associated to form the labium (fig. 2 *h*), whose appendicular nature is shown only by a median furrow and by short, cylindrical palps (fig. 2 *i*) with two or four segments. The maxillae of the first pair (fig. 2 *f)* enclose the mouth at either side. They are broad at the base, but taper towards the tip and carry palps (fig. 2 *g*) with two or three segments. Within the mouth lie a pair of slender piercers (fig. 2 *d),* while a single piercer (fig. 2 *e*) is situated asymmetrically on the left side. The nature of these structures has been much dis­puted. H. Uzel, with the majority of students, regards the paired organs as mandibles and the unpaired as an epipharynx. H. Gar­man and W. E. Hinds believe that the paired piercers are the inner lobes of the maxillae, and the unpaired piercer the left mandible, the right mandible being absent. C. Börner has stated that the unpaired piercer is attached directly to the base of the left maxilla. He therefore regards it as the inner lobe *{lacinia)* of that maxilla, comparing it with the remarkable “ pick ” of the maxilla of a book-louse (see Copeognatha in article Neuroptera). The paired piercers, connected by muscles with the base of the maxillae, but attached directly to the head skeleton, into which they can be withdrawn, are regarded by Börner as true mandibles.

Turning to the thorax we find that the first segment (prothorax) is distinct and free, with a wide dorsal sclerite. The mesothorax and metathorax are rather intimately fused together. Most remarkable in this order is the structure of the feet; there are never more than two tarsal segments, and the claws, usually so conspicuous in insect feet, are reduced (fig. 3 *a)* or absent. But the legs carry peculiar spines, and the terminal tarsal segment is cup-shaped at the end ; from this hollow a delicate bladder (fig. 3 *b)* can be pro­truded, apparently by the force of the blood-pressure, and by means of this bladder—acting as a sucker—the insect obtains firm hold on any surface which the foot touches. The narrow, delicate, fringed wings have already been de­scribed; each wing may be' surrounded by a nervure and traversed by two longitudinal nervures, or the nervuration may be altogether degenerated. A fair number of species are wingless (fig. 5), either in one or both sexes, and the occurrence of winged females with wingless males is noteworthy.

Ten segments are recognizable in the abdomen, which is elongated and tapers at the hinder end. In two of the three families of Thysan- optera the female has a conspicuous ovi­positor. (fig. 4) with serrate processes, projecting from the ventral surface of the abdomen between the eighth and ninth segments. The number of spiracles is greatly reduced; in the adult a pair is present on the mesothorax, sometimes also a pair on the metathorax, and there is always a pair on the first and another pair on the eighth abdominal segment. These spiracles, according to Hinds, are remarkable honeycomb-like structures, and perforations to the tracheal tubes have not been demonstrated. The internal structure of the Thysanoptera has been studied by K. Jordan. They possess a long, tubular gullet and a highly concentrated nervous system; in addition to the suboesophageal ganglion, there are two thoracic ganglia and a single abdominal nerve-mass which is situated far forward. In this condensa­tion of the nervous system and in the presence of four Malpighian (excretory·) tubes the Thysanoptera resemble the Hemiptera.

*Development and Habits.—*Many species of Thysanoptera are known to be habitually parthenogenetic. The eggs are laid on the food-plant, those females possessed of an ovipositor cutting through the epidermis and placing their eggs singly within the plant-tissues; a single female may take five or six weeks to deposit all her eggs. The young insect resembles its parent in most points, but the head is disproportionately large; the anterior abdominal spiracles are on the second segment instead of on the first, and the foot has only a single segment. At first the eyes consist of a few distinct facets on either side of the head; they increase in number as growth pro­ceeds, and become aggregated to form the curious compound eye of the adult. From two to four moults occur, after which the “ pro­nymph ” stage is reached, which in the insect is moderately active and possesses wing-rudiments reaching to the second abdominal segment. After another moult the insect passes into the passive nymphal or “ pupal ” stage, during which it takes no food and rests in some safe hiding-place, such as the soil at the base of its food-plant or the hollow of a leaf-stalk. During this stage the cuticle draws away from the imaginai cuticle which is forming beneath, ultimately becoming separated as a thin transparent pellicle through which the form of the adult can be seen.

