Symmetry of STRUCTURE

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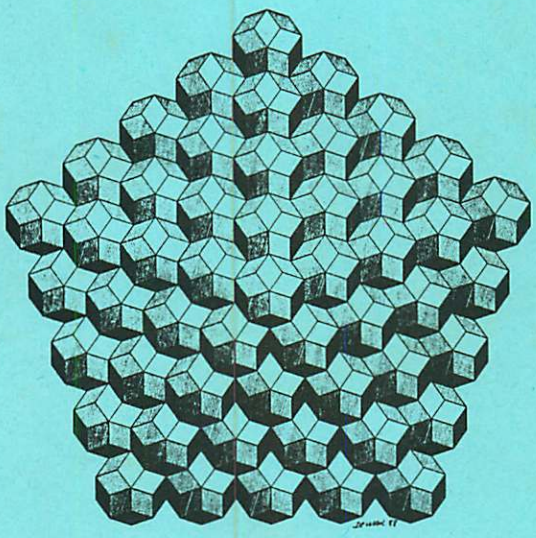
Abstracts

I.



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SOME EXAMPLES OF THREEORTHOGONAL OBJECTS OF NONEUCLIDIAN SYMMETRY

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Objects of three dimensions and local similarity, especially threeorthogonal ones, are of great interest in biomechanics, crystallography, architecture etc. (Petukhov, 1987). Analytical description of such objects is very difficult because of the lack the third coordinate, which distinguish oneself by Nature of its numbers from the first (real numbers) and from the second (imaginary numbers). It is well known that first and second coordinates are usually used in obtaining 2-dimensional objects of local similarity, that is in usual conformal mapping. There are given in the Fig.1 (S,Y,M,M',E,T,R,Y') some examples of threeorthogonal new objects of noneuclidian symmetry: a "Mathematical naturmort". For instance, the "COCHLEA", Fig.1E, and its analytical apparatus was described earlier (Bunin, 1985). The curved ellipsoid-"CUCUMBER" may be chosen by equations:

$$X=B\xi\eta/\mathcal{D}, \qquad Y=-[B\sqrt{(\xi^2-1)(1-\eta^2)}\cos\zeta+2]/\mathcal{D}$$

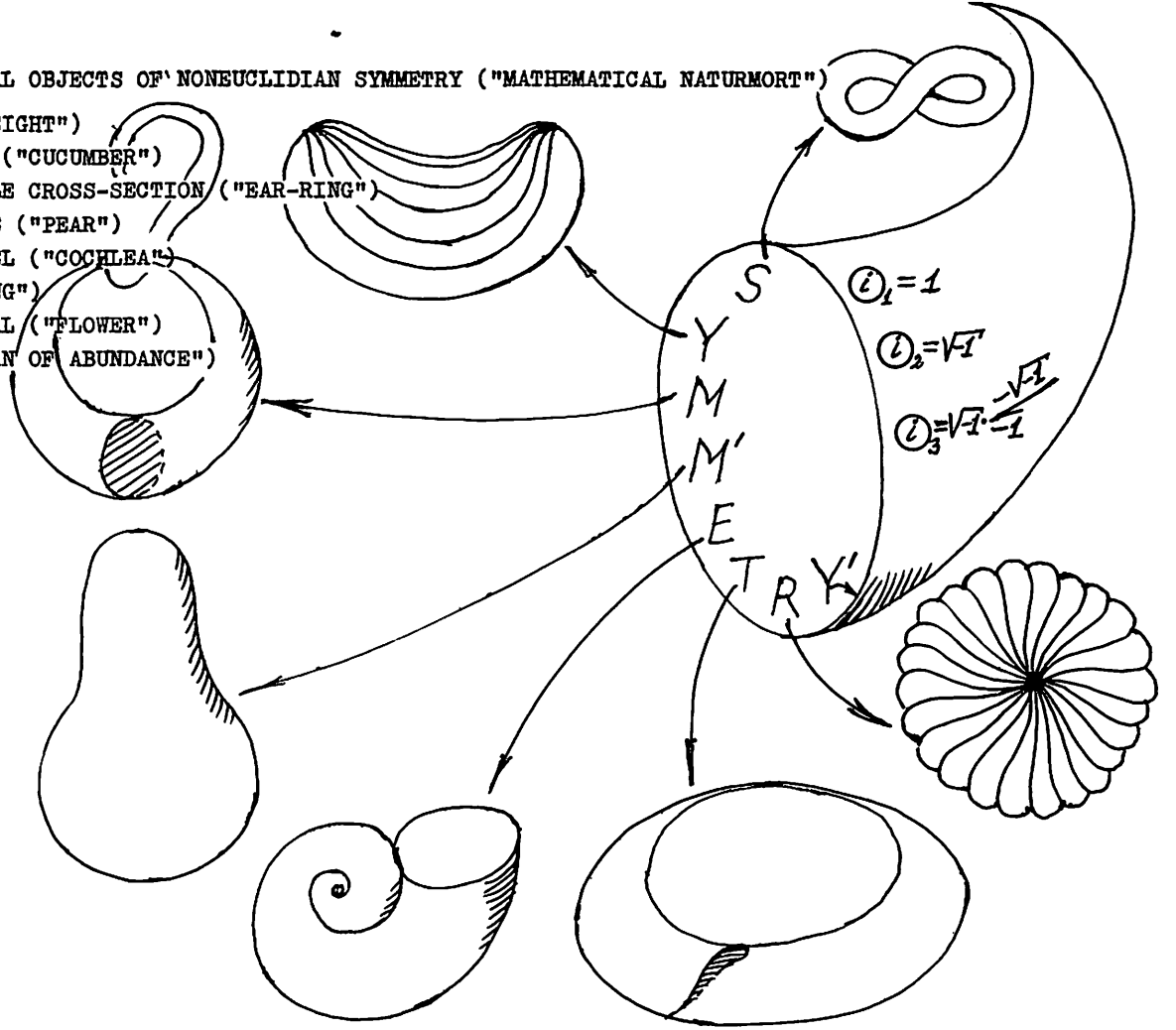
$$Z=-B\sqrt{(\xi^2-1)(1-\eta^2)}\sin\zeta/\mathcal{D}, \qquad B=\sqrt{3}$$

