

A random walk along Symmetry paths

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Our science would not exist in the absence of symmetry laws. The word symmetry comes from Greek language and means “with measure”, “some equilibrium between the parts”. The concept was developed by ancient greek philosophers and mathematicians. Later on, with Vitruvius, its meaning was unfortunately restricted to bilateral symmetry, because of architecture design and considerations on the harmony of the human body. Later on, with the group theory and the development of crystallography, the concept of symmetry received large extensions. It has been claimed that theoretical physics is symmetry relevant. Symmetry considerations are a sure guideline to the solution of many problems.

I shall describe some examples on 1D, 2D and 3D spaces. Decorative arts show marvellous examples of all possibilities discovered by craftsmen and artists – as well as the beautiful etchings of M. Escher. In the field of materials science, symmetry appears in many instances : structure of clusters, molecular arrangements, crystallographic systems, jump processes, grain texture, quasi-crystals, etc. in connection with the problem of space tiling with polygons, respectively polyhedra and polytopes.

A particular emphasis will be given on chirality : especially the asymmetry of molecular components of living organisms, as well as of matter vs anti-matter in the universe, which both remain as yet unresolved enigmas.