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NICOLAS SLONIMSKY'S «THESAURUS OF SCALES AND MELODIC PATTERNS»: A PRACTICAL APPLICATION OF THE SYMMETRY PRINCIPLE IN MUSIC EDUCATION

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Abstract: *This paper is devoted to the symmetrical music scales and their resources for music ear improving. The "Thesaurus of scales and melodic patterns" by N. Slonimsky has been chosen for this exploration. The proposed approach is the first attempt to analyze this "Thesaurus" in that light. The main structural principles of symmetrical scales formatting will be exploring. Parallels with Escher's graphic models will be drawn. Practical application in music education will be shown with many illustrative multimedia materials.*

Keywords: symmetrical scales, solfege, music thesaurus.

1 N. SLONIMSKY AND HIS THESAURUS: AIMS, ROOTS, TRADITIONS, AND MAIN FEATURES

Nicolas Slonimsky (1894 –1995) was a Russian-born American multifaceted musician: composer, pianist, conductor, music theorist. His family had strong music roots (in particular, he was an uncle of the famous Russian composer Sergei Slonimsky). In 1947 N. Slonimsky published his "Thesaurus of scales and melodic patterns" (named further as Thesaurus in this text) as theoretical and practical educational work which was supposed to become one of most influential sourcebook for composers and performers in the 20th century. The author identified his work as a music reference book which is been likened to a phrase book or dictionary of idiomatic expressions. Thesaurus includes 479,001,600 possible combinations of the twelve tones of the chromatic (semitone) scale.

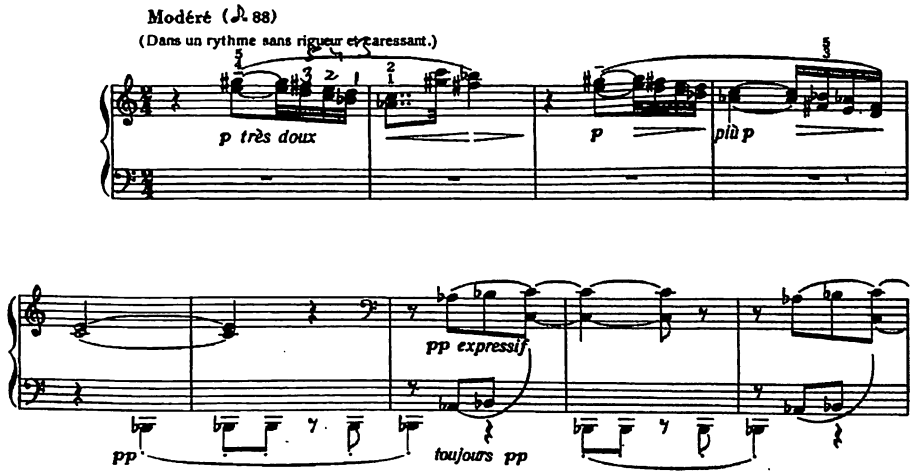
Thesaurus as "an encyclopedia of symmetrical scales" can be perceived regarding with three aspects:
1) according to its main aim: to serve as a keyboard training sheets for music players (first of all for pianists but then also, in adaptable mode, for guitarists);
2) according to its secondary aim: to serve as harmonized scale navigation for music composers;
3) according to an approach presented in this paper: to serve as a "symmetry trainer" for course of modern solfege based on the 20th century music language. This aspect supposes not to be thought out by Slonimsky himself; meanwhile this way of exploration will be the one of an innovative core of this conference presentation.

The principal idea of symmetry in the Thesaurus consists in formation of new scales based on the division of the octave into several equal parts in ascending and descending direction. Slonimsky wrote: "The scales and melodic patterns in the Thesaurus are systematized in a manner A melodic pattern, on the other hand, may be formed by any group of notes that has melodic plausibility. There are scales of 4 notes only; and there are scales and patterns of 12 different notes. The term scale, as used, means a progression, either diatonic or chromatic, that proceeds uniformly in one direction ascending or descending, until the terminal point is reached" (Slonimsky, 1947, p. I).

