

**THE ELEMENTS OF INSECT  
ANATOMY: AN OUTLINE FOR  
THE USE OF STUDENTS IN  
ENTOMOLOGICAL  
LABORATORIES**

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The Elements of Insect Anatomy: An Outline for the Use of Students in Entomological Laboratories by John H. Comstock & Vernon L. Kellogg

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**JOHN H. COMSTOCK & VERNON L. KELLOGG**

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THE ELEMENTS  
OF  
INSECT ANATOMY

*AN OUTLINE FOR THE USE OF STUDENTS  
IN ENTOMOLOGICAL LABORATORIES*

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## PREFACE

The course of study outlined in the following pages is designed to enable students to learn the more general features of the structure of insects. It may serve as an introduction to a more extended study of insect morphology.

While the more obvious object of this course is the learning of certain facts, a much more important thing to be gained is a training in methods of careful observation. The student is urged, therefore, to do the work with great care.



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## CHAPTER I.

### TERMS DENOTING POSITION AND DIRECTION OF PARTS.

**Need of a technical nomenclature.**—It has been found that the use of the terms upper, lower, inner, outer, before, behind, anterior, posterior, and similar expressions in the technical descriptions of animals or their parts frequently leads to ambiguity. A great part of the confusion doubtless arises from the fact that the natural position of man differs from that of the lower animals in being erect. Thus, for example, when applied to men, *before* means in the direction indicated by a line drawn from the center of the body to the ventral surface; in the lower animals it means in the direction indicated by a line drawn from the center of the body to the head. The same difficulty attends the use of the term anterior; and of the opposite of these terms, behind and posterior.

Another source of confusion in the use of this class of terms is the fact that they are very commonly applied with reference to the plane of the horizon. Thus *above* means towards the zenith; *below*, towards the nadir; and *before* and *behind* indicate directions parallel to the plane of the horizon. Consequently whenever the position of an object is changed the terms denoting the relation of its parts must be changed.

In order to avoid these difficulties a special set of terms for designating the position and direction of the parts of animals has been adopted by many writers; and it is the object of this chapter to define such of these terms as are used in this book.

**Construction of the terms used.**—Excepting the noun *meson*, the terms used in this work for denoting the position and direction of parts are either adjectives or adverbs.

The adjectives end in *al*, as dorsal, ventral, and mesal; the adjectives cephalic and intermediate are exceptions to this rule.

The adverbs are formed by substituting for the adjective ending the ending *ad*, the Latin equivalent of the English suffix *ward*. Thus from the adjectives dorsal, ventral, and mesal, are formed the adverbs dorsad, ventrad, and mesad.

In forming compound words indicating position or direction, the vowel *o* is substituted for the termination of the first member of the compound, as dorso-ventral, caudo-cephalic.

**The six cardinal directions.**—There are six principal directions to which the position and direction of the parts of a bilaterally symmetrical animal, like an insect, are commonly referred; these are as follows:

The *cephalic direction* or headward; this is the direction indicated by a line drawn from the center of the animal to the head.

The *caudal direction* or tailward; this is the opposite of the cephalic direction.

Two *lateral directions*, or towards the right and towards the left.

The *ventral direction* or bellyward; this is the direction indicated by a line drawn from the center of the body to the ventral surface and forming a right angle with each of the preceding directions.

The *dorsal direction* or backward; this is the opposite of the ventral direction.

The adverbial forms of the adjectives *cephalic*, *caudal*, *lateral*, *ventral* and *dorsal* are *cephalad*, *caudad*, *laterad*, *ventrad*, and *dorsad*. Thus a part which extends in a cephalic direction may be said to extend cephalad.