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With the Author's best regards.

A SEQUEL TO

Abnormal Entozoa in Man.

A Paper read by Rev. Samuel Lockwood, Ph.D, before the New Jersey State Microscopical Society, March 21, 1881.

[*Reprinted from the American Journal of Microscopy for May,* 1881.]

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A SEQUEL TO

Abnormal Entozoa in Man.*

BY REV. SAMUEL LOCKWOOD, PH.D.

SUNDRY reasons seem to require a few corrections and additions to my paper on "Abnormal Entozoa in Man," read before this Society, at its meeting, in November last. When preparing that paper, my health was such as to forbid much book research. Moreover, my specimen of *Mermis*, and the letter from the donor, were mislaid. Since then, both have been found. I should also add that the publication of the paper has been followed by some instructive correspondence with men eminent in a kindred line of work.

Here is that specimen of *Mermis albicans*. The letter says the writer found it in the core of an apple which he was eating, at Unionville, Orange Co., N. Y. It is dated Oct. 13, 1873, not 1876, as appeared in my article. The donor states that before being put in spirits, it was "white as snow." It soon changed to a cinnamon brown. I should mention here, that in vol. vii, *Popular Science Monthly*, for 1875, p. 506, is a note saying that I had exhibited a specimem of *Mermis acuminata* to a quasi-scientific body, met in Rutger's College. This is that specimen, and to it I gave Leidy's name *acuminata*, which, however, upon better knowledge, I have since assigned to *M. albicans*. The latter fact called forth from a learned naturalist an adverse, though private and kind, criticism; whereas Mr. Lintner, the accomplished State Entomologist of New York, writes me: "In assigning your species to *albicans*, you are up to the last hour of science." It is true that Leidy, supposing he was dealing with a new species, named it *acuminata*. This was in 1875, and he says his specimen was a female, and "parasitic in the larva of the Codling-moth, *Carpocapsa pomonella*." As to the sex, farther on it will appear that it was an error, as the entire species at that stage are sexless. In Hayden's Ninth Annual report, Packard gives the American species of Mermis: *M. elongata*, Leidy; *M. crassicaudata*, Leidy; and *M. acuminata*, Leidy. In the first joint report of the United States Entomological Commission, (pp. 333, 334), of which Packard is a member, it appears that Siebold had named the species found in *C. pomonella*, *acuminata*, but that now he regards the name as simply indicating a certain larval stage in all the

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species: for, "from the studies of [Siebold] Diessing, Meissner, and others, it has been concluded that *M. albicans* is but the mature sexual form of *M. acuminata*, which is the asexual form of [all] the species."

It is now known beyond all doubt, that the larvæ of *Mermis albicans*, both here and in Europe, enter the larvæ of the Codling or apple moth. Thus the caterpillar takes its entozoon with it into the apple—and if this does not explain that royal mystery, how the apple got into the dumpling, it does clear up the entomological query, how albicans got into the apple. The mermis at this stage has no mouth, nor anal duct, nor alimentary canal. It lives and grows within its host, which it consumes by endosmose absorption simply, the guest using up its host, much as some bipedal sponges do. Leaving the apple it enters the ground an asexual individual. A fatty mass becomes developed into these parts which make the sexual differences. The two sexes unite in the wet ground, the pair looking as if tied, perhaps in a lover's knot. The female lays her eggs in the same place. The larvæ seek out insect grubs in the ground, or even at the surface, into which they enter. The point of mystery still is how this little Mermis worm gets at the Codling caterpillar. The same difficulty, however, obtains with the Gordius, or Hair-worm, which is sometimes found in the katydids, seeing that both katydid and Codling, are arboreal beings; but our *Mermis albicans* "is of the earth, earthy." Its life career begins in the ground, and Siebold suggests that the young worm may on wet days climb the trunks of trees, and falling in with the young caterpillar about boring the apple, it there and then, bores the little Codling as an unwelcome guest. Of course, this is opinion, but from Siebold it is entitled to weight, since this able zoologist conducted, with much patience and skill, a series of experiments to determine some habits of the larval Mermes when seeking their insect hosts.

As to Gordius, the Hair-worm, Diessing says, that a girl in Ohio passed *per anum* *G. varians*. In Europe the belief is general that they enter man with the water which he drinks. We think it not unlikely, that *Mermis* sometimes enters man with his food. Hence, may be adduced two important considerations. Gordius, when in a fertile state, lives in the water chiefly. Herein lies the danger to man, and other animals.

Mermis, when occupying insects or fruit, is asexual, and is only fertile in the wet ground, in which state it is hardly probable that it could enter by accident either man or beast.

In the paper to which this is an appendix, I referred to a specimen of that pygmean fish, the Ten-spined Stickleback, *Pygosteus occidentalis*. I have here drawings, exact life-size.

Fig. 1 is a portrait of the fish, showing the belly distended by the presence of larval Gordius, or Hair-worm within. Fig. 2, shows the worm as it was in a snarl or ball in the fish. Fig. 3, shows the same when uncoiled. I have here under the microscope, mounted in a cell of glycerine, the pretty fan-like tail of the fish. It will aid to a conception of the small size of the animal. But it has another interest, which

Fig. 1.

