THE HUMAN MIND

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I have dedicated more than 40 years to the study of human mind and its several aspects. The most part of time I have dedicated to the memory, to its several forms and phases. But, to do that, I had to deepen in other questions, as the feelings, the state of animation and the emotions, their effects under the central nervous system, the responses of this one, and the mechanisms that regulate its perception. As we know since several years, the feelings, the emotions and the states of animation have an immense influence over the memory, which in several cases is already very delimitated and biologically foreseeable. The nervous ways, which register and regulate the feelings, emotions and states of animation, act modulating, through receptors, chains of specific enzymes in several cortical regions, among them the hippocampus and other areas linked to the memory, as well as other areas related to perception and control of the mentioned psychological variables, as the alert, anxiety and stress levels. They are the dopaminergic, noradrenergic and serotoninergic ways, which regulate the perception of, and the responses to, the attention, anxiety, stress, excitation and depression. The regulation of the activity of these ways through medications, used in the depression or anxiety treatment, is associated to cognitive changes in the perception, formation and evocation of the most different memories.

I had also stooped about features of Psychology that border the Philosophy, as Psychoanalysis in its different expressions; the one I've found closer to the current biological knowledge is the Freudian, the primigenial one. It is not accidentally that Freud foresaw, several times, that one day his concepts and entelechies would be explained by the biology and replaced by clear ideas of nervous functions, in some cases with well determined anatomic localization. Freud had a solid neurobiological education and published several works in this area, included a pioneer one to his time, about the effects of cocaine. But, in most recent moments, the named cognitive psychology has been developed

in an intense way, and has passed to be successfully used in the therapy of depression, and with clearer biological correlates.

I've read something about was written about the conscience, nature of dreams, things that were famous and that don't exist anymore. Among them the "déjà vu" phenomenon, which was seen as a form of epilepsy 30 years ago. Or the disputes about the "localization" of the unconscious, expected as an anatomical object, a substantive, and not as an adjective; important, but finally an adjective. The dreams are composed by memories internally evoked, mixed in a different form of the used during the vigil, and not expressed to outside through behaviors. The conscience is still indefinable through rigorous terms, and several people believe that under this name lots of things are hidden, among them the memories, the attention levels and other activities, properties and characteristics of nervous tissues. Nowadays we – who study the Neurosciences and see through this study how much we can advance and how much we ignore about human mind – are surprised that few years ago this kind of phantasmagoric ideas could existed.

For example, a little time ago, mind and soul are confounded. The soul is an abstract entity that body and mind use to communicate with God; the word does not have a meaning to the atheists. Believing or not in God, the human beings can have alert or opaque minds, and also brilliants, as the one of John Nash. Or sick minds, as the same one of John Nash. A schizophrenic, a victim of a post-traumatic stress or a depressed individual, has a sick mind; but his soul stays untouched, since it is necessary to postulate a God to understand the word soul, but not to recognize a mental sick. Christians, Jews and Mussulmans believe a mental patient can reaches the Heaven. The ones who believe in soul transmigration, as the Buddhists, Hindus and Spiritists, not even ponder the transmigration of mind; a newborn baby (or an animal) does not literally have where to lodge an adult mind.

The soul is not treated through therapeutic means, but the mind is, through antidepressant, antipsychotic or anxiolytic medications, and different kinds of psychotherapy. The mental functions can refer to more or less specific anatomical localization: to do, to remember and to extinguish memories is an important function of the hippocampus. The mind is a function of the body and depends on it to exist, to suffer and to manifest. The soul certainly does not have a corporal localization. The ones who believe in it think it appears and disappears with the body; i. e., the soul appears with the conception

and vaporizes with the death. The mind does not exist after the conception and several times disappear very before the death (the unfortunately human beings kept alive in a vegetative life through medical devices, for example).

The concept of spirit is very superposed to the one of soul; but, is several times applied to something abstract (spiritual life, active spirit, combative spirit), which differs from both soul and mind concepts. There is neither cerebral nor corporal localization of the spirit.

Personality, temperament and intelligence are other abstract entities whose definitions vary according to the author. To some psychiatrists, they are attributes or consequences of the mind; to several psychologists or pedagogues they are characteristics of an individual. Both definitions are used several times as a whole, superposed. There is one who thinks it is difficult or impossible to define what intelligence is, for example.

The memory and the mind

Certainly the human or animal mind depends on great part of the memory. The Italian philosopher Norberto Bobbio, dead this year, used to say "we are what we remember". I use to add "and also, we are we decide to forget". According to our habits and personality, we can choose never to forget the insults and aggressions, and in this case we will be inclined to bitterness, paranoia or resentment. We can choose to forget them completely, or also to repress them until they disappear from our pile of important memories, and in this case we will be several times undefended when they occur again. However, we can choose repress them or extinguish them until they are out of our pile of daily memories, but easily accessible when necessary; for example, when it is important to avoid new insults or aggressions.

