

germs continue to develop. The injury done by the parasites to the snails causes serious mortality amongst them, especially at the time the radice begin to leave the sporocyst, for the former are much more active than the almost inert sporocysts, and migrate from the pulmonary chamber into the other organs of the snail, and particularly into the liver, upon which they feed. The radice can be observed with the microscope, through the transparent shell, moving in the snail's liver. So great is the injury done, that in the laboratory, at any rate, very few snails survive three weeks from infection.

The redia increases in size, and may ultimately reach the length of 1.3 mm. or about one-twentieth of an inch. It resembles in every respect the radice I formerly described as found in the same snail at Wytham. Its contents of spherical cells arranged themselves into round germs as in the sporocyst, though I was able in this case to observe the formation of a gastrula. The germs at first were spherical, they then become oval, and afterwards they elongate still more, whilst one end becomes narrower than the other. The narrower end is partially constricted from the remainder, and becoming long and slender, forms the tail of the cercaria, whilst the rest of the germ becomes the body. A sucker appears at the anterior end, and another of nearly equal size at the middle of the ventral surface of the flattened body, whilst within a digestive tract appears. This digestive tract is simply forked, and presents no trace of the lateral branches so characteristic of the adult.

The adult redia contains about a score of germs, but these are in very different stages of development. There are generally two or three nearly mature, the others in various stages down to small spheres of cells. Close to the raised ring surrounding the body of the cercaria there is a small opening, as in all rediæ, by means of which the cercariæ are destined to be liberated one by one as they come to maturity.

But not all the radice produce cercariæ, for they sometimes produce other rediæ, and these daughter-rediæ then give rise to cercariæ. These latter, therefore, sometimes only appear as the fourth generation in the snail; and in one set of experiments I had reason to believe that no cercariæ appeared earlier. It will thus be seen that a single embryo may give rise to more than a thousand cercariæ.

On October 9 a paper, by Leuckart, appeared in the *Zoologischer Anzeiger*, a periodical which gives rapid publication to important papers. In this Leuckart extends his former results, and states that he too has reared the cercaria of the liver-fluke in *L. truncatulus*, and finds that it is the form with the lobed lateral

organs which had already seen, and supposed to have no connection with the liver-fluke. It will be seen, therefore, that the cercaria of the liver-fluke is really the form found by me in *Limnæus truncatulus* at Wytham, and described in the Royal Agricultural Society's *Journal* for 1881. It is interesting to see this result confirmed, not only by my own experiments, but also by Leuckart's independent investigations.

For further details of the structure and natural history of the liver-fluke, as well as the discussion of preventive measures, I may refer to my reports in the *Journal* of the Royal Agricultural Society.

#### AN INVITING FIELD FOR THE AMATEUR.

It does not follow that, because a young man is the son of a farmer, and has grown up to manhood on the farm, he is competent to become a successful amateur breeder of the better classes of farm stock. Taste and precision in practice—and this latter qualification comes only to those possessing tact and judgment—are far more necessary than that it can be merely said of a young man that he has been raised on a farm, and has been accustomed to the routine of ordinary farm work. This routine, in part, fits the land for grass, thus forming the foundation for the breeder to commence upon. It also puts the grain in the bin and the hay in the stack as a commencement for the man who practices the higher art, namely: that of breeding improved farm animals.

A superficial view may lead a man to imagine that the field of raising purely bred stock is already fully occupied, and that for any other than an expert to enter this field is simply an act of presumption; that there is great liability of overdoing the business, and hence good reason for caution. Now, who ever knew of a lot of good farm stock of any sort, no matter how apparently hid away in an obscure neighbourhood, if of fair quality, and ready for market, for which there were not ready buyers. This is not the case in other lines of business, as we are constantly confronted with announcements of overstocking in various lines of manufacturing, and consequent failures, simply because there are not buyers.

Due weight is not usually given to the fact that improving a breed of domestic animals does not necessarily add to their fecundity, but rather, in certain hands, their tendency to increase is lessened, while an important item in the case of manufacturing rests in the increased facilities for turning off work. A moment's reflection will show another point of difference in the case of meat-producing animals. The coat worn may be made in a day, but it wears a year. The car-

riage used is made in a month or two, but may last a decade. A set of furniture made in a month, will last a lifetime, while the flesh of the meat-producing animal, which it has taken from one to three or four years to grow and prepare for market, and several months longer, if we count the time it was carried in the dam, is consumed in a day.

So, upon these reasons in part, the breeding of the higher types of domestic animals may be put forward as one of the best fields, if not the very best for capital, provided, always, that the investments and the management are guided by the highest order of taste, business tact, and energy. It is not an insurmountable barrier for a young man with means, and a taste that way, to say that he is not acquainted with the business, because all lines of business abound with experts, whose fountains of knowledge can be successfully drawn from. Perhaps there is no class of men who can so well be relied upon to give opinions and advice to beginners as breeders of improved stock, and this, too, without hope of pecuniary reward.

The beginner, if he wishes to master the business in all its aspects, should familiarize himself with the leading stock literature, that referring to the past as well as that relating to the present. The young man at the desk, or behind the counter, having means, and a taste for out-door pursuits, with an especial liking for the business referred to, may enter the field as safely as he that has been reared with his hand upon the handle of the plow. His means, under proper advice, can, as a rule, be far more safely placed than in manufacturing, or in any mercantile pursuit. If he secures the best, whether cattle, horses, sheep, or swine, he gets the advantage of other men's years of successful effort; whereas if he takes up with the culls, he pays good money for other men's mistakes and failures.—*National Live Stock Journal, Chicago, Ill.*

ENSILAGE.—Mr. Atkinson, of Boston recently sent a cask of maize fodder and a cask of rye to Professor Voelcker, the well known agricultural chemist of England, with the view of showing the sort of ensilage prepared in America. Having analyzed the samples the Professor reported the maize fodder to be perfectly sound and the rye very slightly mouldy; but both were wholesome food for cattle. A little cottonseed meal having been added to the fodder it was given to cows on an experimental farm. They took to the ensilage at once and evidently enjoyed it. With careful management Mr. Atkinson calculates that four cows can be maintained in good condition to one acre of ensilage.—*Scientific American.*