

Laws of Nature in Semiotics: A Physico-Theoretical Approach

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Abstract

Within the framework of the “Physical Theory of Value” (PTV) project, the author proposes to consider **two axiomatic laws of nature in semiotics** as a working foundation for further theory development.

The first law postulates the physical nature of sign-language operations (the thinking process) as a universal process of information processing by cognitive systems of any type. The second law defines a sign (word, symbol, gesture) as a **memory address of the subject**, pointing to a stored model of the denotatum, while the denotatum itself always remains outside the memory of the communication participants.

According to these provisions, any communication (verbal and nonverbal) transmits exclusively the logical structure of memory addresses, not its content. Understanding arises only when the recipient has or constructs a similar structure of addresses filled with their own individual experience.

These statements are deliberately introduced as **axioms**, not as proven theorems. Their empirical verification, clarification of applicability boundaries, search for counterexamples, and possible falsification remain tasks for future research and the scientific community.

In the present work, these axioms are used as a tool to advance the main goal of the PTV project – the search for technologies to measure real material and spiritual values.

Keywords:

Physical Theory of Value, Real Value Unit System (RVUS), Multidimensional Modeling, semiotics, sign, memory address, denotatum model, verbal communication, nonverbal communication, conditioned reflexes, Physical Theory of Value, intercultural misunderstanding, axiomatic approach

1. Introduction

The Physical Theory of Value (PTV) is built on the premise that value is an objective physical property of material carriers, measurable in certain units. The development of this theory requires a reliable description of how people (and other cognitive systems) operate with values in consciousness, make decisions, and exchange information about them.

To address this task, the present work introduces **two axiomatic laws of nature in semiotics**. They do not claim the status of proven theorems and are not deductively derived from more fundamental principles within this article. These are consciously chosen initial propositions (axioms) that:

- are logically consistent within the framework of observable phenomena of communication and thinking,
- are consistent with known data from neurophysiology, psychology, and reflex theory,
- allow a consistent description of both verbal and nonverbal information exchange processes,
- open the way to constructing quantitative models of value in cognitive systems.

The task of proving or refuting these axioms, clarifying their applicability boundaries, searching for counterexamples, and conducting rigorous empirical tests is deliberately left to the reader, the scientific community, and future research.

The goal of the present work is different:

by accepting the proposed statements as working axioms, to demonstrate how they can serve as an instrument for advancing the main PTV program – the development of methods for the physical measurement of real (material and spiritual) values.

The first law postulates the nature of sign-linguistic thinking as a physical information-processing process.

The second law defines the sign as a memory address and explains the mechanism of the subjective nature of understanding in communication.

The remainder of the text relies precisely on these axiomatic propositions.

2. First Law of Nature in Semiotics

2.1 Main Formulation (Axiom)

Axiom 1.0

The thinking subject (human, artificial intelligence, biological organism, or any other cognitive agent) operates in the process of cognition and intellectual activity not with real objects directly, but with their mental representations – simplified models of real prototypes (denotata) recorded in the memory of the given subject and encoded by means of its internal language.

2.2 Logical Consequences (Principles Following from Axiom 1.0)

2.2.1 The properties of the operated objects in cognitive processes belong exclusively to the model and only partially correlate with the properties of the real

prototypes. This is due to the fundamental limitation of any model.

2.2.2 Any prediction made on the basis of a model contains a systematic error proportional to the degree of adequacy of the denotatum description in the given model.

2.2.3 Any law formulated in any language (natural, formal, or symbolic) has a limited domain of applicability.

2.2.4 Absolute truths exist exclusively within the framework of the subject's cognitive system (in its working memory). Any application of them to reality contains a non-zero error.

2.2.5 Achieving any real goal is impossible with absolute precision due to model imperfection, external factors, and the stochasticity of reality.

2.2.6 An ideal goal (a mental model of a real goal) can be achieved within limited timeframes, since its achievability is determined by the parameters of the model.

2.2.7 Symmetry exists only within the framework of linguistic description and is a product of cognitive activity, not an objective property of reality.

2.2.8 To establish correspondence between linguistic models and reality, a **metalanguage** is necessary — a system of signs with direct physical or operational connection to the denotatum (standards, reference samples, experimental protocols).

2.2.9 Any realistically achievable goal can be realized by an infinite number of alternative technologies.

2.2.10 Achieving any realistically achievable goal requires the existence of two components:

- **I** — information (model of substrate transformation)
- **E** — material-energy substrate.

Formally: $\mathbf{AIM} = \mathbf{I} \times \mathbf{E}$

(where **AIM** is the target function, the real goal).

3. Second Law of Nature in Semiotics

3.1 Main Formulation (Axiom)

Axiom 2.0

A word, sign, or symbol is a **memory address of the subject** in which the model (image) of the denotatum is stored.

