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# A COMPARATIVE VIEW ON GERMANIC AND SLAVONIC HEXATONAL SONG GRAMMARS

This paper is a link in a series of studies intended to outline the transition hypothesis[1]. After having understood Gerald Langner's theory on neural subharmonics[2] it became necessary to revise some elementary points of departure of this hypothesis. This has no effect on the historical conclusions drawn in the author's earlier papers. The revised theory abandons the widely accepted resonance theory according to which *physical* overtones become transformed as such into their *neural* correspondence. The fundamental tone and its possible overtones have their representation in the auditory system but not in the ways believed before. The aim of this paper is to reformulate the points of departure based on what appears to occur in the auditory system. Some of the main postulates of the transition hypothesis are:

All humans have always shared an identical auditory centre whose main functions developed hundreds of millions of years ago, that is, long before the emergence of modern humans. On the rudimentary level all humans react to musical information identically: The auditory system encodes the musical information regardless of culture (knowledge acquired by learning).

1. All human song is based on six hexatonal modal roots or on their six rudimentary embryos.
2. In the subconscious of a singer (listener) the melody is firmly anchored to one pitch called the *anchor*. Universally, this pitch may change to 1, 2 or 3 other pitches during a melody. It is the aim of the analyst to identify the transitions of the anchor because the identification of the active anchor enables the definition of the active mode (root, embryo).
3. All song traditions are based on *song grammars* (sets of rules[3]), which vary locally by virtue of local cultural differences.

1 See the bibliography.
2 Langner 2007.
3 The song grammar does not deal with performance (stylistic articulation, tempo, rhythm, instrumentation). Song grammars are subconscious. Their basis is partly genetically inherited (the mechanism of the auditory centre in which the neural processes occur), partly learned. The rules mentioned mainly comprise the subconscious ideals concerning the metre and the ways the anchors are interconnected. From this point of view can be seen that song grammars are dealing with *syntax*, the arrangement anchors and roots in the flow of melody showing their connections and relations. These rules are learned but, from the universal perspective, they are rarely communicated because of their subconscious nature. People are able to improvise songs according to certain metric patterns without being aware of their existence. The local rules governing the formation of melody function in the same way. It is only in high cultures in which the musicians (priests, philosophers, musicologists) have formalised these subconscious rule sets.

4. All song grammars are based on one rudimentary basis (labelled the *constitution*) and the same basis existed already in the grammar(s) of the first singing humans.
5. The transition theoretical approach proposes the universal comparison of human song by initiating the comparison of local song grammars instead of melodies. The results can be interpreted diachronically and this leads automatically to the evolutionary study of human song.
6. For purposes of comparison, all melodies are calibrated to the *G horizon*: The anchor tone of the initial mode of the tune is always $g^1$.

Figure 1 endeavours to present the constitution mentioned. It is universal and precultural. Its first factor is the immanent series of lower overtones ordered according to the integral multiples of the basic frequency F (the fundamental tone): F–2F–3F–4F–5F–6F etc. If the fundamental is *C* the overtones 2-6 are $-c$-$g$-$c^1$-$e^1$-$g^1$. The second universal in music is the identical auditory system[4], in which the processes occur in micro- and millisecond range as they also do in other mammals. There are structural differences between human individuals[5] but these are marginal for our purposes. Thus, on a rudimentary level, all humans are and always were equal as listeners to music, and it is the auditory cortex that distinguishes humans from other mammals. Thus, the basis of transition hypothesis is made up by two universals underlying all song grammars the *physical constant* as the flow of sound energy, and the *neural constant* as the function of the auditory system.

The global analysis of melodies carried out by the author has suggested that there are certain neural abilities common to all humans. They are a consequence of the identical auditory system and, hence, they are also musical universals. The first is the *ability to memorise* and sustain the pitch heard at the beginning of a tune. There are cultures with a preference to raise the pitch but this preference represents local aesthetics and does not mean that the singers are unable to " keep the key".

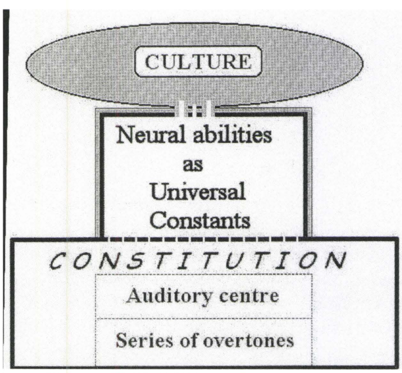



**Figure 1**. *This pre-cultural constitution has formed the basis of all human song grammars ever since the appearance of the first humans ca. 160,000 years . Local varieties in grammar are due to cultural variation.*

4 An informative description of the auditory system is Wallin 1991, 149-231 et passim.

5 Recently has been found that certain people listen to the fundamental tone while the others prefer to follow the timbre (spectrum) in musical processes. Thus difference is genetic. See Schneider *et al.* 2005, 387-394.

The second universal is the human ability to fix the sung tones to a firm anchor. Whatever there occur in melodic progressions the melody stays in a continuous relation to this anchor, which functions as a subconscious drone. Metaphorically it is called the *anchor tone*. (Its neural explanation is given later.) The third universal is the human ability to *create unitary images* of occurrences heard in a song. In relation to acoustics (hartmony) these images are called modes, and in relation to musical time they are called rhythms. The fourth universal is the ability to change the pitch of the anchor tone and to return to the initial pitch after a while. This ability automatically leads either to *transposition* (a mode stays while the anchor changes) or to *modulation*, (a change from one mode to another). It is essential to accept that it is impossible to encounter a musical tradition whose carriers would not transpose and modulate. All this remains subconscious.

Since musical tones do not exist in the physical world, they are neither intentional nor arranged in hierarchical relations. This is due to the fact that tones can only exist as neural images in the head of a listener. The transition hypothesis aims at understanding the cognitive process in the human mind at the moment of singing, listening and composing[6]. This leads to the search for subconscious song grammars which define the songs and their styles. A rich variety of local song grammars may be found in the world but however complex or simple they may be, they share one and the same precultural constitution ( Fig. 1).

In modal analysis the concept of *mode* refers to a consistent collection of tones fixed to an anchor tone. (Even though tones do not exist physically as tones, talking about tones is feasible on a metaphorical level.) Because of the human ability to modulate and transpose, a tune is usually a sequence of alternating modes. That is why the concept of *scale* is interpreted in transition hypothesis as an artificial theoretical construct which hides the internal grammatical processes. There are as many modes in a tune as there are anchors. If we combine one unitary scale out of the tones used, the internal logic of a tune is quickly lost because one tone can have the status of two or three separate degrees in two or three separate modes. All this will become obvious later. If the sentence "Shall I give the toy to Peter here —or is Mary going to take Peter to London to give it him there?" is arranged to a "scalar" order the sequence is "give-going-here-him-I-is-it-London-Mary-Peter-or-the-shall-take-to-toy-there", and the logic and meanings are lost. The sentence comprises two successive clauses, which corresponds to a tune based on two successive modes and anchors. If the independent degrees of these two separate modes are reduced to one scale, the internal logic of the melody is lost.

6 The present author is not arguing that a music analyst "knows" the neural processes in the highly complex auditory system. However, when these processes are simplified and translated into musicological language, it seems to become possible to see what there may happen in human mind while listening to musical progressions.

## On neural representation of physical tones

According to Gerald Langner[7], professor of neuroacoustics at the Darmstadt Technical University, a musical tone with a certain pitch activates neurons which form a constant series of *subharmonics* based on the formula c-c/2-c/3-c/4-c/5-c/6-c/7-c/8 etc. This neural system is inverse to the *harmonic* series in the physical world: c-2c-3c-4c-5c-6c etc. which comprises the fundamental frequency *c* and its overtones. The frequency of each overtone is an integer multiple of the fundamental tone. The subharmonic series is also based on the integers but as an inversion of the harmonic series and, most of all, it is *neural*.

In Fig. 2-A it is seen that the sung tone *c* stimulates the neurons *c-c-f-c-ab-f* etc. which form the subharmonic representation of the sung tone *c*. The subharmonics 1/4, 1/5, and 1/6 form the neural triad *c-ab-f* corresponding to the physical F minor chord *f-ab-c*. In this paper such neural triads are labelled *neurotriads*. In music analysis it is enough to operate with the term neurotriad and to remember that the neurons which have the strongest state of activation are the *c* and *f* neurons. It is now possible to systemise these *subharmonic primary responses* (SR[1]: see Fig. 2-B)[8].

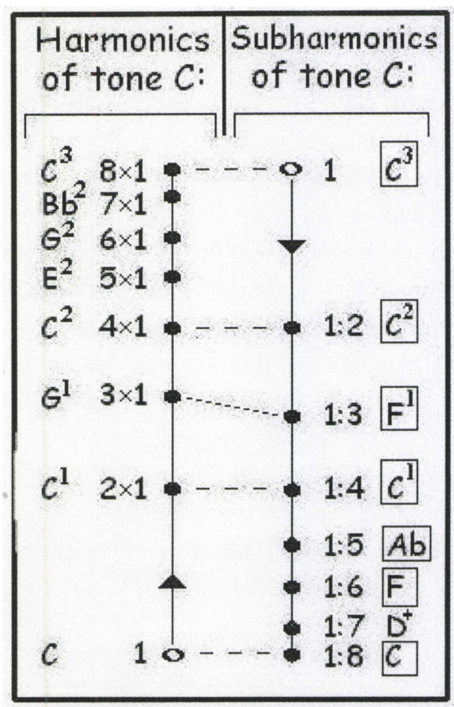



**Figure 2A**. *Beginning of the harmonic and subharmonic series of the sung tone c. Read the former upwards and the latter downwards. The points in the harmonic series represent physical frequences while the points in the subharmonic series represent activated neurons (referred to with the tone names). The core of Langner's theory of harmony (2007) can be reduced to the pattern: the sung tone c activates the neural F minor, or {c Fm}.*

7 Langner 2007. Langner´s other studies are seen in the bibliography.

8 Terms like neurotriad, subharmonic primary and secondary response, as well as neural primary and secondary option do not belong to Langner's theory and terminology. They belong to the transition hypothesis.

| Sung tones: | Neurotriads: | Symbol: | Sung tones: | Neurotriads | Symbol: |
|---|---|---|---|---|---|
| *c* → | ***f-ab-c*** | Fm | *gb* → | ***cb-d-gb*** | Cbm=Bm |
| *db* → | ***gb-a-db*** | Gbm | *g* → | ***c-eb-g*** | Cm |
| *d* → | ***g-bb-d*** | Gm | *ab* → | ***db-fb-ab*** | Dbm |
| *eb* → | ***ab-cb-eb*** | Abm | *a* → | ***d-f-a*** | Dm |
| *e* → | ***a-c-e*** | Am | *bb* → | ***eb-gb-bb*** | Ebm |
| *f* → | ***bb-db-f*** | Bbm | *b* → | ***e-g-b*** | Em |
| : | : | : | *cb* → | ***e-g-b*** | Em |

**Figure 2B**. *The subharmonic primary responses of sung tones are represented here in the form of neurotriads and the corresponding chord names. The primary responses are always in the minor form.*

The central auditory system does not only respond to the fundamental tone. When singing, there are usually certain overtones of the fundamental tone of the voice amplified in the oral cavity. According to Langner[9], the fundamental tone and each of its overtones activate the neurons according to Figures 2A and 2B. In most cases it seems to be enough in music analysis to operate only with the physical harmonics 4-5-6, which form the physical triad in the major form. In the case of the sung *c* the harmonics 4-5-6 are *c-e-g* corresponding to the physical C Major chord. Each of these three harmonics activates its own subharmonic neurotriad. That is, when tone *c* is sung and is accompanied by its low harmonics, at least three separate neurotriads (Fm, Am, Cm) are simultaneously and automatically activated (see Fig. 3-A). Because the neurons are not activated by the fundamental tone but by its overtones the resulting neural combinations are no longer called the primary responses but the *subharmonic secondary responses* ($SR^2$ and $SR^3$) in transition hypothesis.

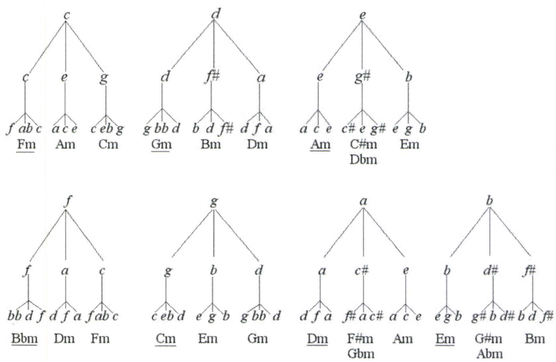



**Figure 3-A.** *The taxonomy of the subharmonic secondary responses to the sung tones c–b. As seen, tone c has f-ab-c = Fm also as its secondary response. This neural response is thus doubled because it was already the neural primary response. Thus, in transition hypothesis, only the two neurotriads to the right of the left triads (each underlined) are counted as the subharmonic secondary responses. Thus, in the case of the sung tones c, d e f the neurotriads Am, Bm, C#m=Dbm, and Dm are defined as* **$SR^2$** *in analysis. Accordingly, the neurotriads on the right side of each $SR^2$ (Cm, Dm, Em, Fm etc.) are defined as* **$SR^3$** *in analysis.*

9 As the main source are the personal discussions by email since January 2006.

The melodies sung by humans cannot be explained solely with the subharmonic primary and secondary responses. Thus, the present author has formulated the *system of optional selections*. In personal correspondence, Professor Langner stated in 2006 that nobody knows how many neurons are activated by each stimulation. Based on this statement, the present author formulated three options for the researcher to choose from for purposes of analysis. The first one comprises the neurons which correspond to the harmonics 4-5-6 of the fundamental in question. This group is called *neural primary options* (NO). If the sung tone is *c* the harmonics 4-5-6 (*c-e-g*) activate three neurotriads in minor form as shown in Fig. 3-A. However, the human mind will easily accompany tone *c* with the C Major chord. This is possible because while *c* is sounding the nerves *c, e,* and *g* are in a state of activation. Fig. 3-B endeavours to exemplify this: There is no direct representation of the physical chord C Major on the neural level. But because the nerves *c, e, g* are active, the auditory centre accepts C Major to accompany tone *c*. Thus, this selection of neurons is not a direct reaction to the tone heard but it is merely *a selection* out of *all* the neurons activated by the tone heard.

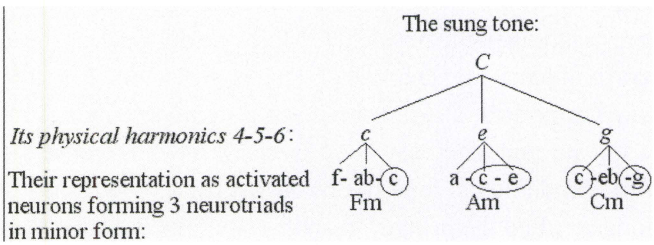



*Figure 3-B. Three simultaneously activated subharmonic neurotriads (Fm, Am, and Cm) as the representation of the physical harmonics 4-5-6 (c, e, g) of the sung tone c. As a result, the active neurons c-e-g (encircled) together form a selection which is the neural correspondence to the physical C Major triad. Such a selection is called neural primary option (NO1), which is always in the form of a major triad. The selection explains why tone c can be accompanied by C Major triad.*

Then there are two more neural options to choose from in analysis. They are labelled *neural secondary options* ($NO^{3-4}$: Figures 4A and 4B). The subharmonic neurons, which have the strong state of activation, make it possible for humans to accept triads emerging as their combinations.

To repeat, a physical (sung) tone has two kinds of automatic neural response, either primary subharmonic (sung *c* → neural Fm) or secondary subharmonic (sung *c* + *e* + *g* → neural Fm, Am, Cm). Both are active simultaneously. Beyond them there are three *neural options* (Fig. 4A and 4B), which are also simultaneously active with the previous two. As an ethnomusicologist, the present author has come to the hypothesis that the auditory system accepts a physical chord to accompany a sung tone if at least one tone of the physical chord already has its active correspondence in the auditory

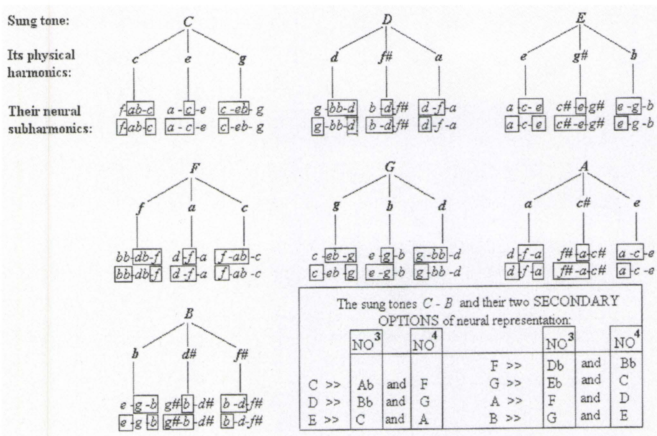



*Figure 4A. The neural secondary options of the sung tones from c1 to b1. The encircled neurons are parts of two separate neurotriads, which are given in the box as NO3 and NO4. See the main text.*

system. In other words, no music analyst can say which neurons are activated in the auditory system but any musician, composer or analyst is "instinctively" able to choose appropriate chords to accompany the sung tones. The expression "appropriate" relates to the melodic context and to the learnt culture of a listener. The context means that, say, the sung tone *c* can be accompanied by many chords — such as C Major, C Minor, F Major F Minor, Ab Major, A Minor, D7 etc. The best solution depends on the context (such as the key). There is absolutely nothing new in this statement but if it is related to possible processes in the auditory centre an interesting hypothesis arises. It seems that the human mind accepts new musical progressions most easily if they activate neurons which are already activated. The human mind respects a continuation, so to say. If the key of a song is A Minor it needs an inventive solution to accompany a tone with Eb Minor because of the lack of activated neurons. The neural secondary options in Figures 4A and 4B do not define all the activated neurons. They only define some of the most probable ones. They explain why a listener is ready to accept *two* more options beyond the three mentioned. It is necessary to remember that all these five are simultaneously in a state of activation. Which one sounds best in the "ear" of an analyst depends on the context, that is, on what was sung in the immediate past both as the flow of sound energy and as the neural activation.

The analysis of this paper suggests that there is an obvious relation between the neural processes of the near past, of the present, and of the future. In practice this can be seen in melodic movements: A singer (a composer) prefers to select the tone to be sung next according to the selection of the neurons which are active in the brief moment of the neural present. This is neither compulsory nor necessary for the easy flow of melody, but this is what repeatedly occurs in melodies worldwide. This subconscious process can be formulated in a general statement that the active neurons of the present moment may function as a *directory* to what is going to happen next.

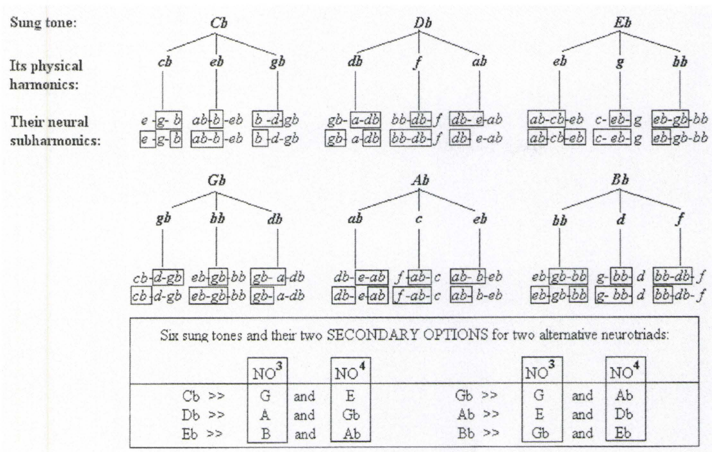



*Figure 4B. The neural secondary options (NO) of the sung tones from cb1 to bb1. The encircled neurons are parts of two optional neurotriads, which are given at the bottom of the figure as NO3 and NO4.*

Methodologically the first step of analysis is to identify the *anchor tone*, i.e. a subconscious drone below the melody. The number of anchors in a tune is usually more than one and less than five. The concept of anchor tone has been part of the transition hypothesis for years but the author could never explain what it is — except that it is degree 5 of the active modal root. The present author identifies the anchors by playing the melodies with the Roland E 10 Synthesizer with the soft French horn as the tone selection (without echo or vibration). (If the source is a sound recording, the synthesizer functions as the drone instrument.) After the anchor sequence has been tentatively defined, it becomes possible to identify the modal root(s) used by the singer(s). This simple procedure can be repeated in the analysis of any song of any song tradition, and, because of the anchor system, it is obvious that all human song functions according to parallel principles. The relations of the sung tones and the anchor(s) are astonishingly similar all over the world — however complex or simple the musical tradition is.

The explanation for the anchor phenomenon can be found in Gerald Langner's theory of how the auditory system functions. Because the neurons analyse all sonic information, all musical processes can be studied tone by tone in song analysis. The present author does this with the help of the neurotriads (see Fig. 5). The neural processes are described with the help of chords usually given with three or four tones (neurons). These are written below the melody like as if an accompaniment. This way it turns out that the *subconscious anchor is composed of the nerve which remains in a state of continuous activation*. The long term neural stimulation functions in such a way that the melody tends to progress in consonant relations to the anchor as exemplified in Fig. 5.

