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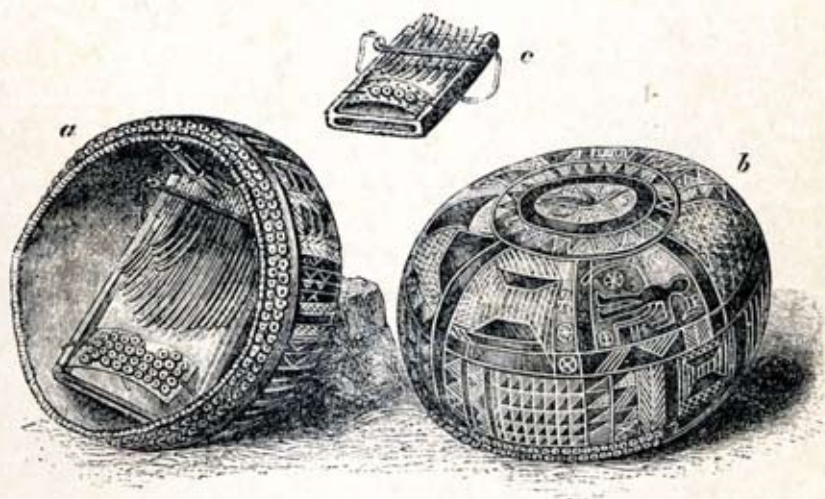
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PHYSICAL PHENOMENA WHICH APPEAR TO HAVE DETERMINED THE BASES AND DEVELOPMENT OF AN HARMONIC SENSE AMONG BUSHMEN, HOTTENTOT AND BANTU

by

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The Kalahari Bushman makes and uses a shooting-bow, and upon this weapon his very life depends and, so far as we are aware, has depended for countless ages. But his shooting-bow acts in a double capacity, for it serves as both weapon and musical instrument. The string of a shooting-bow yields, *ipso facto*, the partials of the harmonic series whenever it is twanged or struck, but these are not always readily observable under ordinary conditions. To render them sufficiently audible for musical purposes some form of resonator is required, and such resonators may be of either of two kinds. The first might be a hollow vessel of some sort, preferably with thin walls, which when associated with the vibrating string would tend to reinforce the fundamental tone and its lower harmonics to a greater or lesser extent, the result in any case being an harmonic chord, the pitch of which would depend upon the length, thickness and tension of the string. This would have put the Bushman in possession of focal points round which to build his vocal melody. In my collection of musical instruments there is an example of this very apposition, in which a shooting-bow, which belonged to an Angola Bushman, was temporarily associated with a hollow calabash, the primary use of which was as a drinking vessel—The second type of resonator is the human mouth, which differs from the first type in that it can be varied in size, and can consequently resonate sounds of different pitch. And, by some strange dispensation of Providence, the Kalahari Bushman constructs a shooting-bow of such a length (about three feet long), and with a string of such a thickness and at such a tension, that the fundamental note of that string yields an harmonic series of which partials nos. 5 to 9 (or thereabouts) can be isolated and resonated by the changing cavity of his mouth over the persistent drone of the fundamental.

I have observed a Kalahari Bushman doing this with his bow shortly after using it as a weapon, and on it he executed a melody on the resonated harmonics to which I have alluded, the fundamental acting as a drone bass, the pitch of it remaining unaltered throughout the performance, since no "fingering" or pinching of the string was employed by the player.

Before I visited the interior of the Kalahari Desert I had come to the conclusion, from an examination of an old cylinder of a Bushman song which has been given to me, that the basis of Bushman vocal music was not only pentatonic, but that his pentatonic system was founded upon the harmonic series, although the manner in which the song was rendered tended to obscure the focal points of the scale on which it was based. I accordingly had an octave of panpipes made in brass by the instrument-maker of the University of the Witwatersrand, Johannesburg, in which the six notes of the pentatonic octave were derived from partials nos. 4 to 9 of the harmonic series, no. 9 having to be transposed down an octave, thus:



I took these brass panpipes with me when I went into the Kalahari Desert in 1936, where, for the first time, I heard choral songs executed by a group of Bushwomen, and was very gratified to hear that not only did my pipes match their scale, but that the harmonic sounds sung by the women were executed in a definite "yodel".