

An Analysis of the Tones of the Languages of the World

By

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Part 1

A Hexatave² in Speech as compared with an Octave³ in Music

An Octave defines a range of musical notes. Between the high and the low of the same Octave, there are six notes. When we listen to someone singing, we notice that the sound we hear corresponds to the musical notes within the Octave. Thus, an ordinary person as a beginner learning to sing will not be expected to utter a sound other than a note from within the Octave. When we hear human beings speak, can we say that there is also a boundary within which the tones are contained? Not only do I claim that there is such a boundary, I believe that like the limitation in the number of notes a person can sing (or produce) within an Octave, there is, in speech, also a limitation in the number of tones, which a human voice can produce within this boundary.

There are eight notes including the highest and the lowest within an Octave. How many notes (or tones) are there within the boundary of speech? To my knowledge, linguistic experts have not so far focused

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² Hexatave is a term invented by the author to describe a band of tones, similar to the Octave in music.

³ The famous mathematician Pythagoras was credited for having invented scales and introduced the understanding of the Octave in 550 BC. He discovered the numerical relationship of notes by means of the number of vibrations needed to produce different sounds. It is useful to note that there are other scales apart from the Octave. They include, for example, the Pentatonic Scale, the Whole Tone Scale, the Chromatic Scale; but the Octave has remained possibly the only common denominator to all scales in music. Taken from "The Scale: A Sound Ladder" by Gail Smith, published by Mel Bay Publications Inc. Pacific, MO63069.

their research from this angle* .

To encompass all the tones used in speech, the first step is to look at the most complicated language, then we should ascertain the total number of tones used by that language and record them in a list. We should then compare these tones with the tones of other languages, and see if we can add anything on to the list.

Cantonese possesses the greatest number of tones. There are six tones in all. Despite our best endeavors, we have found no other language in the world that has a 7th or an 8th tone. At this stage of our research, we can safely say that there is a maximum of six tones used in spoken language. I refer to this range of tones as a “Hexatave” in speech.

In one respect, the Hexatave in speech is similar to an Octave in music: just as the musical notes within an Octave cover the musical notes of all melodies irrespective of the musical background of the composer, the Hexatave would cover all the tones of all languages spoken around the world. The only exceptions, as we shall see, are the combinations produced when two of these six tones are merged or combined to form a new tone. Strictly speaking, however, these are not new tones but a combination or merger of two known tones. We shall continue to accept the total number as six.

So, what are the six tones in the Hexatave? We can refer to them as “hexatones”. They are the six tones used in Cantonese. Like learning musical notes within an Octave, we should arrange these notes in a logical sequence so that we can easily commit them into our memory. All these have helped us to develop a new concept to learn the tones of dialects. We call this “**the Musical Approach Concept**”.

Summary

We have observed that (1) there is a common boundary to the tones used in the speech of human beings. (2) There are six tones used within this boundary. (3) Within this boundary, there are spoken languages, which use only some of these tones, whilst another language may use some others. (4) The tones used by human beings will not go beyond the six tones in the Hexatave, [although a tone created by the combination of two existing ones is not considered as a “new” tone]. These observations could be summarized as the Theory of the Hexatave.

* However, see research by Dr. Zhao Yuanren, *infra*.

Part 2

What are the Constituent Tones in the Hexatave and What is the Best Way to Learn Them.

What are these tones? And how should we learn them?

Like musical notes within an Octave, the tones in the Hexatave could be better understood if we arrange them in a sequence either from high to low or *vice versa*. We opt to arrange them in a sequence from high to low giving the highest tone a numerical value of 1 and the lowest tone a value of 6. Once we understand this order of the tones within the Hexatave, we begin to realize how easy it is to learn the tones of languages. When we see a musical note within the Octave, we could tell how the note is sung. By the same token, when we identify the tone of a foreign word as a tone in the Hexatave, we could also tell how it sounds like.

