# Is there a fractal dimension's part in evolution of everything?

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(Dated: January 5, 2011)

## Abstract

This *philosophical short note* tries to outline a possible role of the fractal dimension in the evolution of everything being, the whole of the structures and objects existing /growing thought of been/being given shape by quadratic Julia sets (these partly controlled by the Mandelbrot set M) as a sort of "thermodynamical" outcome from the chaotic quantum dynamics of the underlying iterative maps.

## About phase-tricks and motion as erratic as could be

Watching physical observables, is there a more obvious quantization than with (topological) dimension: 1D, 2D,…nD, …∞D, ($n \in \mathbb{N}$)? Looked at from a quantum-nature of space-time point of view, just a "zero-point" dimensional quantum state is still missing. Here, the Hausdorff-dimension of a Cantor set, $D_H$ = log(2)/log(3) = 0.630929…(1, 2) could possibly fit and be kind of an analogue to the 1/2 term of a harmonic oscillator's (n + 1/2) quantum number. Further fractal dimensions (3) in the 1 – 2D region, i.e. between a curve and a surface, can be provided by (quadratic) Julia sets' $D_H(J_\lambda(z))$. But how many excitable (real and complex, Penrose-space accessory? integer) dimensions are actually needed for a dynamically stable vacuum state at given absolute temperature T(t), the vacuum always accommodating $n_f(T(t))$ forces and interactions? Were all of the (∞?) dimensions internal ones in the beginning, before part of those(?) got extensive quantities then? Did nature simply lose (especially complex(?)) dimensions via failing dimensional excitation energy thresholds, thus dimensionally compactifying her "theory of everything" (this maybe onto selected line segments like the real c-axis of the Mandelbrot set M) while rapid cooling from an ∞D state, subsequently maybe passing 11D M-theory or so downwards? Or can be done by just 1 – 2D nonlinear complex dynamics' straight use (as was philosophically argued by (4)) under the conditions of broken symmetry & thermodynamics of dissipative processes and structures? Is a part of spatial dimensions tied to a fluctuations' reduction strategy and time itself just an entropic side effect at all? There 's quite a lot of questions.

As space-time and "objects" hosted/propagating are not separable (except for the limit of Galilei/Newton's understanding of space and time), system's "zero-point" dimension(s) might well be contributed by Cantor-set-like Julia sets belonging to the iterative $z \rightarrow z^2 + c$ mapping, i.e. be $D_H(J_c(z))$ for $c \notin M$, $J_c(z)$ thought of shaping both connected-on-average ("normal") and permanently disconnected ("dark") objects (4). For $|c| \ll 1$, $J_c$'s Hausdorff-dimension is $1 + |c|^2/(4\log(2))$ + higher order terms (5), fitting the range mentioned above. At c = 1/4 + ε, ε >0, on/nearby M's real c-axis suitable Cantor-set-type $J_c$s occur, c =1/4 probably being parameter's effective limit tied to system's "on shell" behaviour (for ξ(1/4)= 0 is the external angle accessory to integer charged states, specific angles being counted modulo 1 (6)). A heuristic /tentative "explanation" of evolution (4), although not going into sufficient detail there, e.g. starts from an extremely localized (likely ∞D) state lacking almost all future qualities, the meaning of dimension (in line with some Wheeler–pre-geometry) still open since all of those been dense then and internal, because of the absence of an exterior. For nature apparently likes gauge theory/ies (7), i.e. thus most probably did structure everything being via phases, phase functions or -functionals and whatever perverse extensions conceivable, ab initio -use of the holographic principle can be assumed, in all probability. As surface(s) got defined after averaging out the extreme metrical and topological quantum fluctuations associated to the gravitational interactions, system's dynamics (thus all further forces and interactions) should have been entirely dictated by this(these), i.e. a concept of volume was simply not needed, at least not that immediately. By dimensional excitation to $D_H(J_0(z))$ from $D_H(J_c(z))$, $c \notin M$ via disconnected → connected set digital transition, a gap ΔD of 0.369071… was bridged. Cantor-set-like entities – these lying in the said space sheet surfaces – if covering sufficient area should possibly soften the local surface tension, so relax space curvature (i.e. anti-gravitate) and further alter membranes' local oscillatory properties, mainly via "space cuts" and locally imposing Neumann boundary conditions there (but hard to say whether/when co- or anti-gravitating effects remain/cancel out, because of an unknown oscillator's sophisticated phase-modulation's and/or - coding's involvement). Some "zero-geometry" containing two orthogonal z-planes (accounting for a real 2D surface with most chaotic internal complex dynamics due to iterative maps) and a further (real space) small extra-dimension for $z_{1,2}$-fluctuation reduction purposes would maybe do for the beginning. Fractal dimension is thought to be a sort of dimensional eigenvalue analogue to non-bonded quantum states' continuous energy. System's bonded (object) quantum states most likely are complicated composites, their complexity growing with falling temperature T: $J_c$s, $J_c$-convolutions and aggregates of such, these aggregated once again and so on, according to a *dual reverse Feigenbaum-scenario* of period doubling oscillations. Simple, "elementary" objects on the low momentum side seem to be restricted to a period-$2^0$ oscillation *and* U(1) regime only.

## References/Remarks


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