1) Introduction

a) Information and meanings are present everywhere around us as well as within ourselves.

b) Specific studies have been implemented in order to link information and meaning:

- Semiotics, Biosemiotics.

- Analytic Philosophy, Linguistics, Phenomenology.

- Psychology.

c) No general coverage is available for the notion of meaning.

d) We propose to fill this lack by a systemic approach to meaning generation.

2) Information and meaning. Meaning Generator System [I]

a) The word "meaning" is most of the time related to the performances of humans.

b) Nature of human is unknown ("the hard problem") => nature of "meaning" unknown.

c) Proposal is to analyse "meaning" at the level of elementary life and to reformulate the results in a systemic approach. Brings up an evolutionary perspective on meaning generation.

d) Definitions and properties of "meaning" and of a "Meaning Generator System" (MGS).

e) Meaning generation to be positioned in sensori-motor loop [III].

A meaning is a meaningful information that is created by a system submitted to a constraint when it receives an external information that has a connection with the constraint.
The meaning is formed of the connection existing between the received information and the constraint of the system.
The function of the meaning is to participate to the determination of an action that will be implemented in order to satisfy the constraint of the system.
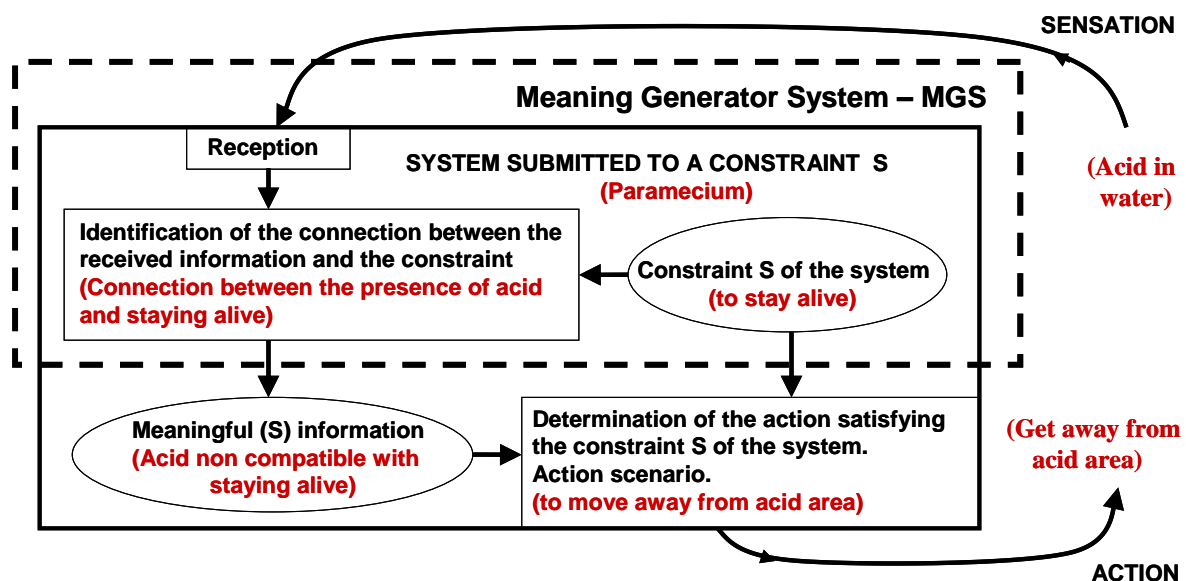

Fig 1. Meaning generation by a system submitted to a constraint

- Introduction to a Systemic Theory of Meaning - (2/4)

3) MGS characteristics [I]

a) Usable as a building block for higher level systems (agents): animals, humans, robots. Compatible with an evolutionary approach (evolution of systems/constraints).
b) Creates interactive and dynamic relations that link agents to their environments in order to maintain and adapt their natures. Meaning is generated by the agent and for the agent.
c) Close to a simplified version of the Peircean triadic approach on sign.
d) Needs some conceptualization on the notion of constraint.

