

ON THE ORIGIN OF HYMENOPTERA

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The ovipositor of *Hymenoptera* is very primitive and primarily fits for cutting the plant tissues. In other *Oligoneoptera* the ovipositor, if present, primarily used for penetrating into the clefts of substrate. It has no second valves, the first pair of valves is reduced more or less, and the third pair is changed from protective sawsheath to the main working part of the ovipositor. The head capsule of *Hymenoptera* is primarily open, but in most of other *Oligoneoptera* it is closed both in imago and larvae. Thus all *Oligoneoptera* other than *Hymenoptera* are united by common specialisations. *Hymenoptera* have no specialisation in common with any group of other *Oligoneoptera*. They are isolated group and probably the oldest branch of *Oligoneoptera*. It means the problem of the origin of *Hymenoptera* is the problem of the origin of all *Oligoneoptera*.

Oligoneoptera have certain similarities with all main groups of winged insects. The only important similarity between *Oligoneoptera* and *Polyneoptera* is the mode of formation of their embryonic membranes. In both groups the membranes usually arise as two folds on each end of the embryo. In *Palaeoptera* and *Paraneoptera* they appear during the backward immersion of the embryo into the yolk. However, this rule has numerous exceptions in each main group of *Pterygota*. For instance, the greenhouse grasshopper, *Tachycinus*, develops quite like dragonflies or bugs. Obviously, such similarity is not sufficient to consider *Oligoneoptera* to be closely related to *Polyneoptera*.

Similarities between *Oligoneoptera* and *Palaeoptera* and *Paraneoptera* are far more essential. Besides some symplesiomorphic features which aren't important from this point of view, they have some common specialisations. Their lateral and medial dorsal muscles are antagonists and not synergists as in *Polyneoptera*. The ninth pair of styles in all three groups is involved in the male genitalia. In *Polyneoptera*, on the other hand, they are still free. Thoracic sternites of *Polyneoptera* are free too. In winged *Paraneoptera* and *Oligoneoptera* they are invaginated. *Polyneoptera*, *Oligoneoptera* and *Paraneoptera* all can fold wings, but they do it in different ways. Hind wings of *Polyneoptera* are primarily large and have numerous veins after Cubitus. The fold, along which the wing folds, runs before all these veins sometimes except one or two. *Paraneoptera* and *Oligoneoptera* have not more than four veins after Cubitus and only one or two after the fold. In folded wing of *Polyneoptera* the common base of anal veins is always turned. In *Oligoneoptera* and *Paraneoptera* it is never turned. In *Polyneoptera* the wings are always set planely on the back, in *Paraneoptera* and *Oligoneoptera* are primarily rooflike. That's why *Oligoneoptera* seem to be more related to *Palaeoptera* and especially to *Paraneoptera* than to *Polyneoptera*.

Now I'll try to describe the supposed morphological evolution of the winged insects. The ancient *Pterygota* could not fold wings either planely on the back or rooflike, and only moved them backward a little. They used to live on trees feeding on pollen or spores. The first *Polyneoptera* were big and heavy insects of weak flight. Because of it they had to leave the trees for forest litter, clefts of dead wood, etc. This process caused many changes in their morphology. Particularly, they began to fold wings planely on the back. This allowed them to hide in the narrow clefts retaining the large wings.

The ancient *Palaeoptera* were smaller and agile insects. They spent much time in the air and failed to fold the wings at all. It probably induced the shift of their lateral dorsal muscles. The strong flight of some these insects caused not only the narrowing of the wings but also the reduction of all veins after Cubitus but four. One part of such *Palaeoptera* probably returned from the open air space to the thicket of vegetation and began to fold wings rooflike. They were closely confined to plants. Some of them developed on the plant surface having the same habits in winged and wingless stages. They acquired incomplete metamorphosis and became the first *Paraneoptera*.

The first *Oligoneoptera* developed inside plants, I think in the sporangia or staminate cones. This caused their complete metamorphosis. Primitive *Hymenoptera*, particularly some Xyelids, retain such habits till now, but the common ancestor of all other *Oligoneoptera* began to develop in the clefts of forest litter, dead wood, etc. It induced the above mentioned changes of their head and ovipositor.

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