Thysanoptera are found on the leaves and in the blossoms of plants. According to Hinds they feed chiefly on the green tissues, which “ are punctured by the piercing mouth-parts and the sap withdrawn by suction. The traces of their feeding are left in irregular streaks of dry, whitened cells.’’ It has been stated that when present in blossoms they feed on nectar, but it is more prob­able that there—as on the green parts—they suck sap. In any case, their presence in apple blossoms has been known to prevent the formation of fruit through injury to the essential organs of the flower, and some species do considerable damage to ears of corn. Some Thysanoptera habitually dwell on the under-surface of leaves, and others periodically migrate to roots. While the majority of the Thysanoptera are thus vegetarian in their diet, and are frequently injurious in farm and garden, some species, at least occasionally, adopt a predaceous habit, killing aphids and small mites (so-called “ red-spiders ”) and sucking their juices. There are even records of an *Λnaphothrips,* when cut off from its normal vegetable food­supply, becoming cannibalistic and feeding on its own species. The usual variations in habit that characterize plant-feeding insects are exhibited by the Thysanoptera some species being found only on one particular food-plant, while others thrive indifferently on a large assortment. Some members of this order spend the winter in the adult state, others in the “ larva! ” or “ pupal ” condition. They shelter in crevices of the bark of trees, in the dried stems of herbaceous plants, or among moss and fallen leaves on the ground. Hinds states that the hibernating individuals live for more than six months. During summer there may be eight or nine successive generations when conditions are favourable and food abundant.

*Distribution and Fossil History.*—The Thysanoptera are probably world-wide in their range, but they have hardly been studied outside Europe and North America. Fossil insects referable to the order have been found in Tertiary beds as old as the White River Oligocene of North America, and the Baltic amber, but nothing is known as to the previous history of the group.

*Classification.—*Only about 150 species of Thysanoptera are known; the European species with a few exotic forms have been described by Uzel, the North American by Hinds. These writers both follow the classification of Haliday, who divided the order into two groups or sub-orders.

1. *Terebrantia:* In this division (figs. 1, 4) the abdomen is cylin­drical, the female is provided with a ventral ovipositor and has the terminal abdominal segment conical; the corresponding segment in the male is usually bluntly rounded. The forewings have at least a single longitudinal nervure—often two—reaching from base to tip of the wing. The maxillary palps have usually three, the labial either two or four segments. There are two families of Terebrantia: (a) the Aeolothriρidae, whose feelers have nine seg­ments; whose wings, relatively broad and rounded at the tip, have a few cross nervules, and whose ovipositor is curved backwards; and (*b*) the Thripidae, whose feelers have six to eight segments, whose narrow acuminate wings have no cross nervules, and whose ovipositor (fig. 4) is curved downwards. This latter family contains the great majority of the order.

2. *Tubulifera:* This division com­prises but a single family — the Phloeothripidae; the species are not numerous, but some of them are of large size for Thysanoptera, as much as 8 mm. (one-third inch) in length. These insects have the abdomen flattened, with its terminal segment (see fig. 5) narrow and cylindrical. The palps, both maxillary and labial, have two segments. There is no ovipositor, and the wings are either without nervures or have only a single degraded longitudinal ner­vure which does not reach to the tip. While the Terebrantia are often rapid in their movements, the Tubulifera are slow and deliberate. According to Hinds, “ they never run or spring.”

Bibliography.—The number of important writings on the Thysanoptera is not large. A. H. Haliday’s papers in *Entom. Mag.,* 1836- 1837, vols. iii. and iv., are still valuable and contain nearly all that is known of the fifty British species. K. Jordan’s anatomical studies *{Zeits. wiss. Zool.,* 1888, vol. xlvii.) are valuable and the descriptions of the jaws by H. Garman (*Amer. Nat.,* 1896, vol., xxx.) and C. Börner (*Zool. Anz.,* 1904, vol. xxvii.) should also be consulted. Indispensable to the student are H. Uzel’s *Monographie der Ordnung Thysanoptera* (Königgratz, 1895; in the Czech language, but with a German summary), and W. E. Hinds’s *Monograph* of the North American species *{Proc. U. S. Nat. Mus.,* 1903, vol. xxvi.). (G. H. C.)