

The Theory of the Systemic Functional Level (Sflt) and Its Consequence, the Law of Functional Information Increase (Lifi)

Argos Arruda Pinto*

Department of Physics and Mathematics, São Paulo, Brazil.

Corresponding Author: Argos Arruda Pinto, Department of Physics and Mathematics, São Paulo, Brazil.

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Abstract

I argue that the new Law of Functional Information Increase, proposed by Michael L. Wong, Robert Hazen, and collaborators, belongs to a theory I developed called the Law of the Systemic Functional Level, because information needs matter and energy to be generated, stored, transmitted, and processed. The Law of Functional Information Increase is the effect; the Systemic Functional Level is the cause. The universe tends to organize systems where matter and energy are shaped by information to ensure persistence. The Systemic Functional Level is a measure or degree of a system's functioning in terms of increasing complexity, given by the combination of matter, energy, and information. The amount of information generated, stored, transmitted, and processed by the system has a greater "weight" than the other two "variables". For example, we have less mass than a lion, we expend less energy, but the amount of information we process, due to our brain, causes the Systemic Functional Level (SFL) to be higher. Since we are dealing with complex systems, it is impossible to express all of this in formulas, but it would be something like mass $\times$ energy $\times$ information; and it may be different. If the SFL increases, the Functional Information also increases, being dependent on it.

Keywords: Law of Increase of Functional Information, Lifi, Michael L. Wong, Systemic Functional Level Theory, TLFS, Energy, Matter, Information

1. Introduction

The Systemic Functional Level Theory posits that the evolution of any system be it mineral, biological, or technological is governed by a concomitant increase in its material, energetic, and informational base. According to this theory, Functional Information does not arise in isolation, but as a direct result of the elevation of the system's Functional Level.

2. The Axiom of the Systemic Trinity

For functionality to increase, the system must necessarily alter or optimize the relationship between three pillars:

- **Mass (M):** the physical support or structural magnitude
- **Energy (E):** the potential for connection, maintenance flow, or processing
- **Information (I):** the configuration, design, code, or specific symmetry that assigns purpose or utility to the other two.

2.1. Central Postulate: Functional Information, expressed in the Law of Functional Information Increase (LIFI) Wong, Michael L. is the manifestation of the organization of matter and energy at levels of increasing complexity [1]. Without the modification of matter/energy, information cannot be stored or transmitted.

3. The Selection Mechanism for Function

LIFI proposes that nature selects by persistence and novelty. NFS explains that this selection occurs through the refinement of the structure: Static persistence (e.g., diamond): the increase in NFS here is seen in the transition from isolated carbon atoms to a crystalline lattice. The spatial configuration (angles of 109.5°) maximizes binding energy and hardness, transforming structural information into physical utility. Dynamic persistence (e.g., stars and cells): systems that maintain a constant flow. In the case of stars, the evolution of hydrogen and helium into heavy elements increases the number of protons and energy levels (electron shells), raising cosmic NFS. Generation of novelty (e.g., biological membranes): in a membrane being internally destroyed by an element 'A', allowing the entry of an inhibitor 'B', due to any transformation in its structure without altering the NFS, it is demonstrated that it increases because the system adds this extra element of protection, mass, and a new recognition code, the information.

4. Comparison: LIFI vs. NFS

The table below summarizes how NFS acts as the engine behind LIFI observations:

- **LIFI:** Universality

- **NFS:** Occurs from the atom to software, as everything that exists occupies mass and processes energy.
- **LIFI:** Enhanced Complexity
- **NFS:** Is the result of compacting more functions into structures with specific spatial configurations.
- **LIFI:** Purposeful Information
- **NFS:** Information is only 'functional' if there is a physical structure (M) capable of performing work (E).
- **LIFI:** Counterpoint to Entropy
- **NFS:** NFS is a 'local accumulator of order', using external energy to organize matter and reduce informational disorder.

5. The Singularity of the Triclinic System (the Turquoise Example)

We can use turquoise to illustrate the increase in information through symmetry breaking. In the triclinic system of this rock ($a \neq b \neq c$, edge lengths and angles between atoms different from 90°), the 'low level of symmetry' paradoxically requires a greater amount of specific information to describe the structure than a simple cubic system. This proves

that mineral evolution is not just a mixing of atoms, but a refinement but a refinement of 'positional information' and bonding.

5.1. Final Synthesis

The Law of Functional Information Enhancement is the effect; the Systemic Functional Level is the cause. The universe tends to organize systems where matter and energy are shaped by information to ensure persistence. Carbon compounds are the "sparks of life" because they possess the versatility necessary to achieve very high systemic functional levels in reactions and structural compositions, allowing the transition from chemistry to biology.

Reference

1. Wong, M. L., Cleland, C. E., Arend Jr, D., Bartlett, S., Cleaves, H. J., Demarest, H., ... & Hazen, R. M. (2023). On the roles of function and selection in evolving systems. *Proceedings of the National Academy of Sciences*, 120(43), e2310223120.