referred primarily and in general terms to conditions of growth, of which they are the result. They may arise, however, as already pointed out,[1] either from unequal growth and nutrition of parts, or from special conditions of turgescence, one or both combined. Or, as Sachs[2] states, "in those movements which occur during growth, the tension of the tissues is concerned only so far as any change in it reacts on growth and modifies it. Periodic movements, and those due to irritation, on the contrary, depend entirely on changes in the the tension of the tissues, which, in this case, are fully developed only when the organ has attained maturity."

These general principles apply to all the subjects now under consideration, and accepting them as tenable, we shall not in the present paper concern ourselves more particularly as to the special physiological changes involved, and whatever references are made to growth are to be accepted in the general meaning of that term, unless otherwise specified. Two general considerations are of importance in this connection, viz., the mechanical value of the tissues, and the continuity of protoplasm.

Of the various tissues which enter into the composition of motile organs, parenchyma, collenchyma, bast and wood, are of chief value. Of these, the parenchyma probably stands first as capable of the most rapid growth and the most extreme variations of tension from turgescence or other cause. The collenchyma undoubtedly stands next in both of these respects; while the bast, from its more permanent character, as well as from the results obtained by both Schwendener[3] and Haberlandt,[4] in which the great elasticity of this tissue appears, is in all probability the most important mechanical element, by reason of the retarding influence it exerts upon the growth of the more rapidly extending and external parts.

The inference which naturally follows from this is, that the principal conditions of tension with reference to elongation, are established and maintained primarily between the parenchyma and collenchyma on the one hand, and the bast and other vascular elements on the other; and secondari'y, between the parenchyma and the collenchyma. It will also follow that, whenever one of these last-named tissues is in excess, it must exert a preponderating influence in changes of tension, without special reference to its particular capacity for such variations.

One of the most important factors in the physiology of motion, particularly that due to irritation, is the continuity of protoplasm. This fact has now been observed in so many widely different cases, and involves so little difficulty in its determination in almost any living tissue, that we can no longer regard its application as a general law, with reasonable doubt[5]. This law is of so recent origin, however, that at present but little is known as to its precise relation to motion; but that it is connected with it in those cases where there is distinct transmission of impulse to parts somewhat remote from the centre of

[1] Darwin, Movements of Plants, p. 2. Sachs, Vorlesungen über Pflanzen-Phys. p. 775.

[2] Text-book, 2nd Ed. p. 878, etc. Morren, La Sensibilité et la Motilité des Veg. Bruxelles, 1885, p. 52, etc.

[3] Das Mechanische Princip. im Anatomischen Bau der Monocotylen. Leipsig, 1874.

[4] Physiologische Pflanzen Anatomie.

[5] Bot. Centralbl. xiv. 89—121. Proc. Royal Soc., xxxv. 163. *Ibid*, xxxiv. 272. Jahrb. Wiss. Bot., xii. 170. Vorlesungen über Pflanzen-Physiologie, Sachs., 102. Nature, xxx. 182. xxxi. 337, 290, 390. Quart. Jour. Mic. Sci., Oct. 1882. Phil. Trans. Royal Soc., 1883, 817. Flora, 1863, 68. Hanstein, Die Milchsaftgefässe, 1864. Wilhelm, Zur Kenntniss des Siebröhrengefässe Dicotyler. Pflanzen, 1880.