

Structured Meme Theory: How Is Informational Inheritance Maintained?

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Abstract The recent consensus is that the range of informational inheritance by genes is limited to physical functions and infantile behavior. Human beings need to acquire basic behavioral skills and communicational skills through experience of behaving in the environment. We propose Structured Meme Theory that explains acquisition and development of these skills. Structured Meme Theory consists of action-level, behavior-level and culture-level memes. These are interconnected non-linearly and reflect the level of complexity of brain functions that map information in the environment onto internal representations. The mechanism with which the three levels of memes and genes inherit information is analogous to an information system. Genes serve as firmware that mimics behavior-level activities. Action-level memes serve as the operating system that defines general patterns of spatial-temporal behavioral functions. Behavior-level memes serve as middleware that extends the general patterns to concrete patterns. Culture-level memes serve as application tools that extend the concrete patterns to the ones that work in a number of groups of people.

Structured Meme

A meme is an entity that represents the information associated with the object that the brain can recognize. The original term "meme" Richard Dawkins coined in the 1970s was conceptual and was not defined clearly. However, the meme, or the structured meme, in SMT proposed in this paper is defined clearly within the framework of a non-linear, multilayered information structure that is similar to the structure of living organisms.

A meme is defined as follows. Each object is defined as a set of elements that belong to each layer in a nonlinearly connected multilayered structure. Those elements that are recognizable as proper entities, such as shape, movement, and quality, are able to exist as memes – latent memes. These latent memes change to manifest memes when they are fixated as part of an object or memorized by the other persons as information objects through the experience that the self takes part in.

As such, memes exist in the brain not only as entities that correspond to real objects that exist in the environment but also as information objects that are included in the layers the elements of the objects belong to. For human beings, the latter has been constructed by mapping environmental information onto the networks in the brain, which has established the relationships between human beings and their surround-

ing environment. This explains the emergence of cultural differences among living groups.

The structured meme consists of three non-linear layers.

- > Action-level memes represent bodily actions.
- > Behavior-level memes represent behaviors in the environment.
- > Culture-level memes represent culture.

Memes as a whole are a collection of information objects that reside in each layer. Each person will develop his/her own relationships among objects.

Figure 1 depicts the structure of inheritance of information in which genes, memes, and language participate.

Memes propagate by means of resonance

Memes propagate from person to person when the receiver estimates that the degree of reality of the meme perceived by him/her reaches a certain level. The process of feeling reality can be conceived as the process of resonance that occurs in the brain in response to the input of memes from a sender. When the meme in question resonates with some patterns associated with valued experiences endorsed by the reward system, the meme is accepted by the receiver.

The entire meme structure in human society is a networked field defined by an individual's connections. Each person's brain forms a proper reality field, and it builds up to the entire reality field. Memes propagate in the thus constructed reality field by means of resonance.

Figure 2 illustrates how memes propagate in the reality field. The process of propagation is facilitated by symbolization. A symbolized meme enables people to think on abstract levels.

Characteristics of meme propagation

A meme is defined as a matrix-like construct that consists of multiple layers and a number of elements. The feeling of reality that an individual experiences is formed by integrating responses generated by the acceptor elements whose structure is defined similarly to that of the structured meme. However, the response sensitivity of the individual's acceptor elements is shaped by experience, and thus it exhibits individual differences depending on the individual's experience.

While a meme is propagating in the network of individuals, the differences in reality responses by individuals also propagate. This implies

Nonlinear Dynamic Human Behavior Model with Real-Time Constraints (NDHB-Model /RT)

Living organisms, including human beings, act autonomously. The living environment on the Earth is a field constructed through interactions among the living organisms in a variety of ways. The Earth's environment changes continuously in a one-year fundamental cycle. In order to attain stability in the ever-changing environment, which incorporates the Earth and the other living organisms, living organisms have developed their own autonomous control systems.

The whole universe of complexly interconnected living organisms thus constructed can be called "an organic self-consistent field." Figure A depicts such a field from the viewpoint of the information structure. The autonomous living organisms act by mapping the information structure shown in Fig. A onto their brains in their evolution. The nonlinear dynamic human behavior model with real-time constraints represents an organic self-consistent field as a model.

