

# A Two Voiced Song With No Words by Lauri Harvilahti

circa 1981

**Overtone singing**, which is often referred to as **biphonic** or **pharyngeal singing**, is a style of singing within the framework of which it is possible to produce two (sometimes three) tones which are distinct auditory experiences (1). Singing in this style involves having the vocal cords produce a low tonic which is then normally used in the same manner as a pedal point. Utilising a specific technique a voice based on the same series of overtones is also produced. Altering the shape of the oral cavity by movements of the tongue, the singer is able to shift from one overtone to another and thus present melodies(2). The area which can be profitably exploited extends from the 5th to the 13th harmonic.

Upon first acquaintance, this type of singing leaves a striking impression; nevertheless it is known to several peoples of Central Asia as the Tuvins, the Mongols, Khakas, the Bashkirs, and the Tibetans. According to A. N. Aksenov, Tuva is the focal area of overtone singing. The Tuvins know four different types of singing, each of which has its own name: *kargyraa*, *borbannadyr*, *sygyt*, and *ezengileer*. The height of the tonic, the tonality, the structure of the melodies produced with the harmonics, and the styles of presentation are criteria providing a basis for differentiating these styles of singing. The general term used by the Tuvins to refer to this style of singing is *khömei*. (3)

Overtone singing (*khöömii*) is most common in the western parts of the Mongolian People's Republic(4). According to the information I have been able to obtain from Mongolian scholars, in the western aimag of Kobdo there are places where the entire male population knows this type of biphonic singing which is not accompanied by any text.

C. Erdenebilig mentions that one of the amateur groups in this region has twenty gifted *khöömii* singers. The state folk song and dance ensemble also employs overtone singers. One of them, Dovčingiin Sundui, the most famous master of this style, has a repertoire of more than 70 folk songs and other melodies.(5)

Some of the peoples who once knew this style seem to have forgotten it. With respect to the Bashkirs, for example, the only accounts that I know of are V.I. Dal's interesting description from the middle of the last century, S.G. Rybakov's "notes of an unfortunate fieldworker", from the year 1897, and L.N. Lebedinsky's article in which he provides a description of his meeting with Sayfetdin in 1939. Advanced in years, Sayfetdin was the only Bashkir he could find who knew overtone singing. Of primary interest, however, is the fact that Sayfetdin claimed to have learned how to sing without any instruction and he tried to convey the impression that he had never even heard anyone perform an özläü Song, özläü being the term used by the Bashkirs refer to this type of Singing. (6)

## ***Overtone Singing and Shamanism?***

Lebedinsky did not consider Sayfetdin's claim described in the preceding section to be reliable, and he surmised that the singer was attempting to conceal the evidently shamanistic origin of this type of singing. Lebedinsky connected özläü singing with the imitation of animal cries used by the shamans, and he linked this style of singing with the technique used to play the Jew's harp. According to him, an additional factor supporting this is the other term the Bashkirs use to refer to the özläü type of singing. Specifically, the Bashkir word for "Jew's harp" is kurai, while the term tamak *kurai* 'throat Jew's harp' is one of the terms used for overtone singing. (7) This is definitely an apt association: playing the Jew's harp and the type of singing depicted in this article are both based on the amplification of overtones in the oral cavity. Naturally, the most important difference is the actual sound source: in the Jew's harp this is the string of the instrument, in overtone singing it is the vocal cords. The Jew's harp was one of the most important instruments used by the shamans. (8). One of the better descriptions is the article about the Shamanism practiced by the Buriats of the Irkutsk region published by N. Agapitov and M. Kharigalov. Among the Buriats in question this instrument is only used by the shamans, and it had to be made by a master who was descended from the "heavenly spirits". (9)

