leaving relatively a greater intensity from before, and we are thus enabled to distinguish, after experience, the direction of sound emanation.

With regard to the external meatus, its general function of conduction is sufficiently apparent, but it is supposed also that its curves and obliquity affect in some way the sound waves—perhaps in lessening the incident force.

The membrana tympani preserves the intensity of vibration, transmitting it to the chain of bones in a most perfect manner, and by means of the tensor and laxator muscles its tension is altered to correspond more nearly with different tones. The membrane, as has been experimented, shews lines and nodes when vibrated, as in Chladni's experiments with plates, and its office is thus conclusively proven.' If the tension remained constant, at certain times, on listening to some melody, the ear would appreciate certain tones corresponding to the fundamental of the membrane -a change in intensity and quality—but this does not apparently occur, and we are therefore justified in concluding that the tension changes, and, according as one person, compared with another, has more power over the muscles, so much the more finely will he distinguish a rise or fall of pitch. As regards, too, the obliquity of the membrane, the more at right angles to the direction of wave incidence, the more intense the vibration; and so, as one would expect, it has been shewn that the position in musicians is decidedly vertical, and in those with imperfect musical ears, oblique, thus accounting for the inheritance of this peculiarity. The membrane, however, is not necessarily essential to hearing. It vibrates by influence, and probably has its own sound appreciated by the ear; it sustains the intensity, and assists largely in the differentiation of pitch. Notice how by closing the mouth and nostrils, then expanding the chest, the air pressure is lessened from within, the membrane is rendered tense, and we become sensitive to high notes, then, by the act of swallowing to release the tension, become again sensible to the lower.

The ossicles act as a single solid body in conducting the vibrations to the labyrinth; their own notes are too high to be appreciated by the ear. The tensor also acts by bringing the bones into closer contact, and thus they serve to transmit with the least possible loss of intensity; thence conveyed to the liquid in the labryinth the vibrations are transmitted through the cochlea to the rods of Corti, bathed in the endolymph of the quadrilateral canal.

These rods, numbering somewhere between eight and ten thousand, arranged in two rows, have been supposed by many to act simply as a pianoforte, each one or pair tuned to a certain note, and that these, vibrating in unison with the incident wave, decomposing the mixed sound, transmit them in some peculiar way to the final nerve terminations, either directly, or by means of the surrounding cells. Supposing an average ear capable of appreciating from 30 to 30,000 vibrations per second, including say about 10 octaves: of the 4,000 pairs, 400 would belong to an octave, if equally distributed, which would allow of say 30 to each musical interval; a good musician then should be able to distinguish the 1-30 of an interval; and some, at least, have been proved to be capable of distinguishing the 1-20.

The hypothesis that the rods are actually vibrating strings might be stated somewhat as follows:

A simple note would cause to vibrate not only that fibre of Corti which is in unison with it, but also those adjoining, higher and lower, and on this point Hensen's main argument against the Theory of Helmholz would seem to be the very one required to prove it, viz.: that it is an impossibility for one rod to vibrate separately.

We have then a *series* of fibres which vibrate with every simple sound. Suppose, now, the incidence of two vibrations. If they be of quite different pitch two different sets of fibres respond, and we recognise the sounds as thus different. But on the other hand, if they be very close, some fibres in common responding, the ear does not so recognise them as separate sounds. The fibres also receive at different times the sums and differences of the two velocities, and as a result we have the phenomena of "beats," which is purely subjective. Whenever, then, the tones are sufficiently distant so that the sets of fibres do not overlap, the beats are lost, and such, in the study of Physics, is found to be the case. These sums and differences form "resultant" sounds when sufficiently distant (100 or so vibrations per second), but are disagreeable when lower (about 30 or 40 per second); when much less they are simply appreciated as intensifications. The disagreeableness of the sensation, or dissonance