

THE TAIL OF A TADPOLE.

Is any one partial to bull-frogs? can any one but the gournand who loves their hind legs served up in white sauce, find any interest in such unwieldy, unmusical, and lopping animals, who have not even the toad's redeeming feature of wearing a jewel in their heads? Yes! some can. The naturalist who loves to investigate all that God has made, and who regards none of his works as "common or unclean."

If to the common mind, frogs are uninteresting, how much more so must Froggy junior, the little black and wriggling tadpole be! What can be found in him worth studying? Science answers that his very tail is a world of mystery and full of wonders as a conjuror's box. Listen how it is described by that loving naturalist and pleasant writer, C. H. Lewes, in the first number of the new English periodical called *Once a Week*:—

A blade of grass is a world of mystery, would men observingly distill it out. My erudite friend, Gerunds, glancing round my workroom, arrested his contemptuous eye on a vase abounding in tadpoles, and asked me with a sniffing superiority, "Do you really mean to say that you find any interest in these little beasts?"

"As much as you find in *Elzevirs*," I energetically answered.

"H'm!" grunted Gerunds.

"Very absurd, isn't it? But we have all our hobbies. I can pass a bookstall on which I perceive that the ignorance of the bookseller permits him to exhibit an edition of *Persius* among the rubbish at 'one shilling each.' The sight gives me no thrill—it does not even slacken my rapid pace. But I can't so easily pass a pond in which I see a shoal of tadpoles swimming about, as ignorant of their own value, as the bookseller is of *Persius*. I may walk on, but the sight has sent a slight electric shock through me. Why, sir, there is more to me in the tail of one of these tadpoles than in all the poems of that obscure and dreary *Persius*. But I won't thrash your Jew unless you thrash mine."

"Why what on earth can you do with the tail?"

"Do with it? Study it, experiment on it, put it under the microscope, and day by day watch the growth of its various parts. At first it is little but a mass of cells. Then I observe some of these cells assuming a well-known shape, and forming rudimentary blood-vessels. I also observe some other cells changing into blood-cells. Then the trace of muscles becomes visible. These grow and grow, and the pigment-cells, which give their color to the tail, assume fantastic shapes."

"Very interesting, I dare say."

"You don't seem to think so, by your tone. But look in this vase: here you see several tadpoles with the most apologetic of tails—mere stumps, in fact. I cut them off nine days ago."

"Will they grow again?"

"Perfectly; because, although the frog dispenses with a tail, and gradually loses it by a process of resorption as he reaches the frog form, the tadpole needs his tail to swim with; and nature kindly supplies any accident that may deprive him of it."

"Yes, yes," added Gerunds, glad to feel himself once more in the region of things familiarly known: "just like the lobster, or the crab, you know. They tear off their legs and arms in the most reckless manner, yet always grow them again."

"And would you like to know what has become of these tails?"

"Arn't they dead?"

"Not at all. 'Alive and kicking.'"

"Alive after nine days? Oh! oh!"

"Here they are in this glass. It is exactly nine days since they were cut off, and I have been watching them daily under the microscope. I assure you that I have seen them grow, not larger, indeed, but develop more and more, muscle-fibers appearing where no trace of fiber existed, and a cicatrice forming at the cut end."

"Come, now, you are trying my gullibility!"

"I am perfectly serious. The discovery is none of mine. It was made this time last year by M. Vulpian in Paris, and I have only waited for the tadpole season to repeat the observations. He says that the tails constantly lived many days—as many as eighteen on one occasion; but I have never kept mine alive more than eleven. He says, moreover, that they not only grow, as I have said, but manifest sensibility, for they twist about with a rapid swimming movement when irritated. I

have not seen this, but M. Vulpian is too experienced a physiologist to have been mistaken; and with regard to the growth of the tails, his observations are all the more trustworthy because he daily made drawings of the aspect presented by the tails, and could thus compare the progress made."

"Well, but I say, how the deuce could they live when separated from the body? our arms or legs don't live; the lobsters legs don't live."

"Quite true; but in these cases we have limbs of complex organization, which require a complex apparatus for their maintenance; they must have blood, the blood must circulate, the blood must be oxygenated—"

"Stop, stop; I don't want to understand why our arms can't live apart from our bodies. They don't. The fact is enough for me. I want to know why the tail of tadpole can live apart from the body."

"It can. Is not the fact enough for you in that case also? Well, I was going to tell you reason. The tail will only live apart from the body so long as it retains its early immature form; that is to say, so long as it has not become highly organized. If you cut it off from a tadpole which is old enough to have lost its external gills a week or more, the tail will not live more than three or four days. And every tail will die as soon as it reaches the point in its development which requires the circulation of the blood as a necessary condition."

"But where does it get food?"

"That is more than I can say. I don't know that it wants food. The power of abstinence possessed by reptiles is amazing. I was reading the other day an account of a reptile which had been kept in the Boston Museum for eight-and-twenty months without any food, except such as it might have found in the small quantity of dirty water in which it was kept."

"Really I begin to think there is more in these little beasts than I suspected. But you see it requires a deal of study to get at these things."

"Not more than to get at any of the other open secrets of nature. But since you are interested, look at these tails as the tadpoles come bobbing against the side of the glass. Do you see how they are covered with little white spots?"

