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The nature of vowel sounds

Prof. Scripture's arguments on this subject which appeared in *Nature* (*London*) for January 13 and 20 last seem to me to be open to criticism. It is true, no doubt, that a strongly damped resonator may be excited by periodic impulses even when its free period is not an exact submultiple of the period of the impulses. But it does not appear justifiable to argue from this that the vibration so excited is inharmonic to the fundamental period. As an illustration of the error in the argument, we may consider the somewhat analogous case of the vibrations of the resonator of a violin. The bridge, belly, and enclosed air of this instrument form a resonating system having a series of free modes of vibration, which, especially those of higher pitch, are strongly damped by reason of the communication of energy to the external atmosphere and otherwise. These free periods are, in general, inharmonic to the fundamental period of the string. It is easily shown from the known mode of action of the bow that the force exerted by the vibrating string on the bridge changes impulsively from a positive to a negative value once in each period. If Prof. Scripture's argument were valid, we should be entitled to argue that the response of the bridge and belly to these discontinuous changes of force should be inharmonic to the fundamental period of the string. Actually, however, we know that this is not the case. The overtones which fall near the free periods of the resonator are, no doubt, strongly reinforced, but the motion of every part of the violin continues to be in strictly harmonic relation to the period of the forces impressed by the bow.

So far as I can see, there is no very vital difference between the dynamical principles involved in this and the foregoing case, except that the body of the violin has four or five well-marked free periods instead of only one or two, as in the case of the resonator concerned in the production of the human voice. The special character of the vowel sounds really arises from the last-mentioned circumstances, as a result of which most of the energy is concentrated in a small group of partials. It seems to me that there is no justification for supposing that there are any "inharmonics" present in the voice tones.

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