

Thus, has the mechanism of respiration been varied in the different classes of animals, and adapted to the particular element, and mode of life designed for each. Combined with the peculiar mode of circulation, it affords a tolerably accurate criterion of the energy of the vital powers. In birds, the muscular activity is raised to the highest degree, in consequence of the double effect of the air upon the whole circulating blood in the pulmonary organs. The Mammalia rank next below birds, in the scale of vital energy; but they still possess a double circulation, and breathe atmospheric air. The torpid and cold-blooded reptiles are separated from mammalia by a very wide interval, because, although they respire air, that air only influences a part of the blood; the pulmonary, being only a branch of the general circulation. In fishes, again, we have a similar result, because, although the whole blood is brought by a double circulation to the respiratory organs, yet it is acted upon only by that portion of air which is contained in the water respired, and which is less powerful in its action than the same element in its gaseous state. We may, in like manner, continue to trace the connexion between the extent of these functions and the degrees of vital energy throughout the successive classes of invertebrate animals. The vigour and activity of the functions of insects, in particular, have an evident relation to the effective manner in which the complete aeration of the blood is secured by an extensive distribution of tracheæ through every part of their system.

§ 4. *Chemical Changes effected by Respiration.*

WE have next to direct our attention to the chemical offices which respiration performs in the animal economy. It

the density of that which the bird had been breathing. We are, as yet, unable to trace the connexion which probably exists between the structure of the lungs, and this extraordinary power of accommodation to such great and sudden variations of atmospheric pressure.