GRAVITY FROM A PROBABILISTIC POINT OF VIEW

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Abstract

In the investigation of entropy dynamics, the “spatial order” of gravity is identified as that which precedes all other low entropy states in the evolution of the universe. Uniform distribution of mass (near-zero Weyl tensor of space-time curvature) has been suggested by Penrose as that initial condition which accounts for the second law of thermodynamics, as the physical expression of the “Max Ent” principle.

This paper is a further exploration of “probability as a physical motive”, an attempt to entertain an alternative to causal, deterministic explanation in science. According to this approach, explanation need not be an account of what forces dynamics; explanation may be found in the correlations of dynamics to possibilities. In this spirit, we might say that Newton’s apple falls not because of a force, but “because” that is the direction of expansion in the phase space of the world.

Phase space might more comfortably be called “possibility space”, since it is supposed to encompass all possible ways in which a system might be configured. With reference to the gravitational effect of mass-energy as curvature of space-time, any distribution or configuration of mass-energy is represented by a certain space-time topography. Thus we inquire how there might be more ways for space-time topography to be irregular than for it to be flat. One usually associates entropy with equilibrium, and equilibrium with lack of difference, or uniformity. The attempt to understand the counter-intuitive circumstance of uniform distribution representing dis-equilibrium, in the case of gravity, leads to the general question of how a configuration may affect, or even effect, the very space in which it is supposed to reside. Going one step further in questioning absolute frames, we might question the immutability of possibility space itself.

There is a philosophical tradition (Leibniz, Mach, Einstein) which has questioned the presumption (expressed by Kant), that space and time must be taken as fixed or absolute frameworks, prior to any reasoning about the world. Is it not similarly questionable, to presume the fixed or absolute nature of phase space? Intended as an introduction to the author’s research questions, the paper concludes with discussion of the ways that phase space might vary or change: change in dimensionality, change in extent, change in the type of number used to specify a component, and change in distinguishability or number of “objects”.

Key Words: Gravity, probability, entropy, phase space.