4) Groundings of meaning [II]

The MGS approach makes available components for the grounding of meaningful information as generated by a system submitted to a constraint in its environment:
- Grounding in the MGS by the reception, the constraint, the identification of the connection.
- Grounding out of the MGS by the incident information, the action determination and its implementation.
- Relations with constructivist or objectivist aspects are on the same chart.
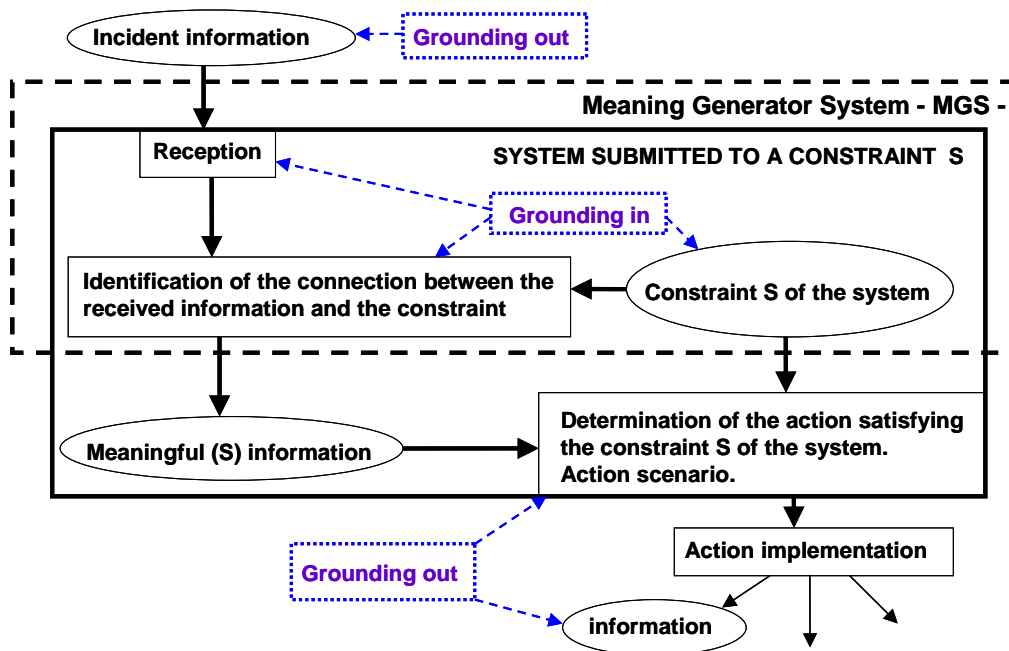
Fig 2. Meaning generation and groundings

5) Transmission and processing of meaning [I]

a) A meaningful information can be transmitted to other systems and survive to the MGS.
b) Introduction of "Efficiency of a Meaning" and of "Domain of Efficiency of a Meaning".

6) MGS and higher level systems (agents) [II]

a) The MGS is part of a higher level system (agent) containing other functions like memory, scenarios simulation, action implementation, other receivers, other constraints and MGSs.
b) The agent can be biological or artificial (intrinsic or artificial constraints and meanings).
c) The agent uses its MGSs to interface with its environment by sensori-motor processes or by using higher level functions like memory, simulation, optimization, ….
d) Action implementation can be of different types (physical, chemical, nervous, data processing, conscious, unconscious, ..). Actions can be internal or external to the agent.
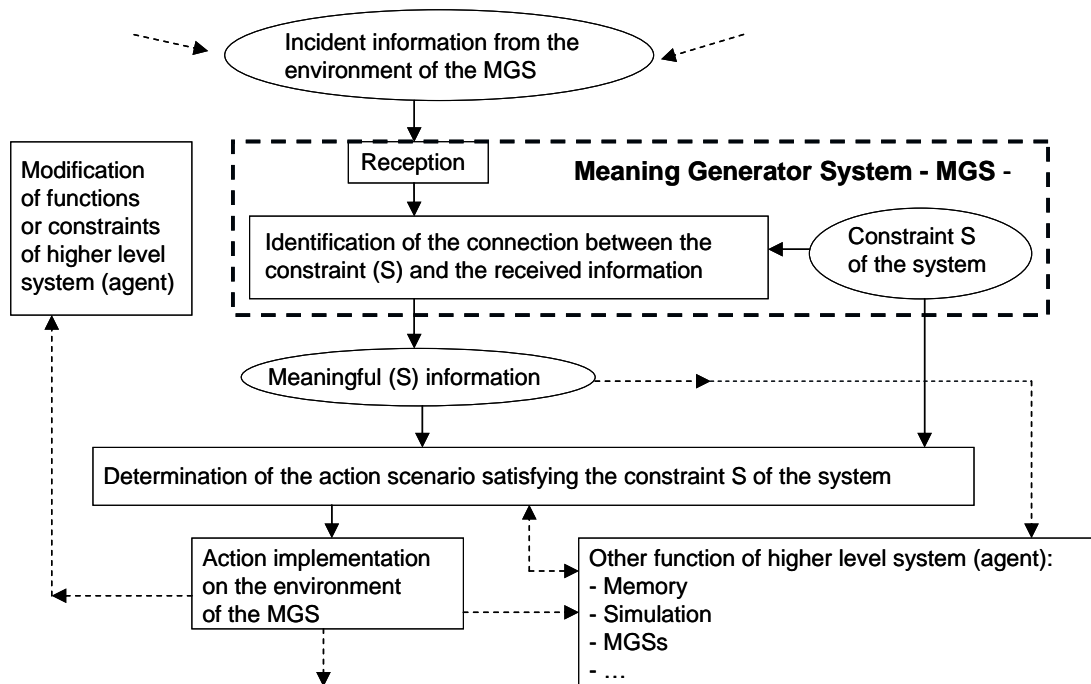
- Introduction to a Systemic Theory of Meaning - (3/4)