A. Aksenov also links the type of singing to playing the Jew's harp, but he claims that the overtone singing of the Tuvins has no connection with Shamanism(10). In contrast to this, Crossley-Holland notes that the type of singing may have become secularised and thus lost its links to Shamanism and the use of the Jew's harp. As an example of the ritual use of overtone singing he mentions the type of singing used in Tibetan dGe-lugs-pa monasteries in conjunction with Tantric rituals. Typical of this type of singing is the presence of a superimposed 5<sup>th</sup> or 6<sup>th</sup> harmonic on top of a low fundamental. (11)

Ter Ellingson-Waugh's extensive article, "Musical flight in Tibet" takes up the question of the influence of shamanism on Tibetan Buddhism connects the glissando technique used in the Tibetan db yangs song corresponding technique of rapid transition between a low and high register used by shamans and described by E. Širokogoroff and J. Yasser (12)

There are many descriptions of the imitation of auxiliary spirits and animals during Shamanistic séances (13). It seems probable that overtone singing would have been one of those techniques of singing which have been used to produce this effect. Erdenebilig notes that Mongolian Traditional lore connects *khöömii* singing with the whistling of the wind, the murmuring of flowing water, and imitating the cries of birds and other animals. He does not, however, mention the connection with shamanism. (14)

The analogy with the Jew's harp provides some verification for this theory: descriptions exist according to which at least the Yakuts and the Turkmenians used the Jew's harp in order to imitate birds as well as animals in general. (15)

The remarks concerning the method the peoples of the upper Altai use to perform epic poems found by B. Šul'gin in the notes left by A. Anokhin, a geographer, are also interesting. According to Anokhin the peoples of the Altai sing epic poems in a voice the tonality of which resembles the buzzing of a flying beetle(16). I have personally made the same observation when listening to an epic poem recorded in western Mongolia by an expedition sent by the Mongolian Academy of Sciences. The manner in which the poems were performed brought Anokhin's description to mind: the singer used an articulation in which the words were clearly differentiated, but in which some of the melodies in the series of overtones constantly resonated in a low voice above the text which was being recited above the text which was being recited.

### ***A Mongolian khöömii Performance***

In 1981 I spent a month in Mongolia. I intended to record folk music and accordingly, I had the study of overtone singing, of which I had heard a few Recordings previously, as one of my goals. Towards the end of my stay Ulaan Bator I was introduced to a geology student named Badzardaran.



fig Geology student Badzardaran performing overtone singing

This young man was from the Kobdo region, and he had learned how to sing from his father, a famous master of *khöömii* singing. In spite of efforts taken on my part, Badzardaran remained my only contact with overtone singing on that trip. He sang two melodies into my microphone, of which the first was, to my surprise, the Song *Ulaan odnii tukhai duu* 'A Song about the Red Star' dedicated to Lenin by the composer Luvsandzav. I told him that I also wanted to hear a traditional melody, and the hurried student found the time to perform the well known folk Song *Dörvön uul* 'Four Mountains' the notes for which follow [page 5].

The melody consists of a series of harmonics and in this case they are the fifth, sixth, seventh, eighth, ninth, tenth, and twelfth harmonics. The scale of the song corresponds to the anhemitonic pentatonic scale which dominates in Mongolian music. This performance differs from the normal version which is sung with respect to rhythm as well as, in places, melody. The style of singing has its limitations: in practice, the melody can only move between the 5<sup>th</sup> and the 13<sup>th</sup> harmonics. The 11<sup>th</sup> harmonic is not used since it is not included in the anhemitonic pentatonic scale (17).

