

times by the ant before the slit on the tenth segment opens and the papilla which bears the drop of liquid is thrust out. The ant laps this up, while it is stroking the larva with its antennae. *L. piasus* emits a drop of the liquid about once every fifteen minutes. The stroking of the larva by the ants acts as a stimulus which causes either the ejection of the liquid or, in case the organs are not in a condition to exude, the eversion of the repellent organs of the eleventh segment.

Piéron (29) gives a general survey of the observations and experiments by various investigators on the problem of orientation in ants. As far back as 1745, when Bonnet published on the subject, it has been known that the sense of smell plays an important rôle in guiding the ant back to its nest. Huber, Forel, Bethe and others have confirmed this, till there is no doubt as to its truth, and Santschi has recently shown that certain species by means of touching the ground with the tip of the gaster actually make an odoriferous "intentional" trail. The differences in this trail, which naturally varies in intensity close to and remote from the nest, are appreciated by the "topo-chemic sense" (Forel) and are therefore valuable in orienting the home-going ant. Odor plays a more important rôle with those ants which have a collective trail, except in some forms, like the wandering Ecitons and the slave-making Polyergus, the armies of which do not return directly by the outgoing trail. In the case of isolated foraging ants, in the environs of the nest, it is probable that sight, smell and touch are all employed, different forms of ants varying in the degree in which these various senses are used. Thus *Lasius* is considered by Piéron to be an olfactive type, *Formica* and *Camponotus* visual types and *Messor* a muscular type. Orientation at a distance from the nest opening has been explained in a number of ways, and it is probable that the muscular memory and the influence of the light are both important elements, though neither fully explains the problem. The ant does not exactly retrace its steps and probably makes more movements on the out-going than on the returning trip, which may cause considerable error in locating the nest again, while the impression given by the light is obviously received only by diurnal species. Piéron points out that the agricultural ants—*Messor*—of Erythrea stop