Fig 3. MGS as a building block

7) From meaningful information to meaningful representation [II]
a) Different meanings generated by an agent about an entity create a network of meanings relative to the entity for the agent. Such network is a meaningful representation of the entity for the agent.
b) Meaningful representations are made of constraint satisfaction oriented information.

8) Conclusion and continuation
a) Basic elements for a systemic theory of meaning have been introduced: meaning, constraint, meaning generation (MGS), meaning transmission, groundings of a meaning, relations with higher level systems (agents), meaningful representation.
b) Continuation by application to life, human, and robots. Needs clear enough an understanding of the systems/constraints (problem with natures of life and of human mind).
c) Needs some conceptualization of the notion of constraint (intrinsic, organic, artificial, ..). "Pre-biotic constraints" to be defined between physical laws and organic constraints.
d) Look at how the notion of autonomy could be related to the notions of constraint satisfaction and of meaning generation.

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* Perspectives from other authors*

"Cognition is conceived as <mark>meaning-generation</mark> and arises from the embodied, sensorimotor <mark>coupling between organism and environment</mark>. The organism's experiential awareness of its self and its world is a central feature of its lived embodiment in the world"
(Torrance, S. and De Jaegher, H. "*Enactive perception and the experience of autism*" June 2005)

"<mark>A definition of cognition</mark> will be also proposed: "a system is cognitive if and only if sensory inputs serve <mark>to trigger actions</mark> in a specific way, so as <mark>to satisfy a viability constraint</mark>".
(Bourgine, P. 2010 Summer school "*Autopoiesis and Cognition* ".)

"*<mark>meaning is generated within the system for the system itself</mark>* – that is, it is generated and at the same time consumed by the system. Importantly, meaning is not uniquely specified by the living system in isolation from its environment. Rather, <mark>meaning is always *relational*</mark>"
(Colombetti, G. 2008. *« Enaction, sense-making and emotion »* (To appear in Stewart, J., Gapenne, O. & Di Paolo, E. (eds). *Enaction: Towards a New Paradigm for Cognitive Science.* Cambridge MA: MIT Press)

"Meaning is not passively derived, it is not the passive retrieval of information from the environment, which is subsequently internally represented in the system. <mark>Meaning is made in the ongoing active interaction with the environment</mark>. <mark>Meaning-making</mark>, moreover, is intrinsically related to the organism's being and context"
(De Jeagher, H*. "Social Interaction Rhythm and Participatory Sense-Making: An Embodied, Interactional Approach to Social Understanding, with Some Implications for Autism"* . University of Sussex September 2006)

" <mark>Meaning</mark> is not to be found in elements belonging to the environment or in the internal dynamics of the agent, but <mark>belongs to the relational domain</mark> established between the two"
(Di Paolo, E., Rohde, M., De Jaegher, H. *" Horizons for the Enactive Mind: Values, Social Interaction, and Play"* CSRP 587 ISSN 1350-3162)

"There are five key "pillars" to the enactive approach: A dynamical systems perspective and emergence, embodiment, biological autonomy, <mark>"sense-making" (the creation of meaning)</mark>, and experience"
(McGann, M*. "What is "Enactive" Cognition?"* euCognition Wiki