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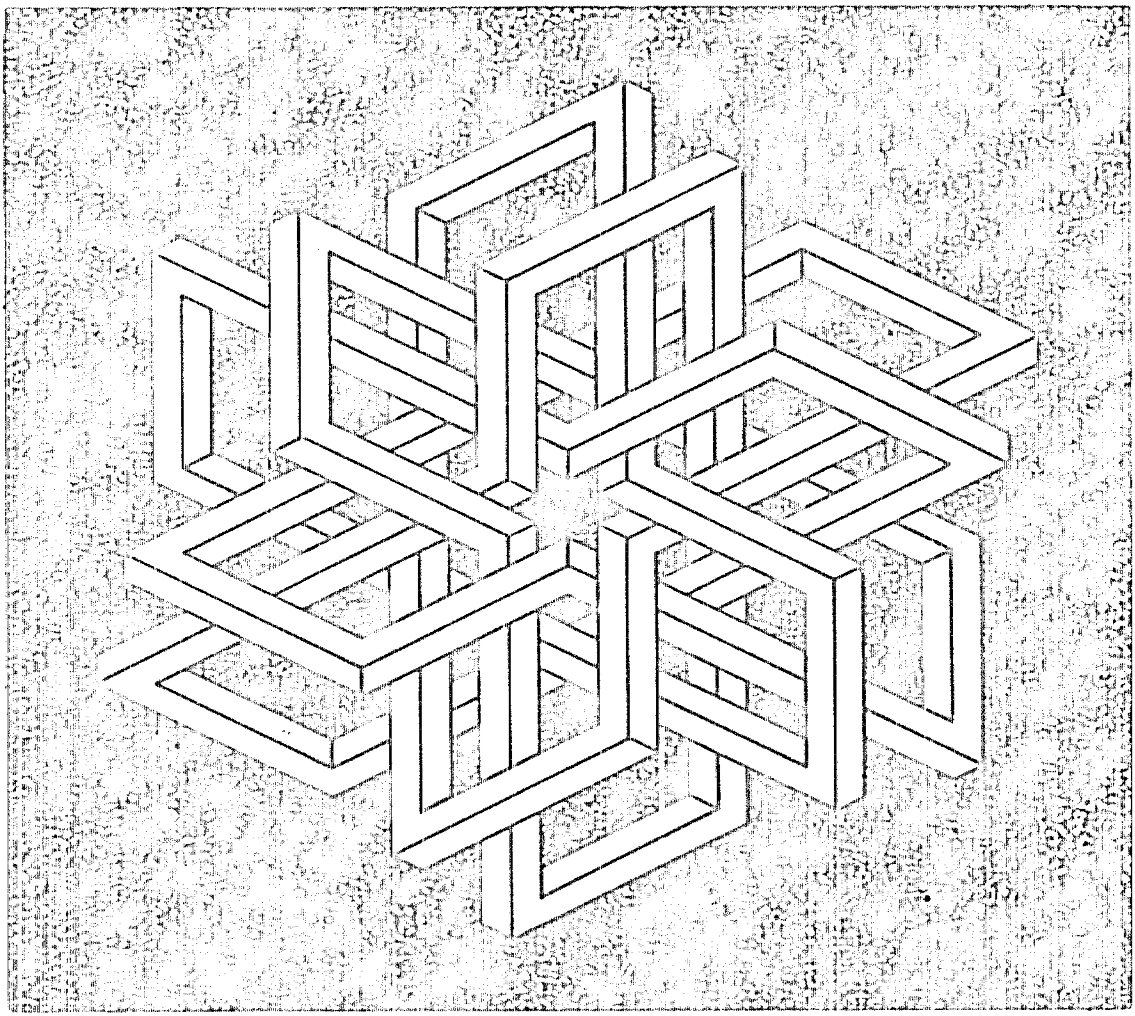

FROM SYMMETRY TO PERCEPTION

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The concept of symmetry originated in geometry, where it denotes that certain properties of geometrical bodies or figures are invariant under some transformations. By abstracting this definition, invariances under transformations in time may also be considered as symmetries. Thus, this concept may be used in relation to decorative and ornamental arts (geometrical entities) as well as in disciplines such as music (temporal art) and science (basically of space-time character). These examples were chosen since they are of a diverse nature and also play a significant role in human culture. Therefore, an analysis of symmetry in relation to these disciplines is of universal value.

However, such an analysis is justified only if a meaningful comparison can thereby be effected between these disciplines. This can indeed be accomplished by analysing the corresponding structures. As it turns out, symmetry is particularly suitable for such an analysis because it is central in creating structures which constitute major building-blocks in these disciplines. These features of symmetry will be demonstrated here via the following comparisons:

symmetry (d-o) - rhythm (m) - symmetry (s)
(d-o = decorative and ornamental arts, m = music, s = science)

Decorative and Ornamental Arts. These shapes and patterns (or structures), which can be found in almost any culture, testify to the most basic manifestations of symmetry: its formal nature and the creation of regularities and order. This universal tendency points to another consequence, namely, that there must be a link beetween ease of construction and ease of perception, or as E.H. Gombrich puts it: "deeply ingrained is our tendency to regard order as the mark of an ordering mind" (Gombrich, 1984). Thus, analysing decorative and ornamental arts brings out not only the most basic features of symmetry but links it to analysis of human perception.

Music. This art comes first to mind for a comparison with other disciplines, since a basic feature of music is its formal-architectural aspect. Indeed, a musical work is comprised of formal features such as tonality, notes, intervals or orchestration. Music, of course, demonstrates also other aspects, namely expresive and representational aspects, but the formal-architectural features can nevertheless be abstracted due to their formal nature. However, not these features as such are of significance but rather their temporal organizations into sound-structures. Comprehending these structures is largely responsible for the appreciation of works of music.

A major formal constituent in such structures is rhythm. Indeed, it may be said that "to study rhythm is to study all music. Rhythm both organizes, and is itself organized by all elements which create and shape musical processes" (Cooper and Meyer, 1963). Rhythm may be thought of as a regular and repetitive sequence of sounds invariant with respect to "time displacement", which is simply an analogous description to geometrical line symmetry. Thus, rhythm fulfils the features discussed here, in being equivalent to symmetry and also central to the structures in music.

Science. Similar to decorative and ornamental arts and music, science is also based largely on structures of which the fundamental elements are formal relations of abstract ideas and concepts about space, time and matter. These relations, realized in mathematical terms, are applicable to reality and form structures often referred to as theories. Comprehending these structures is virtually all that is needed to appreciate a work of science.

Symmetry considerations play a dominant role in creating such structures. Indeed, it is only a mild overstatement to say that science and particularly physics, is, above all else, the study of symmetry, meaning the search for conceptual invariances in nature and their applications. This was true in the realm of classical physics; it is, however, in modern physics that most of the interest in symmetry lies. Thus, the most abstract and complex systems of the "micro-world" owe their descriptions to symmetries (Zee, 1986; Engler, 1990).

Conclusion. All these comparisons demonstrate that the structures meaningfully reveal correspondences in the various disciplines. This assertion, which encompasses art as well as science, possesses a genuine universal meaning. Evidently, therefore, we perceive with the same structural patterns that we create. This reinforces an approach which is compatible with the "Gestalt principle of perception", namely, that the mind is biased towards detecting certain organizations of patterns that are consistent with symmetry and in a wider sense with aesthetic appreciation.

References

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