The following table depicts the series of partial harmonies when the tonic is 'Ab', this situation being analogous to that in the song serving as our example. The area used in the melody is indicated by transversals. In some cases the harmonic is a level lower (↓) than is indicated by the notation. I have written the note corresponding to the 7th harmonic as 'F' in accordance with the pentatonic scale. In actual fact, the seventh tone of the series of harmonies emanating from 'Ab' is essentially a low 'G#'. (18)



### Dörvön uul

$\text{♩} = 132$

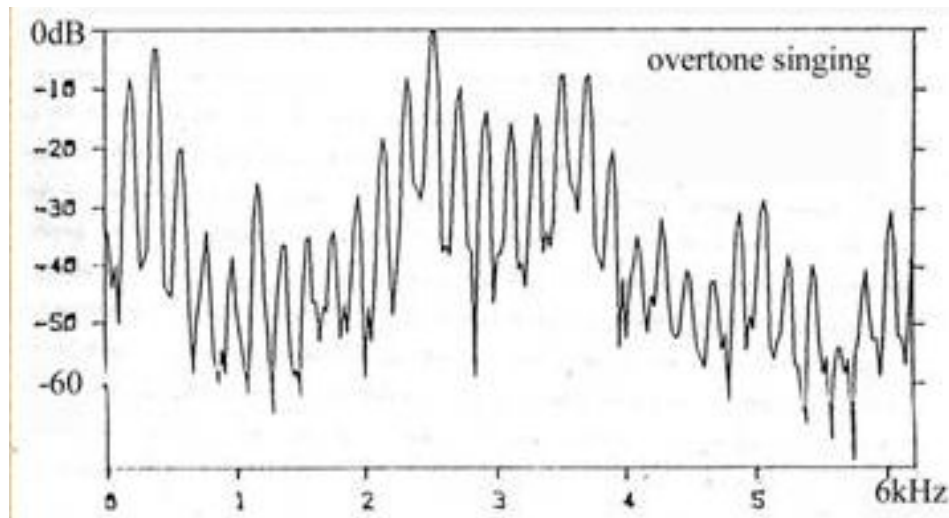
(Note This may be a part of Dorvon Tsag [Four Seasons] not Dorvon Uul, Michael Ormiston)

As a prerequisite to the analysis, samples of the song were recorded on a Revox B77 tape recorder, the tape was an Agfa Professional PEM468: the microphone was AKG CK 22 (linear).

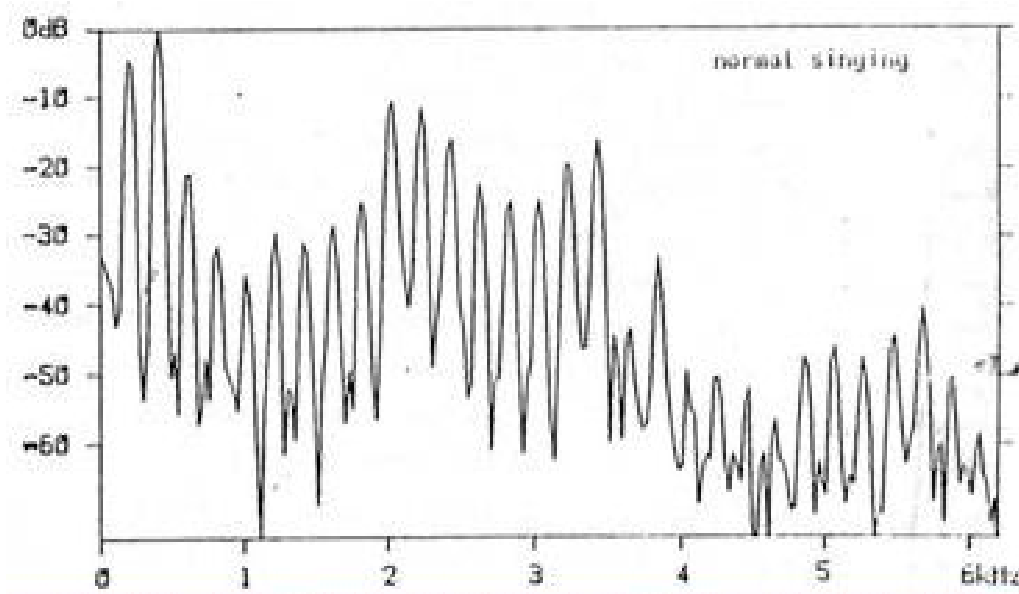
The result of the analysis was a spectrum which is a visible model of the singing voice as a function of both amplitude of the harmonics and the frequency. In the following paragraphs I present a few examples of the various types of analysis which can be obtained. It is my intention to make a more precise comparison based on a wider selection of material of the sonograms used by Walcott and Guillou as well as of Gunji's spectrographs in a more detailed article.