It consists of three fundamental nonlinear constructs that correspond to the information structure of Fig. A.

1. **Brain Information Hydrodynamics (BIH):** BIH deals with information flow in the brain and its characteristics in the time dimension. -- *A companion poster presented at CogSci2008*
2. **Structured Meme Theory (SMT):** SMT deals with empirical effectiveness of information and its range. -- *This poster*
3. **Maximum Satisfaction Architecture (MSA):** MSA deals with how autonomous systems achieve goals under constraints. -- *Poster presented at CogSci2007*

BIH, SMT, and MSA jointly define constraints for actions as follows. The phenomena that emerge in the human society are the results of the actions that each human's autonomous system takes in order to maximize satisfaction and happiness (MSA) under the constraints defined by BIH and SMT. Figure B depicts the brain mechanism according to the proposed model. The brain consists of memory that functions as an autonomous organ and bodily activity control that functions as a somatic organ.

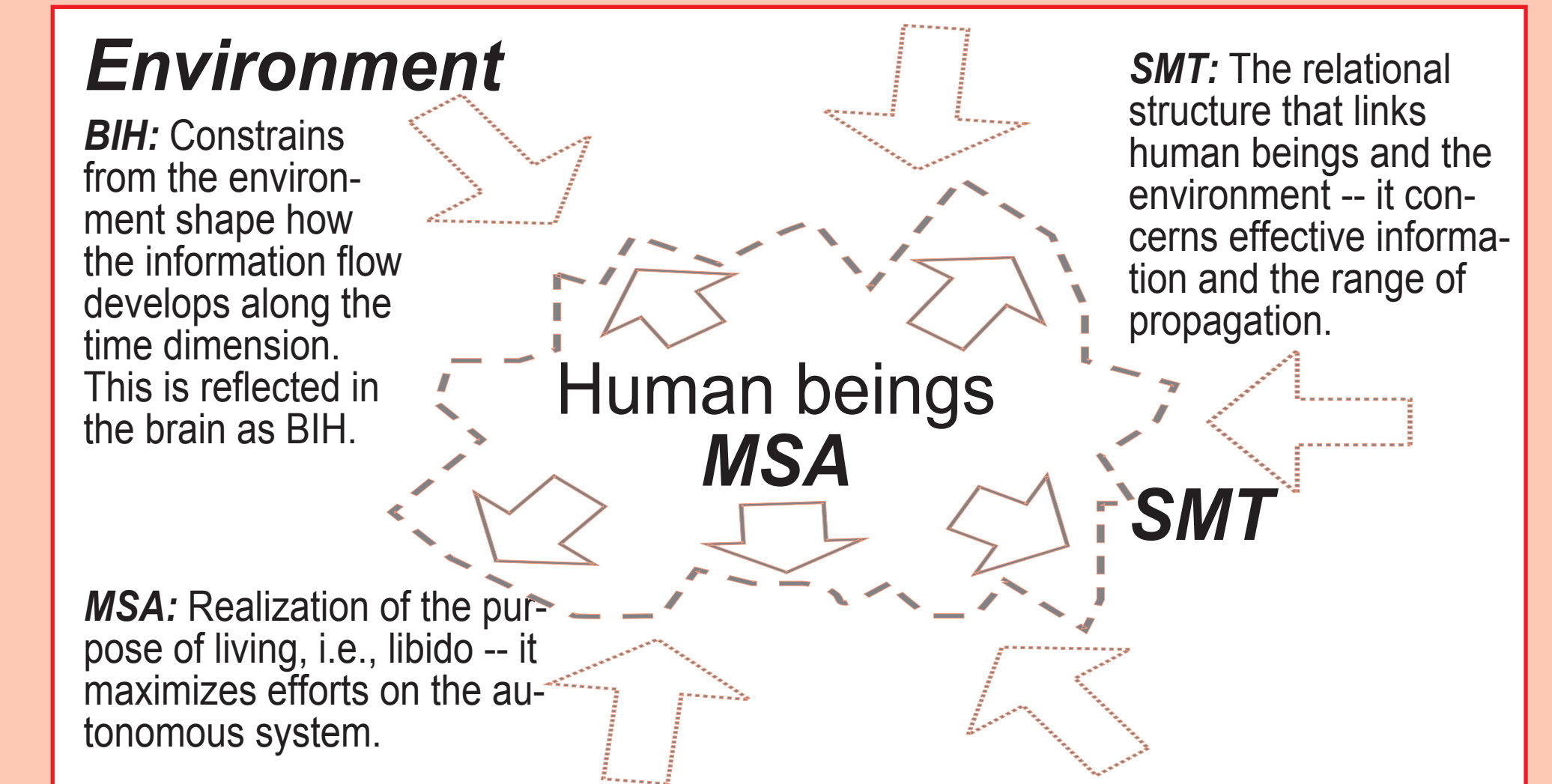


Figure A: Three fundamental constructs that define the nonlinear dynamic human behavior model with real-time constraints.

that the meme may be altered in the propagation process.

Figure 3 depicts the cultural evolution of a meme. It also demonstrates that some amount of fluctuation results in meme quantity and quality because the propagation cannot completely reflect the complexity of the environment.

