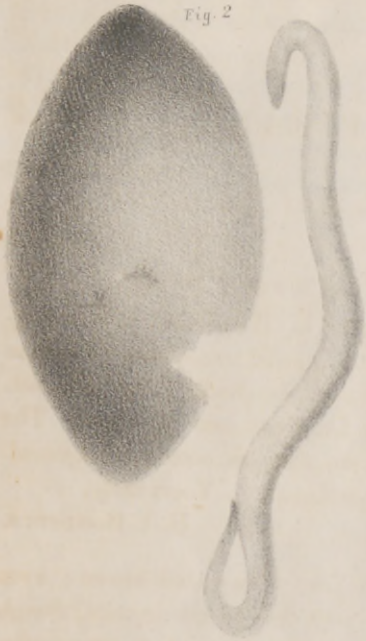

Fig. 2

Fig 1.

Fig 4

Fig 3

Fig 5

Fig. 1. Cyst containing animalcula.
Fig. 2. Cyst accidentally ruptured and Trichina lying by it.
Fig. 3. Structure of animalcula. *a.* mouth. *b.* end of first part of intestine. *c, c.* sacculated portion, and *d.* spiral portion of intestine; *e.* anus. *f.* ovarium.
Fig. 4. Worm cut in halves, sacculated part of intestine protruding.
Fig. 5. Interior cyst or gelatinous mass escaping from exterior.

Boston Med. & Sur. Journal.

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TRICHINA SPIRALIS.

To the Editor of the Boston Medical and Surgical Journal.

Sir,—The following account of the case E. B., affected with malignant disease of the abdomen, and with parasitic animalculæ (*Trichina Spiralis*), was read before the Boston Society for Medical Improvement. It is compiled from accounts taken by Dr. Perry and Mr. Hall. The autopsy was made by Dr. J. B. S. Jackson, and his notes are subjoined. The microscopic observations are by myself. Yours truly,

Boston, March 22, 1842. H. I. Bowditch.

E. B., æt. 36, medium size, good form; hair dark-brown; eyes blue; skin light and delicate; muscles well developed originally, though now (December 10, 1841) much emaciated; during last six months, he thinks that he has lost from twenty to thirty pounds in flesh. He was born in Lebanon, York County, Me., where he lived nineteen years, engaged in farming pursuits; the situation of the place being elevated, dry and healthy. He labored hard, and exposed himself to all kinds of weather; was quite irregular in his usual habits, particularly in regard to eating and sleeping; food good and wholesome; clothing sufficient; never used ardent spirits until after arrival in the city; naturally of a nervous, passionate temper; usually very well during this period; no contagious disease, except a slight attack of measles.

At the age of 20, he came to live at Roxbury, near this city, and there he continued his pursuits of farming or gardening for six years, and resided in healthy spots; but he was frequently attacked with "colds," owing, as he thinks, to kneeling upon the ground while engaged in his work—and finally he was obliged to leave and go into the country in consequence of a cough contracted in this manner. At the end of a year he was sufficiently recovered and returned here, where he has resided ever since, except for a short space of time, when he went

upon a fishing voyage. He was then 27 years old; and about the middle of September, weather being quite cold, the boat in which he was, was upset. He remained in the water for an hour, and when taken out his extremities were numbed, and his whole frame very much exhausted. He says he swallowed a good deal of water at that time, and thinks he has never been relieved entirely of it, and refers the origin of the tumor in the abdomen (hereafter to be described) to it.

During the subsequent four years he attended at a bar-room or a fruit-cellar in Dock square, and lived in a healthy position at the west end of the city; but the cellar was extremely damp, owing to the influx of the tides, so that in the spring, 1836 (æt. 31), the water was at times from six to ten inches deep upon the floor, and after it subsided he used to build large fires that filled the place with the steam of the salt water. Whilst working at this place he produced a hernia by overstraining himself. In the spring of 1836, above alluded to, he was attacked with violent fever, during which he was delirious, and by which he was confined to bed for ten or twelve weeks, and did not wholly recover from its effects for six months. From this period, i. e., from 1836, he has been liable to attacks of colic, which at first occurred annually, but since, they have become more frequent, and during the same time he has had almost constantly pain in the left side and back. For two years (1839–40), was troubled with a "salt rheum" eruption upon skin.

