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THE MATHEMATICAL THEORY OF COMMUNICATIONS VERSUS THE PHYSICAL THEORY OF INFORMATION. THE UNIVERSE VERSUS THE MULTIVERSE

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Starting from the "classical" (mathematical) theory of information (C. Shannon, W. Weaver), this work has replaced the definitions of the: a) apparent information as a decrease of the non-determination (uncertainty) degree, by means of the overlap area of the true and found probability distributions, respectively, b) agreement of a theoretical relation with the experimental data using the correlation coefficients, by means of the error risks at the compatibility rejection, etc., taking into account also the basic notions of the complex systems: (i) the uniqueness parameters, (ii) the similitude criteria, (iii) the universality classes, (iv) the numerical phenomena intervening in the computer simulations of such systems evolution, etc. [1]. *The accomplished analysis pointed out the existence of some surprising co-relations relating the fundamental interactions and particles. The interpretation of these findings by means of the anthropic principles (leading to the notion of designed Universe) or by means of some recent theoretical models ("of quantum gravitation", "self-reproducing inflation", "quantum cosmology with loops", etc., leading to Multi-verse models) was also analysed by this work* (see also [2]).

Keywords: Mathematical information theory, Compatibility with experimental results, Complex systems, Fundamental interactions, Anthropic principles, Theoretical models of cosmology

1. Introduction

As it is well-known, after some preliminary works as [3], the mathematical theory of information was rigorously formulated by C. Shannon and W. Weaver [4] under the name of « mathematical theory of communications », and completed by the works [5] of A. J. Khincin, A. N. Kolmogorov, etc. The basic notion of this theory is the so-called *uncertainty function* $H(p_1, p_2, ...p_n)$ associated to the complete statistical set (collective) $C \equiv \{E_1, E_2, ...E_n\}$ of incompatible events E_i (i=1, 2, ... n), of appearance probability p_i. According to the axioms of A. J. Khinchin [5] (that allow a rather simple derivation of the expression of the uncertainty function), *the uncertainty function* has properties of: 1) *symmetry:* $H(p_2, p_1, ... p_n) = H(p_1, p_2, ... p_n)$, 2) *maximum value for the uniform distribution:* $H(p_1, p_2, ... p_n)$ = maximum for: $p_1 = p_2 = ... = p_n = \frac{1}{n}$, 3) *prolongation:* $H(p_1, p_2, ... p_n, 0) = H(p_1, p_2, ... p_n)$, i.e. the addition of an impossible event (of null probability) does not change the value of the uncertainty function, 4) *continuity:* the function $H(p_1, p_2, ... p_n)$ has to be continuous relative to its variables:

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