Chapter 5
Mathematical Foundations of Aesthetics

ABSTRACT

Mathematical methods were used to prove the principle of aesthetics. It was pointed out that the least action principle is the fundamental law of harmonious beauty. This chapter establishes a variational equation of the beauty of harmony, with the left side of the equation being the least action principle, which represents energy efficiency and time efficiency, while the right side refers to harmony and beauty, namely the beauty of harmony. The mathematical symbol linking the two sides suggests that physics, philosophy, and aesthetics are unified in a harmonious and organic way. Its beauty lies in the fact that the two sides of the equation are not only symmetric, congruous, orderly, and succinct, but also in the fact that it has a very beautiful look.

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INTRODUCTION

Systems aesthetics, mathematics, and physics have profound relations and connections and form an inseparable entity.

NATURAL EVOLUTION AND THE LEAST ACTION PRINCIPLE

The theory of self-organization emergence and the theory of overall optimization illustrate the self-organization evolution mechanism of the universe from singularity into emergency system. This self-organization evolution mechanism is the most profound and most general law of the universe, which presents the coordinated and synergized evolution of the universe from bulgoscopic to littoscopic scales and demonstrates the development trend and direction of harmonious beauty. This inner tension for overall optimization is the motive power for the universal evolution, and what we called in physics the least action principle, which resembles “the first move of immovability” raised by Aristotle in function.

For example, during the evolutionary process of nature, the formation of sun and earth, the origin of animals and plants, the progress of human society etc., the overall emergence generated by evolution of each level is the optimal and most beautiful state of that level.

Optimization is the trend, direction and purpose of the development of systems and even the whole objective world. The value that human society pursues persistently is the structural and functional optimization of all systems in human society, which is also the pursuit of the beauty of the ideal society and the world of great harmony.

What optimization signifies is that during the evolution process of systematic mass (substance), the path under the direction of saving time and energy (the least action principle) finally reaches the most optimal end, as well as the most beautiful end.

Systems of animals, plants, creatures and lifeless system are all consistent with this route, which is neither the arrangement of God, nor the will of hierarch, but the fit-for-purpose of the nature evolution, and the tension and trend of the physical logic of nature.
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