In February, 1841, he removed to the house where he resided at the time of his death; a miserable abode, so surrounded by other dwellings that the sun never enters it; but in other respects the hygienic influences exerted upon him were as previously mentioned. A few months afterwards had a violent attack of "bilious colic," which lasted a week, and during this period and for several weeks subsequently he had severe pain in the left iliac region, and immediately after the illness he perceived a small tumor on the same side of the abdomen, about midway between ribs and crista ilii. This tumor gradually augmented in size until July 28th, when upon experiencing another attack of colic, Dr. Perry was called. "Upon examination [says Dr. P.] I discovered a tumor in the left hypochondriac region, which, as nearly as I could ascertain, was about three inches in circumference; it was well defined, hard and immoveable, not tender when pressure was made upon or near it, but it was to this part that he referred his pain during his attacks of 'colic.' He remained in the house a few days, and as he did not recover his strength, I advised him to go into the country. Upon his return, on the 20th of September, I found his health had improved, but the tumor had been

rapidly augmenting in size. He had discovered likewise two small tumors above the left clavicle. He had now pain and tenderness in the tumor, and the former was so severe at night that he could not sleep without an opiate. This pain extended sometimes down the left leg and into the back. He experienced, likewise, what he called rheumatic pains in right leg and arms. In walking, he was disposed to favor the left leg.

"On October 25th, I again saw him at his house. The pain was now so severe in his side, and the tumor had increased so rapidly, that he was obliged to keep his room, and for the most part of his time his bed. The tumor extended to the right nearly as far as the *median line*, and below to the spine of ilium. Nearly in centre was a small prominence, which was quite soft, and a portion of the large intestine when distended with gas could be felt running over the tumor."

Mr. Hall, who examined his condition on December 10th, reports as follows:—

"Lying on back, although generally he lies on left side; countenance pale, indicative of much suffering; eyes sunken; much emaciation; mind clear, but rather excitable; skin cold and moist; at times has heat and dryness of it; pulse, average 80; respiration good, and respiratory organs well, so far as one can judge from external appearance, but I was unable to examine by auscultation, owing to the debility of the patient; appetite tolerable; some thirst." The left half of the abdomen was still more thoroughly occupied by the tumor, which extended from under ribs to symphysis, and from median line around to spine.

From this time until his death the tumor continued to augment still more rapidly. Paralysis of left leg supervened six weeks before death, with no loss of sensative power; frequent desire for micturition, which was not painful; no vomiting, diarrhœa or cough; no œdema of any part; intellectual faculties remained unimpaired to the last. He took no medicine but laxatives of the simplest kind, and opiates to relieve pain. Death took place January 25, 1842.

In regard to the hereditary tendencies of this patient, there seem to have been none leading to malignant disease. His mother died, aged 62 years, of an acute disease (called fever); his father is still alive, aged 67, subject at times to "*bilious colic*," but otherwise well; none of family, either direct or collateral, are affected as he was.

Autopsy, ten Hours after Death.—Emaciation not extreme; left ankle perhaps swollen; tumor in left side of abdomen very prominent, solid and regular, half filling abdomen, not pressing forward the parietes.

Tumor in neck perhaps two and a half inches in diameter, and composed of three or four regular, rounded, and pretty distinct masses as if glandular; skin loose that lay over. Muscles presented a very strange and new appearance; myriads of minute whitish bodies very distinct, and, when picked out, feeling rather hard or dense upon the nail. All the voluntary muscles exposed in the dissection were affected—cervical, pectoral, abdominal and crural; several in the cellular membrane between the great pectoral muscle and ribs; the heart was free from them.

