

as its outside. The caterpillar, therefore, has not only to get a new skin for the outside, but also a new skin for all those parts in the inside, for there is no difference between the mode of growth of the skin inside and of that outside. Neither of them grow larger; and it will easily be understood that if the skin of the outside alone was renewed, and that of the inside left in, the caterpillar would not be much the better of the new coat to his back. The growth of all parts of the body must proceed at the same time. So the caterpillar gets rid of its skin, both outside and inside. The first symptom that it is going to do so is, that it gives over eating, and becomes restless and uneasy for a day or two. At this time portions of the skin of the inside are seen to be voided along with what it has been feeding on. How it has got these off we cannot see, but we can see how the process goes on on the outside. There must be a crack in the skin, and the old skin is ready to burst. An opening in the skin would not be of much use to it, if the skin stuck to the body as closely as ours does, or even as closely as its own skin usually does.—But a new skin has gradually grown below the old one, and is only loosely attached to it. The caterpillar then twists, and wriggles, and jumps about in the most extraordinary manner, the effect of which is, that it becomes loose. It then bends down its head to its tail, and pushes out its back till the skin begins to split, which it does longways in the middle, a little behind the head. When it has once begun to crack, it continues to puff itself out until the slit becomes large enough to allow the creature to creep out of its skin. This it does back foremost bent like a loop,—the head and tail coming out last. But there is a part from which the old skin has to be removed more inaccessible even than the intestines—namely, the air-tubes through which the insect breathes. These could not be cast off and voided like the skin of the intestines, or coughed up like something sticking in the throat; for insects do not breathe through the mouth, but through small holes which are arranged in a row (usually ten on each side) along the sides of the body,—one on each side of the ring or the segment, except the two first, of which the body is composed. From these holes fine tubes proceed, extending throughout the body, and it is through these that the insect breathes. The skin of these must come off; and if the cast skin is carefully looked at, it will be seen that they have been all drawn off like the fingers of a glove, and are still adhering like threads to the cast skin.

Immediately after the grub has come out, it increases in size with the most astonishing rapidity, so much so, that in three or four hours it has expanded to more than twice its former length and bulk. In the course of a few hours, the soft new skin has begun to harden; it then ceases to increase in size, and grows no larger till it again changes its skin some weeks or months afterwards, when the same process is again gone through.

As soon as the new skin has become hardened, the grub recommences eating with redoubled voracity, often beginning by eating up its old skin. It is supposed that the grub of the wireworm changes in skin, either three or four times, this being the most frequent number in beetles, although the number of times varies greatly in different insects, some changing as often as eight or ten times. The process is the same at each time, the grub increasing about twice its size on each change. The period which elapses between each change, varies according to circumstances. If the grub has plenty of food, and a suitable degree of heat and moisture is maintained, the changes will take place sooner, while, if these circumstances are not favourable, a long time may elapse between them; and it is a necessary consequence of this, that the duration of the life of the caterpillar varies, for its life is composed of the periods between its changes.*

*This is a very important point to be kept in view in the economy of the wireworm. It is usually said, that the duration of its life in the grub state (during which alone its ravages are to be dreaded) is five years. Now this statement entirely depends on the authority of a Swedish naturalist, named Bierkander (who kept the grubs feeding on the roots of wheat for five years, when they emerged as the perfect insect), supported by the observation of Curtis, who says that he kept some for twelve months, during which they scarcely increased in size. But it is obvious that this result is only to be depended upon, if the insects were kept in equally favourable conditions as to food, moisture, temperature, &c., as they would have had, had they been at liberty—and this could hardly be expected, few plants or animals in captivity flourishing as well as when at liberty. The proper degree of moisture is one of the things on which more depends in the rearing of insects than almost anything else; and it is obvious, that with insects living in the earth in garden-pots, it must be nearly impossible to regulate this with accuracy. The alternations between too dry and too