Since most foreign students speak English, to enable a student to remember the tones, I have chosen a sound familiar to the English ear to demonstrate each of the tones. The choice is very important because a student cannot then complain that any tone escapes his memory or is beyond his comprehension. We should remember that the tones of Cantonese and the tones in the Hexatave are identical. Knowledge of one is knowledge of the other. We can refer to these tones as the Hexatones. The words I choose to learn these tones are:

- 1 Sea⁴, as in the deep blue sea (this tone being represented by the phonetic symbol si1),
- 2 See, as in the exclamation: ‘You see, here he comes!’ (represented by the phonetic symbol

⁴ Those of you who understand Cantonese might want to point out that there are two ways to pronounce ‘si1’. One is definitely higher than the other. Is this extra high tone a 7th tone? The answer is “No”. As it will be explained to you later, the difference arises out of the fact that the same tone is positioned in two different Hexataves.

si²),

- 3 Mee, as in ‘do-re-mee’ (represented by the phonetic symbol mi³),
- 4 Far, as in ‘Far, a long, long way to run’ taken from the musical, the Sound of Music (represented by the phonetic symbol fa⁴),
- 5 Ho, as in hotel (represented by the phonetic symbol ho⁵), and
- 6 Ti, as in city (represented by the phonetic symbol ti⁶).

From the above, one can see that the tones within a Hexatave are denoted by the figures 1 to 6 in a scale with the figure 1 representing the highest tone and the figure 6 representing the lowest. I expect a student to recite the six tones of the Hexatave (or the Hexatones) by saying si¹-si²-mi³-fa⁴-ho⁵-ti⁶ like a jingle. A student must accurately master this jingle to become familiar with the Hexatones.

When a student learning a new language (e.g., Cantonese) sees a phonetic symbol with a Hexatone intonation incorporated therein, e.g., “joi³ gin³”, all that he needs to do to figure out how to say it is to substitute the words “joi” and “gin” into this jingle, namely joi¹-joi²-joi³-joi⁴-joi⁵-joi⁶ and gin¹-gin²-gin³-gin⁴-gin⁵-gin⁶. The pronunciation of any word in the correct tone in Cantonese (or, indeed, in any other language or dialect) can then be figured out. What it means is that you can stay in the comfort of your home anywhere and learn the tones of any language or dialect.

Part 3

Co-relationship between the Tones of Different Languages of the World

Since I claim that all the tones in different languages of the World are covered in the Hexatones, I must give evidence to support my claim. I start with English.

English: The tones used in English are covered by tones 1, 5 and 6 in the Hexatave. Any word in English would not normally go beyond these three tones, although Tone #2 is sparingly used. For example, 'momentum' is in tones 5-1-6. 'Coffee' is in tone 1-6. 'Mediterranean' is in tone 5-5-5-1-6-6.

Many teachers use the application of 'stress' to explain what we perceive as a difference in tones. In my view, tones and stress are separate and distinct. Any student learning English must of course appreciate the importance of stress. Take the words (a) 'Poland' (b) 'potential' and (c) 'simple' by way of demonstration. The sound 'po' is clearly said in three different tones, namely Tones 1, 5 and 6 in the Hexatave. Yet, many people, including English teachers, do not share the view that there are tones in English*. They say that English is a non-tonal language. I respectfully disagree. Indeed, any sound a human being produces in conversation has to be said in a certain tone. The tone is there whether or not we want to acknowledge its presence. The only difference between a 'tonal' language and a 'non-tonal' one is that in a so-called non-tonal language, when a wrong tone is used, the pronunciation may sound strange but not unintelligible. In the case of the so-called tonal languages, failure to use the correct tone would not work at all. Let me demonstrate an advantage of knowing the Hexatave.

