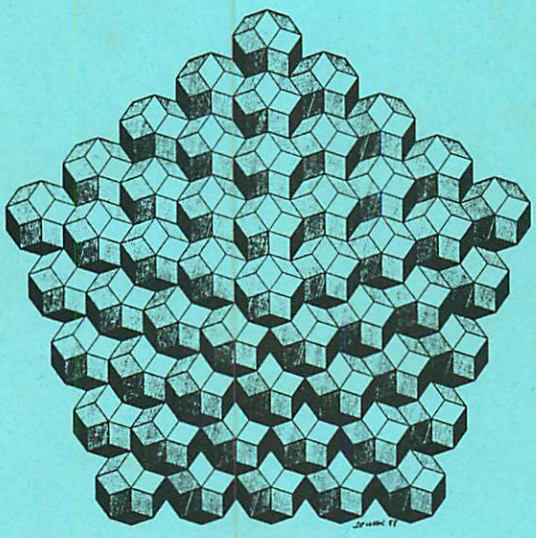
Symmetry of STRUCTURE

an interdisciplinary Symposium

Abstracts

I.



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SOME ASPECTS OF THE PROBLEM OF SYMMETRY IN THE PYTHAGOREAN "MUSIC OF THE SPHERES"

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The disciples of Pythagorus conceived of the world as a manifestation of harmony "which comprises everything and exists in everything". But it is a kind of hidden harmony and it makes itself evident in the way the planets' movement is organized in the cosmos. According to this view the Cosmos in its variety and man as a microcosmos were considered commensurate, reflecting in their relationships "numbers" and "Numeric relations" as an invariant manifestation of "God's wisdom" (Sophia). They seemed to discover in numbers many similar characteristics with everything that exists and happenes - more than in fire, earth, water ... /Aristotle,1934/.

Numbers and numeric relations were perceived as the beginning and becoming of everything that has structure as the basis for an ordered miscelaneous world, built on the principle of harmony and on a particular summetry which is to be found in the so called musical harmony.

The disciples of theorphic-pythagorean school claim that the appearance of number and numeric relations in the Universe in man and in human relations (ethical as wellas aestetic) contains in themselves one common invariant - harmoneous musical relations. As Aristotle rightfully suggested" ... thel saw in numbers qualities and relations characteristic of harmonedus structures..."/Aristotle, I934/. So composition of the universe is seen as dependant on musical relations. This explains the so called "the music of Spheres" which finds its geometrical expression in the "golden proportion".

It should be noted that numbers and numeric relations were interpreted not only in terms of quantity but in terms of quality as well.

If we consider christianity - the most syncretic religion of all,we also find meaningful numbers. Satan's associates are seven and so are the realm of heaven.

One should note olso that the sum of the seven tones of the Diatonic (the european musical system) and the five tones of the pentatonic scale (the eastern asiatic musical system) comes to the twelve tonic classical chromatic scale, that is, the sum of the black and white keys of the piano.

If we consider the classical sonnet excluding the final couplet, we shall be left with the three basic four line couplets - I2 lines in all. Such is the number of the tribes in ancient Israel. Christ's apostles were twelve too. The year has I2 months in agreement with the signs of the sodiac.

Let us consider the situation in Greek mythology: the "argonauts" in the story of Jason and the golden fleece are twelve. They appear to be the greatest heroes in Illium. Could the dosen be considered as a casual invention by the people. The orbit of every planet comprises one "octave" which is divided into I2 parts. The movement of every planet around its orbit at every moment crosses these intervals. In this way different tones could be "heard" and so we have a cosmic music.

It should be noted that the monochord was invented by Pythagorus and it was this instrument that helped the great philosopher and scholar make his great discoveries.

He noticed that if a string is broken it raises the tone one octave. Acoustically this doubles the frequency. On the basis of this law the ancient philosopher invented his own order based on the qaintile pronciple.

Pythagorus has own hypothesis about the"music of the spheres". He assumed that each planet emits its own sound, which the human ear can not hear. Pythagorus looked for that which is common for the gravitational centres of the planets and musical tones.(Dankov - Nagy Denes,1984).

Understood in Pythagorean terms "harmony" includes all kinds of synchrony or conconance which are expressions of a particular kind of summetry. In music this harmony "based on the law of accoustics" with which the idea of "the music of spheres" is associated. There are three main funktional elements forming a triad. They are marked in the following way:

Tonic - T
Subdominant - S
Dominant - D

They exist in a strict functional dependence and all musical compositions are based on them.

The pythagoreans found strict relationship between the order in musical functions and the order of planets in the solar system.Predominance is here given to the triad in the quality of an equivalent that finds expression in the uniform structure of the chords and theplanetary cycle.On this principle three "inner" planets stand distinct and can be seen with the naked eye. They are Mercury,Venus and the Earth. Next came three "outer" planets which can also be seen with the naked eye: Mars, Jupiter and Saturn. The remaining planets which had been discovered with the help of the telescope are also three: Uranus, Neptune and Pluto. There also as in the diatonic (which has three basic tones) exists a relationship of three elements to the centre of gravity: the Sun - planet - satelites - exactly as is the case with the chords.

The principle of summary in the musical acoustics was seen by pythagorean as a heuristic tool for the expression of certain laws in the order and the movement of the planets. This discovery was highly esteemed by Newton himself. He believed that the image of the Pythagorean lyre holds the sicret of the law of gravitation. The music that comes from the seven strings of the harp were seen by pythagoreans as an expression of the"music of the spheres". Newton was surethat sounds and tones are determined by the length of the string in the same way in which gravitation is determined by the thickness of the matter.Thus he rightfully believed that Pythagorus expressed in different terms what people before him had known. In connection with that we should note, that the four constant strings of the lyre stand in relation 6:8 = 9:12, or to put it in another way are in "golden proportion".

B I B L I O G R A P H Y

1. /Aristotle/Аристотель.Метафизика.кн.1.М-Л.,1934, p.27.

2. Ibidem, p. 27.

3. Dankov - Nagy Denes: A pütagoreus filozofia matematikai zenei es termeszettudomanyos vonatkozahai. Termeszettudomany - vilagnezet kultura c, konferencia, Visegrad, 1984 oktober 26-27,