One must say that such approaches have, of course, their antecedent authors with their models of scales. Among them one can mention French piano pedagogue Charles-Louis Hanon with his "The Virtuoso Pianist in 60 Exercises" (Hanon, 1873), or German violinist music pedagogue Henry Schradieck with his "School of Violin Technics in 3

books" (Schradieck, 1899). In the 20th century such antecedents were also Alois Haba in his "Neue Harmonielehre" (Haba, 1927), he proposed new scales (including based on equal intervals) and suggests their harmonization, as well as Joseph Schillinger in his "System of Musical Composition" (Schillinger, 1946) where he has classified new tonal progressions. In the connection the symmetry scales classification one must especially mention "Modes of limited transposition" by French composer Olivier Messiaen who has described these modes in detail in his "Technique of my musical language", (Messiaen, 1944).

It is interesting that Slonimsky indicated Claude Debussy as his antecedent in the world of music composition. We can see Debussy's piano piece "Voiles" with its principal melodic structure is in the Whole-Tone scale (12:6 = 2 semitones). This scale is c – d - e - fis – as – b:



It is needed to add that all the Slonimsky's calculations are done in the tone system in formula: 1 tone = 2 semitones. For these needs Slonimsky has also invented new terms, for instance, "sesqui" (one and a half).

We can suppose that the main aesthetic principles of Nicolas Slonimsky were: orderliness in scale variants finding and feeling of symmetry beauty. It might say that such an approach is compatible to Maurits Cornelis Escher's approach in his graphics.

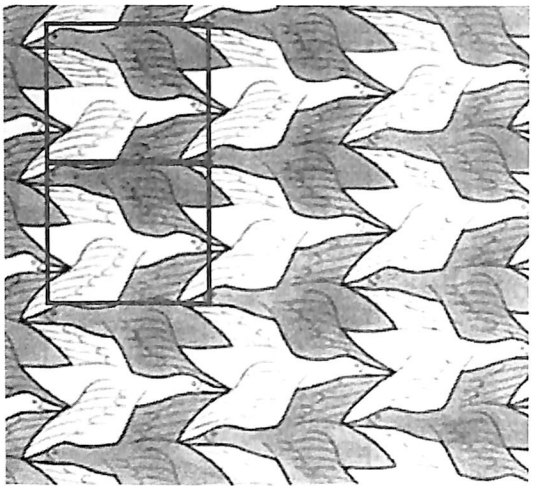


Figure 1: M.A. Esher. Double birds (1938).

We can compare this "white – blue" symmetrically flying birds (to the right and to the left) with typical model from Slonimsky (one can see symmetrical mode "1-5" c – cis – fis in the example given below):

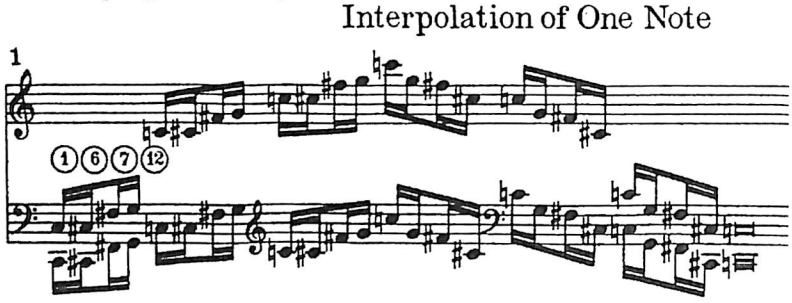


Figure 2: Slonimsky. Tritone Progression. Equal Division of One Octave into two parts. P.1.

This hypothesis becomes more evident if we consider the two types of progressions in Thesaurus. The first type is based on equal division of a whole octave. As Slonimsky wrote, these basic intervals are regarded as fractions of one or more octaves. The whole-tone scale represents the equal division of the octave into six parts. Semitone progression is equivalent to the chromatic scale. By the process of permutation the chromatic scale is productive of characteristic patterns of the twelve-tone technique.

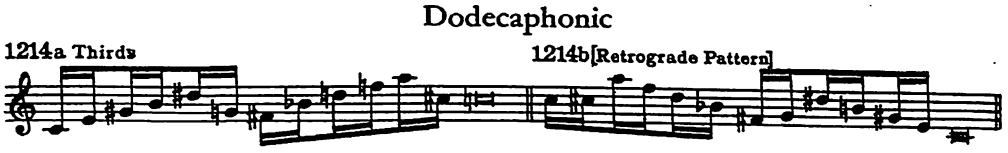


Figure 3: Slonimsky, P. 173.