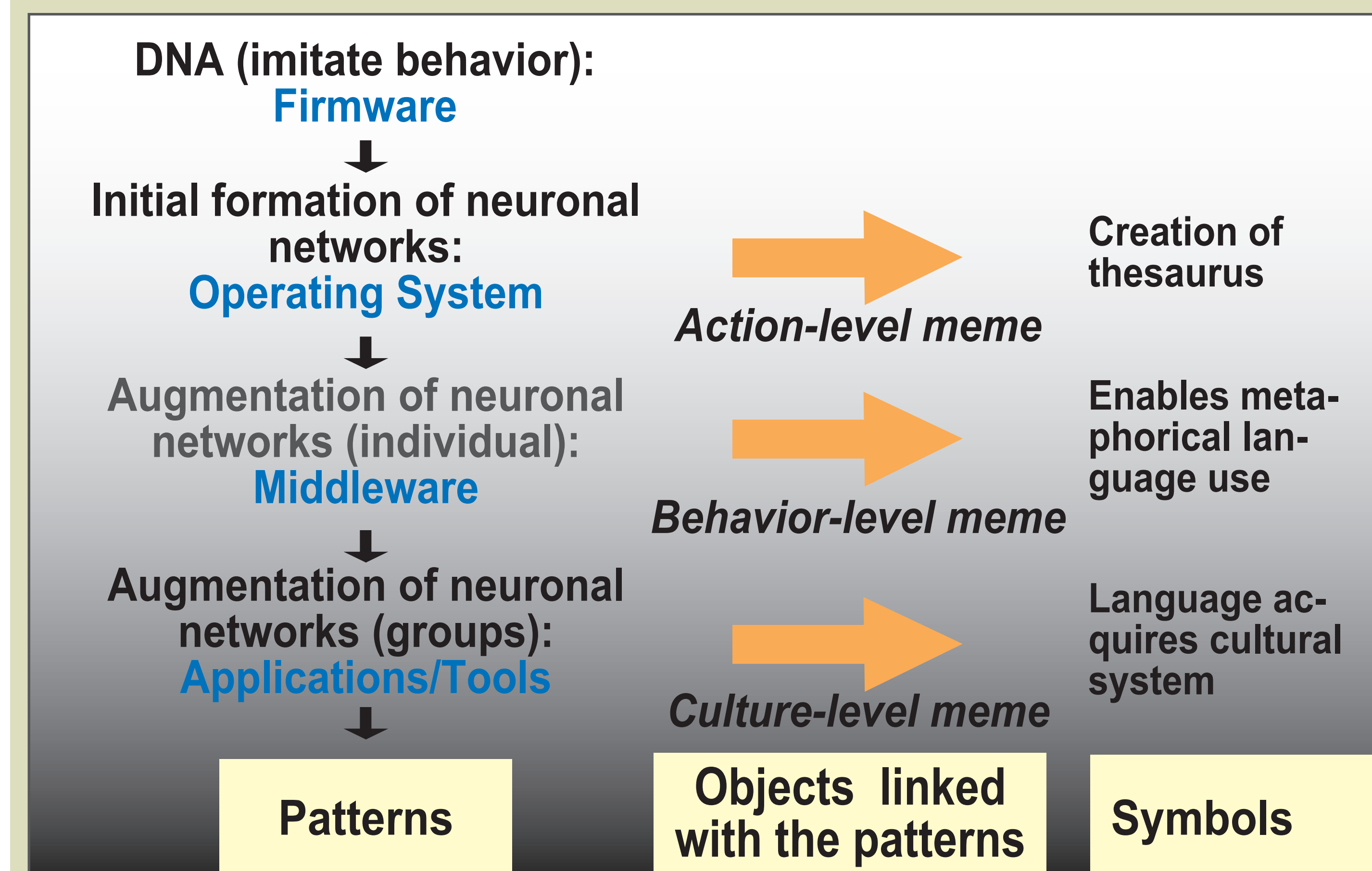


Figure 1: The structure of meme.

