CHAPTER X.

VERTEBRATA CAPABLE OF FLYING.

§ 1. *Vertebrata without Feathers, formed for flying.*

Few problems in mechanic art present greater practical difficulties than that of raising from the ground, and of sustaining and moving rapidly through the air an animal body, composed as it must be of many ponderous organs which are requisite for the performance of the higher functions of life: yet Nature has achieved all this, not only in endless tribes of the more diminutive invertebrate animals, but also in the more solid and massive organizations which are modelled on the vertebrate type. These objects have been accomplished, in all cases, without the employment of any other than the ordinary elements of those organizations; modified, indeed, to suit the particular purpose in view, but yet essentially the same, regulated by the same laws of development which prevail throughout the whole animal system. The adaptation of these elements to the construction of an apparatus of so refined a nature as that which is required for flying, implies the deepest foresight, the most extensive plan, and the most artificial combination of means. The foundations for these peculiar forms of mechanism are laid in the primeval constitution of the embryo; and a long and curious series of preparatory changes must take place before the completion of the finished structures. Of this we have already had a remarkable example in the metamorphoses of insects, which exhibit, in their last stage of development, the highest degree of perfection compatible with the articulate type. Birds, in like manner, present us with the highest refine-