It can be mentioned that there is an essential difference between Slonimsky and Schoenberg's and Messiaen's approach to the scale formation process.

Thus, the tritone progression represents the division of the octave into two equal parts, and it produces sequential scales and patterns. The ditone progression is the division of the octave into three equal parts, and is intervallically identical with the augmented triad. The sesquitone progression is the division of the octave into four equal parts, and is identical with the familiar diminished-seventh chord. The whole-tone scale represents the equal division of the octave into six parts. Semitone progression is equivalent to the chromatic scale. By the process of permutation the chromatic scale is productive of characteristic patterns of the twelve-tone technique.

By dividing two octaves into three equal parts Slonimsky obtains the quadritone progression, which is closely related to the ditone progression, being in fact a spread-out augmented triad. By dividing three octaves into four equal parts he obtains the interval of the major sixth.

The second type of progressions according to Slonimsky is based on unequal division of a whole octave. These progressions and patterns are exemplified by heptatonic scales and pentatonic scales. Among heptatonic scales, or seven-tone scales, are major and minor scales as well as the church modes. One can also see this type of model in the Escher's graphics: namely, the regular and irregular tiling in his mosaics (comparative examples will be shown).

Slonimsky also described the basic methods of tone combinations within a model. Scales and melodic patterns are formed by the processes of interpolation, infrapolation, and ultrapolation. The word interpolation is in common usage signifies the insertion of one or several notes between the principal tones. Infrapolation indicates the addition of a note below a principal tone. Ultrapolation is the addition of a note above the next principal cone. Infrapolation and ultrapolation result in the shift of direction, with the melodic line progressing in zigzags. Infrapolation, interpolation and ultrapolation may

be freely combined, resulting in hyphenated forms: infra-interpolation, infra-ultrapolation, and infra-inter-ultrapolation.

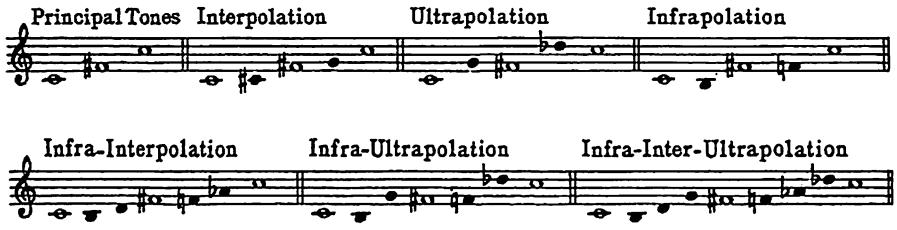


Figure 4: P. ii.

Slonimsky indicates two main principles of chord harmonization for his scales and melodic patterns. The first method is harmonization by common triads, and the second - by seventh-chords. To harmonize in major triads, it is necessary to alternate the root, third, and fifth positions (or the prima, tertia, and quinta positions) given in the table. The second type of harmonization comprises so called Master Chords. Master Chords (in Slonimsky's terminology) are dominant-seventh chords with the fifth omitted. In harmonizing by seventh-chords, ninth-chords, and whole-tone chords, any chord under a given melody note will furnish a workable harmony.

As a special thing Slonimsky presented his own invention: Mother and Grandmother chords. The latter contains all the twelve different tones and different intervals symmetrically invertible in relation to the central interval, the tritone, which is the inversion of itself:

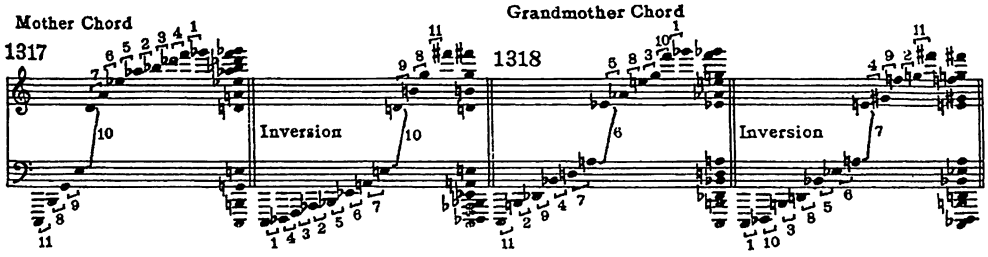


Figure 5: Mother and grandmother chords, p. 185.

