portance in our present inquiry. Whether we are inclined to accept Draper's* very ingenious explanations of it or not, the fact that such change does take place can scarcely be denied; the argument for the proof of this conversion would be similar to that used on a former occasion when speaking of heat.

Conversely, although most cases of animal luminosity may be fairly referred to slow combustion, or phophoresence, in the part where such effect is manifested, yet this explanation does not seem adequate to account for all instances of this kind; and it is believed that in some cases, more particularly in the cases of the marine *Annelidæ*, and some other of the *Articulata*, a conversion of nerve force into light takes place.†

The relation between nerve force and motion has been considered as being a more remarkable instance of conversion than any of those above specified.‡ But this does not seem to me at all so clear as at first sight it might appear to be. For it is certain that in the relationship existing between motor nerves and their muscles, no conversion of nerve force into motion takes place, but, as we shall hereafter see, a connection of an entirely different character obtains. However this may be the converse of it holds good; for motion in the form of mechanical irritation applied to a nerve at its periphery, or in its course, will be followed by a nervous current along that nerve and by excitation of its centre. That is to say, when applied to a nerve of common sensation it causes pain; to the eyeball or optic nerve, flashes of light; to the auditory, sounds; by striking the tongue quickly and lightly with the tip of the finger, a distinct taste is developed, sometimes saline and sometimes acid.||

I have said that the motion produced by the contraction of a muscle cannot be regarded as a continuation of the nerve force which called that muscle into action. It seems sufficient reason for this assertion that there is another, and distinct source known to which to refer for the proximate antecedent of the motion, namely, the chemical change taking place in the muscle; the relation of which to the force put forth is so well shown by the different amount of urea formed under the different circumstances of activity or rest of the muscle.§ Still that there is an intimate relation between the current in the motor nerve and the muscular contraction is well known, and also that in a certain sense a quantitative relation exists between them, the degree of contraction in the muscle being entirely dependent, *cæteris paribus*, upon the amount of stimulation or nerve force conveyed to it by the nerve supplying it. The relation then between nerve and muscular force, though intimate, is certainly not that of direct conversion, but seems to be extremely analogous to that which light bears to the force produced by the union of hydrogen and chlorine when their combination is determined by the action of its rays upon them; for the amount of nerve force, as of light, supplied in any given time, other things being equal, deter-

* Draper's "Human Physiology," pp. 392 et seq.

† Carpenter, "Principles of Comparative Physiology," p. 447. Compare Todd and Bowman "Phys. Anatomy," pp. 224 et seq.

‡ Carpenter, Phil. Tran. 1850.

|| Baly's translation of Muller's Physiology, p. 1002.

§ Draper's "Human Physiology," pp. 444 et seq. and Carpenter's "Human Physiology," p. 391.