Our mind has mechanisms to choose among these possible solutions. The repetitive use of one or another one take us to different routes related to our personality; and personality is not anything we get as a certificate in a defined age: we can change it during our life, as a product of the memories left by our experiences. The world is plenty of people who were "nice" and, as a consequence of a war, humiliation or misfortune, became resentful and dangerous. And other people who were resentful and bitterness and after a

success, a lucky event, the love of somebody, the love of many, the personal accomplishment, or any other reason (the oldness, for example, if it is kind) became tolerant, charitable and with a pleasant and fruitful dealing. The changes of personality, by the set of experiences we have, are many times unconscious and also involuntary. Other times they are conscious and a product of our judgement about what is more convenient to us in the society we live, and about our careful analysis of the characteristics of this society. I referred some lines above "animal or human mind". It is easy to verify changes of temperament in dogs or other pets or laboratory animals submitted to experiences of temper marked on previous paragraph. It is neither by accidental nor innate errors of genetic charge that there are dogs that never bite the hand give them food, and other ones always do it. The animals are also what they remember and what they decide to forget.

The emotions, the human mind and the memory

It is very present that, at each time of our life, at each minute, we are with some defined emotional or state of animation, and with defined sentimental state; and, both are very changeable. The states of animation, the changes of humor and the sentimental states cause, and are regulated by, very well defined cerebral ways, which use as neurotransmitters the noradrenaline, dopamine, serotonine and acetylcholine, each of them acting over well different receptors through the whole brain. Some of these states support the acquisition, consolidation or evocation of the most diverse kinds of memory, by the performance of the mentioned substances above one or another receptor in the cerebral regions that make or evoke memories. Sometimes, they can affect on opposite way the formation of short- and long-term memories; sometimes, oppositely, they affect these two kinds of memory in the same sense; sometimes, the effect of one of these ways prevails over the others; sometimes, these ways perform simultaneously with similar intensity. The very averse or emotive memories have their acquisition, and their subsequent consolidation, preferably regulated by the central noradrenergic ways, which foment their recording and, so, their permanence. We all remember where we were when we saw the Ayrton Senna's death on TV. Most of us will readily remember, years later, some happy event of our life, as for example a defined birthday, or our wedding party, or the birth of sons or

grandchildren. The fidelity of recording and its persistency are notoriously lesser when the memories are less important or remarkable. In the moment of evocation, a greater emotional level will be produced (with larger central discharge of noradrenaline) when evoking memories that are more "exciting" than another ones. Actually, the noradrenergic, dopaminergic and serotoninergic ways are also crucial and participate as important protagonists in the memory evocation, also in the cortical regions linked to the memory.

Besides these ways, there are hormones that are released on the blood by the hypophysis, suprarenal and other glands that deeply affect the formation and evocation of memories, and several times add their effects to the cognitive aspects of each memory, rendering them dependents of them. Thus, the memory passes to be a "learnt information" plus "the effect of the hormone released during the corresponding experience". The release of hormone passes to perform as more one component of memory, as more one conditioned stimulus, to put it in Pavlovian terms. It is easier to evoke this memory when we are again under the effect of this hormone (for example, to new experiences the β-endorphin; to very stressing experiences, the adrenaline and the adrenocorticotrophin or ACTH). It is named as "dependence of state", and it is common, mainly in stressing experiences. The state is which one put us the endogenous substance released. We will more recall the fear memories when we are in new fair situations; we will more recall sexual content memories when our sexuality is stimulated. This is because in each situation we secrete different and specific kind of hormones.

The human mind

However, the human mind embraces much more than the memory. In the mental functions participate the perception, the alert level, the selection of what we want to note, remember or learn, the decision about what we want to do or not to do, the will, the understanding, the feelings, the emotions, the states of animation and everything is embodied under the concepts of intelligence and conscience.

All these variables are strongly influenced by the memories and vice versa; but they are separated entities of the same with own mechanisms. In terms of cerebral areas there is some specialization, but also several superposition. The hippocampus, a structure of the

temporal lobe, and the subjacent cortex (enthorinal) are strongly linked to the building and evocation of memories. But they also register the alert levels and emotions, which regulate their mnemonic functions. The amygdala modulates and regulates the hippocampal performance in the averse or very alert memories; but, besides that, both structures, amygdala and hippocampus, regulate the secretion of hypophysiary hormones, which by their time also regulate the hormonal secretion of suprarenal, thyroid and sexual glands. As a result of the register of internal and external variables, which increases or decreases the alert and attention levels and cause or not anxiety or stress, somatic changes occur (in body), but they are not always related to the memory: hyperventilation, tachycardia, amplification of blood pressure, movements and secretions of gastrointestinal tube, secretion of bile, etc. It is obvious that all of these phenomena, by their turn, affect in a short- and long-term the nervous activity and, inside it, the mental functions, including the ones referred to the memory. There is a mind/body ratio that is the basis of the daily activity of both, and also of the pathology named psychosomatic; that is not only existent, but is one of the basis of the current Psychiatry and Medicine. The repetitive stress can alter some of mentioned physiological parameters (blood pressure, heartbeat, and gastric secretion) in an apparent way.

Thus, the human mind embraces several aspects and it is neither possible to study it or understand it, even in an elementary level, without considering all of these aspects. The mind acts on body, the body acts on mind, and neither of them is related to the soul or spirit.

We know a lot of new and important things about some aspects of human mind and its pathology, mainly about the perception and the memory. We also know how to treat this pathology better today than ten or fifty years ago. But there is a lot to learn.

The mind is, nowadays, even easy to describe in its most general aspects, but the mental function in each specific circumstance of our lives keeps on a mystery. How to foresee, facing a determinate circumstance, if there will be a remote crossing of information that leads us to react in a defined way? We are surprising beings, and this is the reason of our diverseness as individuals, and also of some of our similarity.