We know that people in South East Asia are accustomed to speaking English with some special characteristics in their tones. English teachers would say that they speak with the accent of a non-native speaker. Based on our understanding of the Hexatave, we can be more specific in analyzing the situation. Tone No.3 of the Hexatave is widely used in Malay. If we count from 1 to 10 in Malay, we will notice that

* Dr. Robert Vanderplank, Director Oxford University Language Center (e-mail: robert.vanderplank@langu.ox.ac.uk) has expressed agreement on the need to distinguish between stress and tones.

the 3rd tone in the Hexatave is the first syllable used in all cases. So popular is Tone No.3 that people in South East Asia subconsciously speak English using the 3rd tone. This is why they say “koh3 fi1” instead of coffee (koh1 fi6), and “haai3 est1” instead of highest. So, we can identify what went wrong, why it went wrong, and what can be done to rectify the imperfections.

German: In the context of tones, it does not appear as though there is much difference between German (as well as other languages spoken in Europe) and English. The only observation the author would like to make is that Tone No.2 in the Hexatave seems to be more commonly used in German, e.g. Deutschland.

Thai: The tones used in Thai are similar to those used in Cantonese. For example, if we count from one to ten in Thai, we would say ‘ning6 song2 saam2 si5 ha1 hook5 jet5 baet3 gaau1 sip5’. We have used Tones 1, 2, 3, 5 and 6 in the Hexatave. So, in the given examples, five of the six tones are used. I have not come across any word in Thai not covered by the six tones in the Hexatave.

The tones of the Thai language are well known for their complexity; but once we know the tones in the Hexatave, the entire process for learning Thai is simplified to a point beyond recognition. We can almost read out in perfect Thai a speech after a few lessons through looking at phonetic symbols even without knowing the meaning of the words.

Mandarin: The four tones of Mandarin (Putonghua) are usually demonstrated by the words 媽麻馬罵. Tones 1 and 2 of Mandarin, herein referred to as (M1) and (M2) are similar to Tones 1 and 2 of Cantonese. They are Tone #1 and #2 of the Hexatave. The third Tone of Mandarin (M3) is a variation of Tones 6 and 4 of Cantonese. We can say that it is the result of the two tones, namely tones 6 and 4 combined (pronounced as ma6+a4). For example, when we say 一匹馬 (a horse), the word is pronounced as ma6 +a4. Yet, there are other ways to pronounce the same word, because when we say 馬上 (meaning immediately), the word is said in Tone 6, pronounced as ma6. Tone No. 4 in Mandarin (M4) is also similar to Tone 1 in Cantonese (or Hexatone #1). There is, however, a distinction between M1 and M4. Both M1 and M4 are in the 1st Tone, but they are in two different Hexataves. Because it is the same tone in two different Hexataves, we do not treat M1 as a new or an additional tone in the Hexatave.

Vietnamese: There are six tones in Vietnamese. Using the conventional method, a teacher would find it difficult to explain to a foreigner the minute difference between the Vietnamese tones. Using the Musical Approach concept, we say that it is not as difficult as one would have thought. To someone who understands the Musical Approach Concept and the Hexatave, the tones in Vietnamese can be demonstrated by reading out the phonetic symbols for ‘ba1 ba5 ba3-2 ba6 ba2 baag5’

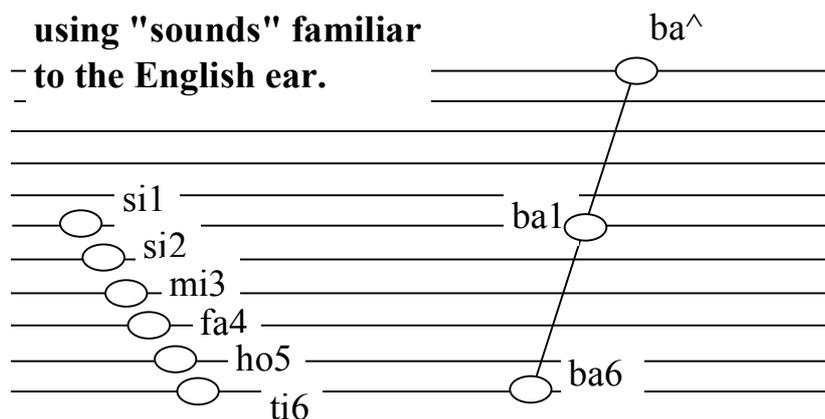
In our analysis of different languages and dialects spoken around the world, it is important that we recognize the co-relationship between the tones used. The Hexatave is the answer.