As the subject of my comparison I have selected the vowel 'i' produced using the overtone style of singing and compared it with a normally sung 'I' vowel at the same volume and level, as well as with the same vowel produced using a normal speaking voice. All of the samples were played at a moderate volume (mp-mf).

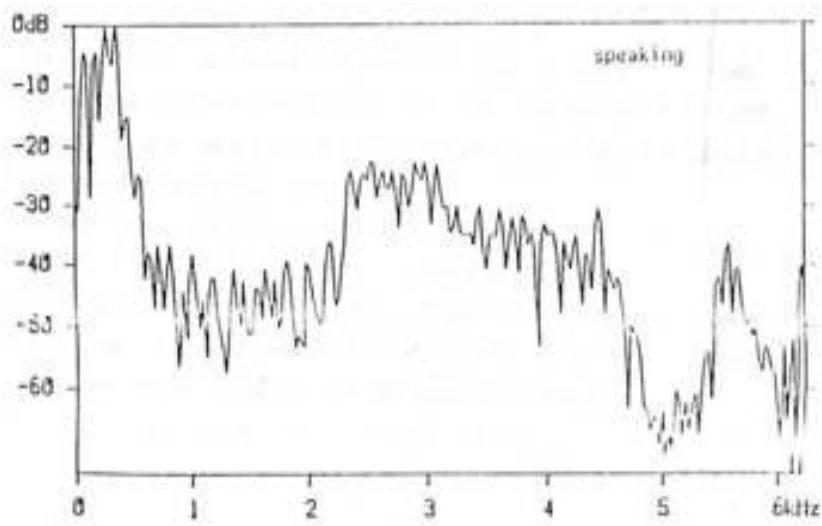
A 30 MS period is visible in each of the following spectra. The amplitude of the harmonics is compared on the vertical axis. The value which is used for comparison is the amplitude of the strongest harmonics (indicated by 0dB on the graphs). The frequency can be read from the horizontal axis (kHz).



Using the technique of overtone singing a 13<sup>th</sup> harmonic can be clearly distinguished by the naked ear and which clearly has the highest amplitude, is produced above by singing the vowel 'I'. The frequency of the tonic is 189 Hz, while that of the 13<sup>th</sup> harmonic is 2513 Hz. (in this connection it should be noted that when performing overtone singing, front vowels produce vowels which give an auditory impression of being higher, while back vowels give an impression of being lower).



The above is a representation of the 'I' vowel presented using a normal singing voice. We note that the 1<sup>st</sup> and 2<sup>nd</sup> harmonics have the highest amplitude and that no other harmonics form peaks which are as powerful as in the foregoing. The frequency of the tonic is 195Hz.



### ***On The Technique***

The term which is often used for the type of singing in question is *throat singing* or *guttural singing*; the use of such a term refers to the fact that both of the audible sounds have been imagined to originate in the "throat"- either in such a manner that the vocal cords produce two sounds or for example, in such a manner that a harmonic could be made audible with the aid of the windpipe or the uvula (19).