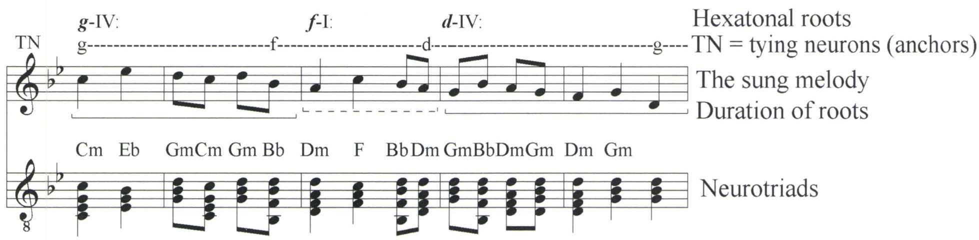



*Figure 5. Analysis of a melodic double line according to the transition hypothesis. The hexatonal roots are defined above the sung melody, which is on the upper stave. The symbol tn refers to the Tying Neurons, i.e. to the anchors g, f, d, and g, and the tying process itself can be seen on the lower stave as the alternation of neurotriads. The modal roots tend to be activated on the stressed metrical positions even if the tying starts earlier (as is the case in all changes in this melody). The melody is in the G horizon: the initial anchor is g1.*

Fig. 5 is dominated by neurotriads in minor form. The encoding patterns of the sung tones are subharmonic primary response (*d*/Gm; *a*/Dm, *c*/Fm); subharmonic secondary response (*c*/Cm, *f*/Dm, *g*/Gm), and neural primary options (*eb*/Eb; *bb*/Bb). There are no neural secondary options. Thus, it might be possible to describe the grammar with these features: $SR^1+SR^2+SR^3+NO^1$. This line of comparison, however, is not followed in this paper.

The identification of the neurotriads occurs by listening, and the choices of the analyst cannot be absolutely final. There are certain details in Fig. 5 which can be explained with the micro analysis like this. For instance, why is it easy for a singer to repeat the melody even if the interval of the final $d^1$ and the initial $c^2$ is the minor 7th? If the final $d^1$ were encoded with the neurotriad Dm by the auditory centre, it is quite difficult for a singer to restart the tune. However, if the final $d^1$ is encoded with the neurotriad Gm, there is no problem in restarting the melody. The reason is the tying. The active neurons of Dm do not share any prominently active neurons of the initial Cm while it is the *g* neuron, which ties the final *d* and the opening *c* together. To sing $c^2$ after $d^1$ is no problem.

According to the transition hypothesis, humans have used only six hexatonal modalities. Practically any modal construction (with the atonal one excluded) on any continent can be explained with the help of these roots or their more rudimentary embryos, which postulate also covers the pentatonic world. This paper has no universal aims because of which these views are not touched upon. These six roots are seen in Fig. 6. — Unlike in all the former papers by the author, the numbering of degrees is now changed to parallel the numbering in tonal analysis. Tonal degree 7 is lacking and is replaced with degree 6. The 4th degree (*f*) is often referred to by symbol ¥.

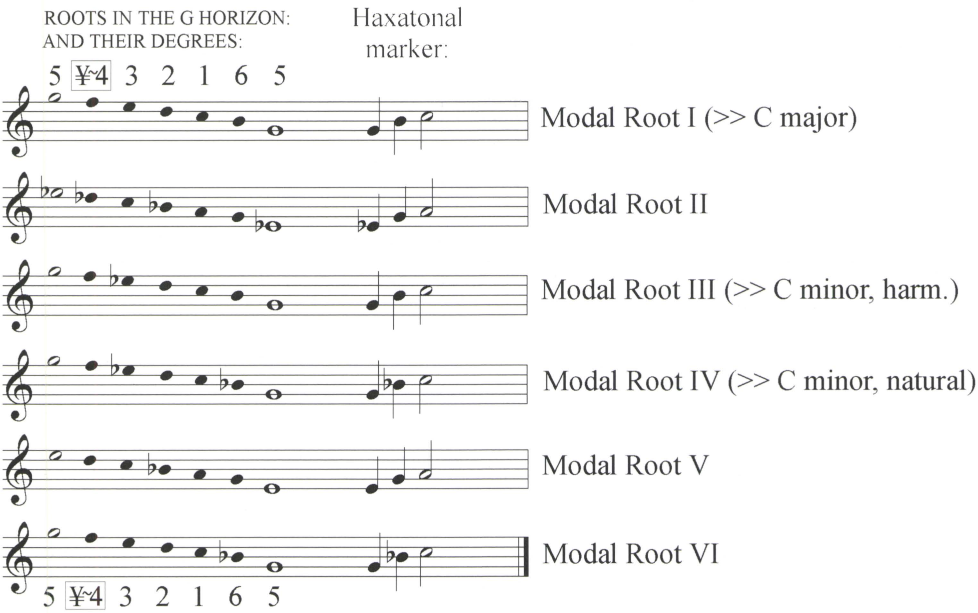



*Figure-6. Six hexatonal root modalities on g1 originally introduced by Gábor Lükő (1964). The degrees run downwards from 5-5. Degree 5 refers to the anchor tone and corresponds to the dominant of the tonal modes. Degree 1 of roots I, III, and IV corresponds to the tonic of the tonal modes. Tones a and ab do not exist. Root VI is as if composed of the harmonics 12—10-9-8-7—6 of tone C. The semitied degree ¥ (f) is in dissonant relation to the anchor and needs a separate anchor. The roots are defined according to the anchor tone written in front of the root number: g-I, g-IV, etc. For neural reasons not discussed here, to be in the G horizon, root II is often on eb (eb-II), and root V on e (e-V).*

The source for the idea of the hexatonal basis of human song was the theory about the pentatonic nature of the Proto-Indo-European song introduced by the Hungarian Professor Gábor Lükő in 1964. According to him, these six roots (see Fig. 6).) are pentatonic having quite often one auxiliary tone between degrees 1 ($e^1$) and the upper octave of degree 5 ($g^2$). The present author slowly learned that these roots are not only European but universal, and that they are not pentatonic but hexatonic (or better: *hexatonal*). They share the same general structure but each has a nature of its own. They are not studied more closely in this paper but introduced in such a way that each of them has $g^1$ as the anchor tone, that is, as degree 5. This causes them to be in the G horizon. Exceptions are roots II and V, whose anchor tone $g^1$ is often their 6th degree.

In Fig. 7 can be seen how the subconscious anchor tones are neurally explicable in roots *g*-I and *g*-IV. The author does not claim that the neural processes are absolutely as presented. However, the neurons given in transcriptions are stimulated by the sung degrees in one way or another.

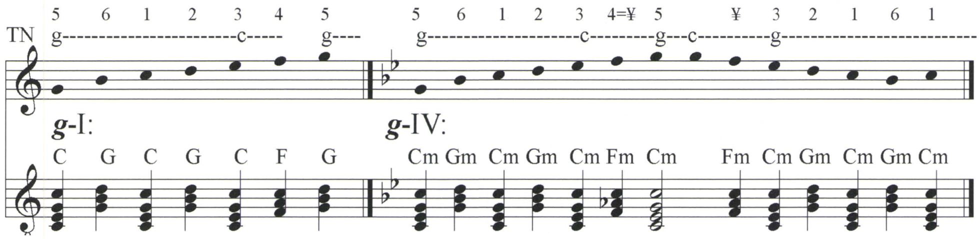



*Figure 7A. The neural interpretation of roots g-I and g-IV (which is also given in its descending form).*

When the degrees of *g*-I are sung the *g* neuron remains active throughout the mode – except when degree ¥ is sung (Fig. 7A). Degree ¥ is encoded by the neural primary option F, as a result of which the *c* neuron ties it together with the preceding triad C. Moreover, the sung tones $f^2$ and $g^2$ are not tied — or they are loosely tied by the *f* neuron albeit the sung $g^2$ comprises its 7th harmonic (*f*). This *f* stimulates Bbm (*bb-db-f*) as its subharmonic secondary response keeping the *f* neuron active. (This is not shown in the transcription.) Thus the neural primary and secondary options are central in the formation of root I: NPO+NSO. — Root *g*-IV is different. On the scalar level this root comprises only neurotriads in minor form (even if the relations *eb*/Eb and *d*/Bb are also possible when ascending). The neural encodings *g*/Cm and *d*/Gm are subharmonic primary responses, *c*/Cm and *f*/Fm are subharmonic secondary responses, and the remaining tones are neural secondary options. The pattern is SPR+SSR+NSO. When the neurotriadic elements of *g*-I are C-G-F, in *g*-IV they are Cm-Gm-Fm. Even if the tying is continuous without cessation, the anchors are the same as in *g*-I. This also holds for the descending form of *g*-I, which is entirely tied (Fig. 7B).

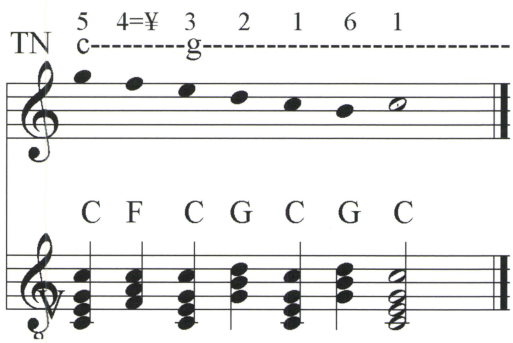



*Figure 7B.*

One more detail deals with the *absolute pitch*. According to Langner's neural theory, there is a need to separate the physical sound (which is the flow of energy that hits the eardrum) from its neural representation (which we "hear" as images of tones and modes). These images are arranged according to subharmonic neural sequences based on integers (Langner 2007). In the light of music analysis, humans are easily able to form images of stable pitches and their combinations (modes, melodies) in spite of various physical deviations. It is possible, with the help of computer programs, to make a detailed analysis of rhythm and pitch and to find out how a sung melody is produced by a performer in the physical world. The variation in duration and pitches may be great. However, the auditory centre is able to "normalise" the natural variation in the singing process and to recreate standardised images of such stable pitches and modes that humans are able to learn them, to remember them and to recreate them. For instance, Jaan Ross has stated that the listeners may form an image of a tone with a certain pitch even if the physical reality was a continuously gliding fundamental tone[10]. This aspect is not dealt with here any further but this provides a clue to the ability of the human auditory centre to normalise physical deviations at least to a certain extent and to form holistic and stable neural images of them.

## On Germanic Song Grammar

In this study, the term *Germanic* is confined to the Central European Germanic speaking areas covering mainly The Netherlands, Germany, Switzerland and Austria. The northern Germanic (i.e. the Scandinavian and the Anglo-Saxon) traditions are excluded. Between ca. 2000 BC and 200 AD the Proto-Germanic territory covered North-Germany, Denmark and southern coasts of Norway and Sweden. The Central European Germanic area was not formed until the end of the Proto-Germanic epoch during the first centuries AD. This study on the grammatical features found in the historical songs of Central European Germanic speaking regions is mainly based on a few melodies selected from the *Deutscher Liederhort* I-III, a large anthology published by Ludwig Erk and Franz Böhme in the 1890s. Most of its tunes are modally in the major form (but not in the Major mode). The melodies selected for this paper are also in the major form.


*Figure 8. A ballad from the Mosel valley, close to Trier, south-western Germany in Rheinland, written down in 1877 (Erk and Böhme I, page 592, no 194b).*

10 Ross 1995, 319-324.

*Der Reiter und seine Geliebte* (Fig.8) is a traditional ballad. It has two anchor tones, $g^1$ and $c^2$, and the alternating modes are as follows (only the bold face degrees are used in the melody):

*g*-I: ***g—b-c-d-e-f-g***

*c*-*I: *c—**e-f-g**-a-bb-c.*

Actually, *c*-I only has three degrees. Therefore it can be treated as embryo *c**I, not root *c*-I. The grammatical structure of this melody can modally be displayed as **$g$-$\mathbf{I_5}$ *c*-*I→*g*-I¹**. The symbol $\mathrm{I}_5$ tells the reader that the 5th degree of root I (tone $g^1$) opens the melody, and the final symbol $\mathrm{I}^1$ tells the reader that the 1st degree ($c^2$) of root *g*-I functions as the final tone. Typical of this tune is the opening leap $g^1$—$c^2$. It seems that the active neurons function in natural singing as the subconscious directors, that is, the singers prefer to choose the following tone among tones whose neural representations are in the state of stimulation at the present moment. In this case, when the singer articulates the initial tone $g^1$, it has the neurotriad Cm as one of its representations and tone $c^2$ is easy to sing. The melody is archaic in grammar. There are only two anchors and one root transposed between $g^1$and $c^2$. The neurotriad F appears briefly twice, otherwise the alternation proceeds between the neurotriads C and G. The grammar seems mainly be composed of neural primary (*g*/G, *c*/C, *f*/F) and secondary options (*b* and *d* encoded with G, *e* and *g* encoded with C) which makes up the pattern NPO+NSO. If we look at the combination of the neurotriads, their string is simple and symmetric: **GC→FC→GC**.

The poem of the Swiss lullaby in Fig. 9 seems to represent an archaic theme with the Germanic god Wotan (Odin) as the *Schimmelreiter* or 'The Rider of a White Horse'. It too has two anchors but now $g^1$ and $d^1$. The roots are:

*g*-I: ***g—b-c-d-e***

*d*-I: ***d—f#-g-a-b-c-d.***

Mode *g*-I opens the melody. It is soon turned to *d*-I, which remains to the end. Thus, the grammatical structure is **$g$-$\mathbf{I_5}$→*d*-I¹**. However, when the anchor is transposed down to $d^1$ there occurs a radical change at the end of the 2nd measure. The melody opened in *g*-I, which is the root of C major. When the anchor is transposed down to $d^1$ the root remains but, from the tonal point of view, there occurs a modulation to G major (because *d*-I is its hexatonal root). The dramatic change is because of the neurotriad D major. The question is: Why is the sung tone *a* encoded by the neural D major in the auditory system? The reason is again in the neural secondary options (Fig. 4A). The sung tone *a* is divided in its harmonics *a-c#-e*, and their neural representations form the neurotriads **D**-F-**A**, **F#-A**-C#, and **A**-C-E. The activated neurons correspond to the physical triad D major (*d-f#-a*), and, as it seems, this is the reason why the auditory centre accepts the physical triad D to accompany the sung tone *a* at the end of the 2nd measure (*zum*).

Thus, from the neural point of view, the grammatical structure is **GC→G→DG**. Its encoding patter parallels the former song: NPO+NSO. On the other hand, because of the neurotriad D, it differs greatly from Fig. 8. According to tonal theory, the melody progresses in G major. According to the transition hypothesis, the specific nature of this tune is a result of the alternation of two separate neurons, *g* and *d*, which are also referred to by the term "(active) anchors".


*Fig. 9. This Swiss lullaby (Schimmelreiter) was first published in 1776 and is here according to Erk and Böhme III, pages 623-624, no. 1916.*

As a parallel example of the alternation of the anchors $g^1$ and $d^1$ is the two-part Austrian love song *Då druntn im Tål* 'Down there in the valley' in Fig. 10. It sheds some more light on the relation of sung tones and their neural representation. The main melody seems to be sung by the lower voice, while the upper voice is accompanying. Therefore it is interesting to see how the Austrian singers chose the sung tones in relation to the main melody. (It is worth remembering that two-part singing like this has been sung for centuries before rural people learned to read and write.)

The map of the geographical distribution of melodies analysed. The numbers refer to corresponding Figures.

Neurally *Då druntn im Tål* progresses in two-measure sections and the singers use the possibilities of the neural primary and secondary options (NPO+NSO). Hence, the string of neurotriads is **G→CG DG**. This becomes possible because the anchors are $g^1$ and $d^1$, and the hexatonal roots are *g*-I and *d*-I. In tonal terminology the melody progresses in G major. However, if we try to understand how this G major construction emerges, and how the grammar of this tune differs from those used in Nigeria or Australia, it is not useful to interpret this melody as tonal. It is hexatonal: When the active neuron is *g*, tone *a* is never sung, and when the *d* neuron functions as the anchor,

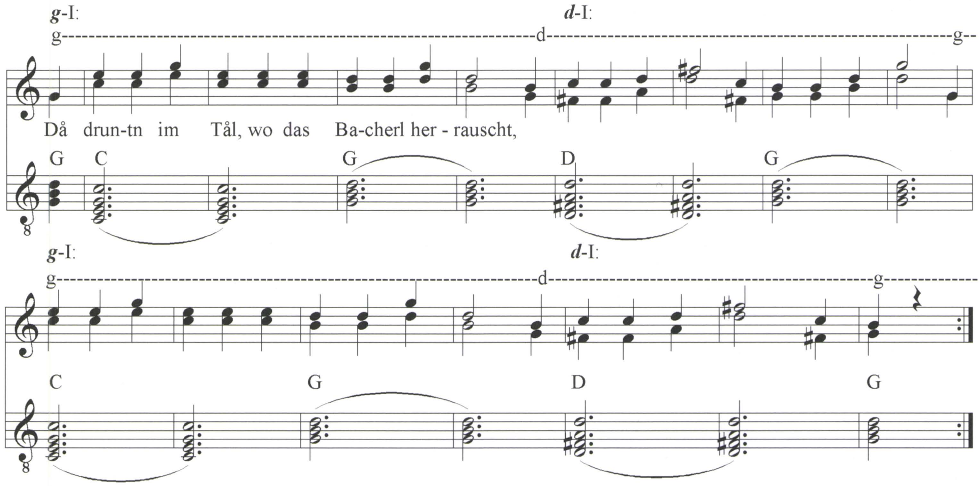
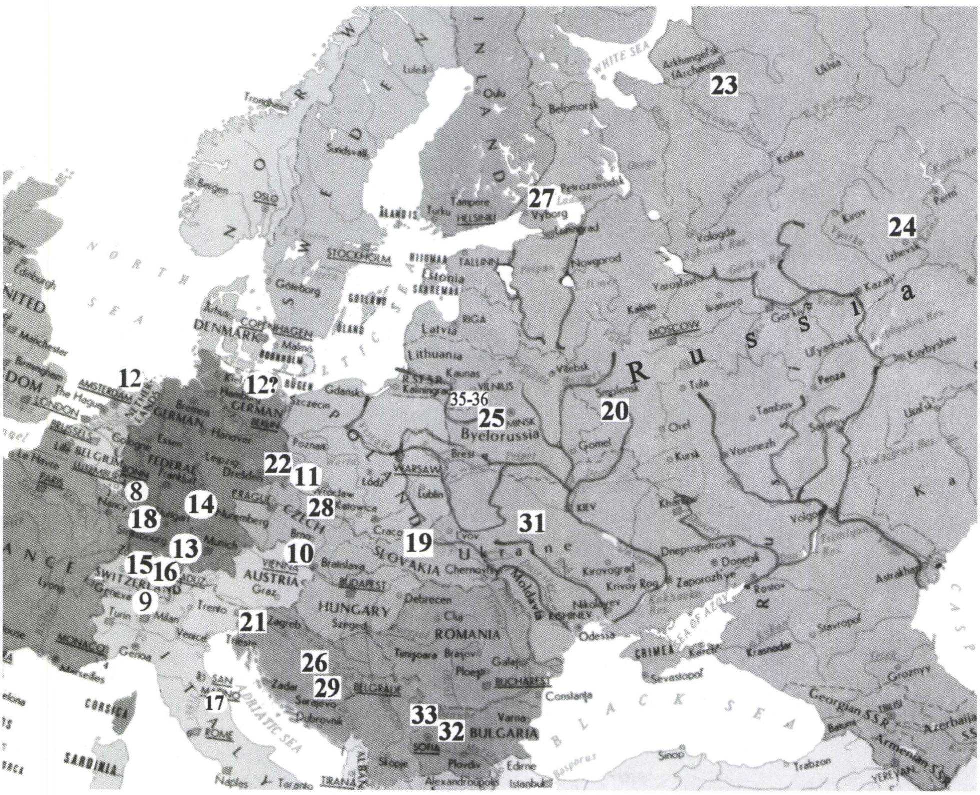



*Figure 10. The love song Då druntn im Tål from North-eastern Austria (Niederösterreich) according to Deutsch 1993, 239, no. 90. The performance was transcribed in 1919.*



tone *e* is never sung. The singers of the upper part do not fail in choosing the right tone corresponding to the active neurons in the moment of singing. In the transcription this is seen in such a way that the tones sung accord with the physical triads G, G, and D. There is one exception.

When the lower voice sings $f\#^1$, the upper voice sings $c^2$, which makes up the tritone and the tonal D7. The singers deliberately chose $c^2$ and this characterises the Central European Germanic style. We scarcely encounter it in any other archaic polyphonic tradition beyond Europe. It is easy to sing tone $c^2$ simultaneously with $f\#^1$ because both tones activate the *a* and *d* neurons. This is specifically easy if a musical instrument supports the singers by playing D major or D7 in this context.

If the grammar is presented with the help of hexatonal roots, the structure of Fig. 10 is ***g*-I$_5$↔*d*-I$^1$** which is grammatically identical with the Swiss song in Fig. 9. One detail is that the change of root does not coincide with the change of anchor: The transposition does not occur until the next sung tone. That is why the final tone $g^1$ is still the 1st degree of root *d*-I.

The following example, *Graf Friedrich,* is a German ballad already known in the late 15th century and transcribed in the late 19th century (Fig. 11). Because of the anchors *g* and *c* it is related to Fig. 8 but obviously the anchors alternate in the opposite direction, that is, descending ($g^1$↔$c^1$) which transition is also typical, say, of the Aranda grammar in Central Australia[11]. Moreover, in this song there is the third anchor on *f*. Thus, the string of neurons which are stimulated one after the other, are $g^1$, $f^1$, and $c^1$. The modes are:

*g*-I: ***g—b-c-d-e***
*c*-*I: *c*—***e-f-g***-*a-bb*-***c***
*f*-II: *f*—***a-b-c-d***-*eb*-***f***

From the tonal point of view the melody proceeds in C major. From the universal, that is, the hexatonal point of view, there occur certain grammatical transitions, and the grammar can be reduced to the string of modulations and transpositions: ***g*-I$_5$→*f*-II→*c*-I→*g*-I$^1$**. Thus, as the grammatical essence is the use of the secondary options, root I, and the anchors *g* and *c* added with the *f* anchor and the root *f*-II (*f*—***a-b-c-d***-*e*-***f***).

