# Review of: "Fractal Biology — Evolution from Molecular to Cognitive, and Psychological Dimensions"

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Potential competing interests: No potential competing interests to declare.

Victor Dyakin's article delves into the concept of fractal biology, exploring how fractal geometry and space-time symmetry principles underpin biological processes across multiple hierarchical levels — from molecular structures to cognitive and psychological functions. The paper posits that understanding these fractal patterns can offer profound insights into the evolution of biological systems and potentially aid in distinguishing between healthy and diseased states, particularly in neurological and psychological disorders.

The article begins by highlighting the shared foundational principles between biological intelligence and artificial intelligence, specifically in space-time information processing and symmetry transformation. It emphasizes that advances in cognitive science can significantly inform AI development, with fractal structures in human languages and protein assemblies serving as compelling examples.

Dyakin discusses how biological processes exhibit temporal and spatial plasticity, linking them to fundamental laws of physics, particularly space-time symmetry. Biological symmetry is categorized into chirality, fractality, and topology, each playing a significant role in biological organization and evolution.

The core of the article focuses on fractal geometry in biological structures, asserting that fractal patterns are evident across all levels of biological organization. Examples include the fractal nature of glycogen structures, cytoskeletal networks, neural circuits, lung alveolar structures, and capillary networks. Fractality is also discussed in the context of protein folding and assembly, with implications for understanding diseases associated with aberrant molecular assembly.

The paper traces the presence of fractal symmetry from molecular assemblies to higher-order functions such as perception, cognition, and psychological states. It suggests that fractal patterns in neuronal networks could underlie cognitive abilities and psychological functions, potentially offering new avenues for understanding mental health disorders.

Dyakin posits that a broad understanding of biological fractality could help discriminate between healthy and diseased states. The article highlights that psychiatric, neurological, and immune disorders are often associated with disruptions in fractal patterns at various levels of biological organization. The author connects biological fractality with fundamental physical theories like the General Theory of Relativity, Scale Relativity Theory, and String Theory. This interdisciplinary approach underscores the potential for unified theories that bridge biology and physics.

My general opinion about the presented concepts is as follows:

The article successfully bridges concepts from physics, mathematics, and biology, offering a holistic view of how fractal geometry permeates various levels of biological organization. By covering molecular to psychological dimensions, the paper provides a wide-ranging exploration of fractal patterns in biology. The suggestion that fractal patterns could be instrumental in understanding and diagnosing diseases presents an innovative perspective that could spur further research.

While the theoretical connections are compelling, the article would benefit from more empirical data supporting the role of fractal geometry in specific biological processes and diseases. The paper touches upon the potential diagnostic uses of fractal analysis but does not delve deeply into how this could be implemented in clinical settings.

Speaking broadly about this field of inquiry, there is a need for experimental studies that investigate the presence and role of fractal patterns in biological systems, particularly at the molecular and cellular levels. Research should explore how fractal analysis can be integrated into medical diagnostics, especially for neurological and psychological disorders.

In general, the article makes a significant contribution to the understanding of fractal geometry's role in biological systems. Its interdisciplinary approach and focus on symmetry transformations offer a novel framework for exploring complex biological phenomena. However, its speculative and highly theoretical nature calls for further empirical research to substantiate its claims and realize its potential applications in medicine and neuroscience.