

phenomena of this kind may be considered as determined. Mersenne also undertook to *measure* the phenomena numerically, that is to determine the number of vibrations of the string in each of such cases; which at first might appear difficult, since it is obviously impossible to count with the eye the passages of a sounding string backwards and forwards. But Mersenne rightly assumed, that the number of vibrations is the same so long as the tone is the same, and that the ratios of the numbers of vibrations of different strings may be determined from the numerical relations of their notes. He had, therefore, only to determine the number of vibrations of one certain string, or one known note, to know those of all others. He took a musical string of three-quarters of a foot long, stretched with a weight of six pounds and five eighths, which he found gave him by its vibrations a certain standard note in his organ: he found that a string of the same material and tension, fifteen feet, that is, twenty times as long, made ten recurrences in a second; and he inferred that the number of vibrations of the shorter string must also be twenty times as great; and thus such a string must make in one second of time two hundred vibrations.

This determination of Mersenne does not appear to have attracted due notice; but some time afterwards attempts were made to ascertain the connexion between the sound and its elementary pulsations in a more direct manner. Hooke, in 1681, produced sounds by the striking of the teeth of brass wheels,⁴ and Stancari, in 1706, by whirling round a large wheel in air, showed, before the Academy of Bologna, how the number of vibrations in a given note might be known. Sauveur, who, though deaf for the first seven years of his life, was one of the greatest promoters of the science of sound, and gave it its name of *Acoustics*, endeavored also, about the same time, to determine the number of vibrations of a standard note, or, as he called it, Fixed Sound. He employed two methods, both ingenious and both indirect. The first was the method of *beats*. Two organ-pipes, which form a discord, are often heard to produce a kind of *howl*, or *wavy* noise, the sound swelling and declining at small intervals of time. This was readily and rightly ascribed to the coincidences of the pulsations of sound of the two notes after certain cycles. Thus, if the number of vibrations of the notes were as fifteen to sixteen in the same time, every fifteenth vibration of the one would coincide with every six-

⁴ *Life*, p. xxiii.