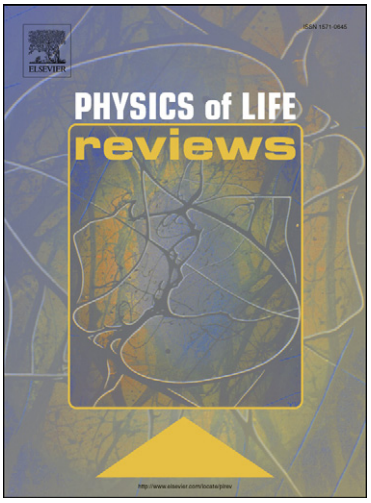

Response to commentaries on physiologic time: A hypothesis

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Response to Commentaries on Physiologic Time: A Hypothesis

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As one might expect the commentators were able to extrapolate various results, formulate additional conclusions and critique speculations presented in the paper into their own particular areas of expertise. There was no direct criticism of the technical content of *Physiologic Time: A Hypothesis [1]*, but a number of interesting points were made, some of a cautionary nature and others along the line of "How could you leave this or that important point out of the discussion?". In the following remarks we address these observations with the intention of at least providing a rationale for the strategy we adopted in reaching the following conclusions*:* 1) fractals are a design principle for biology; 2) physiologic time is more fundamental than chronological time for living systems and 3) physiologic systems are maximally efficient as manifest in their allometry relations.

Entropy as a measure of information is a central component of our argument and as pointed out by Grigolini in his comments [2] it has been used in a related way to suggest a possible mechanism for the generation of 1/f-noise in the human brain in response to preforming tasks. In the cognitive domain the time experienced by an individual is very different from chronological time. The relation between the subjective time of the brain and the objective time of an inanimate clock is determined by the Weber-Fechner law that relates psychological experience to physical measurement. At a given level of abstraction this notion of subjective time and that of physiologic time have a great deal in common, the latter having a psychophysics measure given by the size of the organism through the allometry relation.

Grigolini goes on to suggest that the renormalization group relation used in *Physiologic Time* to characterize the statistical nature of physiological phenomena may be the harbinger of new renormalization group theory that is biology-based. He points out that such a new theory would require an extended notion of criticality, one that has a range of critical values of the control parameter