"No."

"Look closer. All over the tail their are tiny cotton-like spots. Take a lens if your unaccustomed eye isn't sharp enough. There, now you see them."

"Yes; I see a sort of fluff scattered about."

"That fluff is an immense colony of parasites. Let us place the tadpole under the microscope, and you will see each spot turn out a multitude of elegant and active animals, having bodies not unlike a crystal goblet supported on an extremely long and flexible stem, and having round their rim or mouth a range of long delicate hairs, the incessant motion of which gives a wheel-like aspect, and makes an eddy in the water which brings food to the animal."

"Upon my word this is really interesting! How active they are! How they shrink up, and then, unwinding their twisted stems, expand again! What is the name of this thing?"

"*Vorticella*. It may be found growing on water fleas, plant, decayed wood, or these tadpoles. People who study the animalcules are very fond of this *Vorticella*."

"Well I never could have believed such a patch of fluff could turn out a sight like this: I could watch it for an hour. But what are these small yellowish things sticking on the side of parasites?"

"These, my dear Gerunds, are also parasites."

"What, parasites living on parasites?"

"Why not? Nature is economical. Don't you live on beef and mutton and fish? Don't these beefs, muttons, and fish live on vegetables and animals? don't these vegetables and animals live on other organic matters? Eat and be eaten is one law; life and let live is another."

Gerunds remained thoughtful; then he screwed up one side of his face into frightful contortions, as with the eye of the other he resumed his observations of the *Vorticella*. I was called away by a visitor to whom I didn't care to show my tadpoles, because to have shown them would have been to forfeit his esteem for ever. He doesn't think very highly of me as it is, but has a misty idea that I occupy myself with science; and as science is respectable and respected—our Prince Consort and endless bishops patronizing the British Association for

the Advancement of Science—the misty idea that after all I may not be an idiot, keeps his contempt in abeyance. But where he once to enter my work-room and see its bottles, its instruments, its preparations, and above all, the tadpoles, I should never taste his champagne and claret again.

AMERICAN MOWING-MACHINES IN ENGLAND.

While the armies of France are winning battles on the plains of Italy, our American inventors are achieving more noble victories on the plains of Great Britain. The *Liverpool Mercury* informs us that a recent trial took place at the farm of Jonathan Bell, of Blakelow Hall, with one of "Wood's American Combined Reapers and Mowers," and its performance gave the highest satisfaction to a large concourse of gentlemen who had assembled to witness its operations. The *Mercury* says:—

"The place selected for the trial was a piece of rye-grass, mixed with clover, of fair average growth. The experiment was highly successful, and many of the gentlemen present expressed themselves in terms of commendation as to the admirable manner in which the work had been performed. It ought to be stated that the unevenness of the ground presented what might be considered as obstacles to the machine; but these were overcome without any difficulty. In fact, the test being more severe than it would have been under ordinary circumstances, brought the peculiar advantages of the new principle more prominently into view. By an easy and simple adjustment, the machine may be employed in reaping corn and cutting grass or clover, combining all these powers in a most efficient manner. Two other machines were exhibited at the same time—one for tending or spreading hay, and the other a horse-rake, for collecting it and saving it from damage by exposure. These apparatuses are useful accompaniments to the mowing-machine previously described, all of which will, no doubt, as they become more generally known, be extensively used in agricultural operations. Towards the close of the day, the mowing-machine was tried in another field on Mr. Bell's farm, and with even greater success than in the first instance, from the more favorable character of the ground. Several of the gentlemen present, accompanied by Mr. Bell, inspected his farm, which is being fitted-up on the model principle, with new machinery and other appliances for conducting agricultural operations on an enlarged scale. We may add that Mr. Bell himself bore testimony to the advantages of the reaping and mowing-machine, which had been so successfully tested on his grounds."

The term *corn*, in the above extract, is used for oats, the name by which this grain is most commonly known in Great Britain. The horse-rake and hay-spreading machines, which accompanied the mower, were also American inventions, as we understand it.

We also learn from the Glasgow (Scotland) *Morning Journal*, of June 11, that a contest with one of Wood's machines, and one made at Stirling, in that country, by a Mr. Gardner, took place near Glasgow on the day previous to the above date, and which ended in the complete success of the American mower. There were several judges present from an Agricultural Fair then being held in Glasgow, and there was a great crowd of very intelligent farmers present. The *Journal* says:—

"Two fields of grass were placed at the disposal of the judges, and Wood's machine was first set to work upon a slightly hilly field of somewhat light grass. It was drawn by two horses, and without any 'swath' being cut, the machine was driven right to the top of the field, returned, and cut out a small square across the field. In crossing, the side-furrows were very deep, yet the machine worked without the slightest difficulty, making a clean and satisfactory cut."

Mr. Gardner's machine was next set to work in the same field; it was likewise drawn by two horses, and made a very creditable appearance, although it was quite evident at the first start that Wood's machine had an immense advantage by being provided with a guiding-pole, and from the complete arrangements for lowering and raising the cutters and working the machine. But the difference became more apparent when the two machines were set to work upon another field of remarkably heavy grass. There Wood's machine did even better work than upon the lighter grass, cutting close and regular, being easy of draft, and, after the horses became accustomed to it, was driven and worked by one