When one understands the Theory of the Hexatave and the Hexatones, it is much easier for one to learn a second language. For example, a student who has English as his mother tongue can figure out how a Chinese word is pronounced without outside help, even though he has not heard how the word is ever said.

The diagrams in the following pages explain the tonal level of the Hexatones in relation to the different dialects and languages around the world. See if you can figure out how to speak in the different languages and dialects as indicated based upon the phonetic symbols.

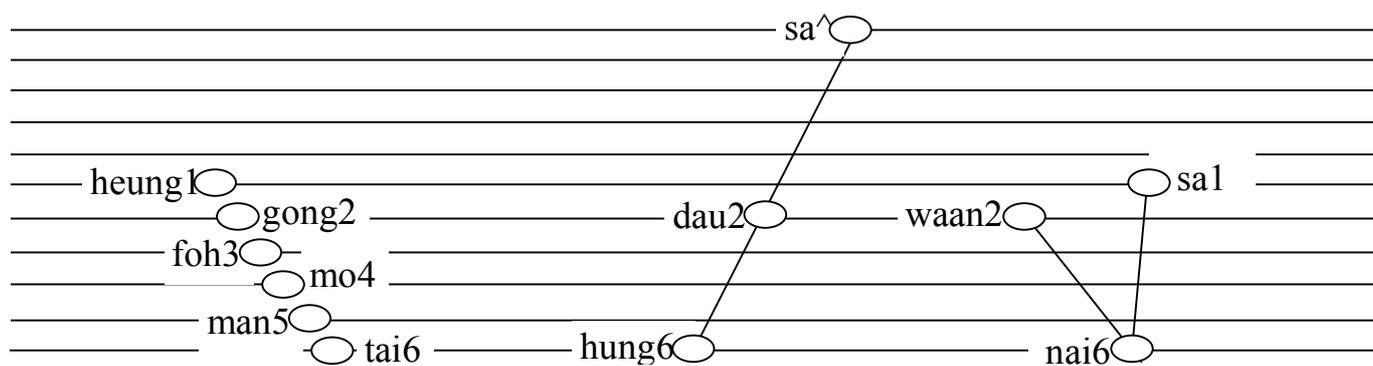
Tonal Level of Words in Different Languages and Dialects in Relation to the Hexatave. The numerical values in all cases refer to the tones of the Hexatave.

A demonstration of the 6 tones of the Hexatave using "sounds" familiar to the English ear.



A demonstration of "sounds" covering 2 Hexataves

A demonstration of Cantonese words in relation to the Hexatave



香港貨冇問題

Meaning:

Hong Kong goods has no problem.

Meaning:

紅豆沙

Red bean in crushed form

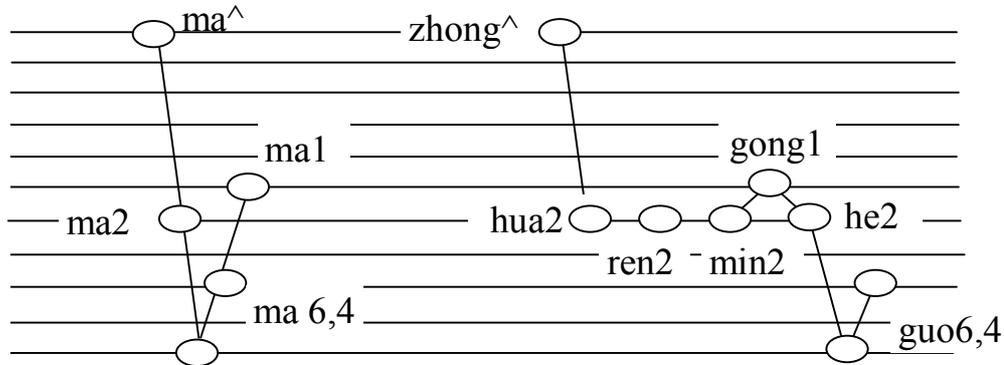
Meaning:

玩泥沙

Playing with sand

("^" denotes the tone1 in a higher Hexatave.)