Tumor in abdomen situated in cellular membrane, behind the peritoneum. Descending colon passed over its left side; left ureter passed across it, was traced from the opening in the bladder to about the summit of the tumor. Left common and external iliac artery passed across a considerable portion of the tumor, inferiorly and on the right side; the spermatic artery and vein ran across it in their usual direction, situated just below the artery. These vessels and organs were not imbedded, but lay directly on the surface of the tumor, unless perhaps the spermatic vessels superiorly and inferiorly, and upper portion of ureter, which seemed somewhat more intimately united to tumor. The last was filled by a reddish, gelatiniform, malignant matter, which adhered to its inner surface, and the parietes (of the ureter) being soon lost in the great mass of the tumor it was inferred that the tumor consisted of a diseased kidney. Late in the dissection, however, the kidney was found, and connected with it a considerable portion of healthy ureter. It would have been interesting to have ascertained how much of the canal was disorganized, but the parts had been too much cut upon for us to determine this point. It may be inferred that the extent of disorganization was not very great, as so much of the ureter was found in a healthy state, allowance being made for the stretching of a canal across the tumor. From the opening into the bladder it was of its usual size, and quite healthy till it reached the summit of the tumor, when the morbid deposit was first found adhering to its inner surface, and within less than two inches of this point the parietes of the canal were lost in the tumor. The iliacus internus lay behind or beneath the tumor; psoas magnus not seen. The tumor extended from the left groin nearly to the diaphragm, not dipping into the pelvis, adhered firmly to front and left side of spine (though not passing the median line), so as to require to be dissected away, the adhesions elsewhere being quite easily separated.

Character of the Tumor.—Weight, perhaps, five or six pounds; length twelve and a half inches; breadth and thickness about six; an

ovoid, tolerably regular mass, and of a fleshy consistence. There were vessels upon its surface beneath the peritoneum, which are so characteristic of malignant disease, apparently thin dilated veins. On being cut through in every direction, it seemed to consist mainly of an unorganized, dusky, yellowish, soft, loose, fibrinous mass, breaking open in many parts by its own weight, and for the most part more or less colored by dark effused blood, which in some places, though not to any considerable extent, constituted the chief mass of the tumor—there being, however, no very distinct coagulum. From several places a considerable quantity of thick, grumous, dark bloody fluid escaped when the tumor was raised. A very small quantity of encephaloid deposit found in one or two places; no gelatiniform matter nor scirrhus. A sort of cyst invested it anteriorly, which was mistaken for the investing membrane of the kidney, supposing the tumor to be formed by that organ.

Tumor in the neck consisted of an encephaloid deposit, resembling fœtal brain with effused blood, but did not extend below the first rib.

State of Organs.—In the lungs, one individual found a diseased mass three or four lines in diameter, of which there was a question between an abscess and an encephaloid deposit; otherwise no trace of encephaloid disease in any of the organs of the thorax or abdomen; no tubercles seen. Heart healthy; foramen ovale closed; stomach and intestines apparently well, but not opened; liver, spleen, right kidney and bladder, healthy. Left kidney not found for some time; it lay behind the tumor, and was much compressed by it; it was perfectly flattened out, pale, but healthy, no trace of encephaloid disease; pelvis and commencement of ureter rather large. Bladder contained ʒ ij. or ʒ iij. of a dark-red, bloody-looking liquid. Inflammation of left iliac and femoral veins, commencing perhaps about two inches from vena cava; vessels contracted; fibrin in them was somewhat mixed with blood that was dark, having in several places to a considerable extent a decided, and in some parts a *strongly-marked* dark yellow color, like an old apoplectic cavity in the brain. This fibrin separated readily from the parietes where an effort was made to raise it; no pus inside or outside the veins; this inflammation extended two-thirds down the thigh, as far as examined; no arteritis.