The suggestion has also been made that when the tonic is formed the glottis is "extremely tense", for which reason singing requires a great amount of physical effort and learning the entire technique requires several years of practice (20). At most, only the last of these views is justified. When learning this type of singing the same criteria are important which are significant when learning to control a style such as that used in singing western classical music: everyone who has studied singing knows how much time is needed to learn such things as to breathe correctly, this being a function of the proper control of the diaphragm and the other abdominal muscles, as well as to practice both maintaining the proper resonance and controlling the muscles in the region of the glottis. The basis of overtone singing is provided by a normal, well supported singing voice which is used in order to produce the tonic. In practice, the choice of the harmonics which are heard above the tonic is affected in such a manner that the form of the oral cavity is *altered* primarily with the aid of the tongue, although the lips and slight movements of the lower jaw are also involved. When singing, the tip of the tongue is pressed against the palate, and the sides of the tongue are supported so that they rest against the molars in the same manner as when producing an 'L' sound. After this it is possible to begin to search for the correct "location" by combining this lateral articulation with a normal singing voice (21). In Mongolia I was told that a silver drinking cup is often held in front of the mouth when practicing *khöömii* singing. The thin metal evidently serves as an extra resonator or reflector which can help the singer learn to select and reinforce the harmonics which he desires. I also made use of the experience had obtained from singing instructions in learning to listen to my own voice. After practicing for about a week I was able to produce acceptable harmonics (22). I quote here Ronald Walcott's clear words with respect to the reinforcement of harmonic: (23)

“Reinforcement of partials is achieved by characteristic changes in the shape and volume of the mouth cavity. This is reminiscent of the principle of the Jew's harp,' where a vibrating tongue sounded at the lips produces a drone fundamental which the player modifies by shaping his mouth cavity so as to form a resonance chamber of critical volume. The volume of this chamber, functioning on the principle of a Helmholtz resonator, reinforces a narrow frequency band area within an existing spectrum. This band is sufficiently narrow to enable the singer to select a given single partial above the drone in accordance with the degree of modification made by him. The principle involving the reinforcement of discrete partials by a specific shaping of the mouth cavity is thus common to both *chöömij* and the Jew's harp. A difference, however, lies in the physical origination of the fundamental. In the Jew's harp it is produced at the lips, in the *chöömij* it originates in the throat region.”

Walcott conjecture's that physiological limitations prevent the singer from going below the 6th or above the 13th harmonic (24). Badzardaran used the 5th harmonic in his performance – I myself have been able to attain this as well as the 14th, 15th, and 16<sup>th</sup> harmonics (with 'G' as the tonic). Nevertheless, the last mentioned are already difficult to filter, for which reason they cannot be used for purposes such as performing melodies.

Walcott also notes that the tonic is usually selected from within the range of 'G' and 'd', and he supposes that it is specifically this area which makes it possible to produce a composition of harmonics which can tie effectively filtered by the oral cavity (25). The optimal height of the tonic is evidently greatly dependent on the singer's voice. For example Badzardaran has 'Ab' as the tonic in both songs, and I myself have attempted to produce even higher tonics with good results (25).

### ***On the possible spectral analysis of overtone singing***

Not too much can be learned about this type of singing if its study is restricted solely to the descriptive level. For this reason I have used a computer to carry out a so-called FFT or Fast Fourier Transform analysis. The pertinent data for this is as follows:

