

ly throughout its whole extent; in the bird, it is rigid and immoveable in the trunk, and is capable of extensive motion only in the neck.

In order that the body may be exactly balanced while the bird is flying, its centre of gravity must be brought precisely under the line connecting the articulations of the wings with the trunk; for it is at these points that the resistance of the air causes it to be supported by the wings. When the bird is resting on its legs, the centre of gravity must, in like manner, be brought immediately over the base of support formed by the toes: it becomes necessary, therefore, to provide means for shifting the centre of gravity from one place to another, according to circumstances, and to adjust its position with considerable nicety; otherwise there would be danger of the equilibrium being destroyed, and the body oversetting. The principal means of effecting these adjustments consist in the motions of the head and neck, which last is, for that purpose, rendered exceedingly long and flexible. The number of cervical vertebræ is generally very considerable; in the mammalia, as we have seen, there are always seven, but in many birds there are more than twice that number. In the swan (Fig. 224,) there are twenty-three, and they are joined together by articulations, generally allowing free motion in all directions; that is, laterally, as well as forwards and backwards. This unusual degree of mobility is conferred by a peculiar mechanism, which is not met with in the other classes of vertebrated animals. A cartilage is interposed between each of the vertebræ, to the surfaces of which these cartilages are curiously adapted, being enclosed between folds of the membrane lining the joint; so that each joint is in reality double, consisting of two cavities, with an intervening cartilage.*

It is to be observed, however, that in consequence of the positions of the oblique processes, the upper vertebræ of

* See Mr. H. Earle's paper on this subject in the Philosophical transactions for 1823, p. 277.