I have been thus minute in regard to the previous history of the patient, in order that, if possible, this case may aid in the discovery of the cause of the development of the parasitic animalculæ, concerning which I beg now to draw your attention. I regret that we did not examine the

other muscles, such as those of the intestines, &c. Circumstances prevented; but as this is the first time, so far as I know, that the *trichina spiralis* has been noticed in this country, the omission perhaps will be pardoned. I shall give first my own results, and afterwards the accounts of the animalcula that have come to us from Europe.

Appearance of the affected Cellular Membrane.—The muscles and cellular membrane underneath them seemed literally covered with myriads of minute white lines, looking at first sight like the ova of the common fly upon decaying animal matter. The bodies seemed to be attached rather to the cellular membrane running among the fibres, than to the muscular tissue itself. They lay parallel to the course of these fibres. They had no motion, and to the naked eye looked like simple lines. I attempted to approximate to the number which probably existed in the body, supposing the other voluntary muscles were as much affected by them as those mentioned above (vide autopsy). I and another individual counted the number contained in a superfices of a quarter of an inch square. Both of us counted many more than fifty. Calling, however, this number the mean for every quarter of an inch over the trunk of the body, and allowing ten layers only (which is a very small number, when we consider that not the thinnest lamina could be removed from a muscle without exposing new specimens of the same morbid phenomena) from the surface to the bones of thorax or peritoneum, we shall have as follows: $50 \times 16 = 800$ = number contained in a square inch; $800 \times 10 = 8000$ = number contained in solid mass an inch square and ten layers deep. Supposing the height of the adult trunk to be fifteen inches, and the circumference thirty-two inches, we have as follows: $15 \times 32 \times 800 \times 10 =$ 3,840,000, contained in the parietes of the trunk of the body. Supposing (what is still a moderate estimate) that the extremities taken together contain as many more, we have at least 7,680,000 of these minute bodies contained within the skin of this patient. Our wonder augments when we find that each of these bodies contains a minute parasitic animal!

Microscopic Observations.—By the use of one of Chevalier's very excellent achromatic instruments, I observed as follows:—They seemed regular oval-shaped cysts, very translucent in the centre, opaque at both extremities. Upon examining very minutely, something very indefinite and circular was seen lying in the cyst. At first I was disposed to believe that this spiral was an alimentary canal, but subsequent investigation proved otherwise.—(Vide figure 1.) Upon using a higher magnifying power, we

saw that while most of the bodies contained evidently a regular rounded worm-like body, others seemed opaque and yet very regular, whilst in one case the cyst had been evidently broken, and the creature had escaped from its interior.—(Vide figure 2.) In one case I observed two animals in one cyst. Dr. Farre has seen three, but this is very rare.

I attempted to learn the dimensions of the cyst. They were as follows:—Length, about one sixtieth part of an inch; breadth, one one hundred and twentieth. Unfortunately I had no micrometer when the figures of the cyst with the animal lying by its side presented themselves.

My examination convinced me that there was a living and moving worm (looking like a lumbricus) contained in a cyst of very delicate texture, and containing besides its living inhabitant a gelatinous mass. It was evidently alive on Saturday evening (patient having died on Tuesday, and the autopsy having been made on Wednesday). Most were very quiet, and but two were seen to move by several observers. At times the whole body stirred, causing an enlargement and diminution of the spiral shape. Usually only one extremity, however, was slightly but very distinctly agitated. When there was most motion, the gelatinous-like substance already mentioned was moved likewise. The length of time that life continued after removal from the body of the patient, seems curious to me. Owen has mentioned* the fact of life having been discovered two weeks after the death of the subject in whom they were found. I watched with great care to see if there was any internal motion of the worm itself, of an intestinal or circulatory nature, but I saw none. One of my assistants thought that he did discover something slight of the kind, but I feared at the time he was in error. I endeavored likewise to decide upon the internal structure, but I was baffled in a great measure. I could see evidently parietes of uniform thickness through whole length of body, and perhaps they were about one tenth as thick as the whole body, while a mass of some regularity filled the interior.

The accompanying drawings (figures 1 and 2) had been made, and many observations instituted upon the animal, when I learned that Mr. Owen, of the Hunterian Museum, had described it under the name of *Trichina Spiralis*, and upon examination I found that my drawings and his were nearly identical in their appearance.