A demonstration of the 4 tones of Mandarin based on the Theory of the Hexatave



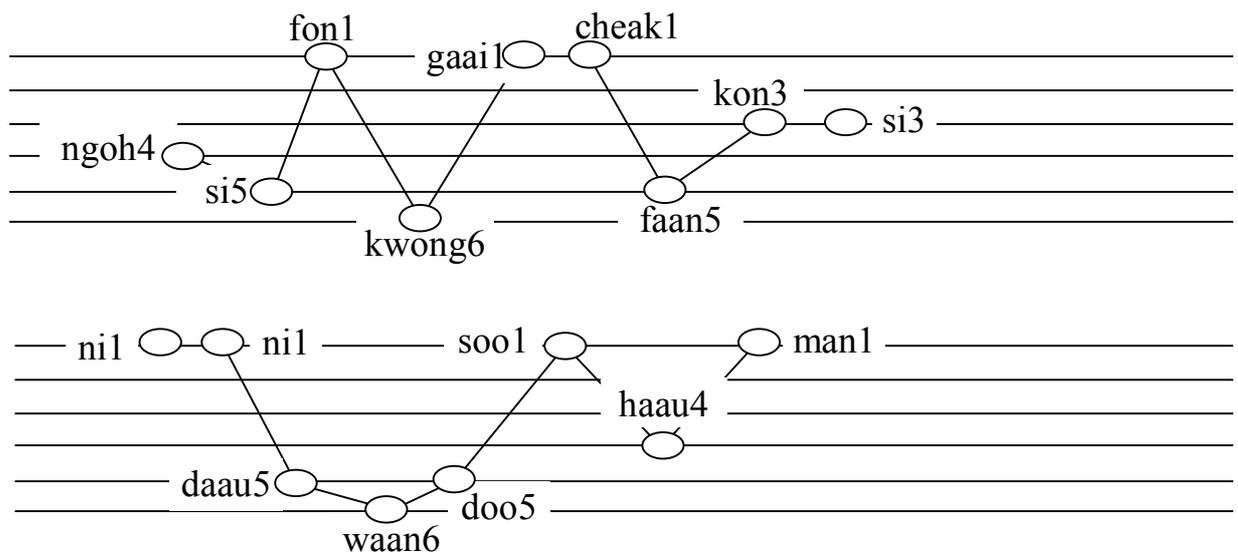
Meaning:

中华人民共和国

People's Republic of China

Notice that the pronunciation of sa[^] and sa¹ as mentioned in the previous page demonstrating a difference in two tones of Cantonese can also be used to demonstrate the difference between Tone 1 and Tone 4 of Mandarin.

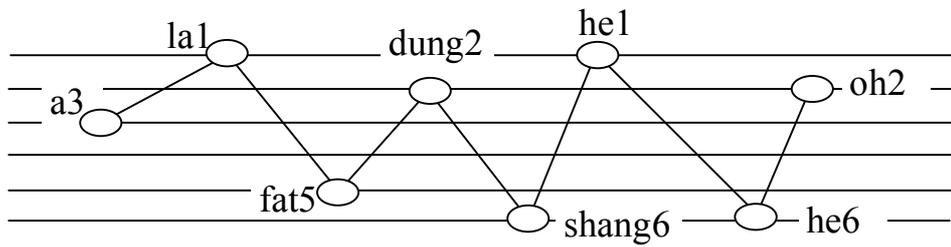
A demonstration of the tones of words in Jiang-xi Province, as spoken by natives living at its capital, Nan-chang:



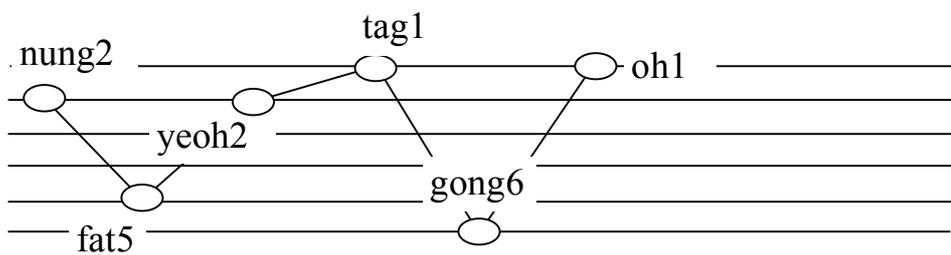
Meaning:

I like going out, for meals, watching movies, having to study everyday is very boring.

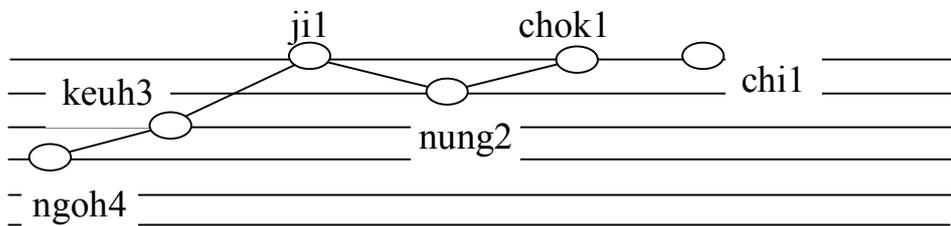
A demonstration of tones of Shanghainese words in relation to the Hexatave



Meaning:
I do not speak the Shanghai dialect.

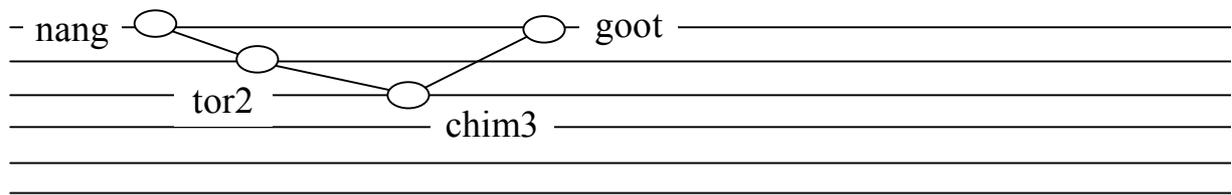


Meaning:
Don't you be so stupid!



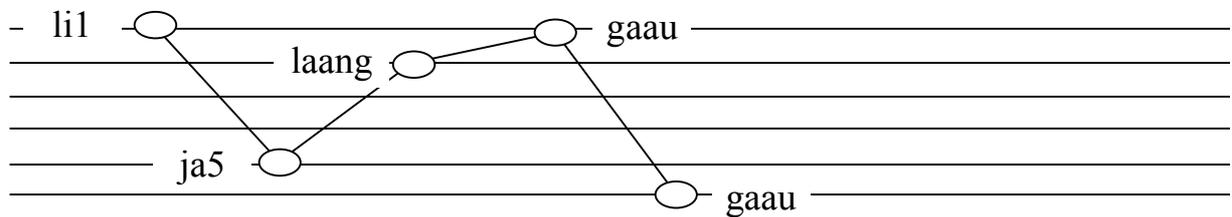
Meaning:
When I see you, I would feel angry.

**A demonstration of the tones of words said in FuJiangProvince,
as spoken by natives living at its capital, Minnan**



Meaning:

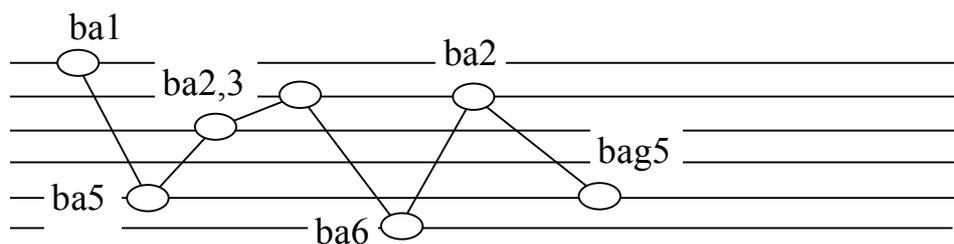
得寸进尺 Give him an inch and he will take a



