

WAVES AND INFORMATION IN THE BIOLOGICAL WORLD

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DISCUSSION PAPER

on

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ACCOUSTICAL AND OPTICAL WAVES: A CONFOCAL POINT IN PHYSICS

In most fields of science and thought we meet with theories and concepts which are interchangeable with other fields; the concept of wave is one of them, and though deeply rooted in the field of physics, it nevertheless spreads over many others. The concept of wave may indeed be considered in a broad sense a concept of communication, thus transcending the usual restrictive meaning, and becoming a decisive connection among many acquaintances and disciplines.

It may in such a way constitute a starting point, looking forward to a synthesis in science and culture. No concept can perhaps be found which is more able of the concept of wave to emphasize the exchange of communications and messages, between the individual and the outside world.

Acoustical and optical waves are indeed an essential mean of exchanging informations between the subject (the individual) and the object (the outside world).

A huge amount of informations can therefore be exchanged by means of wave channels between the physical world and biological entities, and among the latter ones.

The wave, as a concept and a physical entity, may not represent the one and only mean of information; yet it is well known how it can convey an amount of informations which is theoretically endless, since its bounds are set by the

wave length itself only:and the wave length has an unlimited range.

The exchange of informations and messages,that is the ground from which a synthesis of acquaintances and knowledges may arise,can be more easily evaluated if looked at as a network of wave channels,generated by a physical or biological source,propagated through a medium,and received by a receptor.The problems which hence arise are bound to:the source,the medium,the receptor.We are being told that the wave as a mean of transmitting reliable informations has to reach its target with as little variations as possible:so it is compelled to follow many parameters,such as length of generation,coherence,and linearity;moreover,it can be modified by absorption and refraction during its propagation.Lastly,the receiver's features constitute one more series of variable conditions;its impedance determines in fact type and quality of the reception.

We are the aware of the fact that the information, which has reached its target as a coherent and linear wave, has to be now decodified and translated,in a way which is strictly dependant upon the receptor's intrinsic fetures.

The photochemical reaction,for instance,first step in the process of photoelectrical transduction performed by a retinal receptor,is started by a photon,or light quantum,coming into collision with a molecule of photolabile

pigment; in a similar way, acoustical waves coming into contact with the acoustical receptors, are by these translated from mechanical energy into a receptor potential first, and then into a fiber potential.

Through such a series of adaptations and changes, which keep going on from the sensorial receptor up to the anatomical physiological structures responsible for associative functions, the information may even lose its original shape and features, however reliable and clear it had come.

Thus sensation, as a primary identification, and perception, as a secondary identification, can deeply affect the quality of the information. That is why every individual perception has then to be integrated and inserted into a network made of others' perceptions, in order to outline a more objective picture of reality.

Any information received by the individual is thus improved by comparison with informations from others, in the aim of building a less subjective and fragile image of reality.

The whole that includes and overcomes the individual; we think an aphorism can be taken from Ganzheitspsychologie which will apply to our argument: "nothing happens that is not linked with everything".

The subjective perception of sensorial reality is a first step in the process of knowledge. The external stimuli, which are received, assimilated and transformed by sensorial receptors, aim to build a subjective image of external reality; associative and critical functions will then better outline this image, integrating it and comparing it with former perceptions and with others' perceptions and judgements; eventually making it closer to an objective image of reality.

This is the physiological basis of knowledge: signals from the outside world are caught by individual sensorial receptors, which convey them to the higher functions' brain centers to be interpreted and elaborated. Therefore, the very starting point of knowledge in whatsoever discipline or scientific field rises from a series of sensorial informations, issued by external sources and caught by individual receptors.

A communication exists between the outside world and the individual: i.e. a message which is sent, is caught, and decodified. Knowledge means communication. It is then conceivable that different knowledges, different sciences, may be assimilated to a single language, to a common denominator, and that communication may be the starting point to a synthesis in culture.