The following is the history of the researches on the nature of the

* Zoological Transactions, 1835. Todd's Cyclopædia of Anatomy and Physiology, Entozoa. Or Medical Gazette, Vol. XV., p. 125, for analysis of same paper.

animal, so far as I have been able to learn them. Mr. Owen was the first who accurately described its external appearance and gave it a name. This he did in a communication to the Zoological Society in 1835,* and subsequently under the article "Entozoa."† It appears that he and Mr. Paget made contemporaneous examinations, and with equal success. But previously to either communication from Mr. Owen, Mr. Peacock, assistant to Dr. Hodgkin, had made a dry preparation of a sterno-hyoid muscle containing numerous specimens of it,‡ but the true nature of the affection was unsuspected. "A short time afterwards, Mr. I. Hilton observed two or three cases at Guy's Hospital, and drew up a good account of its occurrence and of the various appearances presented by the cysts, but the worm remained undiscovered, although microscopic examinations were made by Mr. J. J. Lister. Mr. Hilton prepared a paper§ upon the subject for the London Medical and Chirurgical Society, but its publication was suppressed by the Council." At a later period some specimens occurred at St. Bartholomew's Hospital, which gave origin to Mr. Owen's paper.‖ Mr. Owen's paper seems to have excited much interest, and a week after the abstract of it was made public, Mr. Wood, of Bristol, published an account of a dissection he made in 1834, and which Mr. W. had been unable to comprehend, until seeing the results of Mr. Owen's examination. The details of the communication confirm most of Mr. Owen's views, except that the animal occurred in an acute disease, and not in chronic complaints as previously.¶

Nine months subsequently to this paper, Dr. Farre, upon the appearance of the animal again in another subject at St. Bartholomew's, published a very able and interesting article. In this, besides confirming what had been previously discovered, he gives us more accurate ideas of the internal structure of the animal, and describes the alimentary canal, the ovary, &c.** (Figures 3 and 4, fac similes of Dr. Farre's drawings, represent this structure.) Professor Harrison drew

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* London Medical Gazette, April, 1835. Ibid., December 26, 1835, and Transactions of Zoological Society, Vol. IV.

† Todd's Cyclopædia, article above quoted.

‡ Hodgkin's Catalogue of Guy's Hospital Museum, Specimen 1361, A.

§ London Medical Gazette, February 2, 1833. This paper gives another curious instance of how near one may come to an important discovery, without, however, recognizing the chief object of interest. Mr. Hilton used the microscope so far as to decide that the cyst was probably entozoa (cysticerci, clustered together, yet he did not see the trichina. The same remark might be made of Mr. Wood's paper.

‖ Hodgkin's Lectures on Morbid Anatomy of Serous and Mucous Membranes, Vol. I., page 212.

¶ London Medical Gazette, May 9, 1835.

** Ibid., December, 1835.

the attention of the British Association to the discovery, at the Dublin meeting in 1835.*

In 1836 it was discovered by Dr. Knox, in his dissecting room in Edinburgh, and in the paper he published he mentions that the animal had been noticed in Ireland and France. He, however, confirms merely the results of previous observations in regard to the nature of the animal, though he has some interesting remarks upon the nature of the cyst, &c.† (Fig. 5.)

In the same year Dr. Hodgkin published a short notice of the worm,‡ and Mr. Curling published notices of two cases.§ Finally, Dr. Farre, whom we have already spoken of, gives a very full account of the matter in his article on "Worms found in the Human Body."¶

Nature of the Cyst.—The worm is never found except in a cyst, which is transparent in the centre, opaque generally at both extremities; at times, however, one end is like the centre, almost translucent. The ends usually are tapering, and some of them very elongated, usually forming thus an ovoid figure. The cysts are in most cases very numerous, and almost exclusively confined to the voluntary muscles—lying parallel to the direction of the fibres, the large flat muscles being most affected—pectoral, longissimus dorsi, &c. "It is an interesting fact that the muscles infested by the trichina are characterized by the striated appearance of their ultimate fasciculi."** At first it was supposed that they were exclusively found in the voluntary muscles; but the fact that they have been discovered in the muscles of the ossicula of the ear, &c., proves the reverse. They have never been seen in the heart or muscular fibres of the alimentary canal.

