

COMMITTEE I

Unity of Science: Organization and
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INFORMATION AND THE SENESCENCE OF MENTAL ACTIVITY

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DISCUSSION PAPER

on

Percy Lowenhard's
MAPPING AND RECONSTRUCTION OF REALITY

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MAPPING AND RECONSTRUCTION OF REALITY

The excellent paper by Percy Lowenhard enlightens us with an encyclopedic review of the many complexities involved in understanding the representation of the external world in our brain. Its scope ranges from information theory to sociological comments on the progress of civilization, geometry of electromagnetic fields, evolutionary epistemology and other topics of no less importance. Especially interesting are the pages devoted to the elusive subject of consciousness.

I would like to restrict myself to the physiological bases of information's transfer within the central nervous system and the possible causes of senescence in its function as a system, not in the usual biological meaning. First, let us examine the well-known phenomena of convergence and divergence. These, together with the capability for encoding and decoding information in synaptic and action potentials and somatotopic arrangement, and the ability to facilitate and inhibit the impulses in the neuronal network, provide the substructure for our understanding of the environment but, at the same time, imply that we cannot have a full and complete representation of reality. Just a partial grasp of some relations pertaining to the object or event we are trying to comprehend. However, there must be correspondence between what is in fact a subordinate system (inner mental representation) and the primary systems in the outside world since translation is possible and most of the simple ideas can be validated by empirical feedback. The so called "a priori" concepts--because we have knowledge of many things innately--are due to phylogenetic development on the encephalon selected by evolutionary forces of the external cosmos as well.

But it must be admitted that the structure of the cortex and central nuclei also imposes a definitive restriction in our understanding of the universe. For

instance, every convergence reduces a complex reality to schematic shadows, and divergence leads to more and more general inferences that can be true or false. The visual system brings down 10^9 bits of information, as Dr. Lowenhard has told us, to less than a hundred bits that reach the central analysers. And the calcarine cortex interprets this input usually in terms of already available models of forms or colors, most commonly by regulating the sensory signals. (This is why we try to surround ourselves with geometrical shapes like parallelepiped rooms or symmetrical furniture). Anyhow, it is unavoidably a degradation of the message both in a quantitative and qualitative sense. Of course, the first is convenient in order to have a rapid reaction to selected stimuli and, therefore, has a survival value. In order to assert the reason for the second we may recall that an incomplete representation may be true and useful especially in predictive behavior. What matters for our present argument is that even in a degraded way the transfer of information to the brain increments the "structuring" of thinking activity, both in a dynamic and the molecular levels, as in long term memory. And since the brain of the human species have the ability to use secondary representations as primary signals--using symbols as signs--this process leads to wider and wider circles of complexity and abstraction, in spite of the basic mechanism being the same for every area or degree of reflection and probably similar to the one already present in lower animals. Let us take the spoken language. First, the sound waves have to be decoded in the auditory apparatus in such a way that the phoneme--and every one is different according to the person that utters it--may be recognized as such. This is activated by neglecting what does not fit a previously learned model. Then the sequence--if adequate--is perceived as a word, the word as a sentence and the sentence as an idea or concept. In the expressive side the same steps are repeated in the opposite way. At each level the input pattern triggers a new, instant and

integral signal by changing temporal into special reorganization. This is what Dr. Lowenhard calls the "elementary time span of conscious experience."

As we have said before, such schemes are the key elements of mental processes. The beginning of them could be simple associations by proximity, in space or time, of groups of stimuli, and can be made up by visual, tactile or acoustic impressions plus inner feelings like emotions or memories. The associative body in such manner formed may not follow at all logical relations or formal thinking. Repetition of the same stimuli slowly fixes the scheme until it becomes what we have called a model. The majority of them have an associated word that usually acts as its symbol.

Let me use another example; if a person sees an object with four legs and a flat surface we may assume that he forms in his mind the representation first, and then a scheme of a table in which may be irrelevant features like color, size, form or material or the number of its legs. By coming in contact to similar objects some repeated properties are reinforced and the less common are weakened (although they do not disappear completely from the forming template) until a model is obtained which serves for comparison with new experiences. A variable combination of some of the attributes of similar objects like one leg and a flat surface or four legs and a broken surface can arouse the complete and general idea of a table, accompanied by the associated images that, even vague and imprecise, remain attached to it even in this particular individual. Of course, wrong association can be made and a fallacious model used. To distinguish between primary and secondary representations or signals is fabric for self awareness and consciousness.

The latter is partially inborn and partially acquired by learning this differentiation which is not always an easy task, specially for children. When the feed back, via sensory organs, is precarious, as in toxic states or mental diseases,

hallucinations may ensue.

Of course, the process we have synoptically presented, leads to many erroneous reconstructions of reality, and indeed this has been of common occurrence throughout history. Only when an individual or group finds that a model is in opposition with some facts, a painful exercise of revision begins. For the only criterium for truth we have is the principle of contradiction and that is how we refine our mapping of reality, both in the immediate experience and beyond our senses. Deductive and inductive methods alone may lead us astray.

Now I would like to point out clearly that although information creates order and organization is the most important product of brain's activity, the thinking process, the "structuring" of it tends to block new information in the same area. Finally, the system becomes rigid and latter decays. This is not a byproduct of age alone since, even for children, it is hard to change a concept or to relearn a skill.

I do not know if this may be a general law for systems but it is my impression that sooner or later they enter into senescence and finally are destroyed. Perhaps the biological ones, or some dissipative structures, that need energy or information to grow or to maintain themselves, by effect of influx of information block their own sources or permanence. In summary we have tried:

1. To clarify further the reconstruction of reality in our brain and have come to the principle of contradiction that is essentially a product of mental activity since truth or falsity do not belong to things or events but to our ideas (models) in relation to them.
2. By observing the intellectual functions and assimilating them to an open complex system we propose that, although the flow of information is

necessary to form internal order, that induces blocking of new information, therefore creating the conditions for senescence of the system and its final destruction. This hypothesis may be applicable to other systems as well.