11 Leisiö 2007.

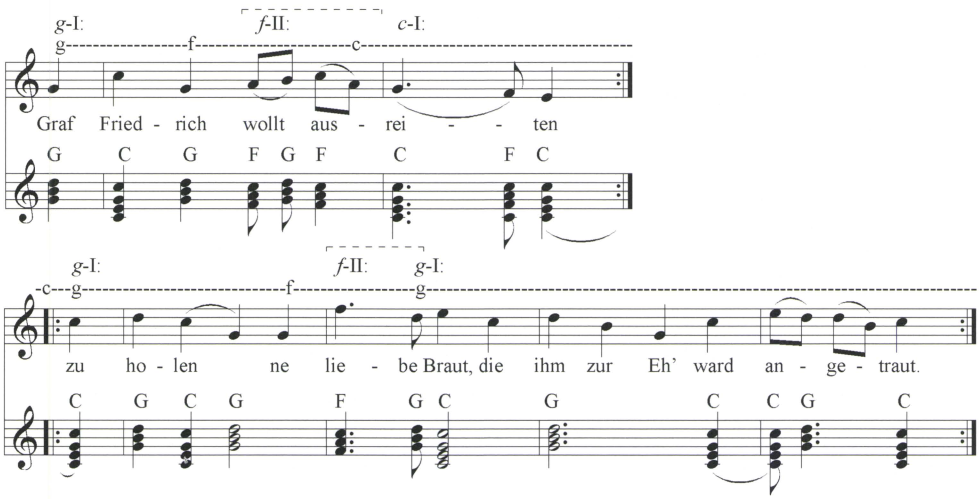



*Figure 11. The ballad Graf Friedrich according to Erk and Böhme I, page 380, no.-07-b, transcribed in the early 19th century in Silesia (Schlesien), which is now in south-western Poland.*

From the tonal point of view *Graf* 'Earl' *Friedrich* is based on the harmonic functions I-IV-V (C-F-G). However, this does not explain what happens when the neurotriad F is active. From the hexatonal point of view there is no F major element in this melody. Instead, there is the transient embryo *f*-*II, which evolved into the hexatonal root *f*-II (which is universally known but has no correspondence in tonal theory). Acoustically root II is complex. This melody shows why tone *f* can be experienced as the anchor tone. It seems that the melodic move $a^1$-$b^1$-$c^2$-$a^1$ (*wollt aus-*) on the upper line activates the neurons in such a way that they accept, as the result of the neural secondary options, the physical triads F-G-F for the accompaniment. Therefore, on the microlevel, there occurs the neurotriadic movement F-G-F. However, the human mind seems to react to this micro-movement by regarding the *f* neuron as the governing anchor. The *f* neuron was obviously activated during the previous tone *g* (*-rich*) because its 7$^{th}$ harmonic *f* stimulated the neurons Bb-Db-F (= Bb minor). This might explain the ascending leap $g^1$—$f^2$ on the lower line (*ne lie-*): The singer had no problem in yielding tone $f^2$ because the *f* nerve was already activated by the preceding $g^1$ (*ne*). The neural sequence is thus **G→||CG→FG→FC||→GC→GF→G↔C.**

Figure 12 is a comic dance song written down by P. Fabricius to his notebook from ca. 1603. The poem was still remembered as children's lore in the 19$^{th}$ century (and probably later), and the melody was also sung by the 19$^{th}$ century Flemings. The tying neurons are $g^1$ and $c^2$, but obviously, for a brief moment on the lower line, $f^1$: the fundamental *f* may also tie the following *g* as its 7$^{th}$ physical harmonic and thus activate the *f* neuron as a neural primary option. Otherwise the melody is based mainly on the neural secondary options. There are some details to be explained in this song. It seems possible that in the $3^{rd}$ measure tone $g^2$ (*Brunn*) is encoded with the neural C, which may result from the influence of the active anchor on *c*. For the same reason, in the last measure of the upper line, tone $g^2$ (*plum-*) is first encoded with the neurotriad C and only later with G (*-pen*). This seems to explain the selection of the following sung tone $d^2$ (*Hätt'*).

The roots are *g*-I and *c*-I (***c*—*e*-*f*-*g***). On the lower line there is also the embryo *f*-*II, which is briefly present as tone $a^1$ (= the $4^{th}$ degree of this root: f—***a***-*b*-*c*-*d*). Thus, the grammatical structure of the melody is constructed of much the same elements as Fig. 11 but is different. One reason for the difference is the final tone $g^1$, the degree 5 of *g*-I. This is obviously due to the continuously on-going character of this dance song: It goes on and on and this trait is seen in the transcription. The grammatical structure is ***g*-I$_5$⇔*c*-I→*f*-*II→*g*-I$^5$**.

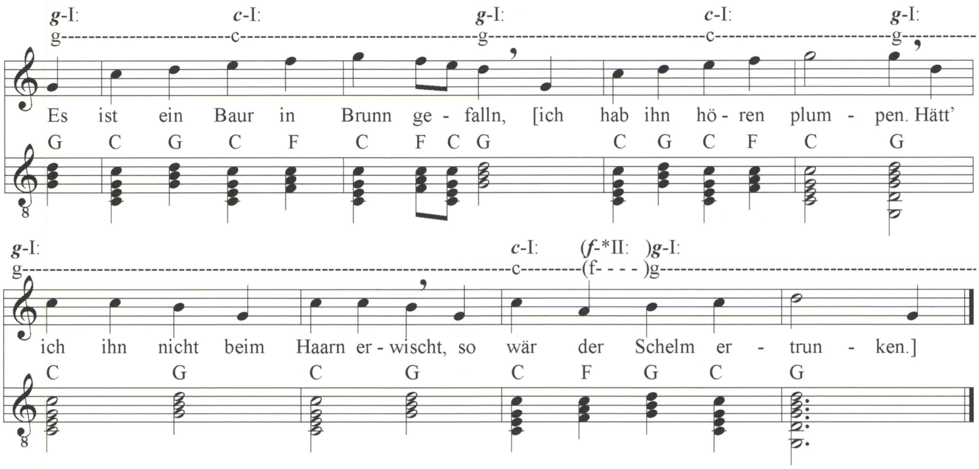



*Figure 12. A 16th century Germanic dance song according to Erk and Böhme III, page 514, no. 1718.*

The neurotriads seem mainly be neural primary and secondary options which make up the sequence NPO+NSO. The neural sequence can be given as **GC→F→CG** being simple and symmetric in its specific way. It is clear that, because of its belonging to the late $16^{th}$ century style period, the melody is not tonal in grammar even if it comprises the three main harmonic functions I-V-IV. In spite of this, the tune is typically hexatonal: When the anchor *g* is active, tone *a* is never sung, and when the anchor *c* is active, tone *d* is never sung.

Erk and Böhme published the South-Germanic May Song of Fig. 13 with the title ‘A $14^{th}$ Century May Song’. The melody was published in 1555 but the dating to the

14th century is obviously based on its poem known far before the melody in historical sources. However, there is

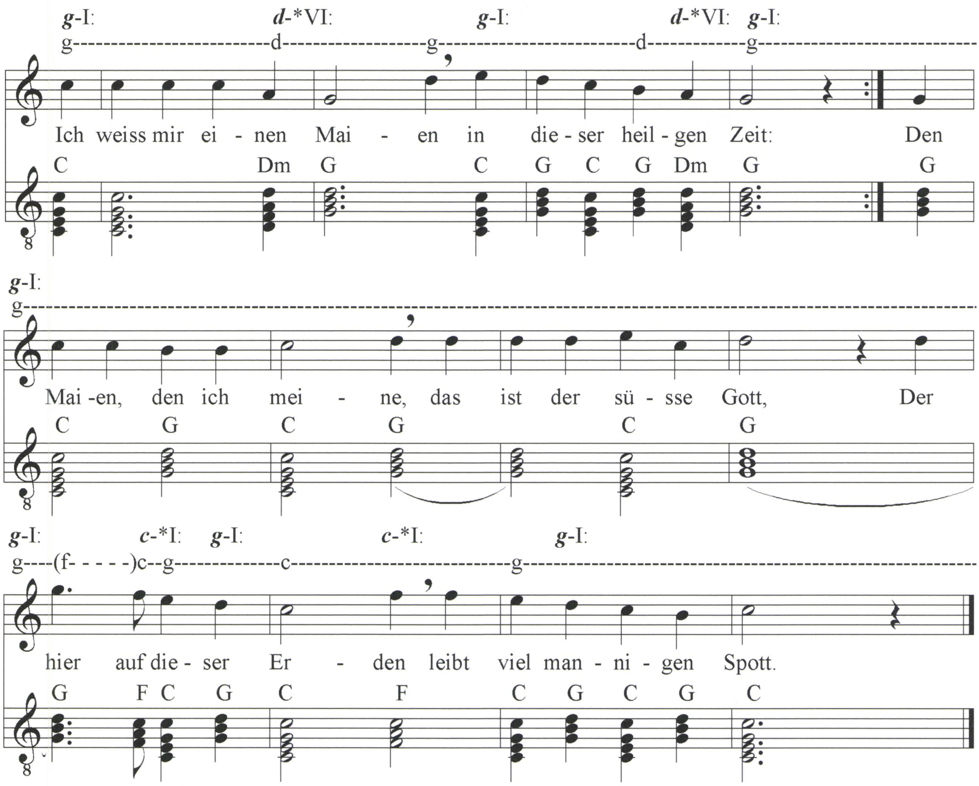



*Figure 13. "14th Century May Song" from southern Germany according to Erk and Böhme III, page 728-729, no. 2025. The melody was first published in 1555.*

reason to assume that the grammatical basis of the melody is also medieval. The main feature of this tune is the opposition of the anchors *g-d-g* and *g-c-g*. When *d* is the anchor, the embryo is *d*-*VI, and when *c* is the anchor, the embryo is *c*-*I. The main root is *g*-I, and the other alternating embryos are:
*c*-*I: ***c—e-f***-*g-a-bb-c*
*d*-*VI: *d—f*-***g-a-b***-*c*-***d***.

A trait parallel to that in Fig. 10 is that a mode seems not to be activated if the new anchor becomes active in an unstressed metrical position. This phenomenon seems universal but it needs to be confirmed. At the moment it seems that a transposition and a modulation may most easily occur in a stressed position. Of course a singer may change this rule. The grammatical structure is ***g*-I$_3$⇔*d*-*VI→*g*-I⇔*c*-*I→*g*-I$^3$**.

A new element in this May song in Fig. 13 is the embryo *d*-*VI which, as it were, comprises structurally the physical harmonics 6-7-8-9-10-12 (*d—f-g-a-b-c-d*) of *g*. The difference between roots I and VI lies in their 6th degrees: In *d*-I it is *f#* and in *d*-VI it is *f*. In this melody the sung tone $a^1$ is the second degree of $d^1$-*VI, and there is scarcely any doubt that its neural representation is its subharmonic primary response Dm, the first of the kind met with in the Germanic melodies so far. Otherwise this tune is based on the neural primary and secondary options C, G, and F. When seen in the neural light, the grammatical string differs from those given above because of the opening and closing neurotriad on C and the subharmonic D minor: **CDm→||G⇔C →GDmG||G→C⇔G→GFCG→CF→CGC.**

The anchor tone relation *g–d* at the beginning of Germanic songs appears in various ways. *Das Rautensträuchelein* (or *Traum eines Ehemannes*; Fig. 14A) represents an early 16th century Central European popular style having *g, d,* and *a* as the anchors. The more or less scornful story is about the relation between a man and a wife no longer having a good marriage. The view is from the husband's side, which makes the song a mockery on the wife. Roots *d*-I and *a*-I are:

$d^1$-I: ***d—f#-g-a-b-c-d***

*a*-I: *a—c#-**d-e-f#-g-a***


*Figure 14A. This German popular song was published in 1540 according to Erk and Böhme II, pages 699-700, no. 912a. Root I is transposed from g1 down to d1, a, and d.*

The grammatical structure of Fig. 14A is ***g*-I$_5$→*d*-I→*a*-I→*d*-I$^1$**. When we study the possible neural correspondences of the sung tones, it is clear that the physical harmonics and the secondary options have a prominent role. Moreover, it is quite obvious that this song was composed while playing a musical instrument, possibly a zither. Notice that the opening root is *g*-I but the closing root is *d*-I. In other words, the opening and the closing tone *g* represents separate degrees (5 and 1) of separate roots, and to restart the melody the singer has to transpose *d*-I to *g*-I. The sensation of the chord A7 is strong in measures 5 and 6 of the lower line (*Er-den*). The sensation does not emerge from the melody alone but because of the instrumental accompaniment. As can be seen, there occurs a quick alternation *d-a-d* of the anchors. It is too fleeting for humans to follow and we tend to simplify the process. The most satisfactory solution is to accept tone *a* as the anchor of *a*-I throughout measures 3-5. It is not until by the final tone (*Do* and *–den*) that the root is transposed to *d* (*d*-I). Moreover, if the song is accompanied with a harmonic musical instrument, there sounds the physical 7th harmonic (*g*) of tone *a*. On the neural level the active nerves form the neurotriad A7 (*a-c#-e-**g**-a*) and the musician quite naturally plucks the chord A7. Because of the anchors the string of the neurotriads is complex: **G→C⇔G→||DCGD→GCG||→A⇔D→ G.** All triads are based on the harmonic options.

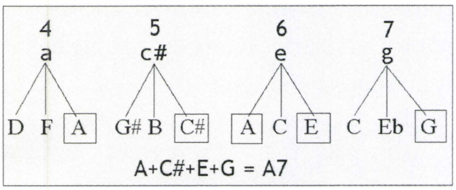



*Figure 14B.*

## Reflections on Root I and the Alphorn Fa Mode

There are various kinds of anchor combinations, such as *g-d-c-g*, not given here12 but they all represent the very same Central European Germanic style based on the neural options so that the sung tones correspond mainly to the combinations of the physical harmonics for instance as triadic progressions. That is why an outsider can easily identify a Germanic (folk) melody as Germanic. There are naturally many kinds of melody based on grammatical idioms adopted from the neighbouring non-Germanic peoples. Some melodies resemble the medieval French song grammar familiar to the troubadour style. There are also melodies close to Gregorian chant, and naturally there are melodies based on roots IV and III. In this paper the focus is on the use of root I because of which these other kinds of grammar (which are naturally regarded as Germanic by local singers themselves) are not analysed here.

12 See, e.g., Erk and Böhme III, no. 2123.

We must ask where this preference to harmonic-like sequences of neural representation comes from. It is well known that the northern descendants of the Proto Germanic culture in Scandinavia prefer roots IV and III (the hexatonal roots of natural and harmonic minor modes). For instance, the melodies found in the old Icelandic collections of folk song13 are mainly based on root IV. Root I is naturally known among all the Germanic peoples but it is specifically prominent in Central Europe. The fact that in an old collection of 54 English children's game songs14 (once sung by adults) 52 were based on root I and one single tune was based on root IV. This seems to suggest that root I was already prominent in the song grammar of the Angles and the Saxons during the time they migrated to the British Isles more than 15 centuries ago. There may be one central reason for the preference to root I, namely the effect of certain musical instruments. For instance, the *Alphorn* produces very loud tones with a wide spectrum, and this fact has specifically affected the Central European mountain peoples for thousands of years. Horns (and trumpets) are more typical of the European instrumentary than on any other continent. Moreover, the Europeans have developed various musical instruments producing sounds with high energy, such as the brass and other wind instruments (racket, chalumeau, oboe, clarinet), the organ, piano and mechanical instruments. All these had profound effects on how people heard musical tones, and how they recreate their experiences by singing. Physical, neural and cultural intertwine.

A natural horn may easily produce the natural tones 3-4-5-6-7-8 (C: *g-c-e-g-b flat-c*) neurally represented as the primary options (Fig. 4A). The harmonic progression 4-5-6 is prominent in horns, and people recreate it with the triadic progressions in their songs. When a singer alternates the natural tones 4-5-6 of *g* and of *c*, this results in *g-b-d* + *c-e-g,* that is, mode *g*-I: *g—b-c-d-e—g.* This is not how root I emerged, but may serve as an explanation for the fact that root I is highly appreciated among the Central European Germanic singers. Formerly the horn and later on many other loudly sounding musical instruments have reinforced the inclination for root I, as well as the preference for triadic movements in melody and the continuous use of the major seventh. And once learnt, there is no need for musical instruments to keep the style alive.

13 Berggreen, 1869. Þorsteinsson 1929.

14 Gomme 1898.

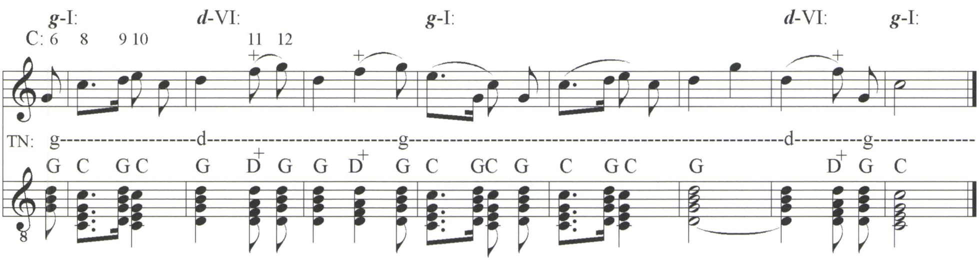



*Figure 15. An Alphorn melody from Muotatal, Central Switzerland, according to Sichardt 1939, no. 106. The small digits refer to the natural tones of C. On the lower stave are the subconscious neurotriads and the anchors, that is, the neurons g and d activated in the listener. The grammar is then g-I5↔d-VI→g-I1.*

A specific example of the influence of the horn on melodic idioms is the use of the mode called the *Alphorn Fa Modus* (i.e. a melody with the 11$^{th}$ harmonic as degree *fa*: When the fundamental of the horn is C, the 11$^{th}$ harmonic is the slightly sharpened *f*). Song melodies based on this "mode" can be found not only in Switzerland but also elsewhere around the Alps. In the short *Alphorn* melody in Fig. 15 the main anchor is *g*. Degree *fa* is given with the sharpening symbol + above tone *f*.

According to the former interpretation the Alpine singers transformed this *f*+ to *f#* in their songs based on the 'Fa mode' (Fig. 16). Typical of it is the tritone *c–f#*, and researchers like Werner Danckert and Wolfgang Sichardt15 were of the opinion that this mode is Pre-Christian in origin. The present author agrees. Here we encounter a highly interesting detail. Fig. 15 closely resembles to songs found in the Celtic song of the British Isles. The reason is that the Celts favour root VI. If the active anchor is *d,* the 6th degree of *d*-VI is *f.* In other words, it seems that the early Celts were influenced by the horn but they treated its degree *fa* differently from the later Germans and articulated it as *f.* Thus, it is root VI (Fig. 6) that still characterises Celtic song. (The remnants of this trait are still found in former Celtic regions in the Iberian Peninsula.) The late Proto-Germans made another solution and treated this same degree as *f#* (which is the 6$^{th}$ degree of *d*-I). As a result, it is root I that strongly characterises Germanic song. A Swiss herding song in Fig 16B exemplifies a melody based on the 'Fa Modus'. It starts as in Fig. 16A with tone *f#*$^2$ as degree *fa*:

15 Sichardt 1939, 30-40 et passim.

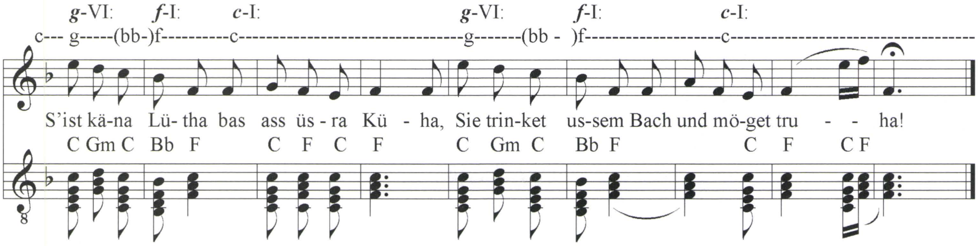



*Figure 16A.*

Because the tune is now not in the G horizon it must be rewritten with tone $b^1$ as *fa* (see Fig. 16B).

