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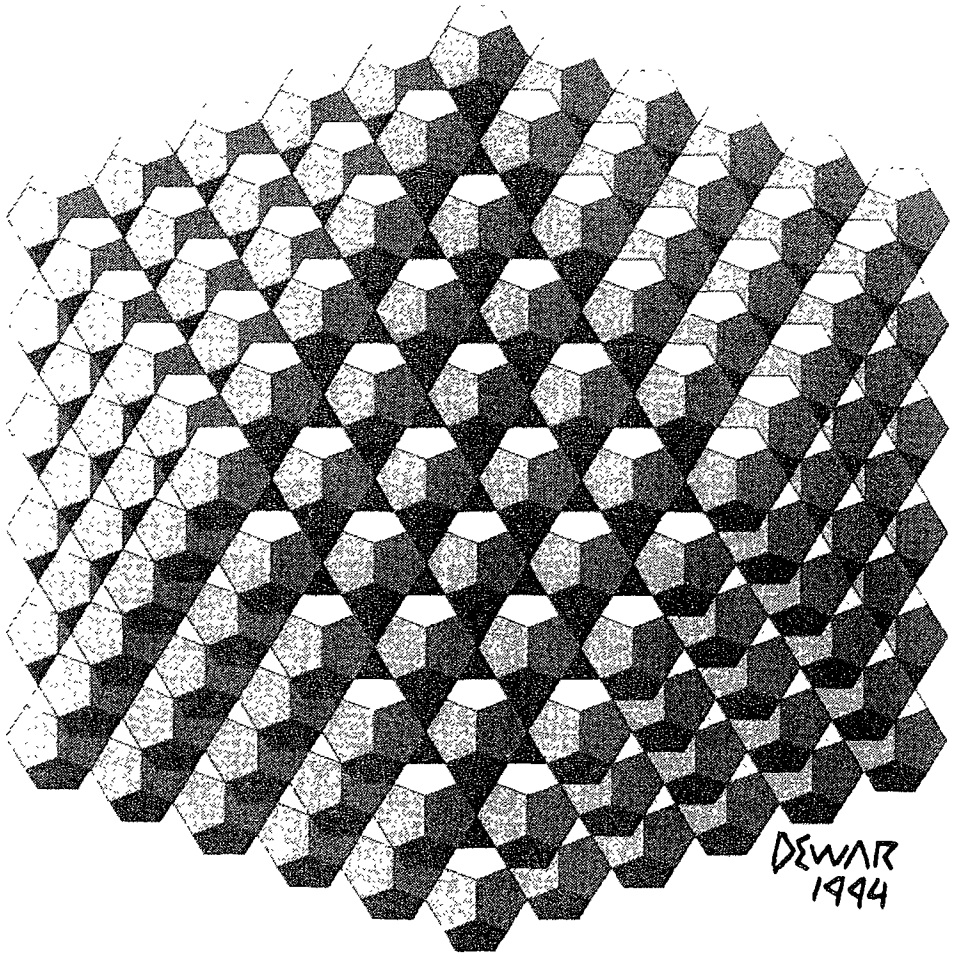

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SYMMETRY OF MUSICAL FORM

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The primary manifestation of global symmetry of a musical piece is the symmetry of form. In symmetry analysis of musical form we may discuss the three different planes: thematic, tonal and structural. As a thematic plane, the appearance of same or distinct themes and work with them will be considered, as a tonal plane the tonal and modulatory aspect, and as a structural plane the thematic and tonal properties expressed by introducing the metrics, with regard to the number of bars.

As the basic kinds of the symmetry of form they appear the static symmetry ("architectural symmetry")- mirror reflection, dinamic symmetry ("evolutional symmetry")- symmetry based on the golden section and antisymmetry- bivalent ("black-white") symmetry or the symmetry of opposites.

The static symmetry- mirror reflection is the most frequent kind of symmetry in the thematic plane. This is the symmetry of three-part song a-b-a, complex three-part song A-B-A (aba-aba-aba), three-part free forms A-b-A or a-B-a , minuet A-B-A, rondo A-B-A-B-A, sonata form with inverted reprise A-B-C-B-A, sonata rondo A-B-A-C-A-B-A or complex sonata form A-B-C-D-C-B-A (Figure 1). Sometimes, this kind of symmetry is consequently respected in the structural plane as well, where equivalent thematic and tonal entireties are of the same duration.