Anatomists vary in their opinions concerning the nature of the cysts. Mr. Owen believes them to be the result of simple inflammation induced by the presence of the animal. Its rough exterior, and its firm adhesions at both extremities to the cellular structure in the muscles, are some evidences of the truth of this assertion. Dr. Knox does not incline to this opinion, but regards cysts as necessary appendages of the animal. Inside of one, I observed a gelatinous mass that moved with the motions of the animalcula. Mr. Owen says the cyst is laminated, and the innermost

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* Reports of the Fifth Meeting of the British Association, 1835.

† Edinburgh Medical and Surgical Journal, Vol. XLVI., p. 86. Vide fig. 5, copied from Dr. Knox's.

‡ Lectures, &c., ut supra.

§ London Medical Gazette, February, 1836.

¶ Library of Practical Medicine, arranged by Alexander Tweedie. American edition, Vol. on Hæmorrhages, &c., p. 369.

** Todd's Cyclopædia of Anatomy and Physiology. Art. Entozoa.

layer may be separated entire like another cyst;* but he does not seem to imagine, as Drs. Farre and Knox do, that there are two cysts, an internal and external one. In fact, the former of these two observers regards the investigation of the nature of cysts as more difficult than that of the animalcula itself. Dr. Farre says he has occasionally seen the cysts in what he is disposed to believe their different stages of development—some being small and opaque, containing apparently no worm, but only some granular substance—others larger and split open. The former may be the young cysts; the latter, perhaps, present the last stage of development. Figure 5 presents a fac simile of this inner cyst or gelatinous mass, given by Dr. Knox.† The object as well as the nature of the cyst remains as yet wholly in the dark. It is difficult to separate the inner from the outer; but in recent specimens, by a dexterous use of a cataract needle, this may be accomplished. Mr. Owen makes them measure one fiftieth of an inch in length, one hundredth of an inch in breadth. This measure corresponds very nearly with my own. Though usually soft, or only gritty, at times they become ossified so as to dull the scalpel of the dissector.

Nature of the Animalcula.—When first discovered, it was classed by Owen among the lowest order of the animal creation—viz., in the *parenchymatous* class of Cuvier. No traces of a digestive apparatus were at first discovered. Subsequent investigations have raised the animal into the higher class, viz., *cavitary* of the same author, and *cælelmintha* of Farre.

The animal is filiform, smaller than any other human parasite, being one fiftieth of an inch in length and one seven hundredth of an inch in diameter; it is rounded, one extremity being smaller than the other, according to Dr. Farre, but according to Mr. Owen obtuse and equally large at both extremities. The truth, as it seems to me, lies between the two —the animal, as I thought, in some specimens, being flattened at one extremity, so that viewed in one direction it would appear very thin, in another quite as large as the other extremity.

Dr. Farre first described an alimentary canal. (Figure 3.) "Commencing from the large end of the worm, *a*, the canal is seen bounded by two slightly irregular lines running parallel to each other, for the distance of rather more than one fifth of the length of the body, where they terminate in a transverse line, *b*, presenting a slight concavity to-

* Todd's Cyclopædia of Anatomy and Physiology, page 14," Entozoa."
† Edinburgh Journal, Vol. XLVI., page 86.

wards the large end, which line I have observed in almost every specimen I have examined. From this point the canal puts on a sacculated appearance, *c*, *c*, and these sacculi appear as if bound down by a line extending along the surface of the canal in the direction of the axis. This sacculated appearance becomes gradually lost towards the smaller end, where the part assumes a zig-zag or perhaps a spiral course, *d*, and at length terminates in the small end."* Dr. Farre saw this canal move inside of the animal—and once, in cutting the animal in halves, the sacs were protruded, as is described in figure 4.