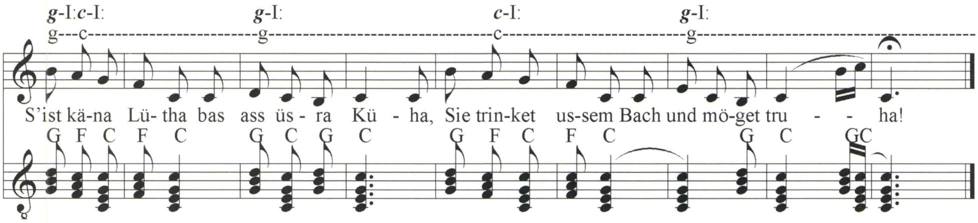



*Figure 16B. A late 18th century cow call (Kuhreigen) from Appenzell, Switzerland, according to Sichardt 1939, no. 84/VII (pages 68-69). Degree fa of this Alphorn Fa mode on f is b1 natural. The melody is written in the G horizon.*

If we study the *Alphorn Fa* mode on *f* in Fig. 16B it can be written as *f-g-a-b-c-d-e-f*. However the yodlers scarcely have this kind of a theoretical construction in their minds when singing. Instead, they alternate root I upon three anchors, $g^1$, $c^1$ and *g*:

$g^1$-*I: *g*—***b***
$c^1$-*I: ***c—e-f-g-a***-*bb-c*
*g*-*I: *g*—***b-c-d-e***

From the neural point of view the anchors $g^1$ and *g* are the same (because the period remains the same) but from the point of music analysis the anchor on *g* descends one octave. What may be heard in the melody is the opening progression $b^1$-$a^1$ because of the shift from neural G to neural F. However, there is the d neuron that ties them together because the sung *b* activates the d neuron, as does the sung *a* (*a*/Dm represents the subharmonic primary option). Thus, the modal pattern of Fig. 16B is **g-*I$_6$→c-*I→g-*I$^1$** while the neural one is **G→FCFC→GCGC**.

Sichardt (1939) has identified melodies in *Fa Modus* from various parts of the world but if they are studied it can be seen that this modus (which actually is no modus but a theoretical construction based on homonyms) may come out in various ways. The

Italian *Ji' mèta* 'I am cutting [grain]' was identified as a song based on *Fa Modus*: *g-a-b-c#-d* now with $c\#^2$ as *fa*. As seen in Fig. 17 this ritual harvest song is composed of two embryos, *g*-*I (***g—b**-c-**d***) and *e*-*VI (*e—**g-a-b-c#**-d*), which means that the principle of formation differs a lot from the previous one.

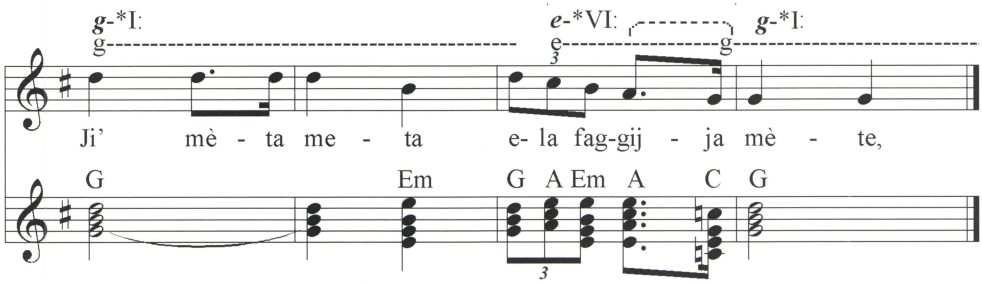



*Figure 17. The first verse of a Central Italian harvest song Ji' mèta according to Danckert 1939, 302. It is obvious that the listeners experience the melody as the alternation of embryos g-*I and e-*VI when the melody is in the G horizon. Tone c# (fa) is thus the 3rd degree of e-*VI.*

The melody is interesting in many ways. Even if in the G horizon, degree *fa* is $c\#^2$, not $b^1$ natural as in the previous melody. Moreover, Fig. 17 comprises embryos I and VI. The melody reveals its Janus faced character in the fact that it can be equally correctly written as here, or a major 3rd lower. In either case the melody is in the G horizon. The reason is that the g nerve and the b nerve are simultaneously active and the auditory centre has difficulties deciding which one is the actual anchor. There are melodies which cannot be written out as in Fig. 17 but which can be transcribed in the G horizon a major third lower. When the melody is studied it can be seen that the main part of the tune constitutes the descending degrees 2-1-6—5 of root *g*-II: $d^2$-$c\#^2$-$b^1$—$g^1$. At the end of the third measure (*-gij-ja*) there occurs a brief modulation down to *e*-*VI. The beginning of the measure belongs to root *g*-II, and the activation of *e* nerve gives a motivation to modulate to *e*-*VI. In this melody root *g*-II is composed of the embryos *g*-*I and *e*-*VI, while the *Fa Modus* is a product of the alternation of root *g*-II and embryo *e*-VI: ***g*-II**$_2$→***e*-*VI**→ ***g*-II**$^5$. This grammatical pattern differs radically from those found in the Germanic world. This means that the *Fa Modus* should be re-interpreted and even if melodies like the Italian *Ji' mèta* appear similar to some melodies in Switzerland, they may be grammatically quite dissimilar. The neural pattern is also different from the Germanic one in Fig. 16: **GEmG→AEm→AC→G**.

## First Conclusion: Germanic Song Grammar

There are some common features in the tunes analysed above. First, the main mode is root I, which is usually transposed to one or two other pitches. In relation to the opening anchor on *g* the other anchors are mainly on *d* or *c*. The second feature is that the number of modulations is small. As the third feature is the use of degree 5 as the opening degree. Fourthly, for centuries the Germanic singers have favoured the "harmonic path" (and not the "subharmonic path"). In other words, the melodies are constructed in such ways that the neural representation of the sung physical tone is either related to its physical harmonics 4-5-6-7 (= neural primary options) or to its neural secondary options. There are two stylistic consequences: the triadic movements and the major 7$^{th}$ progressions in melody and harmony. Moreover, the influence of musical instruments is seemingly obvious in the melody formation. When the *Alphorn* gives the 7$^{th}$ harmonic (*f* in relation to fundamental G) it activates the bb neuron, which makes it possible for singers to perform *bb* in polyphonic songs in which other singers articulate *c, e* or *g*. The result is C7 (Fig. 14B). If this is regarded as the 2nd neural primary option, the reduced pattern of the neural representation characterising the Central European Germanic grammar is **NO$^{1\text{-}2}$+NO$^{3\text{-}4}$**. NO refers to the neural options in general and the digits 1-2 refer to the neural primary options and the digits 3-4 to their secondary options (Fig. 4A and 4B). When the grammar is studied with the help of the anchors and roots (or their embryos), the patterns found in the window below characterise the Germanic song in Central Europe. The fact is that there are only three roots (I, II, and VI) in this list and that roots II and VI are quite secondary in importance. The second notion is that the only subharmonic neurotriad in the Germanic melodies calibrated to the G horizon among these melodies is Dm. Other representations of the sung tones are in major form, that is, neural options (NO).

| | | |
|---|---|---|
| **9:** | $g\text{-}\mathrm{I}_5 \rightarrow d\text{-}\mathrm{I}^1$ | **GC→G→DG** |
| **10:** | $g\text{-}\mathrm{I}_5 \leftrightarrow d\text{-}\mathrm{I}^1$ | $\mathbf{G \rightarrow \Vert CG \leftrightarrow DG}$ |
| **14:** | $g\text{-}\mathrm{I}_5 \rightarrow d\text{-}\mathrm{I} \rightarrow a\text{-}\mathrm{I} \rightarrow d\text{-}\mathrm{I}^1$ | $\mathbf{G \rightarrow C \leftrightarrow G \rightarrow \Vert DCGD \rightarrow GCG \Vert \rightarrow A \leftrightarrow D \rightarrow G}$ |
| **(15:** | $g\text{-}\mathrm{I}_5 \leftrightarrow d\text{-}\mathrm{VI} \rightarrow g\text{-}\mathrm{I}^1$ | $\mathbf{G \leftrightarrow C \rightarrow \Vert D \leftrightarrow G \Vert \rightarrow \Vert C \leftrightarrow G \Vert \rightarrow C)}$ |
| **8:** | $g\text{-}\mathrm{I}_5 \leftrightarrow c\text{-}\mathrm{I} \rightarrow g\text{-}\mathrm{I}^1$ | **GC→FC→GC** |
| **16B:** | $g\text{-}{*}\mathrm{I}_6 \rightarrow c\text{-}{*}\mathrm{I} \rightarrow g\text{-}{*}\mathrm{I}^1$ | **G→FC→GC** |
| **12:** | $g\text{-}\mathrm{I}_5 \leftrightarrow c\text{-}\mathrm{I} \rightarrow f\text{-}{*}\mathrm{II} \rightarrow g\text{-}\mathrm{I}^5$ | **GC→F→CG** |
| **11:** | $g\text{-}\mathrm{I}_5 \rightarrow f\text{-}\mathrm{II} \rightarrow c\text{-}\mathrm{I} \rightarrow g\text{-}\mathrm{I}^1$ | $\mathbf{G \rightarrow \Vert CG \rightarrow FG \rightarrow FC \Vert \rightarrow GC \rightarrow GF \rightarrow G \leftrightarrow C}$ |
| | | |
| **13:** | $g\text{-}\mathrm{I}_1 \leftrightarrow d\text{-}{*}\mathrm{VI} \rightarrow g\text{-}\mathrm{I} \leftrightarrow c\text{-}{*}\mathrm{I} \rightarrow g\text{-}\mathrm{I}^1$ | $\mathbf{CDm \rightarrow \Vert G \leftrightarrow C \rightarrow GDmG \Vert G \rightarrow C \leftrightarrow G \rightarrow GFCG \rightarrow CF \rightarrow CGC}$ |

Wolfgang Sichardt (1939), a student of Werner Danckert, both diffusionistic representatives of comparative musicology, concluded in his study on the Alpine *Jodler* that the yodel emerged among the population once living by the Alps during the late Stone Age and the Bronze Age. It was the tradition of the cattle breeders who used the animal horn and its wooden derivatives as their signalling instruments. Their tradition was later adopted by the Celts during the 1st millennium BC, and later by the Germanic peoples who migrated to Central Europe from the southern Baltic Sea regions after the beginning of the 1st millennium AD. It is obvious that the song grammar of the Pre-Germanic autochthonous peoples has not only continued to our time as the figurative yodel. It is obvious that their grammar also influenced Germanic song style in general.

The present author has no problem to accept the view of the former researchers that many features of the Germanic song originated in Pre-Germanic Central Europe. It also seems that the Alpine Celts, the Bronze and Iron Age fusion of the Indo-European and the autochthonous peoples, used root VI as one of their ethnic symbols during the 1st millennium BC in northern France, southern Germany, Austria, Bavaria and Switzerland16. It was the western Celts who imported this feature to the British Isles in the same millennium. It seems to be the grammar and the prominence of root VI which makes the horn melody in Fig. 15 sound like a regular 20th century Scottish song. This root was not favoured by the Germans, who preferred root I as their modal symbol. Their song style was also known among their neighbours in Romania, Western Poland, the Czech Republic (Bohemia), northern Italy south of the Alps, and in French speaking West Switzerland.17

There are naturally songs in minor form. It is symptomatic, however, that it is laborious to find them in the large collection by Erk and Böhme. One of the few is *Morgengruss* in Fig. 18. This tune is mainly based on root IV but it has two effective modulations to I and to III. The melody is from 1574 and, because it is present in many copies in Germany and Holland, it must have been popular during the 16th century. Its mode is sometimes defined as Aeolian but the transition hypothesis gives another interpretation

16 The author has archaeological cultures like the Hallstatt and La Tene cultures in mind whose representatives also migrated to the British Isles. See Delaney 1989.

17 Toncrová 1999; Macchiarella 1999; Sichardt 1939. A new view on the yodel is Plantenga 2004.

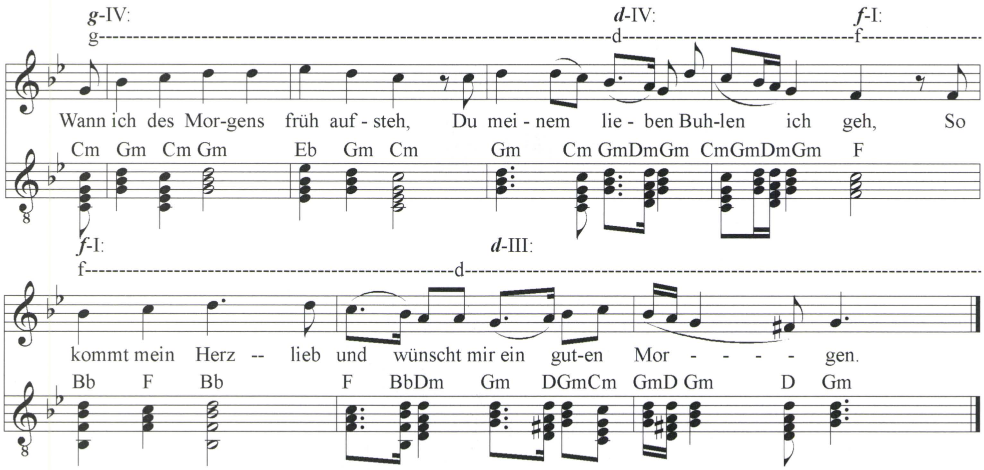



*Figure 18. A Germanic ballad from the Strasbourg region according to Erk and Böhme II, page 289, no. 466-b. The manuscript is from 1574.*

The descending anchor tones are $g^1$, $d^1$, $f^1$, $d^1$. The hexatonal roots are:
*g*-IV: ***g—bb-c-d-eb,***
*d*-IV: *d—**f-g-a-bb-c-d,***
*d*-III: *d—**f#-g-a-bb-c,***
*f*-I: ***f—a-bb-c-d.***

The root sequence is thus ***g*-IV$_5$→*d*-IV→*f*-I→*d*-III$^1$**, i.e. the anchor of the opening root will become the $1^s$ degree of the closing root. The neural activity is complex. On the upper line the sung tones are encoded with subharmonic neurotriads **Cm→Gm→Eb→Gm→Dm→Gm**. Only Eb is harmonic, that is, in major form because it comprises the neurons activated by the physical harmonics 4-5-6 (*eb-g bb*) of the sung $eb^2$. A specific solution occurs at the end of the upper line (*ich geh*), when the second verse ends neither on *c* nor on *g* but on *f,* which is both the $6^{th}$ degree of *d*-IV and the $5^{th}$ degree (the anchor) of root *f*-I. At the same moment there starts the harmonic neural section **F↔Bb→Dm**. The neurotriad Bb is a possible interpretation because the harmonics of the sung tones $bb^1$ and $d^2$ activate the subharmonic neurons *bb-d-f* (see Fig. 4B). The sung tone $a^1$ (*wünscht mir*) can be neurally encoded either by harmonic F or by subharmonic Dm (which option is chosen here). It starts the final subharmonic section, in which the sung tones $a^1$ and $f\#^1$ are neurally encoded by the harmonic D. The sequence is **Gm→D→Gm** added once with **Cm**. As a result root *d*-III (the root of the harmonic G minor mode) emerges. The grammar is internally logical and fully follows the hexatonal principles. However, the anchor selection *g-c-d-g* is not conventionally tonal. The tune is enjoyable and fully European, but to the listener it sounds more or less uncommon or archaic (medieval?).

## On Slavonic Song Grammar

The modern Slavonic peoples are divided into three culture areas. The Russians, Ukrainians and Belarus are counted as the eastern Slavs; the Sorbs, Polish, Czechs, and Slovaks are regarded as the western Slavs, while the Bulgarians, Serbs, Slovenians, Croatians, Bosnians, and Macedonians are counted as the southern Slavs. The Proto-Slavic culture was comparatively homogeneous till the 4$^{th}$ century AD, after which the occurrences during the Great Migrations and the invasion of the Huns set the Slavic tribes in motion. Modern western Ukrainians still inhabit the regions the ancestors of the Proto-Slavs had occupied more than 5,000 years ago.

From the European perspective it is clear that both cheerful and sorrowful tunes are sung in all Slavonic culture area. In spite of this, the minor modalities are more natural as the medium of the expressive communication among the Slavs than among the Central European Germans. The discrepancy is distinctive. For instance, it is next to impossible to find a Slavonic melody in root I for death rituals. The case is opposite in the Germanic world. Among the religious songs connected to death and preserved between the years 1524 and 1894 in the anthology of Erk and Böhme (items 2147-2175 with variants), only seven (less than 20 %) proceed in minor, that is, had roots IV and III as their main mode. More than 80% had root I as the main mode. Before analysing some few Slavonic melodies, there is a need to go back to Fig. 4B to understand how certain sung tones frequently met with in the G horizon may activate which neurons according to the subharmonic principle defined by Gerald Langner.

The song of Fig. 19 is from northern central SLOVAKIA. When transposed to the G horizon the melody is opened with tone $g^2$, the upper octave of the anchor of *g*-IV. The anchors are $g^1$ and $bb^1$. This death lament progresses quite high in the G horizon. Formerly the author assumed that the high register suggests a recent style feature. At the present state of the theory this assumption needs re-evaluation. However, the present lament seems archaic in grammar because the modal elements are not roots but their embryos with only three and four degrees. The embryos are:

*g*-*IV: *g—bb-**c-d-eb—g***

*bb*-*III: *bb—**d-eb**-f-**gb**-ab-bb*

The articulation of the opening tone *g* of Fig. 19 stimulates the Cm neurons. This may explain why the singer started to follow the descending path Cm-Eb-Gm-Cm. It seems that when the singer articulated tone *eb* it always became encoded with the neurotriad Eb, which leads to Gm. There occurs a modulation from *g*-IV to *bb*-*III in the 3rd measure, in which the melodic movement is dramatic, even if it proceeds on the regular degrees 1-6-1-3 (*eb-d-eb-gb*) of the embryo *bb*-*III. Neurally the progression *eb-gb* (*bra-ni-[čki]* 'my brother') is obviously encoded with the neurotriads Eb→Eb minor, a combination with a strong emotional effect on a listener.

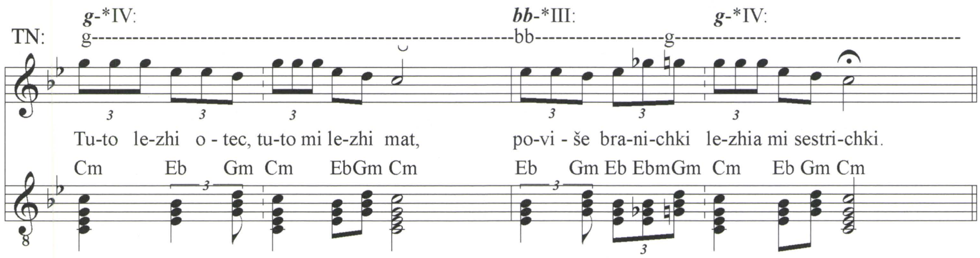



*Figure 19. A Slovakian lament according to Šelcová 1985, 153, no. 6: 'Here rests my father, here rests my mother'. There are two tying neurons (TN: g and bb) representing the stimulated neurons and two alternating modal structures, g-*IV and bb-*III.*

Another dramatic solution in Fig. 19 is the return from the *bb* anchor to the *g* anchor because the return needs the neural reaction Ebm→Gm, in which the neighbouring neurons *g flat* and *g* are successively activated. The proto-hexatonal structure of the double verse is: ***g*-*IV$^5$→*bb*-*III→*g*-*IV$^1$**. No syntax like this was found in the Germanic grammar. One grammatical difference is that the opening tone of the Germanic songs is marked with the lower index (I$_5$), while this lament is opened with its upper octave (IV$^5$). — In tonal music this hexatonal progression *g*-*IV$^5$→*bb*-*III→*g*-*IV$^1$ corresponds to the alternation of natural C minor and harmonic Eb minor.

From the neural point of view the grammatical idea is to follow the subharmonic path Cm→Eb→Gm→Cm. However, in the 3rd measure there occurs a change: Eb→Ebm→Gm. Hence, the grammar can be reduced to the formula **CmEb→GmCm→||Eb→Ebm→Gm||→GmCm.**

The Slovaks live in the Carpathian Mountains. They were neither influenced by the Celts nor the Germans to the measure that the Czechs were in Bohemia. This suggests that their culture may have elements close to those in the Proto-Slavic culture ca. 18-15 centuries ago. Death rituals were important to the Slavs and lamenting has preserved to our time, which is not the case in any Germanic society. From this point of view, it seems that the grammatical detail Eb→Ebm may represent an old Slavonic trait since it is also met with in the context of an important spring ritual among the Eastern Slavic Russians (Fig 20A).