Computer used for the analysis: EXORset 30

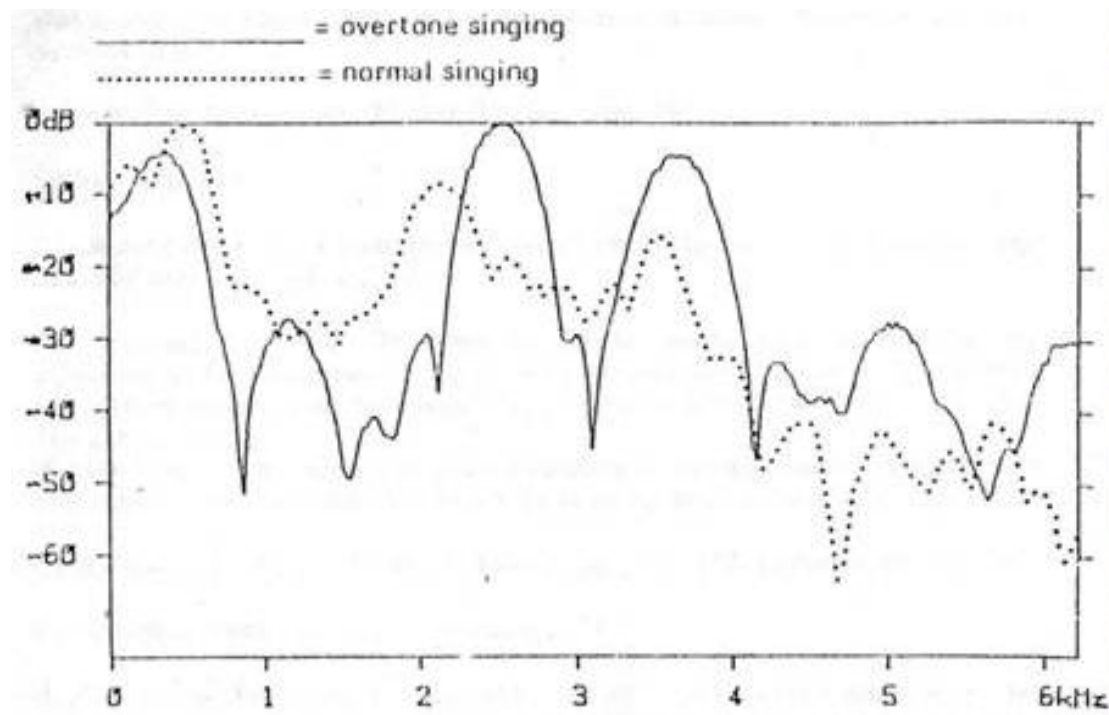
Computer program: VOCOM Speech Processing System

Analysis performed by: Hannu Kaskincen, Phil. Mag., whom I thank for the technical realisation as well as for the friendly advice and guidance he provided me with when I was writing this part of the article.

Place: department of Phonetics, university of Helsinki.

The foregoing is a representation of the vowel 'I' with normal speaking voice. Compared with the previous examples the individual harmonics can only be distinguished from one another with difficulty (tonic=106 Hz).

The preceding three figures demonstrate quite graphically how resonance frequencies with a powerful amplitude form clearly distinguishable peaks in the spectra. These peaks are called formants. The differences between the formants of overtone and normal singing are clearly evident in the spectra reproduced below. In figures 1 and 2 one period of the glottis (~ 6MS) is visible as a superimposed pattern.



The following table is a representation of the frequency of three formants (F1, F2, and F3) of overtone and normal singing, as well as of their divergence in intensity from the standpoint of that formant which has the strongest intensity (-dB). In these examples the variation in the frequency of F2 is a consequence of differences in the tonality of the 'I' vowel.

	Overtone singing		Normal singing	
	Frequency	Divergence in amplitude	Frequency	Divergence in amplitude
Tonic	189 Hz		195 Hz	
F1	297 Hz	-4 dB	405 Hz	0 dB
F2	2513 Hz	0 dB	2027 Hz	-9 dB
F3	3594 Hz	-5 dB	3432 Hz	-15 dB

On the basis of the above it seems that the differences in amplitude noted in the formants of overtone singing are smaller than they are in normal singing. With respect to both what is heard by the ear and what is shown by the spectrum the increase in the resonance of the supra-glottal cavity, which is a characteristic of overtones singing is achieved by making use of a constricted articulation not unlike that used when pronouncing a lateral sound. This involves the tongue dividing the oral cavity into two resonating chambers (27). Maximal exploitation of resonance is also demonstrated by the small amount of respiratory air needed to produce a sound: using a normal voice I am able to sing for approximately a half minute without having to pause for breath, but if I perform a song using overtone singing not even a minute of uninterrupted singing results in any major difficulties.