$$\mathcal{D}=(B\xi\eta)^2+B^2(\xi^2-1)(1-\eta^2)+4B\sqrt{(\xi^2-1)(1-\eta^2)}\cos\zeta+4.$$

To obtain coordinates X, Y, Z we assume reasonable values of ξ, η, ζ. Resulting 3-dimensional coordinates are presented in the Fig.2. Calculation of such objects based on a system of numbers with three units of different Nature $\textcircled{i}_1, \textcircled{i}_2, \textcircled{i}_3$ (Balakshin, Bunin, 1989; Bunin, Chudinov, 1976). A circle means the importance of the Nature i.e. a "mathematical dimension" of a number, for example: a number is reel, imaginary or other one. If it is necessary to describe moving, growing etc. objects like those in the Fig.1, obviosly we need in multidimensional coordinates with n numbers of different Nature. Real numbers $\textcircled{i}_1=1$ are created by inverse operations of the 1-st and 2-nd step, imaginary numbers $\textcircled{i}_2=\sqrt{-1}$ are created by inverse operations of the 3-d step (root), "superimaginary" numbers $\textcircled{i}_3$ are created by inverse operations of the 4-th step ("superroot") etc. It must be noted, that the "Fundamental theorem of algebra" sais nothing about operations of 4-th, 5-th etc. steps. Consequently thise theorem must not be a ban for creation of new numbers, as take place for a long time; and roots of some numbers are not polygons but polyhedrons.

Fig.1 3-DIMENSIONAL OBJECTS OF NONEUCLIDIAN SYMMETRY ("MATHEMATICAL NATURMORT")

S- TWISTED TORUS ("EIGHT")
Y- CURVED ELLIPSOID ("CUCUMBER")
M- THORUS OF VARIABLE CROSS-SECTION ("EAR-RING")
M'-DEFORMATED SPHERE ("PEAR")
E- MATHEMATICAL MODEL ("COCHLEA")
T- CURVED WING ("WING")
R- MULTIPLEXED SPIRAL ("FLOWER")
Y'-CURVED CONE ("HORN OF ABUNDANCE")



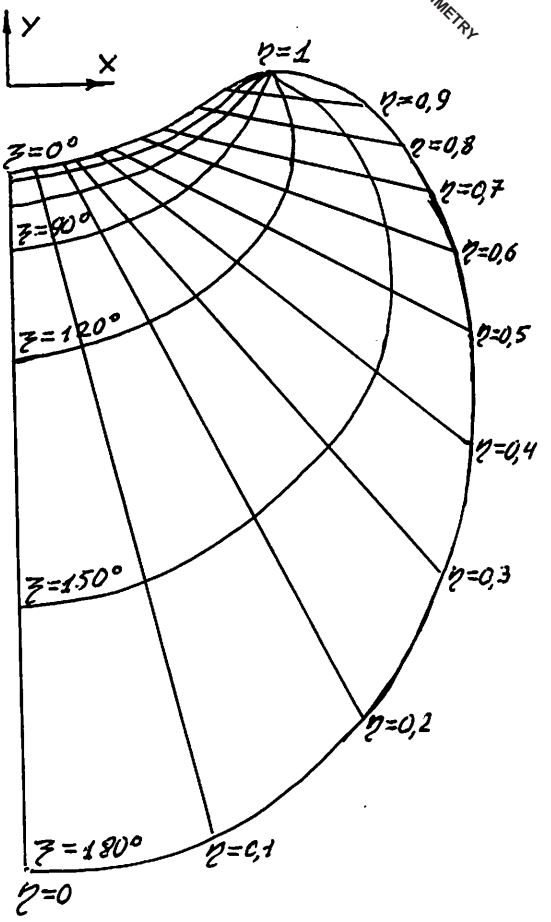


Fig.2 CALCULATED 3-ORTHOGONAL SYSTEM OF COORDINATES OF NONEUCLIDIAN SYMMETRY: CURVED ELLIPSOID ("CUCUMBER")

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