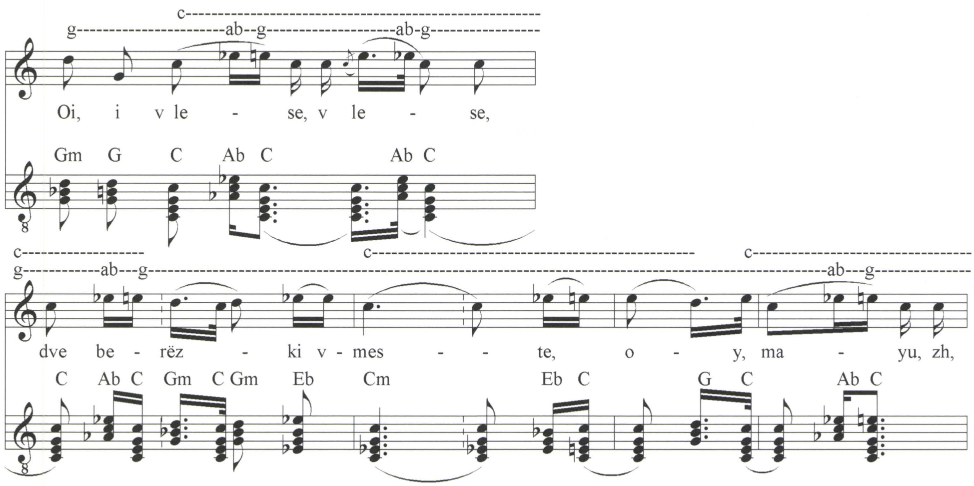


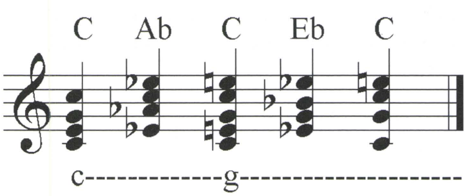

*Figure 20A. The beginning of a young maiden's 'May call' from the Smolensk Region, western Russia, according to Puškina 1983, 61-62, no. 3.*

In the Smolensk Region in western Russia, close to the Belarus border, old spring rituals were still remembered in the early 20th century. One of the traditional *gukanye* melodies, performed by hallooing loudly every May, is in Fig. 20A. The tune remains open because of which the modal identification is uncertain. The reason is the lack of degree 4 of the root: it may be either *b* or *bb.* The first sung tone ($d^2$) seems to activate both the subharmonic neurotriad Gm and the neural option G. Which one of them dominated the minds of the local people cannot be determined. However, the analytical solution is here Gm. The second sung tone moves down to $g^1$ as if directed by the neural G(m). However, because the singing is loud, it is possible that this $g^1$ is encoded with the harmonic neurotriad G. The harmonics of $g^1$ activate the *c* neuron and the singer performs $c^2$. Obviously this tone is encoded with the harmonic neurotriad C. If so, it is possible to define the opening mode as *g*-I. The *g* nerve is in a state of stimulation throughout the song—except for the brief moments the singer articulated tone $eb^2$. After the three opening tones, there are two melodic motives which raise strong emotional excitement in a listener. The question is, where does this excitement come from? The first figure is:

Basically, this is an interplay between tones *c, e* and *eb*. The auditory centre seems to relate all tones to the anchor on *g*, which means that there are two alternating embryos which cannot be defined. Either they are *g*-*I (with the sung $e^2$ and the neural $b^1$) and *g*-*III (with the sung $eb^2$ and the neural $b^1$), or they are *g*-*VI (with the sung $e^2$ and the neural $bb^1$) and *g*-*IV (with the sung $eb^2$ and the neural $bb^1$)[18]. So far, there are no tools to define the modalities in ways the local singers (listeners) experienced them.

However, if we try to understand the neural processes, it seems that the sung tone $eb^2$ is encoded in the auditory centre with the optional neurotriad Ab — not with the subharmonic Cm, which is also a theoretical possibility. As seen in Fig. 20A, the moments during which the neurotriad Ab is active are very brief. Thus, when tone $eb^2$ is sung its neural response in this context is Ab. It activates the *c* neuron, which coactivates the *g* neuron. Thus, the sensation of the continuous anchor on *g* is because of the *g* nerve is coactivated by the sung $eb^2$, which actually is encoded with the neurotriad Ab (= nerves *ab-c-eb*). The other central motive is:


Here the opening phrase *c-eb-e* is contrasted with *d-c-d,* which have no effect on the *g* anchor but on the neurotriads. The syllable *-rëz-* (from *berëzki* 'birch-trees') is pronounced [r-yooz] and is acoustically complex. Therefore it may be that tones *d-c-d* are encoded with neurotriads Gm-C-Gm respectively. This directs automatically to an analytical solution that the following *eb* is encoded with Eb (not Ab) and the closing *c* is encoded with Cm. Why then is this melody closely associated, as a hearing experience, with the Slovakian lament above? The reason may be the adjacent nerves *e* and *eb* whose state of stimulation alternates as fast as in Eb→Ebm in Fig. 19:




Cm, Ab, and C are tied together by the *c* nerve while C, Eb and C are tied by the *g* nerve. At the same time, the alternating neurons *g-ab-g* in relation to *c,* as well as the alternation of neurons *e-eb-e* in relation to *g*, create quite a tense melodic swing. In this context the obvious modulation to the embryo *g*-*IV creates a peaceful moment of rest on the sung tone $c^2$ (*mes-*; see the arrow in Fig. 20B). The presence of *g*-*IV can only be justified by the present author with a possible effect of

18 The modes mentioned ascend as follows:

*g*-I: *g—b-c-d-e—g*
*g*-III: *g—b-c-d-eb—g*
*g*-VI: *g—bb-c-d-e—g*
*g*-IV: *g—bb-c-d-eb—g*

the neurotriad Eb on the emotions experienced while listening to the melody. Therefore it can be assumed that the modulating embryos are *g*-*I, *c*-*IV, and *g*-*IV, whose structures are:
*g*-*I: ***g**—b-**c-d-e***
*g*-*IV: *g—b-**c**-d-**eb***
*c*-*IV: ***c**—**eb**-f-g-ab*

From the modal point of view the grammatical sequence is ***g*-*I$_2$⇔*c*-*IV→*g*-*I→||*g*-*IV→*g*-*I$^1$** in such a way that *c*-*IV has but a transient (i.e., a very brief) duration in time but a considerable emotional effect. The alternation of these three embryos is seen in Fig. 20B.

The central neurotriadic sequence of Fig. 20-A is G→C→Ab⇔C. It seems that in the second measure of the lower line there occurs a transition to the subharmonic path Gm→C→Gm→Eb→ Cm (*-rëzki v meste*) after which the initial pattern returns. Thus, the neural pattern of this melody can be written **GC→Ab⇔C→||GmC→Gm→EbCm→||AbC**. If we want to reduce this long string, the sequence is **GC→Ab⇔C→GmEbCm→AbC**. This can be further reduced to the sequence of two neural regions, **G(m)-C(m)** and **Ab-Eb**. The structure is complex. Thus, even if this can be accompanied by the chords C and Cm, the melody is much more complex, and we, the listeners to this spring call, experience it. The analysis above is one way to understand this complex tune with only four sung tones.

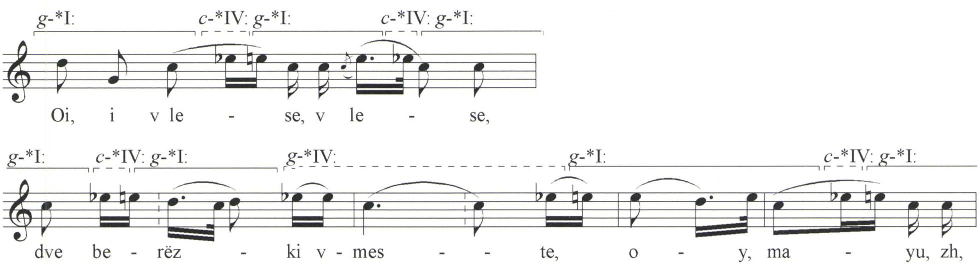



*Figure 20B. The melody of the spring call in Fig. 20A with the modal analysis. The anchors of this melody are g and c neurons, the first mentioned being in a state of stimulation throughout the melody. The alternating embryos and their durations are seen above the staves.*

*Húkan'e* calls like these belonged to the Slavonic ritual awakening of the *khorovód* in each spring, and the tradition survived e.g. in Southwest Russia, the Ukraine and Belarus, as well as in Bulgaria as the *lazarúvane* calls. They represented a "very ancient" tradition of unmarried maidens: "[The] girls in neighbouring hamlets respond to each other, setting the countryside ringing for miles around with their song calls".19 It is thus obvious that these melodies were sung with great energy, which made it possible for the singers to alternate between subharmonic and harmonic paths.

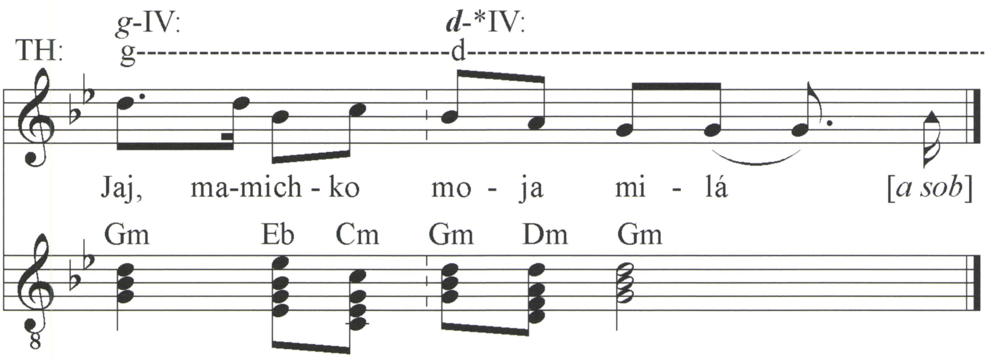



*Figure 21A. A verse of a lament from Slovenia according to Šelcová 1985, 156-159, no. 8: 'Oh, my mother, my dearest'. It is slightly varied when repeated.*

Figure 21A was recorded in 1961 close to the point in the Julian Alps where the borders of Slovenia, Austria, and Italy intersect. This lament represents South-Slavic style in SLOVENIA, and it is based on the repetition of eight poetic double lines characterised by variation in melody and rhythm. One interpretation of its grammatical basis rests on the possibility that the first sung tone ($d^2$) is encoded subharmonically with nerves *g-bb-d* corresponding to the physical G minor chord. This motivated the singer to follow the path **Gm→EbCm→||Gm→DmGm.** The root IV and the embryo *IV are composed of a few tones:

*g*-IV: ***g—bb-c-d-****eb-f-g*
*d*-*IV: *d—f-****g-a-bb****-c-d.*

The modal structure of this song is descending ***g*-IV$_2$→*d*-*IV$^3$**. Even if the melodic progression differs slightly in each verse, the grammatical idea is to follow the subharmonic path added with the harmonic Eb (see Fig. 21B). In many cases the singer progressed by starting a new verse on tone $bb^1$ (arrow). The verse pairs like this based the neural progression Gm-Eb-Cm-Dm-Gm but even if there occur minor changes they have no effect on the grammar, only on the performance.

19 Howe 1991, 56.

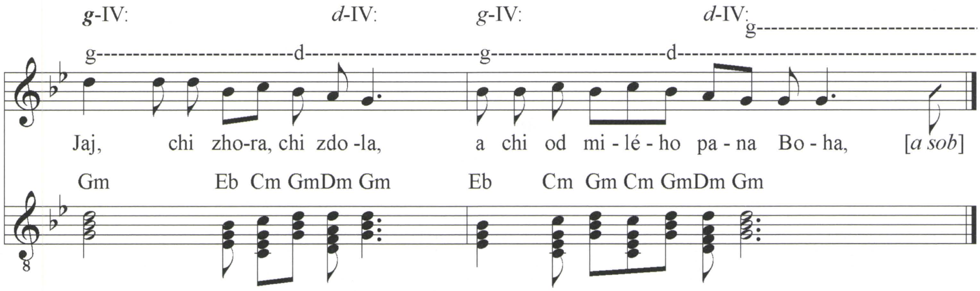



*Figure 21B. Verses 5 and 6 of the Slovenian lament in Fig. 21A.*

In many melodies the Slavonic grammar appears mysterious because more than one interpretation is available. A specific feature in some melodies is to modulate from *g*-IV to *bb*-I (corresponding to the modulation from natural C minor to Eb major). Sometimes this truly happens but sometimes it only is an emotional association. One reason is that a melody can be interpreted in two ways and both ways are neurally possible. As an example, Figure 21A is analysed by assuming that the third sung tone (*bb*$^1$) is not encoded with Eb but with Bb (Fig. 21C). The first tone (*d*$^2$) might even be encoded with Bb which means that the initial anchor is not *d* but *f*. Hence, there are two alternative interpretations. Either the embryos are **d-*IV$^5$→f-*I→d-*IV$^1$** or they are **f-*I$_2$→d-*IV$^1$**. The respective neurotriads are either **Gm→Bb⇔F→Gm**, or **Bb⇔F→Gm**. Figure 21C suggests that various listeners may interpret the same melody in various ways because certain tone combinations activate many neurons, which can be combined in different ways.

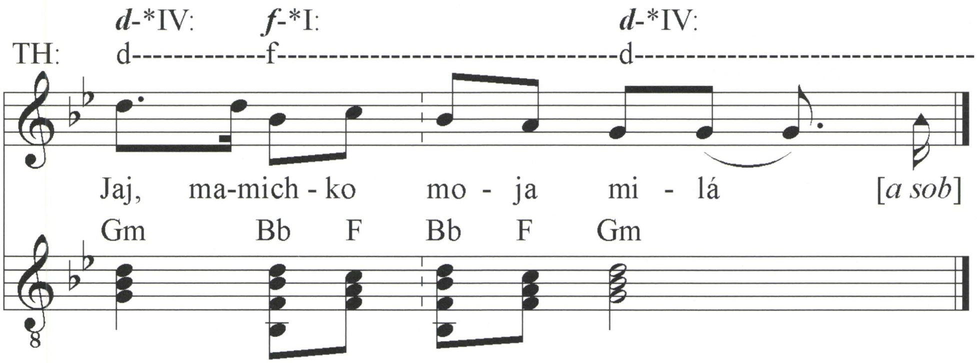



*Figure 21C. One verse of Fig. 21-A as reanalysed. The first neurotriad may also be Bb.*

The Sorbs (the Wends of Lausitz) are a minor West Slavic people in eastern Germany sharing some of the same grammatical elements as the former (Fig. 22). In the same vein it differs radically. The anchor tone is clearly *g* at the beginning of the tune. This means that the neural representation of the tones sung in two first measures is **Cm-G-Cm-Gm**. In the third measure the melody takes the harmonic path. The anchor tone *g* remains but root *g*-III is modulated to root *g*-IV. It might be argued that the first root is not *g*-III but *g*-I. However, because the main character of the melody is melancholy, the interpretation *g*-III seems safe. This "character" is obviously a result of the subharmonic neurotriad Cm comprising the active *eb* neuron. It represents the 3rd degree of root *g*-III. Thus, the modal syntax is ***g*-III$_5$→*g*-IV→*bb*-I→*c*-IV→*g*-IV$^1$**. The modes are:

*g*-III: ***g—b-c-d-****eb* *bb*-I: ***bb—d-eb-f-g***
*g*-IV: *g*—***bb-c-d-eb*** *c*-IV: ***c—eb-f-g****-ab*

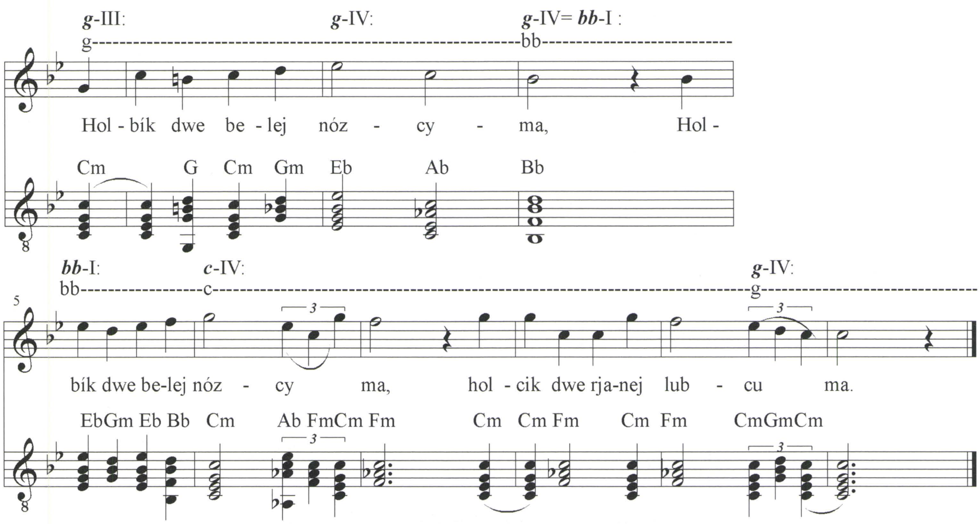



*Figure 22. A Sorbian song from the 19th century according to Kocora 1868.*

There are three highly emotive moves in this melody. The first one is the modulation *g*-IV→*bb*-I in between the upper and lower lines. It corresponds to the move from natural C minor to Eb major. The second is the modulation *bb*-I→*c*-IV in such a way that the anchor is changed from $bb^1$ to $c^1$. The third one occurs between the end and the beginning of the melody when *g*-IV is modulated to *g*-III and this is modulated back to *g*-IV. In other words, the aesthetic "hook" of the melody is the rapid interplay of roots III, IV and I. The alternation IV↔I is common in Slavonic song but root III is much more uncommon. Therefore it is possible that this is due to the Germanic influence (as it is in Poland). In spite of this, the song grammar is Slavonic, not Germanic, and it is actually quite tricky because the listener is constantly a little behind when trying to grasp what is going on. It is impossible for anyone to know that the syllabe *nóz-* (measure 3) begins the root *g*-IV. The listener does not know this before (s)he hears the sung tone $bb^2$ (*-ma*), which (s)he interprets as the 6th degree of *g*-IV. However, as seen from the neural point of view, it also is the degree 5 of *bb*-I, that is, the new anchor. These processes are naturally subconscious but, as the author assumes, they create a chain of surprises, which explains the charm of this melody.

The string of the neurotriads in Fig. 22 can be formulated in the form **CmG→CmGm→ EbAbBb→||CmFm→CmGm→Cm**. The melody is short but the neural activity is great. The neurotriads Cm, Fm, and Gm are subharmonic while Bb, Eb, Ab, and G are harmonic, and they are all acoustically in firm relation to each other. The number of harmonic neurotriads in major form is greater than that of the subharmonic triads. However, the modes in minor form account for the melancholy in mood.

An interesting melody is that for a *bylina* (epic song) written down by the River Pinega, Archangel region, north-western Russia (Fig. 23A). It is quite uncommon in grammatical structure. The only way to calibrate the melody to the G horizon is to assume that the opening tone is the sixth degree of *g*-*I. When the singer opened the tune with tone $b^1$ the neurotriad Em was activated after which she started to follow the path of the neural subharmonics. The melody is melancholy and mysterious due to its grammar. The sequence of the anchors is descending $g^1$-$e^1$-$d^1$-$e^1$. The melody is as if composed of five modules (see the lines beneath the lower stave) with the embryos *I and *IV as the alternating elements. The last measure is more or less enigmatic. The melody proceeds as if the hexatonal marker (degrees 5—6-1 = *e*—*g*-*a*) of root *e*-IV but in this context the auditory centre does not readily accept this obvious interpretation. The melody is ended either as in Fig. 23A or in Fig. 23B.

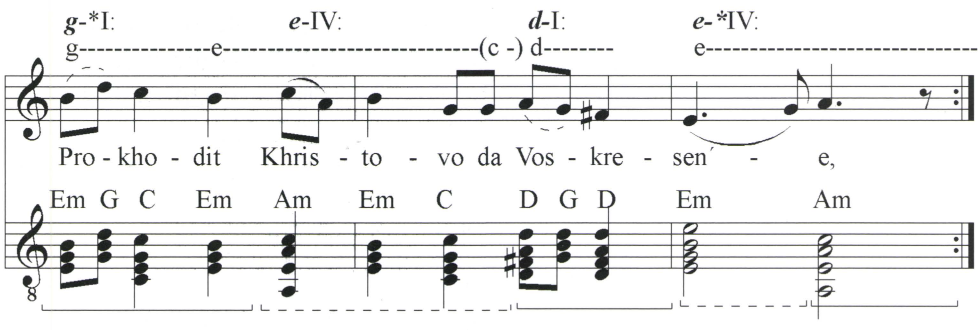



*Figure 23A. This north-west Russian epic song (bylina) represents an early Slavic tradition according to Ozarovskaya 1916, Appendix. This 'Passed Christ's Sunday' relates a bylina in which the story started after the Easter Sunday.*

In the variant A the final $a^1$ is encoded with the neurotriad Am and mode *e*-*IV. This means that the *e* nerve ties the end together with the beginning of the next verse, which is opened with the neurotriad Em. The other possibility is seen in Fig. 23B. The first mode of the closing measure (-*sen′*) is *b*-*IV modulated then to *d*-*I. The triads are Em and D. Because the *d* neuron binds the sung $a^1$ to the opening $b^1$ of the next verse, tone *b* may be encoded with the neurotriad G (instead of Em). This is what happens in Fig. 23 B. (The beginning of the next verse is added to its end.) There are songs in Europe which are felt to be melancholy even if they move in the major form. It is quite possible that the beginning of Fig. F-23-A gives on answer to explain this contradiction: If mode *g*-I is opened neurally encoded with Em (and not G), Em may appear even later (as it occurs in this melody) and this gives the subconscious "knowledge" of the melancholy. This may mean that the end of the A variant is more probable than that in the B variant.

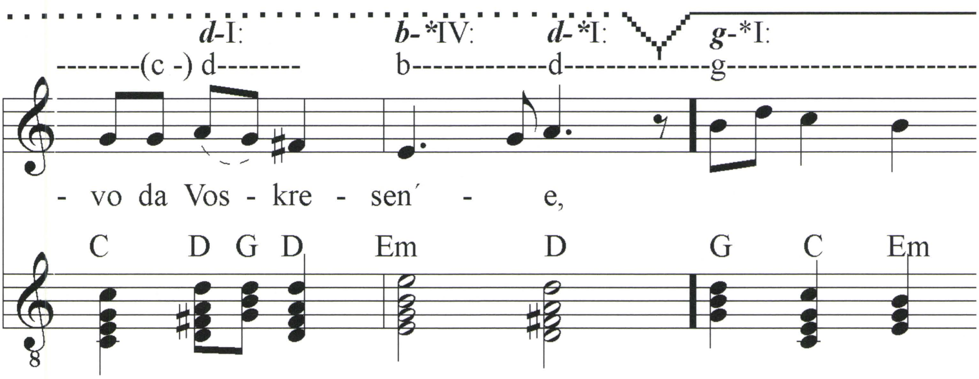



*Figure 23B. The end of the bylina in Fig. 23A and the beginning of its next verse according to another interpretation.*

The syntax of the variant in Fig. 23A is ***g*-*I$_6$→*e*-IV→*d*-*I→*e*-IV$^1$**, and the modes are:

*g*-*I: *g*—***b*-*c*-*d***-*e*
*d*-*I: *d*—***f#*-*g*-*a***-*b*
*e*-IV: ***e*—*g*-*a*-*b*-*c***

Neurally the main progression is unusual but still subharmonic Em→G→C→Em→Am. The insertion of the D-G-D element in the middle of the tune is a radical move and gives the rest of the song a tension, which is not quite resolved. Because the bylina is a long story, this is appropriate to its overall idea. The neural sequence can be now reduced to: **EmGC||→DCD||→EmAm**.