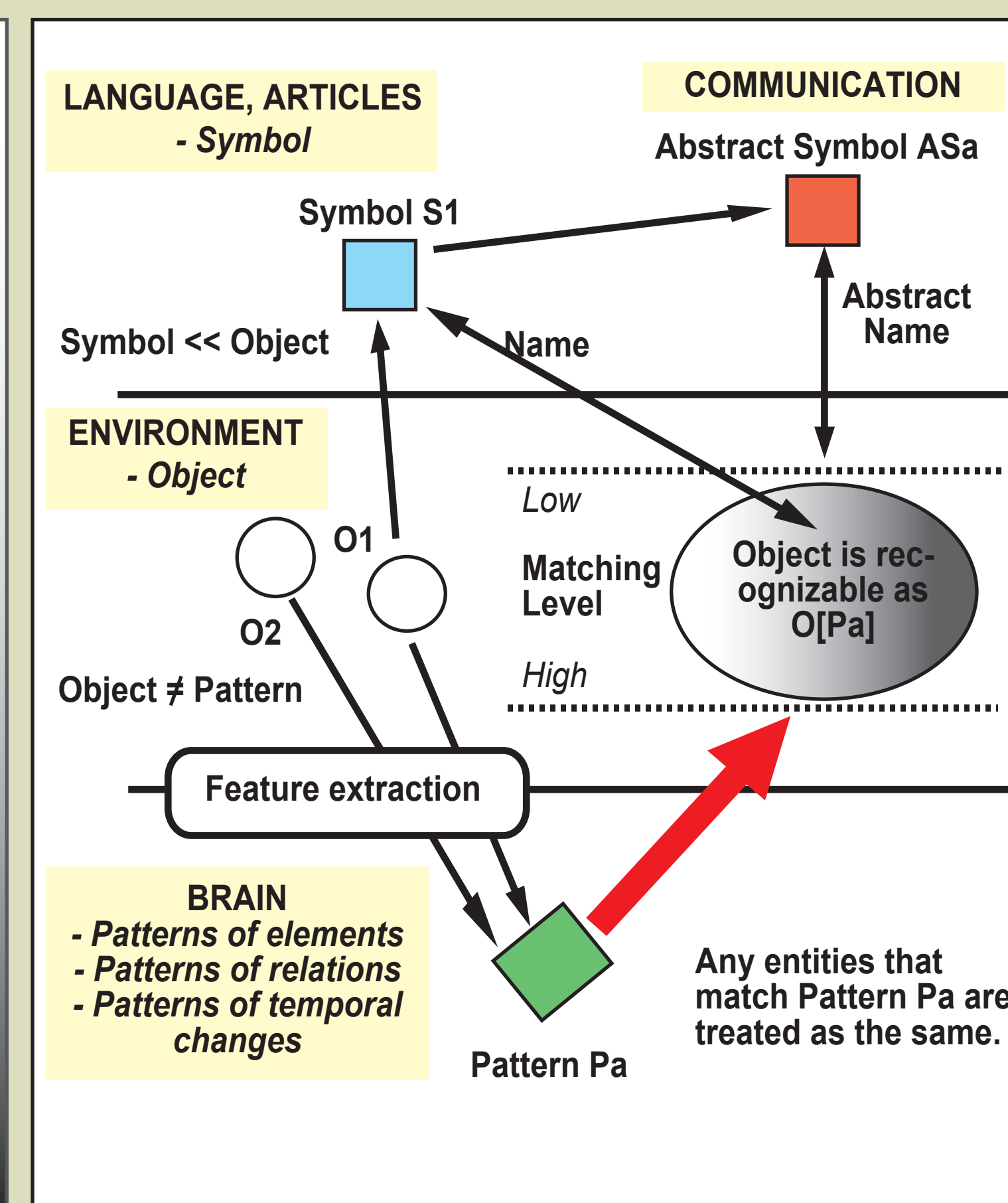


Figure 2: The structure of meme.