#### References

1. With respect to the name and definition of the style of singing see e.g. Tran/Guillou, pg 162.
2. Cf. e.g. Hamayon, pg. 484; Aksenov, pg. 12; Crossley-Holland, pg. 65-66; erdenebilig, pg. 29.
3. Aksenov, pg. 12- 13; Tran,pg. 162 and pg. 165.
4. Vargyas propose (pg. 71) that the style of singing concerned is particularly widespread in the eastern parts of the Mongolian People's Republic. This information might be based on a misunderstanding.
5. Erdenebilig, pg. 29.
6. Lebedinskiy 1948, pg. 50-51; 1965 pg. 82-86; Rybakov, pg. 271
7. Lebedinskiy 1948, pg. 51. For some reason the references to shamanism are not included in Lebedinsky's later work (1965).
8. Cf. e.g. Emsheimer, pq. 19-22, and Rouget, pg. 187 and 189.
9. Agapitov/Khangalov, pg. 43.
10. Aksenov, pg. 12
11. Crossley-Holland, pg.66
12. Ellingson-waugh 1974, pg 13-14. Cf. also Ellingson 1979, pg. 44:"In western terms their melodies 'db Yangs' consist of sequences of smoothly and continuously varying intonational contours including changes in pitch, loudness and/or configurations of resonance (overtone) mixtures.
13. Anna-Leena Stikala gives a thorough assessment of the shamanistic descriptions in her dissertation, cf. e.g. pg. 236, 5L-5P1N; pg. 266, 3G-3H 51; pg. 294, 3H. Cf. also Rouget , pg. 192.
14. Erdenebilig pq. 29. The only musical transcription of this type of singing as used for imitating the sounds of nature that I have been able to find is in Smirnov's book, pg. 225-229, cf. also the commentary on page 353. Smirnov has made a musical transcription of the imitation of flowing water (usnii sorgio) produced by Čimitosor, who is from the Gobi-Altai region. This imitation occurred in a secular context. Cf. also Musical Voices of Asia, pg. 48; "Tanimoto asked Sundui to demonstrate the imitation of a water stream by xöömij. Sundui performed a piece, which was composed when inspired by the sounds of water flows in a mountainous area".
15. Cf. e.g. Emsheimer, pg. 20, Serosevskiy, pg. 592

16. Sul'gin, pg. 459.
17. Cf. Walcott, pg. 56. Examples of use of the 13th harmonic: Smirnov pg. 226-2227 and Vargyas, pg. 72.
18. Cf. Walcott, pg. 56... "The melodic style would seem to dictate the selection of tones agreeable to an anhemitonic pentatonic scale widespread in Mongolian music, and this would naturally require the lowering of the 7th partial..." a lowering of the harmonic would require a corresponding reduction in the drone. However, nothing like this is to be heard. Cf. Gunji, pq. 135.
19. Lebedinskiy 1965, pg. 83-84, Rybakov, pq. 270-272. Erdenebilig, pg. 29.
20. Lebedinskiy 1948, pg. 51; Vargyas, pg- 71
21. B.P. Cernov 1982, pq. 87-92, notes in his article which deals with overtone singing of the Tuvins and the Khakas that Soviet researchers have carried out tests using a laryngoscope and x-rays, the results of which demonstrate that the Tuvins singers produce the constriction in the anterior portion of the glottis between the arytenoid cartilages and epiglottis. Use of this constriction to produce overtone singing varies according to the type of singing in question. Evidently the Kargyraa and borannadyr singing of the Tuvins is based on the use of this technique as does the resonating type of the Khakas and the Altai. The slit between the arytenoid cartilages characteristic of Tuvins singing is 1 - 1.5 mm, while that used in the style used for recitations by the Khakas is greater, measuring from 3 to 5 mm. Cf. Maslov/Cernov Pg. 157-159
22. Tran mentions, pg. 163, that he needed two years to learn overtone singing. He also gives instructions, more detailed than those presented by me above, concerning the physiological mechanisms involved. I think that many people would be able to produce Overtone singing - the quality will, of course, depend on each person's musical talent. I have also noticed that some people working as professional musicians and music teachers cannot distinguish the various harmonies. Guillou is, without doubt, right in saying: "The western ear may need a certain amount of training before becoming accustomed to the sound quality" (Tran/Guilou pg. 168)
23. Walcott, pg. 55, Cf. also Crossley-Holland, pg. 65-66
24. Walcott, pg. 56
25. Walcott, pg. 56
26. Cf. Tran/Guilou, pg 164. "favourite fundamental tone varies according to the tonal quality of the singer's voice and his windpipe" Cf. also *ibid.* pg. 169
27. For more details Cf. Tran/Guilou, pg 170-173.

