

is an intimate connection between respiratory movements and locomotion. In Cephalopoda this is still plainer; for, from the form of the respiratory cavities, and from the disposition of the sacs in which the gills are placed, we can easily infer that the contractions and dilatations of these sacs, by which the water is renewed, must afford a material mechanical assistance in the progress of locomotion. Again, throughout the type of Articulata this connection is most intimate, the respiratory organs being directly connected with the locomotive appendages, and forming, indeed, part of the various kinds of oars, fins, legs, and chewing appendages, by which the principal motions of the body are sustained. Not a joint can be moved here, without influencing respiration; and, again, the expansion and contraction of the respiratory cavities, the filling of the respiratory vesicles or the large circulatory sacs connected with the gills or fins, and the introduction of air into the tracheal tubes, must, in their turn, influence locomotion. It is a subject worthy of the attention of physiologists, to trace more minutely this double connection throughout the animal kingdom. Perhaps the type of Articulata is best adapted to make a beginning in these investigations. For among them, in the Crustacea for instance, the chewing of the food itself is directly connected with the process of respiration. The motion of the jaws aids in forming and maintaining a regular current of water along the gills through the respiratory cavities; and, even when not otherwise employed, the jaws are kept in motion in some degree to assist respiration. And it can hardly be doubted, that the process of respiration also materially aids the Insects in their flight, and that the degree of expansion or contraction of the respiratory cavities is very different in the state of repose or during flight. While watching grasshoppers I have often been struck with the wide expansion of their abdomen at the moment of starting, and with the collapsed condition of the whole body soon after they have alighted, which is even so great as to prevent their rising again immediately when chased.

Again, among Vertebrata we find in Fishes that the respiratory movements—the lifting and shutting of the operculum, the filling and emptying of the branchial cavity—aid the fish in slowly progressing; so much so, that, when resting upon the bottom of a glass jar, apparently immovable, these animals are at times suddenly propelled forward under the action of a powerful occasional contraction of the branchial cavity, even though the ordinary locomotive organs—the tail and fins—remain absolutely quiet. How close a connection exists between locomotion and respiration in the Ichthyoid Batrachians, I have often had occasion to witness in a *Proteus* kept in confinement, in which the gills grew gradually paler and paler when the animal was absolutely motionless, but would instantly be filled with a large quantity of blood and appear intensely red after some violent motion. It might be objected, that this is a mere influence of locomotion upon circulation; but if