There are Russian songs which are subharmonic in nature but opened harmonically. Fig. 24B is one of these. Its first word *kovo* 'who; the one' is pronounced *ka-vó*, and when *ka-* is sung as $c^2$ it seems to form its harmonics 4-5-6 (*c-e-g*). Therefore the singer descends as if from its 4[th] harmonic $c^2$ to its 3[rd] harmonic $g^1$, which is encoded with the neurotriad G. The sung tone $g^1$ activates the *c* neuron, and the singer returns to $c^2$ which is divided into overtones *c-e-g*. In this context the auditory centre accepts the chord Ab to accompany this sung $c^2$ (see Fig. 4B). The two opening measures of this melodic progression are seen in Fig. 24A. The anchor and the mode change quickly, making the melodic progression difficult to follow.


*Figure 24A. The beginning of a song by the Russians in Udmurtia. The whole melody is seen in Figure 24B.*

The neural processes in Fig. 24B occur because the sung tones stimulate the nerves which form the encoding triads. Because the number of activated neurons is great and the number of various neural combinations also is great, there seems to be no need for too detailed analysis. The human mind aims at symmetry and holistic images which make it easy to comprehend the musical processes. Therefore the analysis best serves the aims of a study if the results are simple.

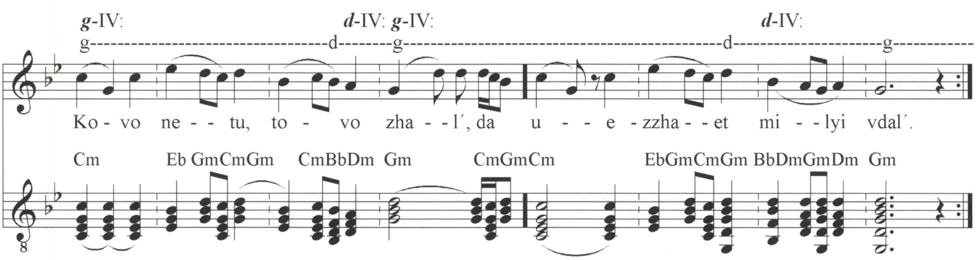



*Figure 24B. The first double verse of a lyric Russian song from Udmurtia according to Starodubceva 1999, no. 35: 'The one who is not [alive] – is grieved'.*

The melody in Fig. 24B was composed by ordinary Russian village people and it only existed in their memories. The structure of the song cannot be too complex and therefore the present author had to admit that there are but two anchor tones and one mode alternating in this melody. Too detailed analysis makes the result so complex that it is hard to draw any conclusions from the data. In other words, the simpler the analysis, the closer it obviously is to that image that the singers had in their minds. Therefore, for example, the analysis in Fig. 24B assumes that even if the neural process could be as given in Fig. 24A, the secondary options make it possible for the listener to accept the chord Cm to accompany the first three (or even four) sung tones. The anchors are $g^1$ and $d^1$, and the root IV is the only modality:

*g*-IV: ***g—bb-c-d-eb***
*d*-IV: *d—f-**g-a-bb**-c-**d***

The modal structure is ***g*-IV**$_1$**⇔*d*-IV**$^1$. The melodic curve (*-tu, tu-vo ža-*) in measures 2-4 resembles that found in measures 2-3 of Fig. 23A (*-to-vo da Vos-kre-sen΄-*) but the neural activation is different in some of the sung tones. This is due to the prominence of the active *f* neuron in *Kovo netu.* Therefore the *d*-based mode in this song is *d*-IV, while it is *d*-I in the Pinegan Figure 23A.

The melody progresses subharmonically. The harmonic neurotriads are Eb and Bb, and the sequence can be reduced to **CmEbGm→Cm→BbDmGm**. The neural structure is balanced: The left side of the string comprises the neurons *c-eb-g* corresponding to the physical Cm, while the right side comprises the neurons *bb-d-g* corresponding to the physical Gm. The final tone *g* is the first degree of *d*-IV, and when the following verse is started the *g* nerve remains activated as the anchor of *g*-IV. The continuity of the verse is perfect.


*Figure F-25A. A Midsummer ritual song from Belarus according to Kostyukovec 1983, 80: No. 2:1: 'Kupala, in St. John's Day, dear kupala, where is your daughter?'*

Another example of a song, which also can be seen to open with the physical C major, is in Fig. 25A from Belarus. The Eastern Slavic tradition of *kupalo* comprised magical rituals performed during Midsummer Eve and Day. The Summer Solstice has for long held had a central position in the Slavic *khorovód* or the cycle of the ritual year. It was important to youth, and specifically to the maidens because the *kupalo* rituals symbolised the "completion of the girls' transition to adulthood, giving them the right to enter into marriage relations", and the "parents did not have the right to forbid their children to participate in them”20. The melody of Fig. 25A belongs to these Midsummer songs performed in the Minsk region in central Belarus.

The *Kupala* opens upwards from $c^2$, and there emerges the physical harmonics 4-5-6 (*c-e-g*), which direct the singer to ascend as if from the 4th harmonic to the 6th harmonic ($c^2$-$g^2$) of *c*. The sung $g^2$ generates the neural Cm. Because the 3rd harmonic of the sung *c* activates the neurons *c, eb,* and *g,* the listener has no problem accepting the Cm chord to accompany both sung tones of the first measure of Fig. 25A. The melody seems to have as many as four anchors, $g^1$, $bb^1$, $c^2$, and $f^1$. The modal sequence of this melody is **g-IV$_1$→*bb*-I→*c*-IV→*g*-IV→*f*-*VI→g-IV$^1$**. The modes are:

*g*-*IV: *g—bb-**c-d-eb**—**g*** *bb*-*I: *bb—d-**eb-f-g***
*c*-*IV: *c—**eb-f-g**-ab* *f*-*VI: *f—ab-bb-c-**d—f***

When the anchors change as quickly as they do in this *kupalo* song, it may suggest that there is something wrong in the analysis. There are some problematic details in this tune. For example, is the neural Bb active throughout the measure 5, or do its first tones ($f^2$: *Ku-pa-*) activate the neural Fm, as assumed here? Because of the solution of the author the anchor can only be *f,* and the mode can only be *f-**VI. Thus, the neural progression underlying Fig. 25A can be reduced to the string: **Cm→EbBb→CmFm→CmGm→Cm**. It is clearly subharmonic, and, in tonal terms, we may say that there is a modulation from minor to major.

The Belarus researcher Kliment Kvitka once identified one melody type of the same *kupalo* ritual once widely known west of the River Dnieper in the Ukraine and Belarus. According to L. Kostyukovec, this type, seen in Fig. 25B, was related to that in Fig. 25A but was much more ancient.21

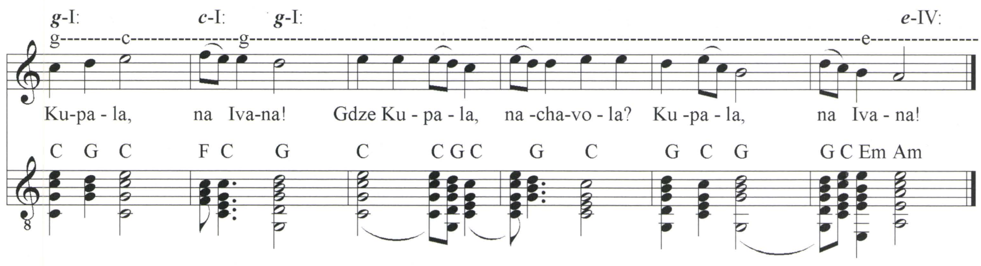



*Figure 25B. An interpretation of a melody for a Belarus kupala ritual according to Kostyukovec 1983, 80, No. 1. First published in 1817. The main part of the tune progresses harmonically but the path changes to the subharmonic one at the end.*

20 Howe 1991, 59.
21 Kostyukovec 1983, 79-80.

It is true that the poem is much the same and the three half notes (arrows), corresponding to descending *a*-LA pentatonal degrees *mi-re-la*, so typical of Russian song, are identically situated. However, these two melodies are not identical in grammar. The half tones are not *mi-re-la* in Fig. 25B but *re-do-sol* of *c*-SOL even if both tunes open in the G horizon. As seen above the upper stave, the beginning of the melody in Fig. 25B obeys the path of the physical harmonics but is turned to the path of the neural subharmonics at the end. The grammar in measures 1-2 is most typical of Central European song (especially the anchor tone movement $g^1$-$c^1$-$g^1$ in the context of *g*-I) because of which it may be reminiscent of a Germanic melody. Its modal structure differs radically from that of the younger version in Fig. 25A: ***g*-I$_1$→*c*-I→*g*-I→*e*-IV$^1$**. The anchors correspond to the harmonics 3-4-5 of *c,* which strengthens the harmonic character of the song. However, since the 3rd measure, the melody progress is typical of East-Slavic song. One reason is that the melody is firmly fixed to the 3rd degree ($e^2$) of the root on *g*.

The neural structure is also quite different between the two melodies. The main part of Fig. 25B comprises the neurotriads **CGC→FCG→C**. It is not until the end that the grammar is changed to the subharmonic path: **G-C-Em-Am**. We may ask why it is that the third sung tone ($e^2$) of Fig. 25B is encoded by C and not by Am? The reason seems to be, first, the effect of the active *g* neuron which functions as the anchor, and, secondly, the physical harmonics of the sung tone $e^2$ (*-la,*), which stimulates the *c*, *e*, and *g* neurons. The same explanation holds good for the final tone $a^1$ (*-na*) encoded by Am, not by Dm: When sung, the anchor is *e* and the powerful active neurons are *a*, *c*, and *e*.

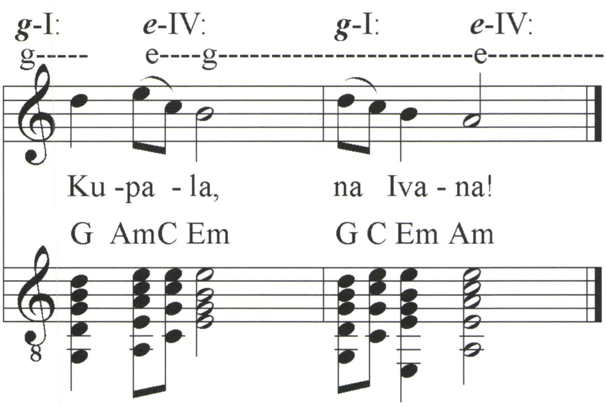



*Figure 25C.*

In Fig. 25A there occurs a modulation from root IV to root VI in the fifth measure. The same may also happen in Fig. 25B but, with the help of the music analysis, it is not possible to judge the exact nature of the modulation, which may be *e*-IV→*g*-I→*e*-IV at the end. If so, the listener experiences that the melody is closed in *e*-IV, the root of natural A minor (Fig. 25C). Thus, it seems that these two melodies share the same poem and ritual context but it is quite difficult to find proofs for the hypothesis that the melodies are genetically related in grammar. Some social occurrences have led to radical changes in grammar.

Quite a different grammatical solution can be found in CROATIA whose people had contacts with Germanic populations for about 15 centuries. Fig. 26 represents a lyric tune with a melancholy poetic content which is not modern while the motive of the departing home is eternal: ‘Early in the morning the sound [of church bells?] was sounding, quickly shall we leave for regions far away---’.

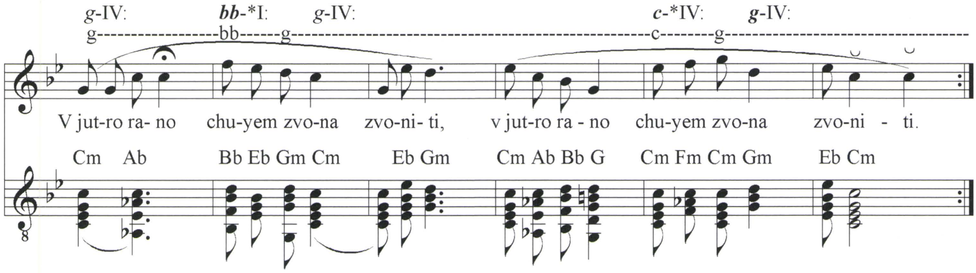



*Figure 26. A lyric song from Croatia according to Žganec and Sremec 1951, no 104.*

The Croatian melody was not easy to understand because there are many different ways to explain the melodic progressions. The greatest problem was to understand the appearance of the neurotriads Ab and Bb in moments when the anchor is undeniably *g,* which does not belong to either of them. The melody sounds logical and balanced in all details because of which there must be something to explain the contradiction. The neurotriad Ab appears in measures 1 and 4 when tone $c^2$ is sung (arrows). Usually the sung *c* is encoded with neural F(m), C(m), or Am. The initial leap $g^1$-$c^2$ of Fig. 26 can easily be accompanied by Cm chord because of which the *g* nerve serves as the anchor. In this context the neural Ab, however, sounds the most suitable option because of which the anchor is changed to *c,* which starts to violate the anchoring system of the whole song. There is one explanation available. The articulated tone $c^2$ (*rano*) is divided in harmonics 4-5-6 (*c-e-g*). As seen in Fig. 4A, the harmonic *c* activates the neurons *ab* and *c,* the harmonic *e* activates the neurons *c* and *e,* and the harmonic *g* activates the neurons *c* and *eb.* Thus, while the *g* neuron remains activated. the Ab neurons are also activated. This means that Ab is fully possible along with the *g* anchor. The surprising appearance of the neurotriad Bb in the fourth measure can be explained in the same way. When the singer utters $bb^1$ (*ra-*) it is obviously encoded with neural Bb, whose fifth harmonic *d* activates the *g* neuron. Thus, the analyst can easily accept the neurotriads Ab and Bb without any need to assume that the anchor must be changed from *g* to somewhere else.

A common Slavic trait is the modulation of root *g*-IV to *bb*-*I and back. The modal elements of Fig. 26 are:

*g*-IV: ***g—bb-c-d-eb***
*c*-*IV: *c—**eb-f-g**-ab*
*bb*-*I: *bb—**d-eb-f**-g*

The grammar can be presented with the formula ***g*-IV$_5$→*bb*-*I→*g*-IV→*c*-*IV→*g*-IV$^1$**. From the neural point of view the grammatical nucleus is complex because of the great variation:

**Cm→AbBbEb→Gm→G→CmFmCm**. Acoustically the variation is sound. The subharmonic neurotriads Cm-Gm-Fm are closely related, but so are the harmonic Ab-Eb-Bb, and G. The vivid alternation of subharmonic and harmonic elements is characteristic and one may wonder that the style of this song may not be too old. A specific feature of the melody is the leap upward from $g^1$ to $eb^2$ (*zvo-**ní**-ti* 'was sounding') in the 3rd measure. From the universal point of view this leap of the sixth, i.e. from the anchor tone to the 3rd degree of *g*-IV, is more or less non-existing beyond the Slavonic song. As can be seen, it was preceded by the neural Cm (*c-eb-g*) activated by the sung *g*. Thus, theoretically, the leap of the sixth is a transition from the *g* neuron to the *eb* neuron. In other words, the subharmonic Cm seems function as a subconscious directory to what is going to happen next. When the singer articulated these two tones, they were obviously encoded with triads Cm and Eb, as suggested in Fig. 26.

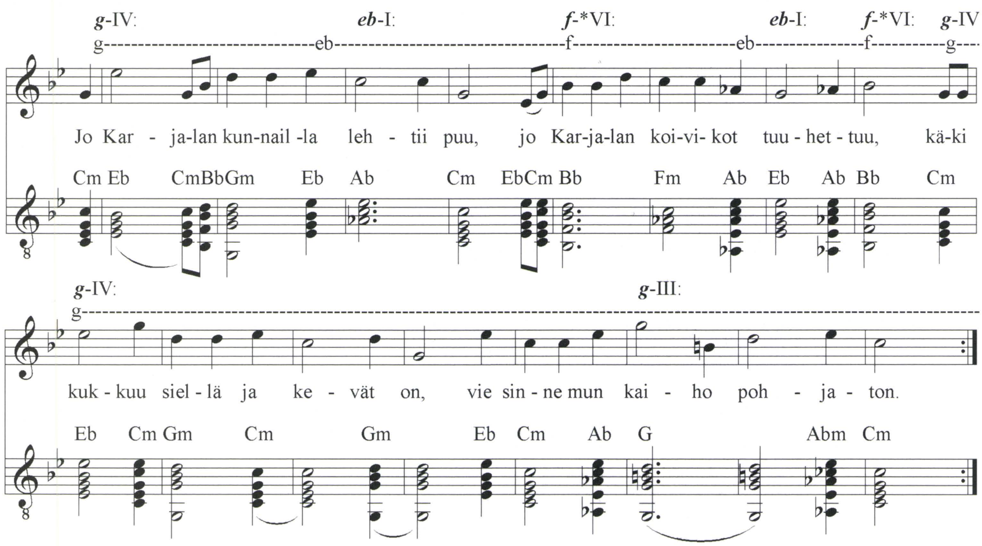



*Figure 27A. The first interpretation of a Karelian song as remembered by the present author. It represented a new grammar in Finland that was much influenced by the Russian song grammar based on the subharmonic path in the melody formation: 'On Karelian Hills the trees are already green'.*

Boris Asafjev postulated that the most typical motive in the 19th century Russian melody was the ascending minor sixth, which can be found in folk song as well as in orchestral music. Sometimes it is called "the Slavonic sixth". It is known in all Europe even if it is specifically typical of the Russian melody22. Because of the areal interaction it is normal that neighbouring populations influence each other regardless of their different cultures. A Karelian song *Karjalan kunnailla* 'On Karelian Hills' (Fig 27), is an example of a melody composed by an unknown Finn or Karelian in a new style adopted from the 19th century Russian song grammar. Because the Soviet Union conquered Karelia in the World War II, more than 300,000 Finnish Karelians were evacuated to the rest of Finland. When this melody was recorded and published in commercial markets in the 1940s and 1950s, the Karelian refugees adopted it quickly as a musical symbol of their lost homes23. They identified its grammar as Karelian but historically the grammar goes back to the Russian and, more generally, to the Slavonic song grammar.

The initial leap $g^1$-$eb^2$ of *Karjalan kunnailla* represents this minor sixth repeated afterward twice. It seems that two times this leap is subconsciously prepared by the subharmonic Cm as the representation of the sung tone $g^1$ followed by harmonic Eb as the representation of the sung $eb^2$. This combination may be the reason for the strong emotional effect of this leap. As a common Slavic trait is the alternation of roots IV and I, as a result of which the grammatical structure of the most of the song is *g*-IV⇔*eb*-I. At the end this is changed when the melody is transposed from *g*-IV up to *c*-IV and then finally returned to *g*-III. Because the singers usually articulate tone $g^2$ (arrow) by the syllable *kai-* (of *kaiho* 'longing, yarning'), it is articulated quite powerfully and its neural correspondence may be G because of which the root will be *g*-III (and not *g*-IV as elsewhere). Thus, the roots are:

*g*-IV: ***g—bb-c-d-eb—g***; *eb*-I: ***eb—g-a***-*bb*-***c***
*g*-III: *g*—***b-c-d-eb—g***;*f*-*VI: *f*—***a-bb-c-d***

The modal process is ***g*-IV$_5$→*eb*-I→*f*-*VI→*g*-IV→*g*-III¹**. From the tonal point of view the mode is C minor. It starts in natural minor, ends in harmonic minor, and is modulated to Eb major on the upper line. From the hexatonal point of view the melody is much more complex and in many cases open to many interpretations.

The neural syntax is a quite complex combination of subharmonic and harmonic neurotriads with the structure **CmEb→CmBb→Gm→EbAb→Cm||→AbG→AbmCm**. The subharmonic elements are Cm, Fm, Gm, and Abm, and the harmonic ones are Bb, Eb, Ab, and G. In other words, with Abm excluded, the grammatical elements are identical with those in Fig. 26. This combination may explain why tone *f* is not sung at

22 Jalkanen 2003a, 93-111-
23 Jalkanen 2003b, 332, 334. Kurkela 2003, 431.

all. It is neurally present when the triad Bb is active but it is so weak in this song that it was difficult for the composer to add tone *f* to the melody. The presence of subharmonic Abm on the lower line can be explained by the low energy of the unstressed tone $eb^2$ (*-ja-* before the final tone) which motivates the interpretation of Abm.

The beginning of the lower line is analysed in Fig. 27A in such a way that the sung tones are encoded with neurotriads Cm and Gm. As a result the *g* nerve serves as the anchor throughout the line. It is quite possible that the analysis is oversimplified. In Fig. 27B the beginning of the line is analysed a little differently because of which the modal and neural sequences become more complicated. In the 2nd and the 3rd measure the neurotriads Gm-Ab-Fm-Bb are fully possible representations of the sung tones. This would mean a rapid change of anchors and of two modalities in the 3rd measure, the embryo *ab*-*II (*ab*—***c***-*d*-*eb*-*f*) and *f*-*VI, which already was active before. It seems as if the neurotriad Fm is active only in this context.