## LITERATURE

Agapitov, N. N., Khangalov, M. N. Materialy dlja izucenija samanstva v Sibiri. Samanstvo u burjat Irkutskoj gubernii. Izvestija Vostocnosibirskogo Otdel. Imperatorskogo Russkogo Geograficeskogo Obscaestva T.XIV, Nr. 1~2. Irkutsk 1883.

Aksenov, A. N. Tuvins Folk Music. Asian Music IV-2. New York 1973,

Černov, P. B. O. fiziologi mekhanizma tuvinskogo i khakasskogo gortanogo penija. Problemy Khakasskogo Fol'klora.. Abakan 1982.

Crossley-Holland, P. Central Asia. The New Grove DIctionary of Music and Musicians 4, s. 65-66 London-Washington. Hong Kong 1980.

Ellingson-Waugh, T. Musicat Flight in Tibet. Asian Music V-2. New York. 1974.  
- Tibetan Chant and Melodic Categories. Asian Music X-2. New York 1979.

Emsheimer, E. Maultrommel in Sibirien und Zentralasien. Musikhistoriska Museets Skrifter 1. Studia ethnomusicologica eurasiatica. Stockholm 1978.

Erdenebilig, C. Two voices in one throat. Mongolia nr. 5/1978. Ulan Bator 1978.



- Gunji, S. An Acoustical Consideration of Xöömij. Musical Voices of Asia. Tokyo 1980.
- Hamayon, R. Mongolia. The New Grove Dictionary of Music and Musicians 12, s. 484. London-Washington Hong Kong 1980.
- Lebedinskii, L. N. Iskusstvo "uzljai" u baskir. Sovetskaja Muzyka Nr. 4 1948. Moskva 1948.  
- Baskirske narodnye pesni i naigrysi. Moskva 1965.
- Maslov, V.T., Cernov, P.B. Tajna sol'nogo dueta. Sovetskaja ethnografija 1/1980. Moskva 1980.
- Rouget, G . La musique et la Transe. Ed. Gallimard 1980.
- Rybakov, S. G. Muzyka i pesni ural'skikh musul'man. Sankt-Peterburg 1897.
- Serosevskij, V. I. jakuty.Etnograficeskogo issledovanija. T. I. S.-Peterburg 1896
- Siikala, A-L. The Rite Technique of the Siberian Shaman, FFC 220, Helsinki 1978.
- Smirnov, B. Mongol'skaja narodnaja muzyka, Moskva 1971.
- Sundberg, J. Rostlara, Stockholm 1980.
- Sul'gin B. Ob altajskom krae. Maadaj-Kara, altajskij geroiceskj epos. Moskva 1973.
- Tran Quang Hai/Guillou, Denis Original Research and Acoustical Analysis in Connection with the Xöömij Style of Biphonic Singing. Musical Voices of Asia. Tokyo 1980.
- Vargyas, L. Performing Styles in Mongolian Chant. Journal of the international Folk Music Council, Volume XX. Cambridge 1968.
- Walcott, R. The Chöömij of Mongolia. A Spectral Analysis of Overtone Singing. Selected Reports in Ethnomusicology, Volume 11, No. 1. California 1974.

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