3.2 Logical Consequences

3.2.1 In verbal communication, the sender transmits to the recipient only the **logical structure of addresses** of their memory, encoded in the external (public) language common to both participants in the communication. Understanding arises when the recipient constructs a similar structure and fills it with their own models formed in the course of individual history. At the same time, the information package implied in the transmission splits into two parts: the **logical structure of memory** that is actually transmitted through the communication channel to the recipient, and the **memory content**, which is not transmitted anywhere. The recipient must independently extract this content from their own experience and fill the received structure in their memory.

3.2.2 In nonverbal communication, the sender transmits a **reflex response** to a stimulus — a memory address with an innate or conditioned psychic reaction.

3.3 Central Conclusion

In verbal communication, what is transmitted to the information recipient is **not the content** of the sender's memory, but only the **structure of memory addresses** encoded in the public language chosen for communication. The informational meaning of the message appears in the recipient's memory exclusively after "translating" the language of communication into the recipient's internal language.

3.4 Conclusion 2

Logic is the ability of memory to remember with an acceptable level of error.

Formally, this can be expressed as the condition of logical consistency:

$L = 1 - \epsilon$, where

$\epsilon \leq \epsilon_{\max}$

Here ϵ is the relative level of distortion / loss of connections between memory addresses during storage, retrieval and inference; $\epsilon_{\max}$ is the maximum allowable error level at which the cognitive system still classifies the result as "logically valid / coherent" for a given task or context.

When $\epsilon > \epsilon_{\max}$, the system experiences logical failure (contradiction, loss of meaning, disintegration of inference chains).

3.5 Illustrative Examples

3.5.1 Unconditioned Reflexes

- Salivation in a dog at the sight of food (Pavlov)
- Knee-jerk, pupillary, sucking reflexes in humans

3.5.2 Conditioned Reflexes

- Salivation at the sound of a bell after pairing with food
- Salivation at the sight or mention of a lemon

3.5.3 Culture-Specific Reflexes

Bulgarian nod: vertical = "no", horizontal = "yes" (reverse convention compared to most European cultures)

3.5.4 Semantic Conflicts (examples of content divergence at the same address)

- "Is the sky blue or light blue?" (depends on numerous unaccounted parameters of subjects and environment)
- "What is logic / value / truth?" (ignoring the uniqueness of each memory)
- "What is energy / speed of light / democracy / love?" (when each subject believes that their own image / model is the correct one)

3.5.5 Metalanguage Errors of "Quantization" (discrete models vs. continuous objects of reality)

- "What is the size of an electron? / Where does the atmosphere end? / What are the dimensions of a part?" (irrationality of metalinguistic elements – length standards)
- "What is the speed of light? / When does a child become an adult?" (irrationality of the concepts "child / adult")

3.5.6 Errors of External Language Logic (sender's linguistic constructions vs. recipient's)

- "What do quarks have to do with it if we are discussing acceleration?!" (the working memory volume of the recipient is insufficient to create and maintain a logical connection between the contents at the addresses "quarks" and "acceleration")
- "Yes, you are a free person, but you do not have the right to be here" (what counts as a "free person" and the "right to be present")

3.5.7 Internal Language Logic Errors (Memory Errors)

- The mass game "Chinese Whispers", where participants deliberately distort the meaning of a received word and pass it on.
- Statements made by a political figure before and after an election.
- A subject claims: "I always tell the truth" → but a minute later says: "I never lie." At first glance, these statements seem identical. However, there are inevitably differences ("not lying" and "telling the truth" refer to different memory addresses and thus contain different images/models). In a specific context, this discrepancy may exceed the allowable error threshold and produce an incorrect result.

4. Discussion

The proposed axioms are consistent with classical semiotic approaches (Peirce, Saussure) but shift the emphasis to the physical and neurophysiological level (memory addresses, reflex mechanisms). They align well with modern concepts of grounded cognition, episodic memory, and mirror neurons.

Limitations of the current formulation: qualitative nature, lack of strict mathematical formalization and direct experimental confirmation.

Prospects:

- explanation of the limitations of modern language models of AI
- improvement of intercultural communication and language learning
- resolution of psychotherapeutic and philosophical conflicts related to different "filling" of key concepts
- creation of quantitative metrics for model synchronization in communication

5. Conclusion

The two proposed axiomatic laws of nature in semiotics allow a consistent description of the mechanisms of communication and thinking in terms of the Physical Theory of Value. Information transmission is always limited to memory addresses, while true meaning is formed exclusively in the consciousness of the recipient.

Acceptance of these propositions as working axioms opens the way for further development of PTV toward the objective physical measurement of values.

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