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          a - b - a
      aba - aba - aba
          A - b - A
          a - B - a
          A - B - A
      A - B - A - B- A
      A - B - C - B - A
  A - B - A - C - A - B - A
  A - B - C - D - C - B - A
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Figure 1

In distinction from the static symmetry, i.e. the symmetry of equilibrium (balance), the dinamic symmetry- division according to the golden section is the perfect form of dissymmetry. In the theory of visual perception, they are two optimal possibilities to divide an unit: mirror symmetry- the mirror congruent division and the golden section- dissymmetrical division, where the proportion of the smaller part to the bigger is the same as the biger to the all unit. In opposite to the static symmetry, prevailing in the world of crystals, the dinamic

symmetry is the property of life. The approximation of golden section is given by the ratios of succesive numbers of Fibonnaci sequence. The importance of the golden section in living nature illustrates the phylotaxis: the optimal distribution of plant leaves, realizing their maximal illumination. In the general sense, the golden section is the ideal proportion: division of an entirety, preserving proportionality, i.e. self-similarity. Therefore, it is connected with growing process: the proportional enlargement of an organism, preserving self-similarity. It is often followed by the appearance of spiral forms (Nautillus shell, sunflower *Heliantus maximus*,...). In the history of liberal arts, the golden section is the representative of dinamic harmony.

In the symmetry of musical form, the thematic plane of the *transitional form of two-part song a-b-a-c-a and rondo* A-B-A-C-A is characterized by the dinamic symmetry. The more important role it plays in the tonal and structural plane, where all most important changes- e.g. local and global culmination or modulation points coincide to the division points corresponding to the golden section. Each culmination point or peak is accompanied by the change of the symmetry of melody, harmony and dinamics. For example, in the first part of "Microcosmos" by B.Bartok, the culmination points- melodical peaks coincide to the left and right point of golden section.

In "Prelude 1" by F.Chopin the golden section point coincide to the melodical and dinamical peak, expressed by the number of bars. The dinamical *fortissimo* and melodical culmination in the bar 21 divides "Prelude 1", consisting of 34 bars, in the ratio 21:34≈0,6176 according to the golden section.

Samples of the dinamic symmetry can be find also in musical pieces with a thematic plane based, at the first glance, on the static symmetry. However, after considering their structural plane, this means the number of bars corresponding to certain thematic entireties, the role of dinamic symmetry can be percieved. As an illustrative example may be considered third part of "Piano sonata in B major, K.V. 281" by W.A.Mozart. To it's thematic plane, based on the static symmetry of sonata rondo A-B-A-C-A-B-A corresponds dissymmetrical tonal plane B-F-B-g-B-B-B, so it's dinamic symmetry can be registered only after the structural analysis of thematic and tonal plane is fulfilled (Figure 2).

The repetitive (translational) symmetry occurs in various musical forms based on the principle of imitation, songs with refrain (a-b-c-b-d-b-e-b-f-b) or rondo with several themes (A-B-A-C-A-D-A-F-...+ Coda). Repetitions present in the tonal plane can be considered in the same way.

The antisymmetry ("black-white" symmetry) is the basic construction principle of counterpoint monothematic pieces (question-answer): canon (*proposta-risposta*), fuga (*dux-comes*) or occurs as a kind of dinamic symmetry. Namely, the thematic plane of an extended song a-b-a-c-a, rondo A-B-A-C-A (this means, the relations b-c or B-C), or not-standard form of sonata rondo A-B-A-C-A-D-A-B-A (this means, the relation C-D) can be treated

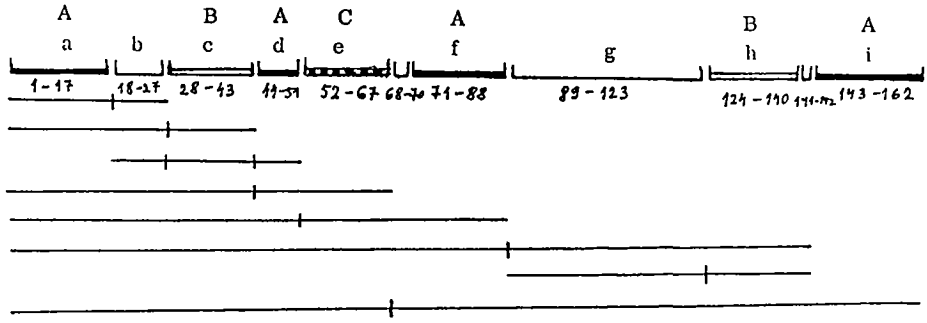

Figure 2

as the example of antisymmetry. In the tonal plane it is represented by the occurance of tonal opposites and contrasts: major and minor, non-relative or polar tonalities.

Because the *recognition of symmetries characterizing only* thematic or tonal plane it is not sufficient for making conclusions about the symmetry of musical form, investigating symmetry of form we must, in fact, solve the problem of the correlation of symmetry structures realized on the structural plane, so that requires the introduction of common metrics (expressed by number of bars), making possible simultaneous analysis of the thematic and tonal plane.

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