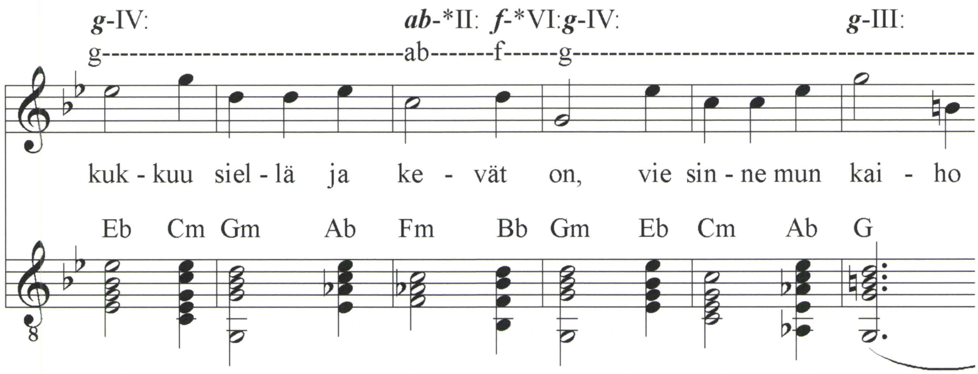



*Figure 27B. Karjalan kunnailla: The beginning of the lower line as re-interpreted.*

The song from north-eastern Polish Szczytna resembles the Sorbian song in Fig. 22 because the grammar alternates vividly between the physical and neural harmonics, and the anchors change rapidly (see Fig. 28). This feature makes the melody quite problematic to analyse. The sequence of the anchor tones is unexpectedly vivid: $g^1 \rightarrow c^1 \rightarrow f^1 \rightarrow d^1 \rightarrow bb \rightarrow d^1 \rightarrow c^1 \rightarrow g \rightarrow c^1 \rightarrow a \rightarrow d^1$. This means that the melody proceeds low in the G horizon, and the opening anchor $g^1$ is transported one octave lower to *g* (parallel to that in Fig. 16B). Root IV governs the first two measures, then there come three modes (*I, III, *I) sharing the same hexatonal marker. Root *g*-IV returns, and the two final measures are so complex that they will be looked closer some few lines lower. The modes are:

*g*-IV: ***c-d-eb-f-g—bb-c- d*** *f*-*I: *f*—***a***-*bb*-***c***
*d*-IV: *d*—*f*-***g-a-bb*** *bb*-*I: *bb*—***d-eb-f***-*g*
*d*-III: ***d—f#-g-a-bb***


*Figure 28A. A Polish song according Kolberg 1857, 220, no. 20.d.*

In the two last measures the progression of anchors is $c^1\rightarrow g\rightarrow c^1\rightarrow a\rightarrow d^1$. They change so quickly, and have such a brief duration, that it is useless to mark other modes to the transcription but *g*-IV. The hexatonal embryos are *c*-*VI (***c***—*eb-f-g-a*), *a*-*V (***a***—*c-d-eb-f*), and *d*-*III (***d***—*f#-g-a-bb*). This is a too complex combination of tonal processes for the human mind to grasp. Therefore it simplifies the process by forming an image of modal unit known as the universal root no. V. In this case, it is *a*-V (***a*—*c-d-eb-f-g***), and this simplified solution is represented in Fig. 28B.

As seen from Fig. 28B, the formation of root *a*-V is complex and the question is, why does the listener experience the *a* neuron as the anchor? The sung tone $f^1$ (*o-*) is encoded with the neurotriad F with the *a* neuron activated. Of the sung tones $eb^1$ and $d^1$(*-go-*; *-ja*) it is the latter whose 3rd harmonic *a* activates the *a* neuron. The 5th harmonic *e* of the sung $c^1$ (*-spo-*) activates the *a* neuron, as does the sung tone $f^1$ (*-ta-*). Thus the *a* neuron remains in the state of stimulation almost throughout the last two measures, even if it is only seemingly obvious by the two last tones *f* and *d*. The modal progression can be described with the syntactic formula **g-IV$_5$→f-*I→d-III→bb-*I→d-IV→a-V$^1$.** Root V is easy to identify by listening but, because of its complex neural structure, it always sounds more or less tense or excited.

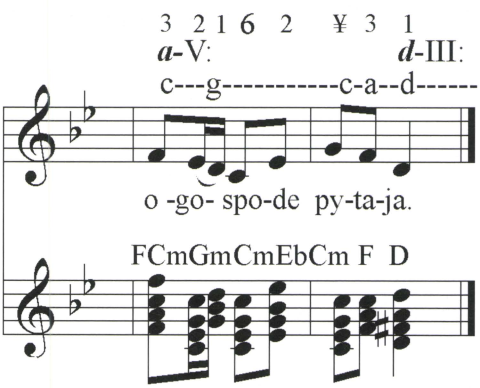



*Figure F-28B. The last two measures of the Polish song A we Lbowie given as a new interpretation: The closing root is a-V. The small digits above refer to degrees 5-1 and ¥ of this root.*

There are four moments when the neurotriad Gm appears in contexts where it is not expected to appear (see the arrows in Fig 28A). These are the last tone of the 3rd measure (syllable *-ja*), the second tone (*-no-*) of the 4th measure, and the first and the third tone (*ja-* and *-ja*) of the $6^{th}$ measure. In each case, the human ear accepts the physical Gm because of the active anchor tone on *d.* The sung tones are thrice $g^1$ and twice $bb^1$. When tone $g^1$ is sung loudly, its physical harmonics *g-b-d* (4-5-6) activate three neurotriads (*g* > Cm; *b* > Em; *d* > Gm). The main effect is directed to *g* and *d* neurons because of which the human mind accepts most easily the physical chord Gm corresponding to the neural state governed by the neurotriad Gm. Accordingly, when tone $bb^1$ is sung, the *bb*, *g*, and *d* neurons are stimulated. This helps to accept the physical Cm chord. Likewise, in the first and the second measure, the sung tones $bb^1$ and $d^2$ (*we Lbo-*) can easily accompanied by Gm. Moreover, the initial tone $g^1$ will possibly be encoded with the neurotriad Gm when the following stanzas are started.

When the syntax is studied from the neural point of view, the complexity is obvious. The series of neurotriads can be displayed as **CmGm→CmFDm→BbEb→CmFD**. Thus, the subharmonic path is resting on the neurotriads Cm-Gm-Dm, while the harmonic path is based on Eb-Bb-D-F. The neurotriads Eb, Bb and F are present in all Slavonic song while D is much more uncommon. Therefore it is possible that it suggests some influence from the Germanic direction.

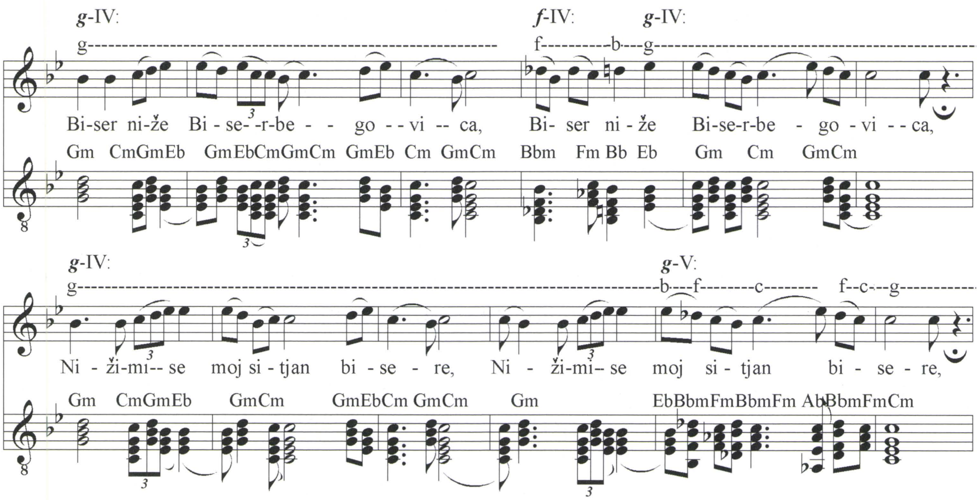



*Figure 29. Verses 1 and 3 of a Bosnian epic song from Hercegovina according to Bartók 1951, no. 8a. The recording is from 1935.*

Root V is found in all Slavonic song and specifically in regions having contacts with Mediterranean peoples. For instance, Béla Bartók (1951) selected for his large *Serbo-Croatian Folk Songs* melodies mainly based on *d*-IV. There are many melodies having the grammatical idea of the alternation *d*-IV$\leftrightarrow$*f*-I. Then there are melodies whose main root is *d*-V (see his items 10b, 15, 16b), or which alternate such as *d*-V⇔*d*-IV (item 25), or *d*-IV⇔*d*-V (see Fig. 29 in this paper).

The BOSNIAN song is quite complex because of decorative treatment of melody. A typical trait is that the singer articulated tone $d^2$ slightly flattened or precisely as $db^2$. The characteristic string of the neurotriads is **Gm→CmGmEb→Cm**. The first exception occurs in the upper line, when the singer transposed the melody to *f*-*IV and *f*-*VI (during tone $d^2$) without any tying. The end of the lower line is acoustically too complex for a listener to follow the changes of anchors *b-f-c-f-c*. Therefore the simplified interpretation will obviously be *g*-V (*g—bb-c-db-eb*) even if the *g* neuron seems to be activated only during the sung tones *bb, c,* and *eb* (see Figures 4A and 4 B). These activations are not seen in the transcription. Root *g*-V remains through the two final measures of Fig. 29, and its modal complexity is seen in the syntax: **Eb⇔Bbm→Fm→|Ab|→Bbm→Fm→Cm**. A new element is its neurotriad Bb minor, which has a prominent role. The final form of the sequence is **GmCmGmEb→GmCm→BbmFm→BbEb→//Gm⇔Cm** *or*: // **Ab-BbmFmCm**. It is possible that a listener may also interpret measure 4 of the upper line as *g*-V. However, the modal structure is according to the present interpretation **$g$-IV$_6$→*f*-*IV→*g*-IV→*g*-V**[1].

Around the Winter Solstice Europeans celebrated in December and early January. The main function of these traditions was to ensure that the cultivated fields and domestic animals would be productive in the becoming year. The eastern Slavs knew this ritual as the *kolyadá, koledá* (< Latin *calendae* 'the first day of month') and specific songs were sung. One of them appears in Fig. 30A. It comes from the Smolensk region in western RUSSIA but it was also sung by the Belarus. Because of its calendar nature, it can be assumed that the grammar is archaic. Therefore it is interesting to understand that, on the grammatical level, the song is in most details identical with Fig. 28. This Russian variant is slightly more simple and is lacking the neurotriads Fm, D and Eb. The original transcription was given as in Fig. 30A, that is, metrically in 3/4.

*Figure 30A. A Russian kolyad song according to Zemcovski 1975, 159, no. 187.*

However, if the metre accords with the internal neural changes, the melody can be written differently (Fig. 30B.)

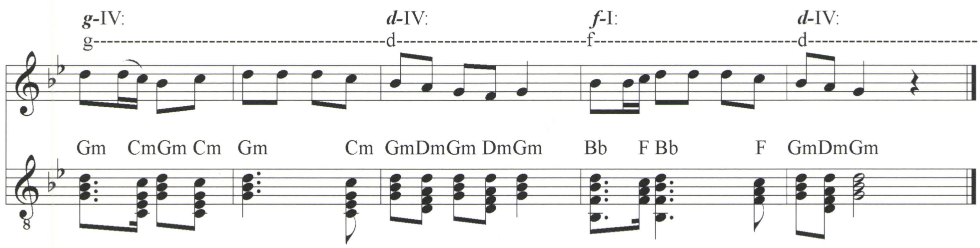



*Figure 30B. A West-Russian kolyad according to Zemcovskiĭ 1975, 159, no. 187. Root IV is prominent except while the f neuron and the embryo f-*I are active.*

The grammar of Fig. 30 is neurally divided into four parts. When the *g* neuron is active the melody is encoded with the subharmonic triads Gm and Cm. When *d* is active, the triads are Gm and Dm. When *f* is active, the melody progresses supported by the harmonic triads Bb and F, and when the anchor *d* is reactivated at the end the neural triads are Gm and Dm with Gm as the finale. Thus, this grammar is dually balanced: **GmCm|→GmDm||→BbF||→GmDmGm**. The main result is that the melody is subharmonic but different from the former ones because it is composed of dual elements. The embryos of the tune are as follows:

*g*-*IV: *g*—***bb-c-d***
*d*-*IV: *d*—***f-g-a-bb***
*f*-*I: *f*—***a-bb-c-d***

The modal structure of Fig. 30 is $\boldsymbol{g}$**-IV**$_2$**→*d*–IV→*f*-I→*d*-IV**$^1$.

The next song represents two-part singing from the Ukraine. It is typical of the East-Slavic style but there are also some problems in definition. The first question is, how to calibrate it to the G horizon? Is the first sung tone $bb^1$ in relation to the anchor tone $g^1$ (meaning that it is the degree 6 of *g*-IV), or is it in relation to the anchor tone $d^1$ (meaning that $bb^1$ is the degree 3 of *d*-IV). There are two reasons to assume that this melody is started as shown in Fig. 31. First, the second tone $c^2$ is fully motivated as the degree 1 of root *g*-IV. The second reason is that when the melody is repeated on the second line, the upper voice articulates $eb^2$ (measure 1: *-lo*), which is the 2nd degree of *g*-IV but no degree in root *d*-IV. Thus, the melody is quickly transposed from *g*-IV to *d*-IV and then starts the more or less peculiar melody with the anchor tones $g^1 \rightarrow d^1$-$f^1 \rightarrow g^1 \rightarrow a^1$. The modes are:

*g*-IV: ***g—bb-c-d-eb*** *a*-IV: ***d-e-f-****g*-|***a—c-d-e***
*d*-IV: ***d—f-g-a-bb-c-d*** *f*-I: *f*—***a-bb-c-d***.

The modal syntax is ***g*-IV$_6$→*d*-IV→*f*-I→*g*-*IV→*a*-IV$^1$**. There are some features not present in the former melodies. As found, in various Slavonic melodies the grammatical core can be reduced to the root alternation IV→I→IV. This occurs here, too. Parallel to Fig. 28A, IV→I→IV is present but the final figure of each line differs from the pattern and has some specific element of its own. In this Ukrainian tune the unexpected element is the transposition of root IV to *a*: *a*-IV. To close a tune on the *a* anchor in the G horizon is not impossible but it is quite rare. It can be found in Finnish 19th century improvised youth songs known as *rekilaulu* 'round-dance song' but it can also be found in some Russian melodies. How common it is among the Slavs in general remains an open question

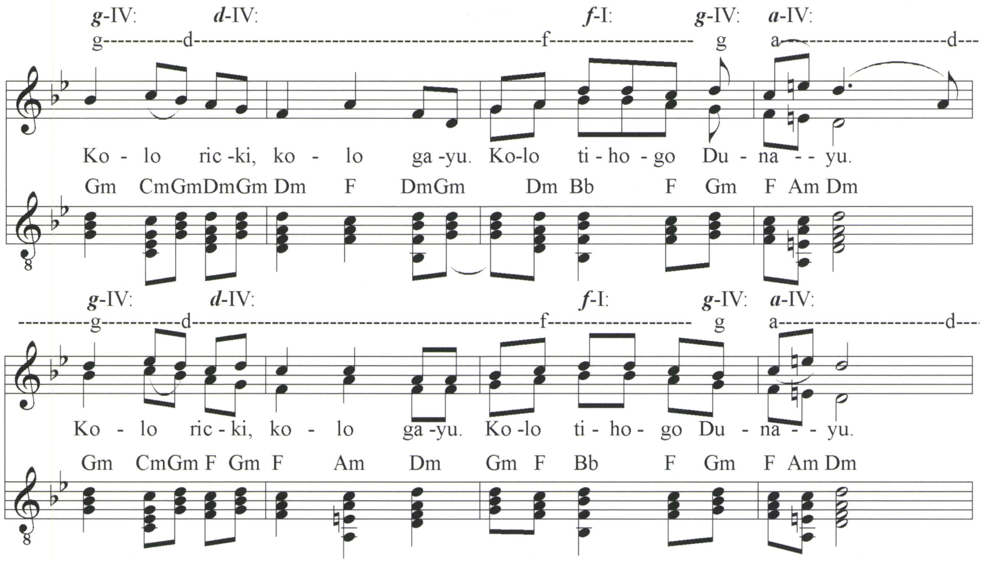



*Figure 31. Two double verses from a Ukrainian lyric female song according to Avdievs'kiĭ et al. 1989, 351-352. The main melody is the lower voice: 'Close to river, close to field, close to the silent Danube'.*

Another peculiarity in Fig. 31 is the neural progression Gm→F→Gm, which may also appear as F→Gm→F. The former is neurally tied together with the *d* neuron, not tightly but to a certain extent because the 5th harmonic of the sung *a* stimulates the *d* neuron. When the order is the opposite (F→Gm→F), the tying effect seems to be so weak that the tones sung during the syllable *Du-* in the third measure of both lines (arrows) may be experienced by the listener as if a detached element in the melody. However, what follows in the last measure is a surprise, and this kind of low-energy tying effectively prepares the transposition to *a*-IV. As a result of this root serving as the closing one, it is the *d* nerve that ties the finale with the opening tone of the next verse. This kind of tying is not too common because it is only possible in long-term memory. In spite of this, it is not at all difficult to start the following double verse. From the neural point of view the melody represents a grammar lacking Fm and Eb but having F, Dm, and Am prominent beyond the main triads Gm and Cm: **GmCm→GmDm→BbF→GmF→AmDm**.

Bulgaria was populated by various peoples long before the Proto-Slavs migrated there and its various song grammars suggest all kinds of substratic grammatical features. There are songs which clearly parallel the syntactical elements encountered in the preceding Slavonic songs. Then there are melodies which should be carefully studied because of their non-Slavonic elements, and there are melodies which reveal both Slavonic and non-Slavonic elements.

A

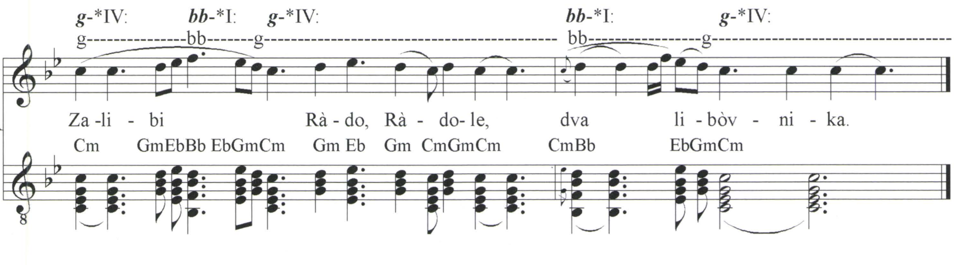



*Figure 32. This Bulgarian mythological chant according to Stoin′ 1928, no. 1403 represents the Proto-Slavic song grammar. 32-B. This chant was performed yearly in St. Vasilei's Day (Stoin′ 1928, no. 178) but its song grammar suggests an Old-Turkic origin.*

The Slavs migrated to modern Bulgaria in the 6th century and the Bolghars followed them in the 7th century. Both invading populations fused with the autochthonous peoples and most started to speak Slavonic. Fig. 32A represents an archaic Slavonic grammar with the embryonic modal sequence ***g-*IV$_1$↔bb-*I→g-*IV$^1$***. The neural syntax is also typical: **CmGm→EbBb→EbGm→Cm**. There is no doubt that syntactical structures like these represent the song grammar, which was used in all Proto-Slavic communities for ca 17 centuries ago.

The Bulgarian melody in Fig. 32B is totally different in grammar. The neurotriads look Germanic because of the neural options but the combination is neither Germanic nor Slavonic: **GCG→CGD→AmD→GD**. The modal syntax is also exceptional because the main embryos are inverted ¿VI and ¿I: ***g-¿*I$_2$→a-*VI→d-¿*VI$^2$***. This kind of grammar is characteristic of the Central Siberian Yakuts. Specifically typical traits are the small number of degrees, the preference for embryo VI and the mictic nature of the grammar: the tones simultaneously form the proto-pentatonal embryo *d*-*RE (*a—c-d-e—g*). The Bolghars were a Turkic people from Central Asia who founded the prosperous city of Bolghar[24] on the eastern bank of the Middle Volga around 500 AD. As an ancient tribe they sprang directly from the Proto-Turkic people. It is possible that, after converting to Christianity in Bulgaria, the Bolghars changed their language but sang Christian calendar songs like this according to their Siberian song grammar. If this was the case, the grammar springs ultimately from the Proto-Turkic song grammar known around Mongolia about 4,000 years ago.

