

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

by

PERCIVAL R. KIRBY

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".

But it was while studying the music of the Southern Bantu that I came face to face with the fact that the bulk of their instrumental music, whether stringed or wind, is, when unadulterated by external cultural influences, based upon the practical use of the harmonic series. So far as their stringed instruments are concerned, I have dealt with the whole question in a paper which I published in 1932 (*The Recognition and Practical use of the Harmonics of Stretched Strings by the Bantu of South Africa*). In this paper I came to the conclusion that all the indigenous stringed instruments of the Southern Bantu employ a technique of harmonics yielded by a single string, and not of fundamentals yielded by several strings (as in the case of most stringed instruments made by modern man), and that the harmonics are used in either of three ways:

1. Sounded together as a chord.
2. Isolated for melodic purposes.
3. Used in conjunction with their fundamentals in order to produce elementary polyphony.

By analysing many examples of the music produced by the third method, I found that there existed between them and certain forms of medieval polyphony an almost perfect parallel into the details of which I unfortunately cannot go here.

An even more striking illustration of the use of harmonics by the Southern Bantu is afforded by an interesting flute made and played by Zulu, Swazi and, in former times, by Xhosa. It is a "seasonal" instrument, manufactured and played only at the summer solstice at the conclusion of the Festival of the First Fruits. In every respect but one this instrument, known as the *umtsbingo*, corresponds to the oblique flute of the ancient Egyptians, the sole difference being that it lacks regular fingerholes, the opening at the end opposite to the embouchure alone fulfilling that function. If, therefore, there was ever any connection between the Zulu instrument and that of ancient Egypt, it must have been pre-Pharaonic, since all the Pharaonic oblique flutes are provided with several finger holes. I shall show how the Southern Bantu plays upon his oblique flute of reed, using for the purpose a simple brass tube open at both ends. If I blow it with its lower end open, I can produce several partials of the harmonic series; but if I blow it with the lower end closed it acts as a "stopped pipe", and yields only the odd-numbered partials of the series. And by combining the two methods, which is precisely what the Zulu does, I obtain a pentatonic scale, based on the harmonic series, the very scale that I showed could be obtained from the Bushman's shooting-bow. Here it is, the open sounds being indicated by \circ and the closed ones by \bullet :



If one were to add even higher partials which, however, are very difficult to elicit, one would arrive at a hexatonic scale, and even a heptatonic one, but this the Zulu does not achieve.

If we start once more with a plain cylindrical tube, and perforate it with three fingerholes, such as are found in many ancient Egyptian oblique flutes and in the ancient *ti* of China, we find that we are compelled to produce a heptatonic scale, since the narrow tube refuses to yield its fundamental sounds, and those that can be most readily elicited are nos. 2 and 3 of the various series belonging to the whole tube and to the tube when temporarily shortened by opening the different fingerholes, thus (the fingering being indicated by the customary tabulature):



The whole yields the following heptatonic scale:



The principle of producing a heptatonic scale on a three-holed flute still exists in the *galoubet* of Provence, and in the remaining specimens of the Elizabethan "pipe", though both of these instruments are very easy to blow, since they are sounded by means of a "fipple".

Even this is not all. The phenomenon of parallelism, observable so frequently in vocal music all over the world, must be taken into account. I have long been of the opinion that parallelism is primarily due to the fact that in primitive speech the pitch at which words, and the syllables forming words, were uttered determined their meaning. There is ample evidence of the phenomenon still remaining in the various native languages in use in South Africa, and, although its force may not perhaps be as all-compelling today as it undoubtedly was in the past, vestigial remains of its importance are still to be regularly observed; for example, in the use of whistling instead of speech during certain ceremonies among the Venda of the Northern Transvaal. The late Miss Dorothea Bleek, the great authority on Bushman speech, once told me that she had heard Bushmen singing together many years ago, and that their voices moved in parallel, though there was no recognisable interval of parallelism between the various voices, each man apparently using the pitch which suited him best. This is the one extreme, and the other is the perfect parallelism of the various tribes of Southern Africa, which displays the interval of a fourth or fifth. And here a most important point arises. In early medieval Europe, the parallel singing known as *organum* seems to have been developed after heptatonic scales had become firmly established with the result that complete parallelism at the fourth or fifth was possible, except where the augmented fourth or the diminished fifth occurred. And at those points it became customary to correct the inconvenient interval.

But in South Africa similar parallelism was achieved while the musical system was pentatonic, and consequently complete parallelism was impossible at either the interval of a fourth or fifth; for the nature of the pentatonic scale involved the introduction of a third in the one case and of a sixth in the other. The Southern Bantu were therefore in a position to accept the intervals of the third and sixth without difficulty. The following illustrations will, I think, make my point clear.

Pentatonic parallelism:



Heptatonic parallelism:



Parallelism within the limits of a pentatonic system would therefore appear to tend to hasten the development of an harmonic sense in man, whereas parallelism within the limits of a heptatonic system would seem to delay it.²

¹ Reprinted by permission from the *Bericht über den siebenten internationalen Musikwissenschaftlichen Kongress*, Köln 1958.

² Professor Kirby when delivering this paper in Cologne gave practical demonstrations of all the important points that he made, performing upon a shooting-bow as well as upon the brass facsimiles referred to in the text.