Meaning:

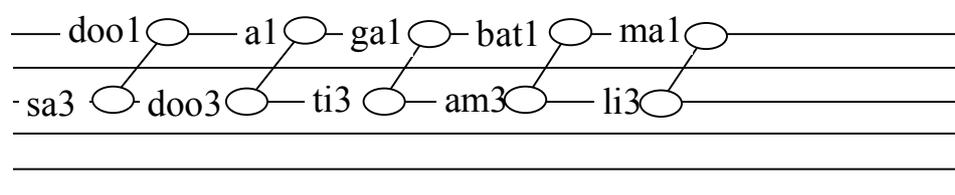
得寸进尺 Give him an inch and he will take a yard (slang).

A demonstration of Vietnamese tones in relation to the Hexatave



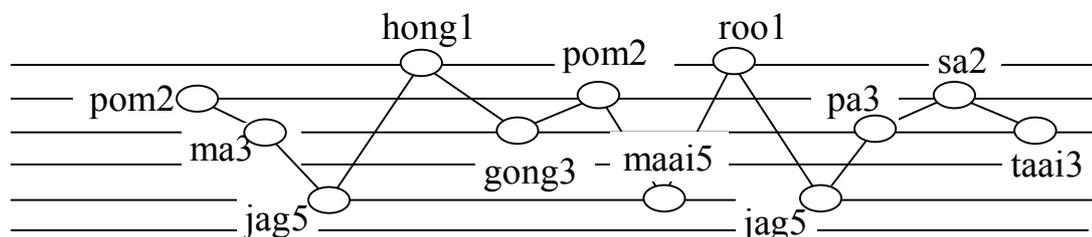
An illustration of the six tones of Vietnamese.

A demonstration of the tones of words said in Bahasa Malay in relation to the Hexatave



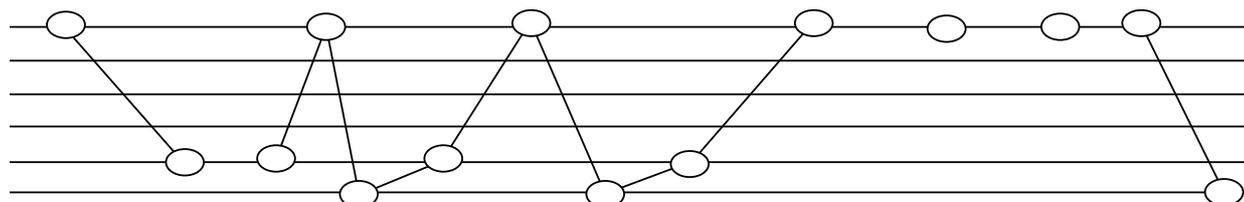
Meaning: 1, 2, 3, 4, 5

A demonstration of the tones of Thai words in relation to the Hexatave



Meaning:
I came from Hong Kong.
I do not speak the Thai
language.

A demonstration of the tones of English words in relation to the Hexatave



There	is	potential	in	Poland	but	it's	not	so	simple.
1	5	5 1 6	5	1 6	5	1	1	1	1 6

Part 4

A Scientific Analysis of the tones in Speech

In music, the highest note in one Octave is by definition the lowest note in the next. The same is true with the Hexatave. It is not difficult to demonstrate this point. Those who speak Cantonese will find it much easier to follow my argument. I would choose a compound word having the lowest and the highest tone in a Hexatave to prove my point. Let us take “ba6-ba1” meaning ‘father’ in Cantonese. Ba6 is in the lowest tone within a Hexatave, and ba1 is the highest.