2 HOW CAN SYMMETRY SCALES BE OF USE FOR EAR TRAINING

In order to obtain good ear for music the solfege teacher can use wide spectrum of modes proposed in Thesaurus: from diatonic modes up to symmetry modes, and also to polymodal structures. Since the Thesaurus exercises are fairly difficult as a whole, they may be learned in the conservatory level. However, there are some examples like conjugate diatonic and pentatonic scales and progressions which might be studied at the music school level. Below is an example of the diatonic progression for the basic level of ear training.

Figure 6: Slonimsky, P.193.

The Slonimsky's Thesaurus may be used for different types of work at the ear training lessons.

For intonation improving. If one uses the transposition-symmetry it works for the imprinting the interval configuration as a melodic cell in memory; if one then uses the mirror-symmetry pattern it serves to form an ability for transformation of already learned melodic patterns into their variants by music ear. Moreover, while singing the symmetrical cells student can practice in interval recognition given in direct, zigzag, and spiral line-movement, as well as in line-movement with different intervals. All scales and patterns in the Thesaurus are centered on C as the initial and concluding tone. So these progressions can be used for the purposes of transposing them to any other tonal center in order to train note-reading abilities. Some examples are good also for two-voiced singing.

For harmonic ear improving. The main accent may be done on training in chromatic tonality, namely in its harmonic functions with major-third- and minor-third-root tones correlation (based on both the types of Slonimsky's harmonization). Some given chords include non-third structure and polychords (see below).

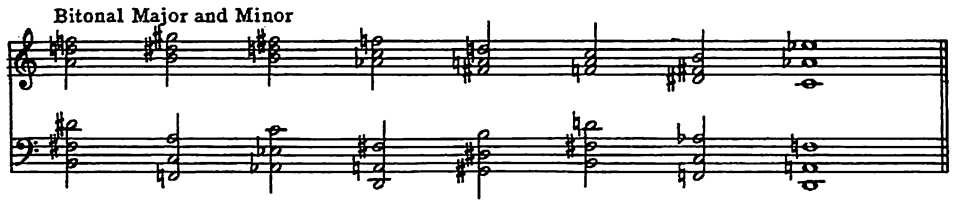


Figure 7: Slonimsky, P. 239.

For polyphonic ear training. There are some two-voiced canons including palindromic ones, which can be singing the same forward and backward.

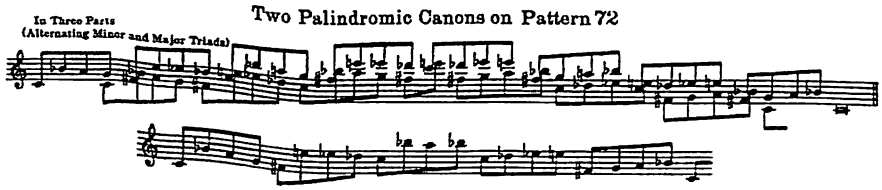


Figure 8: Slonimsky, P. 235.

For the rhythmic sense training. There is a great variety of accents in melodic patterns which may have three, four, and more tones within the cell. Polyrhythmic patterns like 3:2, 4:3, 5:3, 5:4 are used in Thesaurus too. All these examples can be used as helpful exercises for rhythmic ear training in the higher stage of music education.

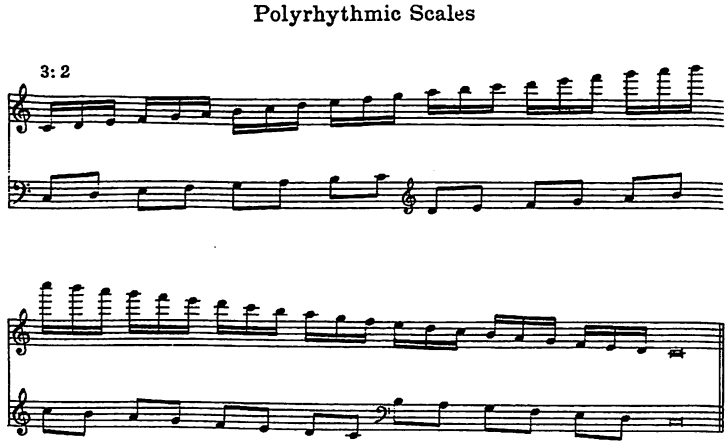


Figure 9: Slonimsky, P. 224.