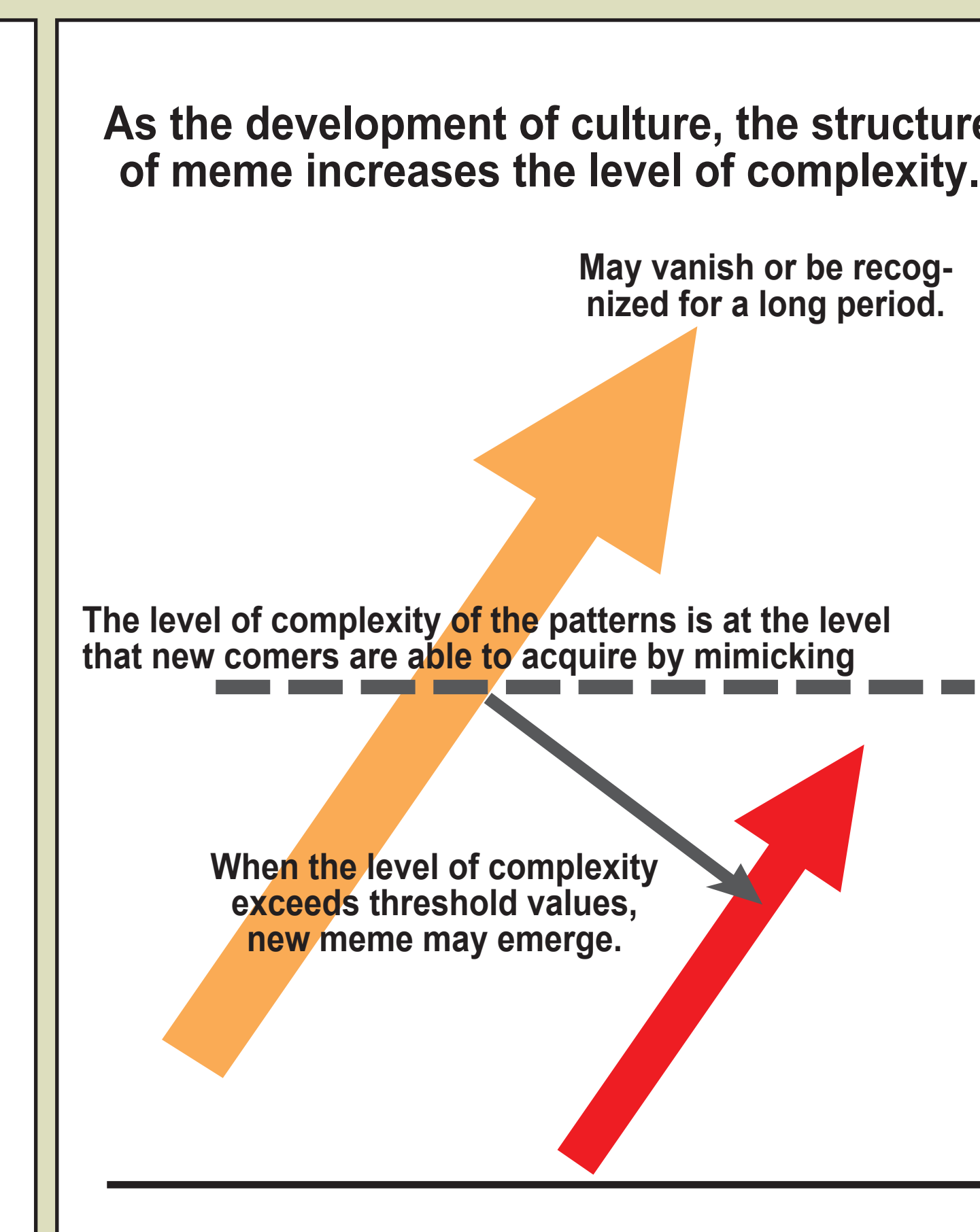


Figure 3: Evolution of meme.

