

SYMMETRY, INVARIANCE, GEOMETRY AND THE NATURE OF SPACE

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I trace the emergence of the concept of symmetry in physical science, starting with the contributions of Pythagoras, Plato's approach to space, Aristotle's "realism" **and** his "minimalism", first physically realized in Hero's "minimal path". In the modern world, I follow the pre-Leibnizians (Fermat and Huygens), Leibniz's "best of all possible worlds", Bernoulli, Maupertuis, Euler and Lagrange, the evolution of the concept of "invariance" and of the calculus of variations, leading to **the** Principle of Least Action - the "laziest" of all possible worlds, rather than the "best".

I explain the conceptual transition generated by Special and General Relativity, better understood and generalizable with $E=mc^2$ Noether's correlations. XXth Century physics appears to indicate that Nature has voted for geometry, validating Plato's guess. Moreover, General Relativity and Quantum Mechanics establish Plato's view of space itself.