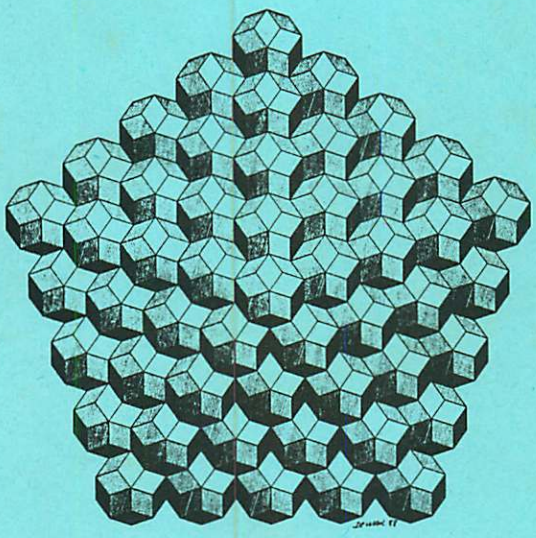
Symmetry of STRUCTURE

an interdisciplinary Symposium

Abstracts

I.



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THE SYMMETRY OF MUSIC

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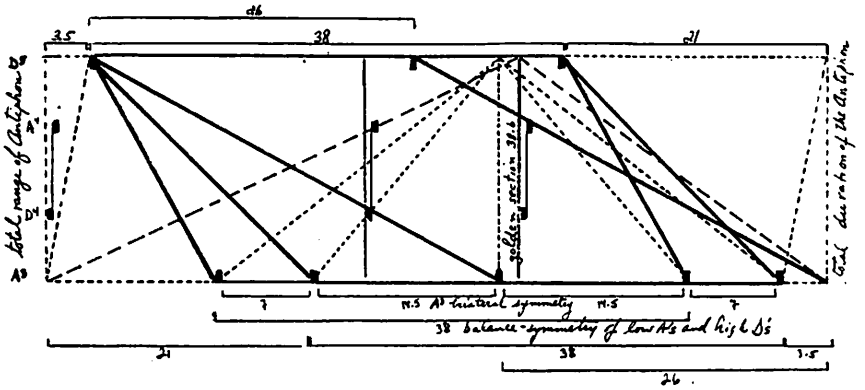
Bronowski writes that discoveries of science and the works of art are both explorations and explosions of a hidden likeness. It is this likeness that is often equated with symmetry. Pagers, in The Cosmic Code, says "If we could go back to the beginning of time, to the primordial fireball of quarks, leptons, and gluons, when the gauge symmetries were as yet unbroken, instead of 'Fiat Lux' we might have heard 'Let There Be Symmetry'". Physics searches for symmetry laws as it pushes to the boundaries of the material world -- fundamental laws of symmetry as that space is the same in all directions and places. In music the hidden likeness is a projection of mathematical models which often show stupendous spatial and time deployments. A myriad factors intervene or are combined to structure a sonic design where dynamic symmetries play the only role. Weyl, the philosopher of mathematics, writes that nature's surface beauty conveys no more than a hint of the loveliness hidden within; the mathematics is not in its skin, the symmetry must be uncovered. In music, a first audition does not discern the internal architecture; it is analysis of the written score which discloses the schema.

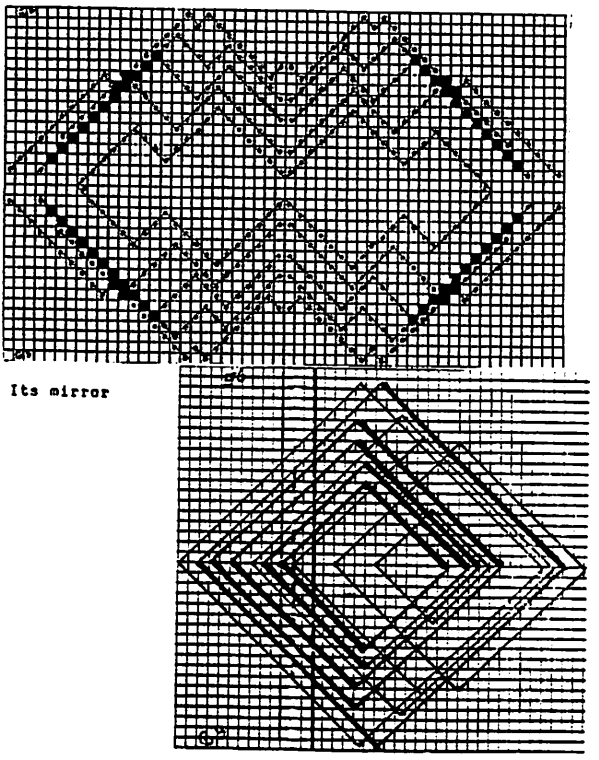
To Plato symmetry in nature is governed by mathematical laws and these are intuitively realized in the creative mind. For St. Augustine music is number and progressive divisibility affected the entire work down to the smallest details of its dimension: a hierarchy of symmetries. Bronowski again cites how Da Vinci was occupied with the logic of the processes he saw in people and machines; he looked for the hidden structure because it expressed that logic, proportion and symmetry. This essay presents that exploration and explosion of a hidden likeness as it uncovers the symmetries of musics from medieval Hildegard von Bingen to the contemporary Gyorgy Ligeti. Two brief examples follow.

Using a complex plane (two-dimensional time-space figure) which translates accurately the temporal-linguistic measurements, we may see in Antiphon 61 of Bingen that the five same lowest and three same highest sounds are proportioned and symmetrical. The work Harmonies by Ligeti outlines a multiple symmetrical perspective. One order of

this multi-faceted geometry shows the ten voices spanning 231 units of one total attack point each moving with parallel finger-exchange and in exact cumulative addition. To overview this space we may obtain through a one-to-one reduction (cancelling the cumulative addition) the geometry that pictures the symmetries of the parallel voices. Completing the lined squares of which Ligeti used only $\frac{1}{7}$, the dual bilateral symmetry is revealed.

Being responsive to the pattern which connects means being responsive to the critical aspect and esthetic experience, writes the biologist Bateson. Symmetry in biology results from the facts of growth. In music symmetry offers balance and correspondence between parts, parts and whole. These musics are strata of connective patterns involving remarkable invention. It is this discovery which conveys one other understanding of explorations and explosions of a hidden likeness.





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