Fig. 33 represents the mixed type. Its verses 1 and 3 are non-Slavonic in grammar while verse 2 represents a typical Slavonic progression in root *b*-*IV — except at its end. The melody is dramatic and beyond *g*-*I the main modes are:

*f#*-*V: *f#—a-**b-c-d-e***

*b*-*IV: ***b—d-e-f#-g**-a.*

Root *b*-IV of the middle part is in contrast to embryo *b*-¿*I and both are in contrast to *f#*-*V. The formation of the last mentioned is interesting. It is the *a* neuron that is prominent as the anchor. In spite of this the *f#* neuron is also stimulated in the last two measures of both lines and assumes the status of anchor. Both lines are closed with the normal 3$^{rd}$ degree of *f#*-*V. This song obeys the hexatonal grammar but is atypical among melodies presented in this paper. The string of anchors is long: $g^1$-$a^1$-$f\#^1$- || $b^1$-$d^2$- || $g^1$-($e^1$-)$a^1$-$f\#^1$. The modal syntax is ***g*-¿*I$_2$→ *f#*-*V→||*b*-IV→*d*-¿*I→||*g*-¿*I→ *f#*-*V$^3$**. The anchor move $b^1$-$d^2$ is familiar with melodies above corresponding to $g^1$-$bb^1$ — whereas $g^1$-$a^1$-$f\#^1$is a Bulgarian idiosyncrasy possibly suggesting a substratic grammar. The tying of the end to the next verse occurs with the *b* nerve that is not found elsewhere above. The neural string is interesting: **G⇔C→AmD→B→||Em⇔ Bm→D→||GC→EmAm→DAm→B**. The relation G-B between the first and the last neurotriads is unusual but so is the relation Em-Bm-D in the middle verse because of the anchor tone progression. One more thing that makes the melody somewhat mysterious is the inverted embryos *g*-¿*I and *d*-¿*I. The grammar seems to suggest an Old-Bolgharic substrate.

24 Bolghar was close to the modern city of Kazan by the central Volga. The name Bolghar is related to the name Volga, which comes from the Finno-Ugric word referring to wide and bright rivers full of light (like Veps *volge*).


*Figure 33. A Bulgarian love song according to Stoin′ 1928, no. 2373.*

## Comparison of Slavonic Data

The few melodies presented reveal that the Slavs prefer songs based on the subharmonic primary and secondary responses. As a result the neurotriads are in minor form. They tend to alternate with neural options which are in major form (C, G, Eb, Bb etc.) The natural consequence is the Pan-Slavonic modal pattern IV↔I→IV. Moreover, the melodies are quite often Janus-faced in character. The grammars are seen in Figure 34.

It is typical of the groups A and B that they are opened in root *g*-IV, while the C group is opened by root *g*-I. If the opening degree of *g*-IV is 2 or 4, the initial neurotriad is Gm and the mode is often inverted. The essence of group A is the modal alternation $g$-IV$_2$→$d$-*IV$^3$ with Gm as the opening and closing triad. Parallel to this is group B1 with one difference: Because the 3rd degree opens the tune in *g*-IV the initial triad is Cm. Subgroup B2 is characterised by the opening roots *g*-IV and *g*-III along with the closing root *g*-IV. Subgroup B4 has specific traits: the melody is closed on the *a* anchor. The closing root is either *a*-V (accompanied by the harmonic neurotriad D) or *a*-IV (accompanied by the subharmonic neurotriad Dm). Subgroup C is opened in root *g*-I and the harmonic activity is prominent on the neural level. This does not, however, lead to solutions that is characteristic of the Germanic grammar. It is only Fig 23 of group C which shares one common trait with the Germanic song: the opening of the melody in *g*-I is supported by neural Em.

| | | |
|---|---|---|
| 21: | *g*-IV$_2$→*d*-*IV$^3$ | **Gm→Bb↔F→Gm** or **Bb↔F→Gm** |
| 30: | *g*-IV$_2$→*d*–IV→*f*-I→*d*-IV$^3$ | **GmCm\|→GmDm\|→BbF\|\|→Gm→Dm→Gm** |
| 31: | *g*-IV$_4$→*d*-IV→*f*-I→*g*-*IV→*a*-IV$^3$ | **GmCm\|→GmDm\|→BbF\|\|→GmF→Am→Dm** |
| 29: | *g*-IV$_4$→*f*-*IV→*g*-IV→*g*-V$^3$ | **GmCmGmEb→GmCm→BbmFm→BbEb→ →//Gm↔Cm** *or*: **//Ab-BbmFm→Cm** |
| **B-1:** | | |
| 24 | *g*-IV$_3$↔*d*-IV$^3$ | **CmEbGm→Cm→BbDm→Gm** |
| **B-2:** | | |
| 32A | *g*-*IV$_3$↔*bb*-*I→*g*-*IV$^3$ | **CmGm→EbBb→EbGm→Cm** |
| 25A | *g*-IV$_3$→*bb*-I→*c*-IV→*g*-IV→*f*-*VI→g-IV$^3$ | **Cm→EbBb→CmFm→CmGm→Cm** |
| 26 | *g*-IV$_5$→*bb*-*I→*g*-IV→*c*-*IV→*g*-IV$^3$ | **Cm→AbBbEb→Gm→G→CmFm→Cm** |
| 22 | *g*-III$_5$→*g*-IV→*bb*-I→*c*-IV→*g*-IV$^3$ | **CmG→CmGm→EbAbBb\|\|→CmFm→CmGm→Cm** |
| **B-3:** | | |
| 19: | *g*-*IV$^5$→*bb*-*III→*g*-*IV$^3$ | **CmEb→GmCm→\|\|Eb→Ebm→Gm→\|\|GmCm** |
| 27 | *g*-IV$_5$→*eb*-I→*f*-*VI→*g*-IV→*g*-III$^3$ | **CmEb→CmBb→Gm→EbAb→Cm→\|\|AbG→AbmCm** |
| **B-4:** | | |
| 28: | *g*-IV$_5$→*f*-*I→*d*-III→*bb*-*I→*d*-IV→*a*-V$^3$ | **CmGm→CmFDm→BbEb→CmF→D** |
| **C:** | | |
| 20A | *g*-*I$_2$↔*c*-*IV→*g*-*I \|\|→*g*-*IV→*g*-*I$^3$ | **GC→Ab↔C→\|\|GmC→Gm→EbCm→\|\|AbC** |
| 23: | *g*-*I$_4$→*e*-IV→*d*-*I→*e*-IV$^3$ | **EmGC\|\|→DCD\|\|→EmAm** |
| 25B | *g*-I$_3$→*c*-I→*g*-I→*e*-IV$^3$ | **CGC→FCG→C\|\|→GC→EmAm** |
| **D:** | | |
| 32B | *g*-¿*I$_2$→*a**VI→*d*-¿*VI$^2$ | **GCG→CGD→AmD→GD** |
| 33 | *g*-*I$_2$→ *f#*-*V→\|\|*b*-IV→*d*-*I→\|\| *g*-*I→ *f#*-*V$^3$ | **G↔C→AmD→B→\|\|Em↔Bm→D→\|\| GC→EmAm→DAm→B** |

*Figure 34. A typology of the grammatical features governing the Slavonic songs analysed. There are three groups (A, B, C) divided according to the opening neurotriad and root. Group A is opened with Gm, group B with Cm, and group C is opened in g-I. Group B is divided into four subgroups according to the closing neurotriad. Subgroup B3 is lacking the neural F(m) element. Group D is non-Slavonic.*

Modally the grammar is heavily based on root IV. Root III appears along with it, rarely without it. Root VI appears mainly as its embryo *VI, and root V also appears as short fractions. In the G horizon the most prominent neurotriads are Cm, Gm, and Dm but Am, Em, Abm and Ebm may also appear. What is somewhat surprising is the fact that Fm is only seldom present in these melodies. The harmonic neurotriads Eb, Bb, D, F, Ab, C, and G alternate vividly with the subharmonic ones but are subordinate to them. The Slavonic pattern of the neural encoding is **SR$^{1\text{-}2}$+NO$^1$+NO$^{3\text{-}4}$**.

## Concluding remarks

The main conclusions deal with the past. The first conclusion is that the singers of both culture areas share the same hexatonal grammar. The surprise was that so many melodies were based on proto-hexatonal embryos. In 2005 the present author was still of the opinion that most of European folksong was mainly hexatonal, based on complete roots. After understanding that even the melodies in tonal classical music are quite often based on the same embryos, it became clear that it is the embryonic alternation on the micro-level of a melody that unites all humans and that serves as explanations for the essence of each melody.

In the view of the author the Middle Dnieper Culture (3,300 cal. BC–) around the city of Kiev in the western regions of the river Dnieper was carried by the population speaking north-western Proto-Indo-European. It was this culture area in which the archaeological Corded Ware (or Battle Axe) Culture was developed, and the earliest stages of the later Baltic, Slavonic and Germanic cultures existed. The Corded Ware communities were relatively small and had cattle breeding as their main mode of subsistence. When some of these communities started to move towards modern Germany ca 5,000 years ago they exported the innovations like the oxen-drawn wagon and the domesticated horse to autochthonous societies in which the Indo-Europeans started to live as a kind of elite. On the other hand, the Indo-Europeans learned from the local peoples in Germany about advanced farming. The ancestors of the Proto-Baltic peoples moved northwards to the regions south-east of the Baltic Sea, and the ancestors of the Proto-Slavonic peoples stayed in modern Ukraine. For thousands of years the Proto-Baltic and Proto-Slavic cultures remained closely related while the fusion of the local majorities and the Indo-European minority started to differ from them and slowly to develop into what is called (Pre-)Proto-Germanic culture. It existed throughout the 2nd millennium BC in North-Germany and Denmark.[25]

The point is that the Middle Dnieper Culture shared a more or less homogeneous song grammar. It was proto-hexatonal and known by all contemporary Proto-Indo-European (such as Pre-Proto-Indo-Iranian and Proto-Graeco-Armenian) singers**.** Because the embryonic alternation *IV-*I-*IV exists both in Germanic and in Slavonic as well as in Indian song, it is probable that it is an ancient grammatical solution. However, the difference between the two culture areas is clear: Germanic song grammar represents a harmonic (options-based) dialect and the Slavonic song a subharmonic dialect both within the hexatonal grammar. Regarding which one is closer to the original song grammar, there is reason to study briefly how the Baltic grammar is related to the Slavonic grammar. Fig. 35 represents a 'family song'[26] from the south-eastern county of Dzūkai, opposite Belarus. In the original transcription it looks like a regular melody in F major but the melodic progression follows no tonal logic. The hexatonal elements are:

*g*-I: ***g—bb-c-d-eb***
*c*-*I: *c—e-f-****g-a****-bb-c*
*d*-*VI: *d—f-****g-a-b****-c*

25 Carpelan and Parpola 2001, 55-150.
26 *Šeimos balades.* It may be of interest for a Finnish reader to know that the Lithuanian word *šeima* 'family' is the etymological source for the Finnish word *heimo* 'tribe'.

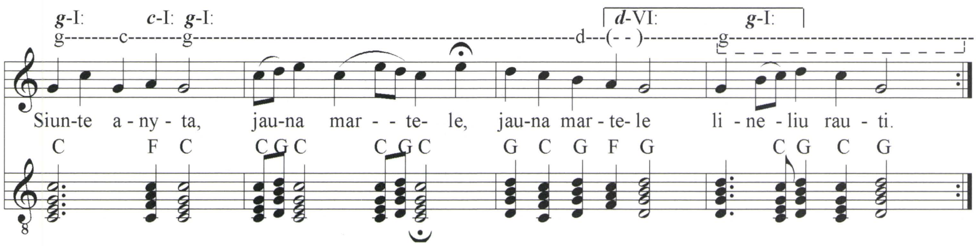



*Figure 35. This Lithuanian family song seems to represent an archaic song grammar once common to the western part of the Proto-Indo-European culture area. The tune is according to LLM 1938, no 212. The embryo g-*VI and the root g-I overlap in the last measure.*

The essence is not the major mode but the modulation of two independent modalities, I and *VI. This modulation is the reason for the specific character of this Lithuanian song whose grammar is not found in any Germanic grammar: ***g*-I$_5$→*c*-*I→*d*-*VI→*g*-I$_5$**. The tying in the 3rd measure is interesting. The neurotriad F (*-te-*) does not have *d* but the sung $a^2$ activates the *d* nerve as seen in Fig. 4A. Melodies like this can be found in Slavonic and Old-Iranian song but not in the Germanic tradition. It is then possible to assume that this Lithuanian song represents an ancient Indo-European proto-hexatonal grammar, which was the foundation of song among the much later ancestors of the Proto-Baltic, Proto-Slavic and Proto-Germanic singers— but also known in the Proto-Indo-Iranian culture area in southern Russia. No Palaeo-European influence can be seen in this. The neurotriads form the series **C→F→C⇔G**.

A most typically Lithuanian tune is in Fig. 36. It is a Pre-Christian calendar song of the Winter Solstice corresponding to the *kolyad* tradition of the eastern Slavs. Its modal structure is descending ***g*-*IV$_5$⇔*d*-*IV$^1$**, which is close to that found in Slavonic examples (Fig. 21 and 24). The poetic metre is regular and has 8 morae (+o +o +o øø) but the musical rhythm varies: 3+5+4/8. This is different from the Germanic idiom but parallels the Slavonic one. The syntax of the neurotriads is **Cm→Gm⇔Dm→Gm**. This can also be found on the Slavonic side (Fig. 24 and 31). However, there are also minor differences and the melody is more typical of the Baltic than the Slavonic style.

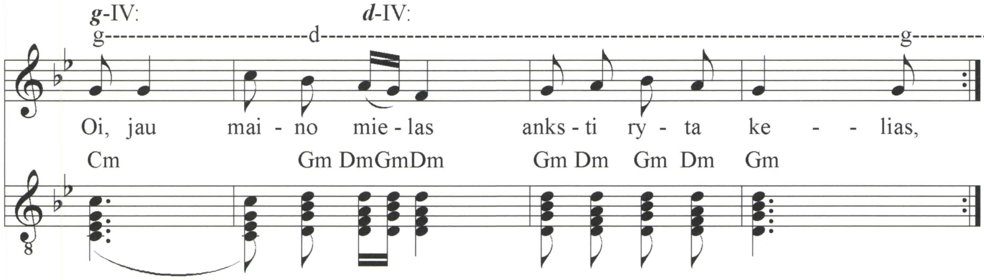



*Figure 36. This advento daina is from Dzūkai, Lithuania, according to LLM 1938, no 302.*

Peter Schneider and coworkers (2005) concluded that there are two kinds of people, fundamental pitch listeners and spectral pitch listeners. The reason for this dualism seems to be in the genetically inherited differences in the brain structure and functions. Those who prefer to follow the fundamental tone also like to play or listen to musical instruments which produce short, sharp, or impulsive tones (piano, trumpet, flute etc.). Those who prefer to listen to the spectrum (overtones) like to play and listen to low sounding musical instruments with a rich timbre (saxophone, french horn, violoncello, organ, human voice, etc.). Schneider *et al.* (390-391) state that pianists perceiving the fundamental pitch favour of performing with virtuosity and in complex rhythms whereas the harmonic perceivers concentrate on timbre and melody. Because the reason for this duality is genetic, musical ability or education has no effect on this difference.

Could this be a reason for the Slavonic vs. Germanic duality? A Germanic song is often based on harmonic structures, that is, a sung tone activates the neurons corresponding to its physical harmonics (as neural options). There are two results. First, the tones which a singer (composer) chooses, accord with the physical harmonics in the major form, and secondly, the analyst can also accompany the melody with major chords. As shown in Fig. 3, the auditory system does not create a neurotriad in major form as such but as a selection of neurons from three active subharmonic neurotriads. Accordingly, it is the fundamental tones in Slavonic melodies that directly activate the subharmonic neurotriads in the minor form. Typical of the Slavs are the subharmonic responses. In addition to this, the Slavic singers also follow the directory of the neural primary and secondary options. Therefore, both the Germanic and the Slavonic singers now follow the fundamental tone and then the timbre. An individual may be either or but the style differences as such cannot be explained with these perceptual differences.

The instrumentary of the former Slavs and Balts differed from those in Central Europe. The Proto-Slavs had various clarinets and the *gusli* (meaning ‘the strings’) which was the lyre and later the psaltery. The Balts knew this psaltery as their *kankles.*

They also had wooden trumpets but generally speaking their instruments were mainly with a soft sound27. In Central Europe their number was more numerous and louder in sound.


*Figure 37. The basic line of a Shelk´nam (Ona) Indian song Halupé k´méyu from Tierra del Fuego according to SCTF 1978, Vol. II, record 2, no. 13. Transcribed by the present author.*

There are two details to be briefly cosidered. The first is that root I is not at all as favoured in the world as it is in Europe and the Arabic world (*maq m rast*). Root I is the central element in the Germanic song and one might assume that, universally, the more the singers are in contact with the musical instruments producing impulsive and loud sounds and natural tones, the more likely they are to use root I in their songs. Secondly, the less the singers have percussive musical instruments, the more they listen to the timbre (spectra) and the grammar is characterised by the subharmonic path. The now extinct Ona or Shelk´nam Indians lived in Tierra del Fuego, the southern part of South America, having no agriculture, animal husbandry, weaving, or pottery and living a nomad way of life28. They did not have any specific musical instruments but a complex system of rituals and songs connected to them (Fig. 37). In spite of the lack of musical instruments their song grammar was markedly based on the embryo *I, which notion contrasts with the hypothesis presented. The grammar of this individual Shelk´nam song is clear. There does occur melodic and formal variation and sometimes the singer articulates the pitches with minor differences. There is only one anchor (*g*) and one mode, the embryo *g*-*I with its descending degrees 2-1-6-5 ($d^2$-$c^2$-$b^1$—$g^1$). The neural representations are C and G, which means that the grammatical formula is **G⇔C→G**, or, if the opening grace tone $c^2$ is included, **C→G⇔C→G**.

27 Apanavicius 1994.
28 Murdock 1981, 90, 128-129. Gusinde 1931.

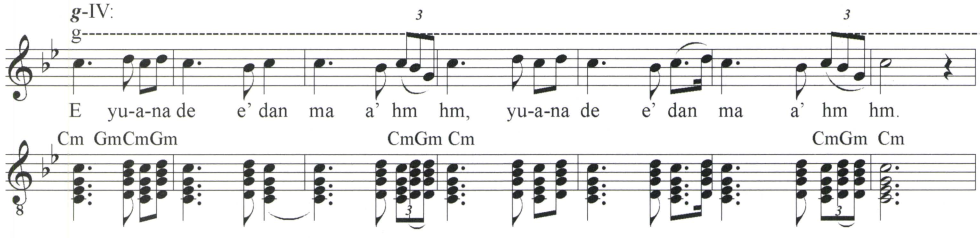



*Figure 38. A Yekuana chant to invoke the good spirits to bring good luck according to MYI 1975, Side 1, Band 1. The text is only an imitation of how the author thought he heard the words pronounced. Transcribed by the present author.*

The Venezuelan Yekuana Indians live between the Rivers Orinoco, Coura and Paragua and belong to the eastern Cariban peoples. They are hunters and fishers and they cultivate manioc, taro etc. in the ash fields, they lack domestic animals and metal but the men weave and make pottery29. They have flutes, panpipes and large bamboo clarinets with a deep tone and conch trumpets, all these played by men.30 According to the knowledge of the present author their song grammar is mainly based on the embryos *VI, *V, and *I but they also use the embryo *IV as seen in Fig. 38. The proto-hexatonal grammar is **g-*IV$^{1\rightarrow 1}$** and **Cm→Gm→Cm**, and it is fully subharmonic. The embryo can be defined in two ways. First, the *eb* neuron is activated by the sung $c^2$. Secondly, the proto-hexatonal embryo *g*-*IV can also be interpreted as the proto-pentatonal embryo *g*-*LA ($d^2$-$c^2$-$bb^1$—$g^1$). The simultaneous presence of hexatonal and pentatonal modality in one and the same song is called a grammatical *mictos*, that is, an independent fusion modality. The mictos of this song can be presented as *g*-*IV *g*-*LA which is a universally known pattern.

The Amerindian data suggests that the harmonic path of the song grammar typical of Germanic song, may also dominate peoples having no typically *musical* instruments — like the Shelk´nams. On the other hand, the Yekuana Indians have some musical instruments and they base their grammar mainly on the harmonic path but they also know the subharmonic one—as do the Germanic singers. From this point of view, it is possible to assume that the preference for the harmonic path is not necessarily due to the influence of musical instruments. However, if the Indo-European song grammars are seen as a unit, it is possible to draw some conclusions because the grammar of their eastern populations (Indo-Aryans, Proto-Iranians31) parallels that of the Slavonic grammar. On the other hand, root IV is quite common in Anglo-Saxon as well as Icelandic song (representing the grammar of the pre-Christian North Germans).

29 Murdock 1981, 126-127.
30 Coppens and Rodríguez 1975.
31 The author refers to the Indian veda chants, folk song in Pakistan and Afghanistan as well as the Old Iranian influence on the Turkic cultures in Asia, such as on the Kyrgyz song grammar.

Therefore, the conclusion is that the Slavonic and the Baltic grammars are still close to the Proto-Indo-European proto-hexatonal grammar. The Central European Germanic song grammar has clearly deviated from these. The Icelandic data suggests that the Old Scandinavians were not influenced by the southern prominence of root I. This is why their song was mainly based on root IV. The borderline may have been in modern Denmark, since the English children's song give a faint suggestion that Northern Germany was strongly influenced by root I already during the 1st millennium BC. In other words, the Germanic speaking peoples adopted the grammatical features from the local peoples in Central Europe. Who were these peoples? This needs a study of its own. It is clear that one part of them were the Celts. Their grammar was clearly influenced by the local (non-Indo-European) grammars. This means that both the Celtic and the Germanic song grammars bear elements, which go back to the ancient and strong song grammar(s) of the autochthonous peoples. The Germanic singers did not adopt their proto-pentatonal elements as did the Celts but they adopted their option-based (NO) grammar and root I which seems to have evolved among the Pre-Indo-European peoples. The role of the horns remains uncertain because there are no exact proofs of their existence long before the Indo-European migration to Central Europe. In the same vein it can be said that the musical instruments have clearly supported and developed the strong position of the hexatonal grammar in Central Europe to the extent that the tonal grammar with its three modes evolved from it during the 18th century.

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