Fig. 2.

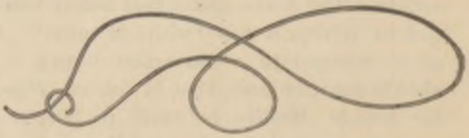

Fig. 3.

decided my making the mount, which is now some seven years old—the tail fin is attacked by the aquatic fungus *Saprolegnea*, the cause of a destructive disease among fishes.

Referring to the larvæ of the Anthomyia, or Flower-flies, which were discussed in the former article, and which, as stated, were voided by a teacher, it might be asked—what about this change of food, and appetency; for these grubs were really vegetal feeders, but in their new habitats, they must feed on an altered and mixed diet? Perhaps we are but just beginning to observe correctly on these matters. Rily gives instances where the *Anthomyia*, or Flower-fly, lays her eggs in the nidus of the Rocky Mountain locust, that is, the grasshopper, *Caloptenus spretus*, and the grubs suck out the juices of the locust eggs. Surely this is encroaching on animal food. Yet Rily contends that this is but a variety of *A. radicans*, the radish-fly,* whose larvæ, by feeding on this esculent, make it worthless for man, and he assigns to this devourer of locust eggs, the name, *Anthomyia radicans*, Var. *Caloptena*.

In the article which we are now supplementing, I stated that an undoubted American instance of a beetle entozoan was not known to me. We can now pick up "the missing link." Under this microscope is an interesting specimen presented by our fellow member, Dr. Shannon, to whom it was given by the mother of his patient, a girl suffering with diphtheria in New Brunswick, N. J. The child ejected it from the mouth by coughing a few days ago. Alas, it is but fragmentary, for only a portion of the anterior part is here. The mandibles are quite distinct, and really formidable. It is clearly a coleopteran larva, and is quite suggestive of the larvæ of the minute beetles, *Bembidium* and *Cillenum*. "These," says Packard, "are found abundantly under the refuse of freshets, and tides, preying upon dead animal matter, and (living) insects." Hence it may have been taken with food in a cooked condition, or in some other accidental way it could be taken living, as if fish accompanied with shore debris, should have been in contact with fruit or other vegetables, at the store, or at home.

We have medical authority for a number of instances of so called "larvæ of *Oestrus humanis*," having been found in the human stomach. I do not myself believe in such a species, as a human bot-fly. If those larvæ were true Oestridæ, they have been adventitious, and the eggs were accidentally swallowed from contact with some domestic animal.

It is profoundly interesting to know that the larvæ of such aerial, sunlight-loving creatures as the diptera. can live and attain the pupa state as accidental parasites in the human alimentary canal. Could this continue for a few consecutive generations, I doubt not that there would be a fetch-up in a decided degradation in the direction of well marked pseudelminths. What opulence of organs, and functional capacity do we not observe in the higher grades of insects! Here we should find a steady impoverisation of this organic affluence. Confined to that busy dismal laboratory, the digestive tract of their animal host, with its acid, and heat, and mucous slime, and darkness, it is sure that organic reduction would rapidly set in, and they would soon become eyeless, wingless, and footless, as the first stage of change. Take even an ectozoon, or external parasite, and is it not indisputably a morphological pariah in its own class? *Pediculus*, the body louse, is a wingless hemipteran, hence, is true cousin to cicada, the great harvest-fly; and *Melophaga* the bird mite, and *Pulex*, the flea, are real diptera, and although wingless are true cousins to the flies—of so noble a stirp were their ancestors; but established as parasites they are reduced to these degraded forms. There seems really a parallelism in the lines of movement of the material, and the moral forces, for whether in the domain of the physical, or the moral, parasitism gravitates toward degradation.

Should any desire to read on the Gordiaceæ, which embraces the genera Gordius and Mermis, the following sources are accessible.

1—The Gordius, or Hair-worm. By Prof. Joseph Leidy. May, 1870. *American Entomologist*, vol. ii. p. 193.

2—*Gordius and Mermis.* By Dr. Packard, Hayden Annual Report, Geol. and Geog. Survey of the Territories, for 1875, pp. 662–667.

3—*On Mermis Acuminata.* Leidy. Entomological Contributions, No. IV., Art, i. By J. A. Lintner. Albany, N. Y. 1876.

4—First Report of the United States Entomol. Com. for 1877, pp. 326–334. Gordius and Mermis.

5—For interesting Experiments with larvæ of Mermis, see "On Tape and Cystic Worms. By Carl Theodor Von Siebold. Translated by J. H. Huxley." In Kuchenmeister's Manual of Parasites, vol. ii, Sydenham Society's Pub's., pp. 8–12.

6—Entozoa. By Cobbold. 1864. London. See Family II, Gordiidæ.

NOTE.—Since this paper was read, a specimen has been submitted to me by Dr. Ephraim Cutter, received from Houston, Fla., where it was obtained from the fæcal discharge of a woman. It reached me dead, and proved to be a dipteran grub, of the family *Muscidæ*.

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