You can do the experiment yourself. In your normal natural voice, say ‘ba6 ba1’. Don’t stop there. Prolong the ‘ba1’, and use this ‘ba1’ as a ‘ba6’ and proceed to say ‘ba6 ba1’ one more time. In doing so, you have said ‘ba6 ba1’ two times in two different Hexataves. The last ba1 you said is the highest tone in a higher Hexatave. It would be ideal if you can record what you say, and afterwards listen to what you have said. In this exercise, we have demonstrated how the highest tone of one Hexatave is treated as the lowest tone in the next. In Part 3, we explained the relationship between Mandarin and the tones of the Hexatave, we have already explained that Mandarin has four tones, one of them is taken note from a higher Hexatave.

Language teachers in Cantonese now have the scientific means, to prove the relative frequency level of different tones. Using a speech machine, an eminent professor Dr. Zhao Yuanren (趙元任)⁵ devised a method to calculate the average values of tones by subdividing sound frequency into 5 segments as follows: From 0 to 1.0 is categorized as 1, 1.1 to 2.0 is categorized as 2, 2.1 to 3.0 is categorized as 3, 3.1 to 4.0 is categorized as 4, and 4.1 to 5.0 is categorized as 5. The sound for each tone is subdivided into various parts e.g., the beginning, the middle and the end. Each part of the sound is tested and is given a frequency value (the highest being 5 and the lowest, 1). From this exercise, the vibration frequency of the tones is scientifically proven.

I have made a study of the relative tonal values of the six tones of Cantonese. In an Article written by Dr. Shi Feng (石鋒) as reported in the 45th issue of the Chinese Language Review (H.K.) published in Sept., 1994, the author enumerated the findings of a number of prominent

⁵ Dr. Zhao was a Professor of Linguistics at Harvard University.

linguists. Each of them has given a relative value to each of the tones of Cantonese using the method developed by Dr. Zhao. Based on the data presented, I have calculated the average value of each tone.

When I arrange the tones based on these average values from high to low, in line with my expectation, I have an order, which coincides with the order I suggest for the Hexatave. The average values are:

(For the tone known as yam1 ping6) si1	=	4.16
(For the tone known as yam1 seung5) si2	=	3.66
(For the tone known as yam1 hui3) si3	=	3.25
(For the tone known as yeung6 seung5) si4	=	2.22
(For the tone known as yeung6 hui3) si5	=	2.00
(For the tone known as yeung6 ping6) si6	=	1.20

We should understand the contribution and limitation of the analysis of the tones using Dr. Zhao's method. The contribution is that a relative value is scientifically established. The limitation is that nothing more than a relative value is established. It does not bring us, as students of a new language, any closer to being able to produce a sound in the correct tone.

Different names are given to depict the tones of different languages. The following Table describes the names given to the tones of various languages in South East Asia:

Cantonese	High level, high falling, middle rising, middle level, low falling, low rising, and low level
Thai	mid, low, high, falling and rising
Laos	Low, mid, high. Rising, high falling and low falling
Vietnamese	High, mid, low, stopped syllable, and high broken
Burmese	Plain high, creaky high, low, stopped syllable, and reduced (weak) syllable

It is extremely difficult to use words to describe how to sing the notes of the Octave: 'do-re-mee-fa-so-la-ti-do'. It is just as difficult to describe in words the tones of speech. The use of diagrams with arrows and curves can hardly help in the explanation. The description of the tones as stated in the above Table is supposed to be indicative of what these tones are; but to someone who does not understand the language, such a description is not helpful at all. Not only is it difficult to learn the tones of speech by textual description, when the same tone is heard, linguists in different territories use a different name to describe it. This compounds

the difficulty.

The ability to appreciate the existence of a Hexatave in tones would make a world of difference. When we look at the phonetic symbol of a word (with tonal identification based on the Hexatave Theory), no matter what language that particular word comes from, we would know how to say it correctly.

Conclusion

With the Hexatave and the Musical Approach Concept, the process for learning a new language is simplified. Invaluable time is saved. As we are entering an age of globalization, we should possess common ideas and a common knowledge about Tones. We should use an identical symbol to describe words having the same tonal level, so that people everywhere would know exactly how to say it.

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