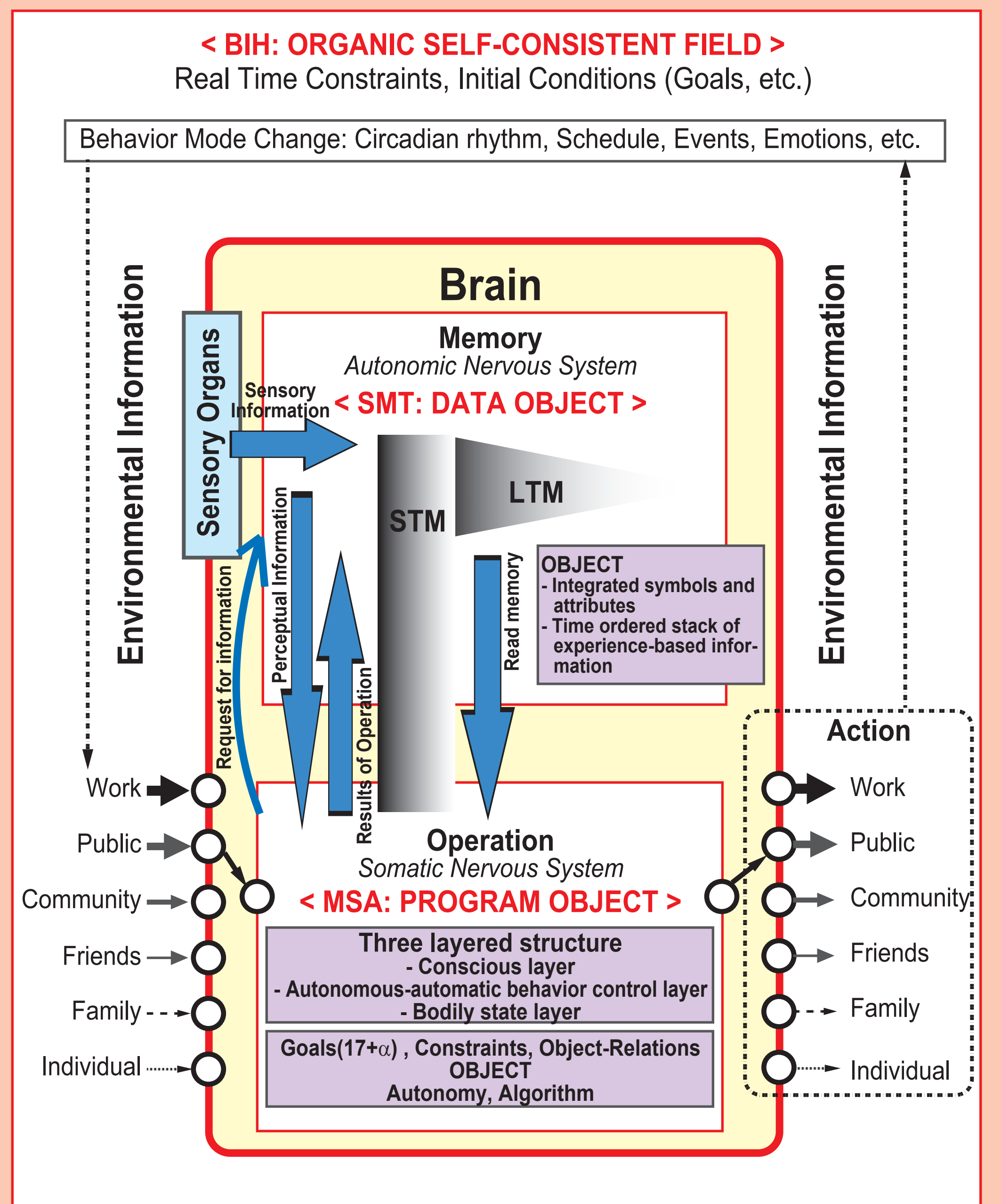


Figure B: Mechanism of the brain explained by the NDHB-Model/RT.