Mr. Owen, in the early part of his investigations, discovered an aperture at *a*, which he regards as the mouth. Recently he has seen a small slit at the other extremity, at *e*, which he calls the anus. Drs. Farre and Knox have observed the same. Another feature, first pointed out by Dr. Farre, was a small body, *f*, or a collection of ten or twelve granules about one fifth of the length of the body, from the blunt end, and occupying one half of the diameter of the body. This he considers the ovarium, and it is found very frequently. No nervous system has been discovered.

Finally, Mr. Owen regards the *Trichina* as not a distinct species, but probably the young of some other genus—perhaps a strongylus.

Symptoms produced by the Animal.—Nothing satisfactory has been discovered upon this point. Our patient had a kind of "rheumatic" pains in various parts of his body. In other cases the physicians could discover nothing; and I am by no means disposed to refer such a vague symptom to the presence of the animal in the case actually under our notice. In Mr. Hilton's case there were observed numerous animalculæ, apparently "common lice," upon the head and face of the patient, who was cleanly at his entrance to the hospital, and was not near any one from whom he could have received a new supply. "The hair became matted together, and superficial ulcerations were observed on the integuments of the head. The hair was removed by shaving, but after death, when it was about a quarter of an inch long, another accumulation of lice was found."† Whether these were connected with the *Trichina*, I do not learn.

It is connected with no particular disease, though from the seven cases on record that I have been able to find, it usually occurs in chronic

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* London Medical Gazette, December 12, 1835, and Library of Practical Medicine, ut supra.
† Ibid., January, 1833.

organic disease. It has, however, been found in a man who was killed apparently in perfect health. On this subject, the list of recorded cases may be consulted at the termination of this article.

How is it introduced into the body? On this point we may refer to some of the most common theories and facts relative to the introduction of parasitic animals into *any* part of the system.

1st. Ova are sometimes introduced in connection with food, water, or the more solid articles. The ova, for instance, of the Guinea worm may be received in this way. Dr. Chisholm, in a very interesting paper upon this subject,* makes it almost certain that a part of the well-water drunk by the laborers in the island of Grenada contains numerous ova of this parasite. It appears that at one time the worm was apt to be epidemic among the laborers, so that during the months of November, December, January and February, for several years in succession, they were wholly prevented from work. Finally, it was remarked that those alone were diseased who drank of the water of certain wells near the sea shore, that were affected by the tides, they being sunk in a kind of tuf, and only a hundred yards from the salt water. The whites and domestic negroes who used rain water were not affected by the worm. By building tanks for rain water, and by avoiding totally the well water, the worm never returned upon the plantation negroes. The ova in this instance must have been so minute as to be imperceptible to the sight, the water being perfectly transparent, and in taste only a little brackish.

The disease called "botts," in the horse, is caused by the ova of the fly being taken into the stomach from the skin of the animal where they are frequently deposited in great numbers in the form of little white specks.

2d. The œstrus deposits its ova in the skin. The Guinea worm likewise infests the backs of the water-carriers and feet of the pedestrians during the wet season in Bombay, where the soil is of an argillaceous nature. In both of these instances the animal in its perfect form insinuates itself into the skin, the backs being affected in one case from the escape of water from the leathern bottles, and in the other case the feet are attacked in consequence of constant soaking in the water and mud.

3d. There are germs of plants constantly floating invisible in the air. May there not be some ova of animals, in a like minute and volatile shape, which may be received into the body through the respiratory organs, and having found a proper nidus in the muscular apparatus or else-

* Edinburgh Medical and Surgical Journal, April, 1815.

where, be there developed. This certainly happens in plants; why not in the case of these minute animals?

4th. The doctrine of equivocal generation might be brought forward. Neither Muller* nor Hodgkin† seem disposed to deny that this may actually take place. In fact, they both lean to the belief that it may at times occur, though neither is disposed to refer to it everything which seems difficult of explanation in the formation of animals. Moreover, direct experiment rather tends to disprove the doctrine.