3 CONCLUSION

Though Slonimsky's Thesaurus is a rather difficult thing to understand, it has been a popular book among musicians including such different style approaching players as John Coltrane, Frank Zappa and other musicians and jazz improvisators. Nowadays Masaya Yamaguchi may be called as the Slonimsky's follower with his "Lexicon of geometric patterns for jazz improvisation" (Yamaguchi, 2012). On the Figure one can see triton linked tonal centers which are often used in contemporary jazz music.

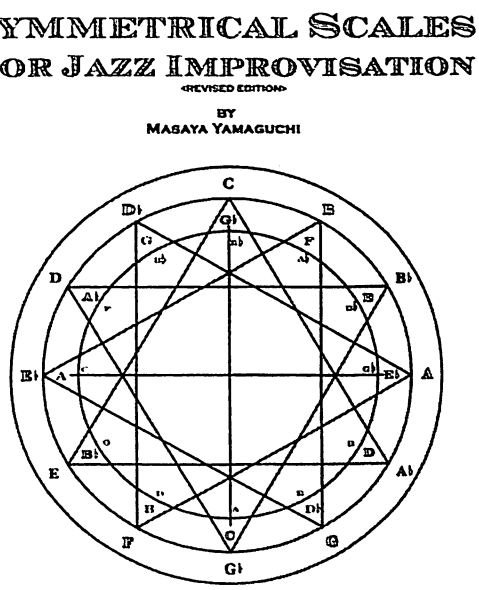


Figure 10: Yamaguchi's tritone circles.

At the end of presentation some multimedia examples as short movies from the presenter's ear training lesson on the Thesaurus material will be shown among the other audio-visual compositions.

All this speaks about vivid music roots and great pedagogical potentialities of the concepts and symmetrical inventions by Nicolas Slonimsky.

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CONCERT PROGRAM

SYMMETRY FESTIVAL 2016, MUSIC NIGHTS

Ivan Soshinsky

The *Music and Symmetry* program is divided into two concert nights on July 19-20, 2016 in the Concert Hall of the Collegium Hungaricum Vienna.

The SymFest'2016 concert program is scheduled in five performances, each of which is dedicated to different kinds of music: «Biocomputer Music», «Genetic Music», «Symmetry in contemporary music», «Genetics, 5D Geometry, Multimedia Art», «Symmetry in classical music».

The goal of the contemporary music concerts is to introduce the public a few essential directions of creativity in the field of modern music and symmetries.

The program will feature a world premiere of the introduction of "Genetic Music", based on Fibonacci-stages scales related with parametric characteristics of the molecular genetic system (DNA molecules). The proceeding parts of the concert will also include the minimalist composer, Tom Johnson, a former student of Morton Feldman (USA/F), Eduardo Reck Miranda (UK) with bio-music, the Scottish musicologist and pianist Roy Howat (UK), and a multimedia performance featuring local researcher and artist Renate Queheberger and collaborators Mia Zabelka and Benjamin Skepper (AU/JP)

"Genetic music" was founded at the Moscow P.I. Tchaikovsky Conservatory by a team of musicians and researchers, namely prof. Alexander Koblyakov, Ivan Soshinsky, Ivan Stepanyan and Michail Puchkov based on mathematical and genetic research conducted by Sergey Petoukhov from the Russian Academy of Sciences. A new "Center for Interdisciplinary Researches of Musical Creativity" has been established at the Conservatory where local musicians and composers actively participate in research and development. Benjamin Skepper has most recently joined the Russian team, as a composer, musician and Foreign Representative to the Genetic Music School. One of the main tasks of the Center is to study the genetic musical scales from different viewpoints including new opportunities for composers and the analysis of genetic music for musical therapy and medical applications. The first concert of genetic music was conducted in Vienna on in June 2015.

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