

## **“Cognition as management of meaningful information. Proposal for an evolutionary approach”**

\* C. Menant – Bordeaux – France -  
(<http://crmenant.free.fr/Home-Page/index.HTM>)

### **Extended Abstract (submission).**

Humans are cognitive entities. Our behaviors and ongoing interactions with the environment are threaded with creations and usages of meaningful information, be they conscious or unconscious. Animal life is also populated with meaningful information related to the survival of the individual and of the species. The meaningfulness of information managed by artificial agents can also be considered as a reality once we accept that the meanings managed by an artificial agent are derived from what we, the cognitive designers, have built the agent for.

This rapid overview brings to consider that cognition, in terms of management of meaningful information, can be looked at as a reality for animal, humans and robots. But it is pretty clear that the corresponding meanings will be very different in nature and content. Free will and self-consciousness are key drivers in the management of human meanings, but they do not exist for animals or robots. Also, staying alive is a constraint that we share with animals. Robots do not carry that constraint.

Such differences in meaningful information and cognition for animal, humans and robots could bring us to believe that the analysis of cognitions for these three types of agents has to be done separately. But if we agree that humans are the result of the evolution of life and that robots are a product of human activities, we can then look at addressing the possibility for an evolutionary approach at cognition based on meaningful information management. A bottom-up path would begin by meaning management within basic living entities, then climb up the ladder of evolution up to us humans, and continue with artificial agents.

This is what we propose to present here: address an evolutionary approach for cognition, based on meaning management using a simple systemic tool.

We use for that an existing systemic approach on meaning generation where a system submitted to a constraint generates a meaningful information (a meaning) that will initiate an action in order to satisfy the constraint [1,2]. The action can be physical, mental or other.

This systemic approach defines a Meaning Generator System (MGS). The simplicity of the MGS makes it available as a building block for meaning management in animals, humans and robots. Contrary to approaches on meaning generation in psychology or linguistics, the MGS approach is not based on human mind. To avoid circularity, an evolutionary approach has to be careful not to include components of human mind in the starting point.

The MGS receives information from its environment and compares it with its constraint. The generated meaning is the connection existing between the received information and the constraint. The generated meaning is to trigger an action aimed at satisfying the constraint. The action will modify the environment, and so the generated meaning. Meaning generation links agents to their environments in a dynamic mode. The MGS approach is triadic, Peircean type. The systemic approach allows wide usage of the MGS: a system is a set of elements linked by a set of relations. Any system submitted to a constraint and capable of receiving information from its environment can lead to a MGS. Meaning generation can be applied to many cases, assuming we identify clearly enough the systems and the constraints. Animals, humans and robots are then agents containing MGSs. Similar MGSs carrying different constraints will generate different meanings. Cognition is system dependent.

We first apply the MGS approach to animals with "stay alive" and "group life" constraints. Such constraints can bring to model many cases of meaning generation and actions in the organic world. However, it is to be highlighted that even if the functions and characteristics of life are well known, the nature of life is not really understood. Final causes are difficult to integrate in our today science. So analyzing meaning and cognition in living entities will have to take into account our limited understanding about the nature of life. Ongoing research on concepts like autopoiesis could bring a better understanding about the nature of life [3].

We next address meaning generation for humans. The case is the most difficult as the nature of human mind is a mystery for today science and philosophy. The natures of our feelings, free will or self-consciousness are unknown. Human constraints, meanings and cognition are difficult to define. Any usage of the MGS approach for humans will have to take into account the limitations that result from the unknown nature of human mind.

We will however present some possible approaches to identify human constraints where the MGS brings some openings in an evolutionary approach [4, 5]. But it is clear that the better human mind will be understood, the more we will be in a position to address meaning management and cognition for humans. Ongoing research activities relative to the nature of human mind cover many scientific and philosophical domains [6].

The case of meaning management and cognition in artificial agents is rather straightforward with the MGS approach as we, the designers, know the agents and the constraints. In addition, our evolutionary approach brings to position notions like artificial constraints, meaning and autonomy as derived from their animal or human source.

We next highlight that cognition as management of meaningful information by agents goes beyond information and needs to address representations which belong to the central hypothesis of cognitive sciences.

We define the meaningful representation of an item for an agent as being the networks of meanings relative to the item for the agent, with the action scenarios involving the item. Such meaningful representations embed the agents in their environments and are far from the GOFAI type ones [4]. Meanings, representations and cognition exist by and for the agents. We finish by summarizing the points presented and highlight some possible continuations.

[1] C. Menant "Information and Meaning" <http://cogprints.org/3694/>

[2] C. Menant "Introduction to a Systemic Theory of Meaning" (short paper)  
<http://crmenant.free.fr/ResUK/MGS.pdf>

[3] A. Weber and F. Varela "Life after Kant: Natural purposes and the autopoietic foundations of biological individuality". *Phenomenology and the Cognitive Sciences* **1**: 97–125, 2002.

[4] C. Menant "Computation on Information, Meaning and Representations. An Evolutionary Approach" <http://www.idt.mdh.se/ECAP-2005/INFOCOMPBOOK/CHAPTERS/10-Menant.pdf>

[5] C. Menant "Proposal for a shared evolutionary nature of language and consciousness"  
<http://cogprints.org/7067/>

[6] Philpapers "philosophy of mind" <http://philpapers.org/browse/philosophy-of-mind>