But to return to the trichina among the seven cases whose records I have seen; none have afforded sufficient details in regard to the hygienic influences to which the patients had been exposed. When I connect our present case with what has been stated in reference to the Guinea worm, it seems more interesting than any previously published. This creature, the Guinea worm, as I have already stated, is brought into the system by water that is drunk, or with which the exterior of the skin happens frequently to be in contact. In the island of Grenada, the sea-water washes into the wells, which are dug in the *tuf* soil. In Bombay the rainy season produces epidemics of this worm from an *argillaceous* soil. May not the sea-water of this country, acting upon its soil, set free the entozoic animal now in question? Is it possible that the ova are in the water itself under certain circumstances? Our patient, it will be remembered, was exposed for an hour to the action of salt water. He has never felt well since. He in fact attributed his "tumor to a part of the water that was never removed from him." However absurd this opinion may seem, it proves one thing, viz., his bad health since that time. For several years he has kept a fruit cellar, in which the salt water has at times been eight or ten inches deep; and after the ebb of the sea, the whole atmosphere has been filled with the steam from the saturated earth, augmented by the large fires that he built in order to keep the place fit for habitation. The animals are scarcely visible to the naked eye. Is it difficult to suppose that the ova may have been wafted upon the vapor? or perhaps some of the trichina may have found their way into the stomach of the patient, when we remember that he probably drank water that may have been somewhat deteriorated by exposure in his cellar.

But after all, this is a mere hypothesis. It may be said that thousands of fishermen are equally exposed, and few are affected. In answer, I would state that I throw this out as a suggestion for future observers, and not as an explanation. Moreover, I would remark that probably the

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* Elements of Physiology, Baly translation, page 16, Vol. I.

† Lectures, &c., as above, Vol. I., page 217.

reason that the parasite is not found oftener, is owing to our want of care in post-mortem examinations. The question, however, of how the animal got into the patient's body, is yet, and I fear may continue to be, wrapped in darkness; but I thought the Society would feel interested in the subject, as, to say the least, it is new. Only a few specimens of the animalcule have been found in Great Britain, fewer still on the European Continent. I think this is the first time it has been seen in America, and therefore it is worthy of our attention. If my suggestion in regard to the introduction into the system in the present instance seems untenable, all that can be said is that it shares the fate of many other more ingenious *apparent* solutions of difficult problems.

I subjoin a list of the recorded cases that I have been able to find, together with a few hints as to the best method of examining the animal; and I quit the subject with the wish that it should be watched for more carefully, and if found, the previous history of the patient, and the results of post-mortem examinations, should be accurately detailed.

Number of Recorded Cases.

Mr. Hilton,	Lon. Med. Gaz.	Jan. 1833,	Cancer penis,	æt. 70,	male.
" Wood,	" "	May, 1835,	Rheumatism,	" 22,	"
" Owen,	" "	Dec. 1835,	Tubercles,	" 50,	"
" Owen,	" "	Dec. 1835,	Ulcer,		female.
" Curling,	" "	Feb. 1836,	Good Health,		male.
" "	" "	Feb. 1836,	Aneurism,		"
" Knox,	Edin. Med. Jour.	July, 1836,	Diarrhœa,	" 65,	female.

Method of examining the Animal.—Cut a very thin slice of the affected muscle, and place it on a piece of glass; stretch until it is translucent, then compress still farther with a piece of talc. In this way, with a microscope of little power, you will see very distinctly the cyst. To examine the structure of the *animalcula*, more care is requisite. You will isolate a cyst, and with a delicate cataract needle you may cut open one end of it, and by pressing a little on the other the worm will come out, either alone or enveloped in the gelatinous mass surrounding it. Straighten it by means of two needle-points, and you may then examine its structure, and for this a very powerful instrument is needed. I have preserved some specimens by drying and varnishing a very thin lamina of muscle.