and single arch, or which suppose no support but that which our own position supplies, will assuredly never become realities. We must have a firm basis of intermediate generalizations in order to frame a continuous and stable edifice.

In the subject before us, we have no want of such points of intermediate support, although they are in many instances irregularly distributed and obscurely seen. The number of observed laws and relations of the phenomena of sound, is already very great; and though the time may be distant, there seems to be no reason to despair of one day uniting them by clear ideas of mechanical causation, and thus of making acoustics a perfect secondary mechanical science.

The historical sketch just given includes only such parts of acoustics as have been in some degree reduced to general laws and physical causes; and thus excludes much that is usually treated of under that head. Moreover, many of the numerical calculations connected with sound belong to its agreeable effect upon the ear; as the properties of the various systems of *Temperament*. These are parts of Theoretical Music, not of Acoustics; of the Philosophy of the Fine Arts, not of Physical Science; and may be referred to in a future portion of this work, so far as they bear upon our object.

The science of Acoustics may, however, properly consider other differences of sound than those of acute and grave,—for instance, the *articulate* differences, or those by which the various letters are formed. Some progress has been made in reducing this part of the subject to general rules; for though Kempelen's "talking machine" was only a work of art, Mr. Willis's machine,[10] which exhibits the relation among the vowels, gives us a law such as forms a step in science. We may, however, consider this instrument as a *phthongometer*, or measure of vowel quality; and in that point of view we shall have to refer to it again when we come to speak of such measures.

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[10] On the Vowel Sounds, and on Reed Organ-pipes. *Camb. Trans.* iii. 237.