to light. This is possible without any complicated structure, even if we assume that the egg is only a mixture of different unformed substances. But this is only one of the elements which determine the positive heliotropism. The second circumstance is, as we have seen, the bilateral symmetry of the animal. For the transmission of the instinct, this, too, must be determined by the egg. This makes it necessary that a difference of the ventral and dorsal, of the oral and aboral pole is already intimated in the ovum, or originates early during the development. An unequal distribution of the substances of the egg would suffice to bring about this peculiarity.

But we have seen that the same larvæ, as soon as they have eaten, leave the tips of the branches and creep downwards. Why does the light not hold them permanently at the highest point of the branches? My experiments showed that the caterpillars of the animals are heliotropic only as long as they are starving, while they lose their heliotropism as soon as their are fed. This is not the only observation of this kind, for I have found a series of facts which show that chemical changes influence the irritability of the animal towards the light. We may imagine that the taking up of food either leads to the destruction of the substances which are sensitive to light, or leads to changes which inhibit their action. Thus the analysis of the curious instincts of the caterpillars of Porthesia does away with all complications, which might very easily lead to the assumption of mysterious structures in the egg.

2. While in this case, the external circumstances lead the young offspring to the feeding places, there is a second class of instincts in which the female deposits its eggs at places where the hatching larvæ find their food. A simple example of this group of instincts is the deposition of the eggs of a common fly. They lay their eggs upon putrefying meat, or cheese, and these substances are material upon which the young larvæ of the fly feed. I have often made the experiment of putting pieces of fat and of meat from the same animal side by side in front of the window, but the female fly never made a mistake; the eggs were always deposited upon the meat and never upon the fat. Moreover, I tried to raise the young larvæ upon fat. As was to be expected with this kind of food they did not grow and soon died. It was possible to find out in these young larvæ the mechanics of this peculiar instinct of their mothers. The larvæ are oriented by certain chemical substances which emanate from a centre, and this orientation takes place in the same way as the orientation of the larvæ of Porthesia by the light. The rôle which the ray of light plays in the heliotropic experiments is played in these experiments by the lines along which the molecules are carried away from the centre of diffusion into the surrounding medium. The chemical effects of these molecules upon certain elements of the skin influence the tension of the muscles in somewhat the same way as the rays of light do in heliotropic animals. We call the orientation of an organism through diffusing molecules, chemotropism, and speak of positive